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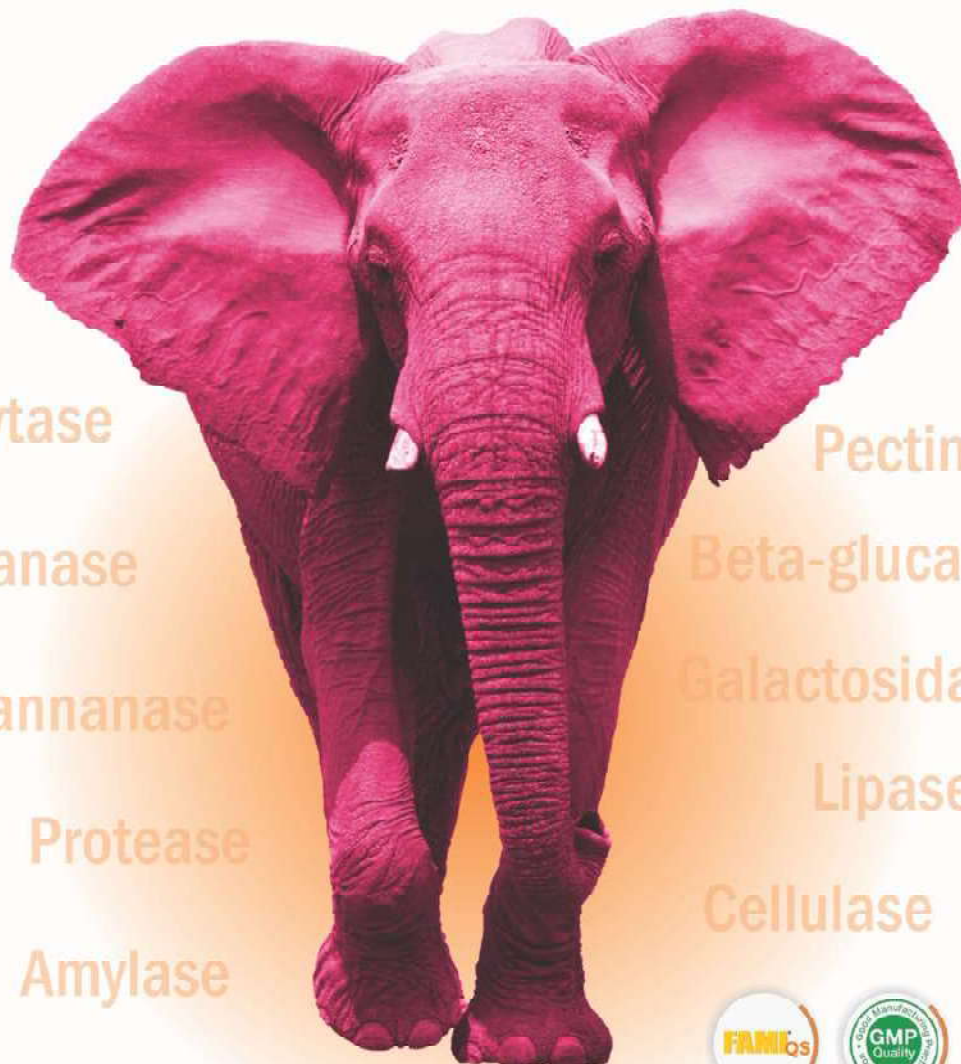
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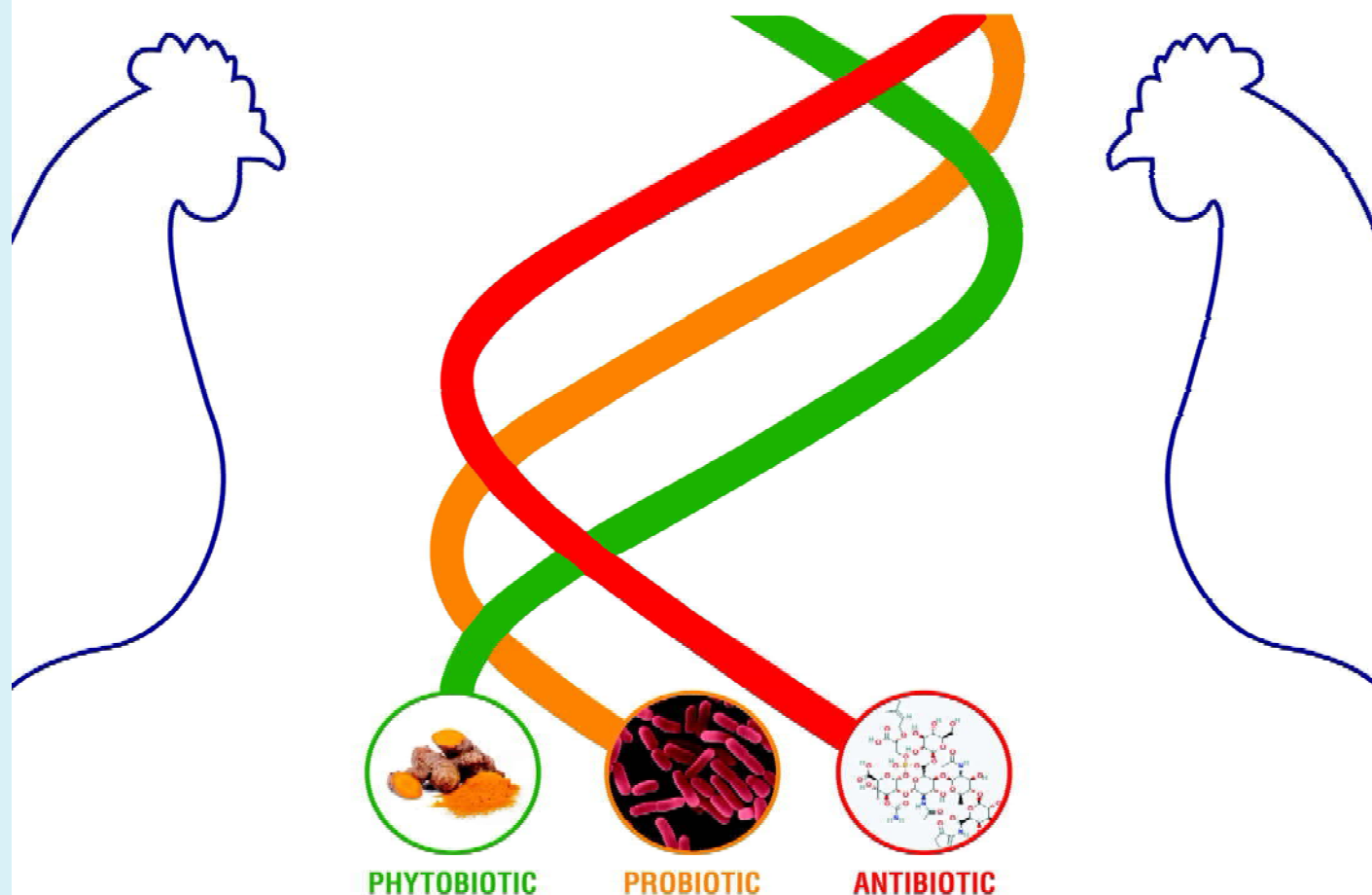


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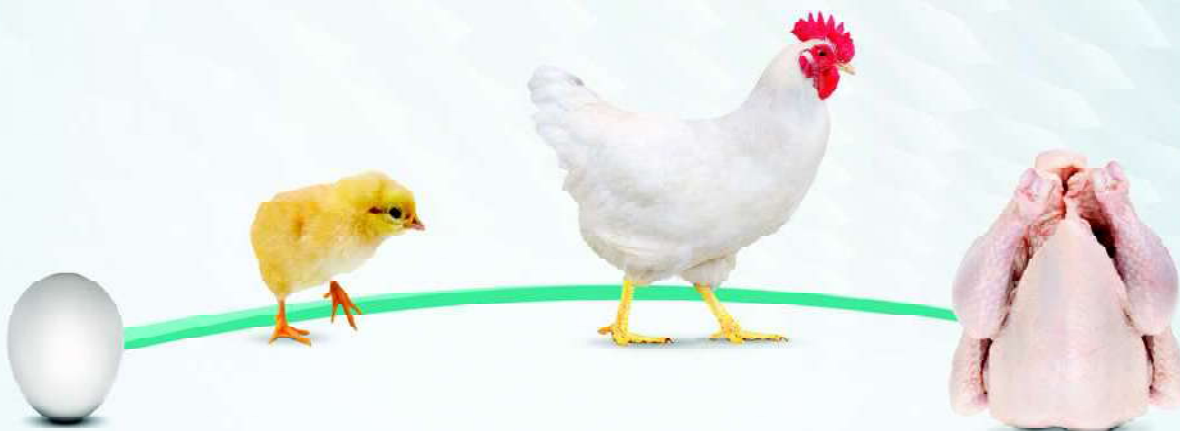
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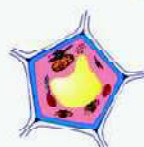
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Multiple Mycotoxin Syndrome - The Ever Increasing Threat

Dr. S. K. Maini, Vesper Group, Bengaluru.

Major problem with the Poultry, Livestock and Aqua industries today is the **Multiple Mycotoxin Syndrome or MMS**, a large variety of mycotoxins, that were not tested earlier, are now being studied, evaluated and recorded on regular basis but by a very few laboratories around the world. A 2017 – 18 Survey (Provimi-India) revealed more than 95 % of the samples tested were contaminated with Multiple Mycotoxins.

There are nearly **54 detectable mycotoxins**, that can be tested, most of these are not routinely tested by laboratories or regulated by the governments. Their incidence and co-existence is regularly increasing and causing damage to the production and performance of the animals and birds, while the experts in the Industry and Government/ICAR/Universities and private companies look the other way.

These Mycotoxins are here and will stay as long as the grains, their products and their by-products are being used for the feeding of the above mentioned types of animals and birds, in other words for ever.

The fact is more than 90% of the poultry and livestock problems today are directly or indirectly related to the presence of MMS, all other problems like the bacterial, viral, parasitic diseases, nutrition, vaccinations and disease control, management, hygiene and sanitation etc., together come to hardly 10 %, MMS is neither properly understood nor studied, and the market situation will not change for several years to come..

Local Vets, Poultry Advisors, Consultants and Farmers, when told of toxicity in feed as a reason for their problem, think only about the aflatoxins, Farmers are usually heard as saying I personally inspect every lorry of ingredients received and ensure its quality, Nutritionists give well balanced computer feed formulations for economy and

efficiency, Vets, Pathologist and laboratory people, who fail to properly diagnose the problem, always think and tell, its some viral infection and no further work is done, taking advantage of the situation the pharma companies keep launching and introducing new products, everyone makes money while the birds and the farmers suffer directly and the consumers of the products produced by these mycotoxin affected birds suffer indirectly.

For several years, mostly and only aflatoxins are being tested and reported, other mycotoxin testing has not been taken up by the laboratories for various reasons. My request to the Farmers and their Associations, and all other Associations connected with the Poultry Farming Business is to impress upon the Central Govt., the State Govts, and private laboratories to start testing the various mycotoxins in the feed and feed ingredients used and detecting their metabolites in the body fluids and blood, that cause damage to the birds and their performance and end up in the human food chain, for the safety of both the birds and the people who consume their products.

It is well understood that testing mycotoxins in the feed or the feed ingredients alone is not enough, it needs to be combined with the body fluids and blood analysis for better understanding and covering the total risk of the presence and damaging effects of the multiple mycotoxins present. Today validated and patented biomarkers are available to **test 36 different mycotoxins in blood** using the FTA cards, enhancing the accuracy and helping the detection of minute quantity of mycotoxins that will escape the normal test procedures or go undetected.

It is true aflatoxins and other mycotoxins, alone or in combination cause extensive damage to the GI Tract, liver, kidneys and metabolism of the birds and animals that consume it, by interfering in the nutrients uptake, suppression of the immune

system, cause various metabolic disturbances in the body, inhibit protein synthesis, cause inflammation of the gut epithelium, also cause damage to the functioning of the liver and kidneys, and are sometimes neurotoxic, are cytotoxic to cells and cause cell death, some are estrogenic and interfere in reproductive performance.

As Aflatoxins never come alone, they always are accompanied by few other type of mycotoxins, they work synergistically and do the damage, hence called MMS, Mycotoxins are secondary metabolites of fungi, mostly produced by the genera like Fusarium, Aspergillus, Penicillium, Alternaria etc., One mold can produce a variety of mycotoxins, that can be classified as Neutral, Acidic or Basic depending upon their physic-chemical properties, hence any one product, chemical or ingredient/item will not be able to give desirable results.

Till the establishment of laboratories with the latest state of the art analysing and detecting facilities for various mycotoxins, the Farmers, field Vets., and others need not worry, get the aflatoxin tested (these facilities are available in almost all places) and multiply it with a factor 3.5 during dry weather period and with a factor of 5.5 during wet weather period, new grains with higher than normal moisture and for places close to the coast where

humidity is high, that will give the **approximate mycotoxin load** of the feed that needs to be looked into and its remedial methods/products adjusted accordingly.

The strategy that works best in the absence of the elaborate testing for the mycotoxins, considering the above mentioned situation and available facilities, begins with purchase of good quality, dry grains with less than 12 % moisture, the storage area be sprayed with a product containing a mix of organic acids to check the growth of fungus on weekly basis, prevent rodents and insects in the storage and feed milling area as is done in the storage area's of FCI, and in the farms, use products that protect the health and functioning of the GI Tract, Liver and Kidneys of the birds, a good toxin binder, adsorber and absorber to bind the mycotoxins already produced, along with product for the biotransformation or enzymatic degradation of the chemically different toxic molecule, and a good probiotic, also support the immune system of the birds to ensure the vaccines used give the desirable results, simultaneously increase the inclusion level of trace minerals and vitamins by 25 to 30 % during this period, to ensure minimum damage to the flock and its performance and to get maximum returns.

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Introduction

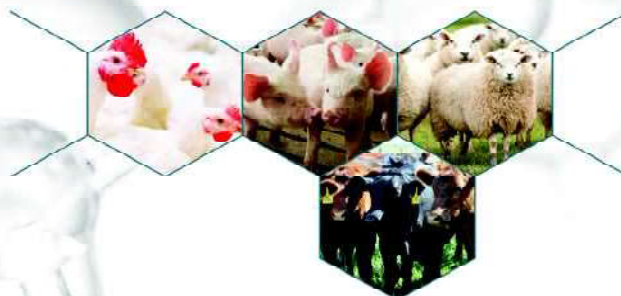
The world economy is experiencing an exceptionally strong but highly uneven recovery. Global growth is set to reach 5.6 % in 2021- its strongest post-recession pace in 80 years- in part underpinned by steady but highly unequal vaccine access. Growth is concentrated in a few major economies, with most emerging market and developing economies (EMDEs) lagging, while about 90% of advanced economies are expected to regain their pre-pandemic per capita income levels by 2022, only about one-third of EMDEs are expected to do so. In low-income countries, the effects of the pandemic are reversing earlier gains in poverty reduction and compounding food insecurity and other long-standing challenges. The global outlook remains highly uncertain, with major risks around the path of the pandemic and the possibility of financial stress amid large debt loads.

By 2022, global output will remain about 2% below pre-pandemic projections.

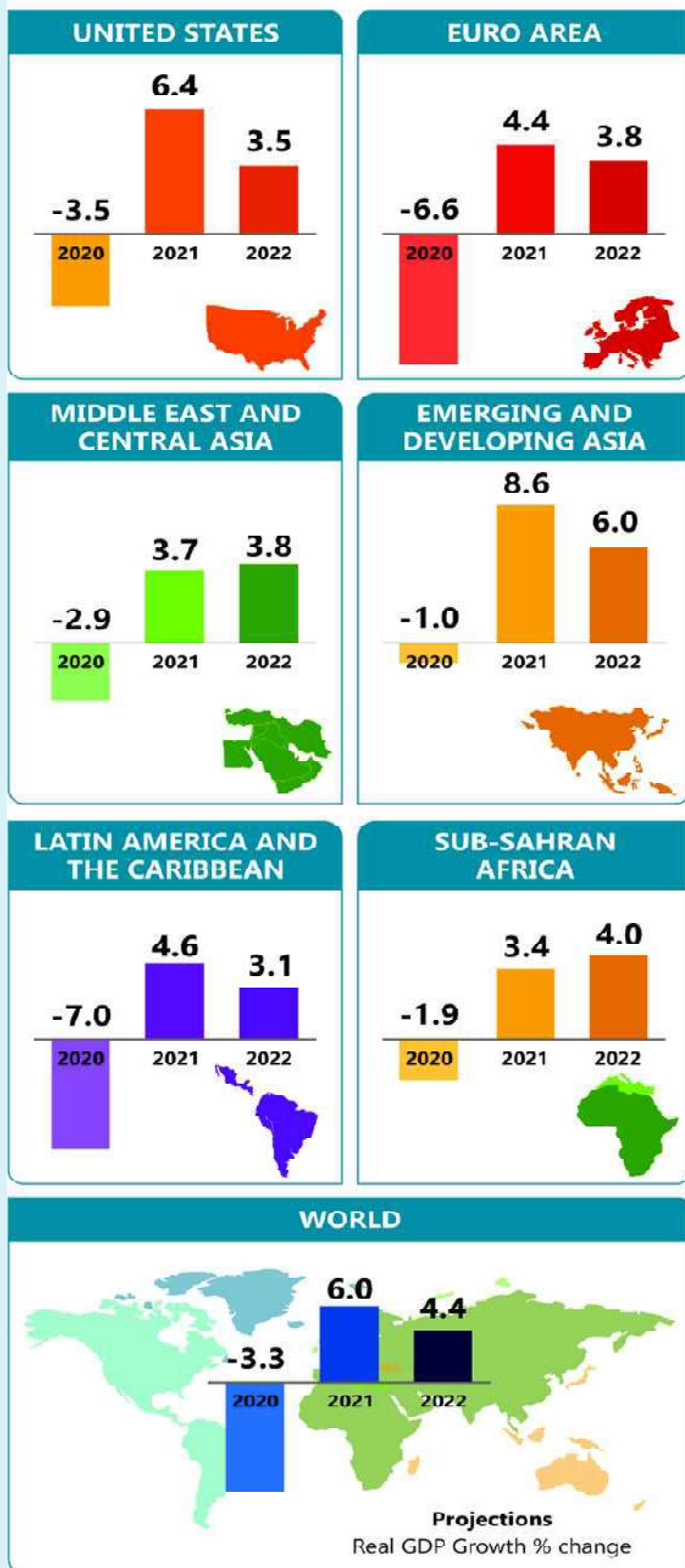
By 2022, output in all regions is expected to remain below pre-pandemic projections, weighed down by the ongoing pandemic and its legacies, which include higher debt loads and damage to many of the drivers of potential output.

The recovery is expected to be strongest in East Asia and the Pacific, primarily due to strength in China. In South Asia, India's recovery is being hampered by the largest outbreak of any country since the beginning of the pandemic. In the Middle East, North Africa, Latin America and the Caribbean, the pace of growth in 2021 is expected to be less than the magnitude of the contraction in 2020, while the tepid recovery in Sub-Saharan Africa will make little progress.

In most regions, risks to the outlook are tilted to the downside. All regions remain vulnerable to renewed outbreaks of COVID-19, which could feature variant strains of the virus; financial stress amplified by elevated debt levels; deeper-than-expected scarring from the pandemic; and rising social unrest, potentially triggered by rising food prices.



GDP % Growth Projection by Region



With 1.2 billion people and the world's third-largest economy in purchasing power parity terms, India's recent growth has been a significant achievement. Since independence in 1947, a landmark agricultural revolution has transformed the nation from chronic dependence on grain imports into an agricultural powerhouse that is now a net exporter of food.

Since the 2000s, India has made remarkable progress in reducing absolute poverty. Between 2011 and 2015, more than 90 million people were lifted out of extreme poverty.

The International Monetary Fund (IMF) cut India's GDP forecast to 9.5% for the Financial Year (FY) 2022. This is considerably lower than the IMF's previous 12.5% growth estimate for India.

Growth prospects for India for FY22, however, remain higher than all other major economies. As per the IMF, India's GDP is expected to do better than China and the United States.

To build back better, it will be essential for India to stay focused on reducing inequality, even as it implements growth-oriented reforms to get the economy back on track. The World Bank is partnering with the government in this effort by helping strengthen policies, institutions, and investments to create a better future for the country and the people through green, resilient and inclusive development.

China is forecast to grow 8% in 2021 and 5.6% in 2022. It said that China's prospects for 2021 are marked down slightly due to stronger than anticipated scaling back of public investment. And in the long term, demographic challenges in China and other emerging markets make it more pressing to reverse a persistent decline in long-term growth and build a more buoyant post-pandemic global economy.

The recovery is not assured until the pandemic is beaten back globally. Concerted, well-directed policy actions at the multilateral and national levels can make the difference in diminishing divergences & strengthening global prospects.



Economic Recession and Recovery of the two Powerhouses of Asian economy:-



What is the future of meat? Well, it should continue to be produced and consumed, just like it has been. Let's start from the start. Global population is expected to grow to 10 billion by 2050. 2.1 billion more mouths to feed from today. To meet the projected food demand the answer can hardly be keeping twice as many poultry, 80% more ruminants, 50% more cattle and 40% more pigs, utilizing the same level of natural resources as we currently do. Also, just producing enough food will not be enough. Feeding the world population adequately would also mean producing safe food that ensures nutrition security.

While demand for livestock derived foods is expected to plateau in high income countries, it will grow rapidly in Africa & Asia mostly due to rising populations and rising incomes. As income rises, people will increasingly consume more resource-intensive, animal-based foods.

World Meat Markets at a Glance and how will the economic recovery affect meats market?

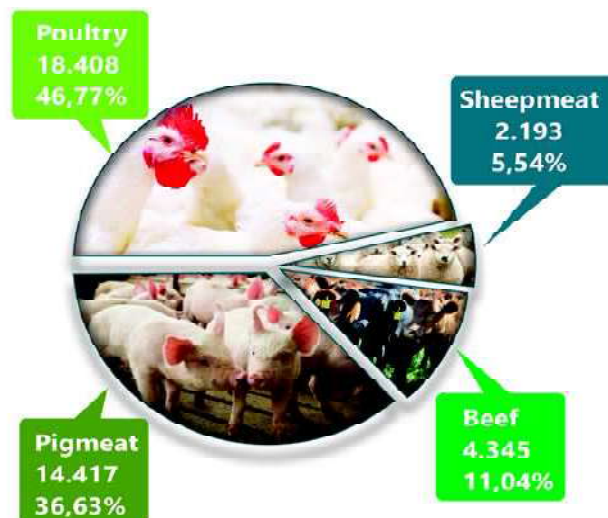
	2018	2019 estim.	2020 f'cast Nov	Change: 2020 over 2019
million tonnes (carcass weight equivalent)				%
WORLD BALANCE				
Production	342,2	339,0	337,3	-0,5
Bovine meat	71,6	72,8	71,9	-1,2
Poultry meat	127,3	133,6	137,1	2,6
Pig meat	120,9	109,8	105,3	-4,0
Ovine meat	15,7	16,0	16,0	0,2
Trade	33,8	36,2	37,6	3,9
Bovine meat	10,5	11,2	11,0	-1,7
Poultry meat	13,5	13,9	14,1	1,1
Pig meat	8,4	9,5	11,1	15,9
Ovine meat	1,0	1,0	1,0	-5,3
SUPPLY AND DEMAND INDICATORS				
Per caput food consumption:				
World (kg/year)	44,6	43,6	43,1	-1,3
Trade - share of prod. (%)	9,9	10,7	11,1	4,4
FAO MEAT PRICE INDEX (2014 = 2016 = 100)				
	2018	2019	2020 Jan-Oct	% Jan/Oct 2020 over Jan/Oct 2019
	95	100	96	-3,0

India will have 1.7 billion people by 2050, creating the most populated country in the world and with the most demand for food – an increase of a staggering 70%. Consumer spending will increase significantly, as more Indians move up the economic ladder. If you are in India, you are seeing the meat consumption is on the rise, and not in a small way.

Meat consumption has been shifting towards poultry. In lower income developing countries this reflects the lower price of poultry as compared to other meats, while in high-income countries this indicates an increased preference for white meats which are more convenient to prepare and perceived as a healthier food choice. Globally, poultry meat is expected to represent 47% of all the protein from meat sources in 2030, an increase of 2% points when compared to the base period. The global shares of other meat products are lower: beef (11%), pigmeat (36%), and sheep meat (6%).

The world production of meat of the main species will increase by 39,363 kt between 2021 and 2030

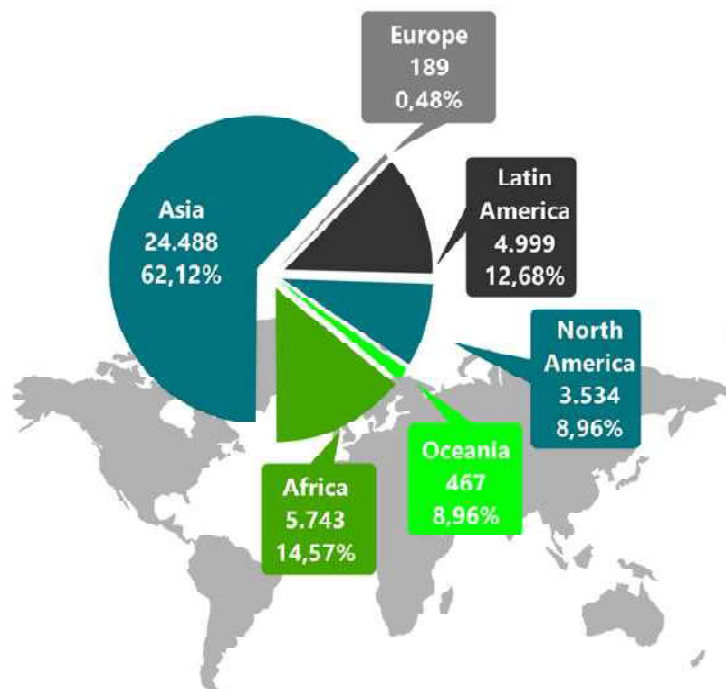
**World Meat Production Increase -
Δ in kt 2021-2030**



More than three-quarters of global agricultural land is used for livestock production today, which supplies one-fifth of the world's calories. Additionally, the domestication of livestock has altered the makeup of our ecological systems. Livestock production contributes to 14.5% GHG emissions globally. Livestock will continue to be raised in widely different ways around the world. By accounting for this diversity in live-stock systems and businesses and their various development trajectories the rising demand for meat, milk and eggs must be met sustainably.

Asia will account for 62% of the increase in world meat consumption in the next decade

Increase of Consumption of Main Meats between 2021 and 2030 World Total of 39,419 kt



Meat is big business and supports billions of livelihoods. Many view the aggressive push for alternative protein as an anti-meat agenda. Conventional protein production is fundamental to today's food system. A reduction in animal protein demand would reduce demand for feed crops like corn and soybean, altering the economics of production, putting producers under increasing pressure to diversify production.

Finally, this consumer preferences will evolve according to historical patterns. As a result, dietary preferences for lower meat consumption or for alternative protein sources are assumed to expand slowly and to be adopted by a small part of population concentrated mainly in high income countries, and therefore hardly affect meat consumption over the next decade. Nevertheless, while the competition from substitutes will increase, consumer choice will continue to be influenced by the nutritional content in meat as compared to protein substitutes.



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Together, beyond animal health

Scenario of Duck Production in India

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Introduction: The domestic ducks belong to the Kingdom-Animalia; Phylum-Chordata; Class-Aves; Order-Anseriformes; Family-Anatidae; Sub-Family-Anatinae; Genus-Anas and Cairina; Species- *A. platyrhynchos* and *C. moschata*; Sub-species-*A. p. domesticus* and *C. m. domesticus*. Almost all varieties of the domestic ducks (*Anas platyrhynchos domesticus*) are descended from the Mallard or wild ducks (*Anas platyrhynchos*) except the Muscovy duck (*Cairina moschata*). The domesticated ducks are mostly raised for eggs and meat purposes; however they are also kept for down, show and as pets. (Makram, 2016). The male and female ducks are known as drake and duck (hen). The drake and duck can be differentiated from external appearance, sound, behaviour, and internal anatomy. The drakes have generally more colourful feathers & bills, prominent curled feather near the tail, softer & harsher quack sound extended or elongated genital organ and are larger in size. However, the ducks have generally dull feathers and bill colour, absence of curled feather near the tail, distinctive loud quack sound, cone-like genital organ, and are smaller in size.

The total population of ducks in India is 33. 511 Million, which is only 3.93% of the total poultry population of the country. However, the percentage of increase in duck population than the previous census is more (+42.4) than the fowls (+16.6). The top ten states of ducks in India are West Bengal (37.87%), Assam (35.95%), Kerala (5.30%), Manipur (5.13%), Jharkhand (5.09%), Tripura (2.55%), Bihar (2.05%), Andhra Pradesh (1.07%), Odisha (1.05%) and Uttar Pradesh (0.65%). In India, the population of ducks in rural areas (95.98%) are more than the urban areas (4.02%). Further, both in rural areas and urban areas, ducks are mostly kept in backyard (97% and 96.89%) than in farm (3% and 3.11%) conditions. The top ten duck egg

producing states of India are West Bengal (51.52%), Assam (10.53%), Kerala (9.96%), Andhra Pradesh (6.24%), Bihar (5.61%), Tripura (4.77%), Jharkhand (3.13%), Manipur (2.09%), A & N islands (1.42%) and Uttar Pradesh (1.11%). The average egg production in ducks per layer per year is 168.23, which includes 146.05 in desi ducks and 190.46 in improved ducks (Anonymous, 2019).

Advantages of ducks farming

The advantages of duck production over chicken are long production year, large size eggs, early morning egg laying, hardiness to diseases, Suitable for integrated farming and different types of rearing system including backyard farming, survivability in moist land, easily tamed, can be maintained under minimum input system of management, etc (Meulen and Dikken, 2004; Panda *et al.*, 2005).

Important duck breeds in India

In India, the important exotic breeds are Khaki Campbell (KC), White Pekin (WP) and Indian Runner (IR). The origin of KC is United Kingdom. It is mostly kept for egg production. There are three colour varieties of KC ducks *i.e.* khaki, dark and white. The body weight (BW) of adult KC drake and duck are about 2.2-2.4 kg and 2.0-2.2 kg, respectively and the annual egg production is about 250-340 with egg weight of about 70 g and off-white colour (Panda *et al.*, 2005; Bais *et al.*, 2014; Giri *et al.*, 2014; Makram, 2016). The mean BW at 8th week of KC ducks are about 1165.47-1292.97 g (Padhi *et al.*, 2009; Padhi and Sahoo, 2012; Padhi, 2014; Joshi *et al.*, 2015). The age at sexual maturity or age at first egg production, age at peak egg production, age at 50% egg production and duck day egg production (DDEP) % of KC ducks are about 143-210 days, 180.5-196 days, 173-239 days and 53.9-60.7%, respectively (Rashid *et al.*, 1995;

Islam *et al.*, 2002; Nageswara *et al.*, 2005). Rashid *et al.* (1995) reported 67-92 egg production up to 300 days; while Islam *et al.* (2002) reported 120-140 annual egg production in KC ducks. The origin of White Pekin (WP) duck is China; however, now it is the most popular duck breed in United States and is known as Pekin or American Pekin or Long Island duck. WP ducks are mainly used for meat purpose and have about 2.84-3.40 kg BW in 8 weeks. The annual egg production of WP ducks during first year is about 160-200 eggs with large size tinted white eggs (Panda *et al.*, 2005; Bais *et al.*, 2014; Giri *et al.*, 2014; Makram, 2016). However, other researchers (Padhi and Sahoo, 2012; Padhi, 2014) have reported BW of white Pekin ducks 2462.05g at 8th week; and higher BW gain (g) between 4-6 weeks (979.04) than 2-4 weeks (570.37) and 6-8 weeks (623.03). The origin of Indian Runner (IR) is East India and Malaysia and is known as Penguin Ducks or Baly Soldiers. There are three varieties of IR ducks *i.e.* fawn & white, white and pencilled. The adult body weights of drakes and ducks of IR are about 1.6-2.2 kg and 1.4-2.0 kg, respectively. IR is an egg type breed and lays about 200-300 eggs per year with white egg colour (Panda *et al.*, 2005; Bais *et al.*, 2014; Giri *et al.*, 2014; Makram, 2016).

Besides, many indigenous or non-descriptive ducks breeds *viz.* Pati, Nageswari, Pati, Chara, Chemballi, etc. are available in different parts of the country. However, only Pati duck of Assam and Maithili duck of Bihar are registered under ICAR, New Delhi. The home tract of Pati duck is Assam. The adult BW of Pati drake and duck is about 1912 g and 1800 g, respectively, with average BW of about 1580 g. The age at sexual maturity is about 220-240 days, egg production is about 75-90 eggs per annum with egg weight about 60.5 g. (Rithamber *et al.*, 1986; Mahanta *et al.*, 2001; Islam *et al.*, 2002; Anonymous, 2021a, b). Nageswari ducks are distributed in the Barak Valley basin areas of India and are called as Nagi or White Breasted Nagi. The age at first egg production, hen day egg production and annual egg production per duck of Nageswari ducks are about 130-195 days, 55.67% and 140-204, respectively with large size (62.45 g) thick

shelled greenish blue colour egg (Islam *et al.*, 2002; Sharma *et al.*, 2002; Bhuiyan *et al.*, 2017). The adult BW, age at sexual maturity, BW at sexual maturity and annual egg production of local ducks of Andaman are 1100-1500 g, 183, 1257 and 110, respectively (Senani *et al.*, 2005). The 8th week BW of Desi ducks of Odisha is about 1032.64-1120.15 g (Padhi *et al.*, 2009; Padhi and Sahoo, 2012; Padhi, 2014). The adult male and female BW of Kashmir ducks is about 1.79 kg and 1.62 kg, respectively (Bihaqi *et al.*, 2014). The Kuttanadu ducks are known as Chara, Chemballi, etc. and are mostly suitable for nomadic type of duck farming. The Chara and Chemballi of Kuttanad, Kerala ducks attain more than 2.2 kg BW at 8 weeks of age and lay an average of 200 eggs per annum with egg weight of about 70 g. (Harikrishnan and Ponnuvel, 2012; Anonymous, 2021c). The indigenous ducks of Tamilnadu mostly include Kollam, Arni, Sanyasi, and Keeri; and the annual egg production, duck housed egg production and duck day egg production are 160-200 eggs, 13.78-50.94% and 25.37-54.40%, respectively with average egg weight of about 60-64g (Gajendran and Karthickeyan, 2009, 2011; Veeramani *et al.*, 214). The cross breeding between two exotic pure breeds (KC, WP, etc.) or between exotic pure breed with the locally available non-descriptive Desi (D) breeds is made for the enhancement of the production and reproduction potential of the ducks. The origin of Muscovy is South America or Brazil and is also known as Barbary Duck or quackless duck. Muscovy ducks are meat type and also available in India particularly in the hilly tract of Odisha and Assam. There are mainly two varieties of Muscovy ducks *i.e.* white variety and dark variety. The adult Muscovy drake and duck BW is about 4.5-6.4 kg and 2.2-3.1 kg, respectively. The age at sexual maturity and annual egg production of Muscovy duck is about 300-315 days and 50-60, respectively (Panda *et al.*, 2005; Bais *et al.*, 2014; Giri *et al.*, 2014).

Constraints of ducks farming

The major constraints of duck farming are unavailability of suitable germplasm, scarce in

scavenging areas and natural feed resources, drying of natural water bodies, excessive use of chemicals in crop fields, unavailability of adequate vaccines, poor marketing facilities, etc. There is need for development of breeding strategies for higher growth rate and egg production, different farming systems, nutrient requirements for different types of ducks, protocols for prevention and cure of duck diseases, increase in fertility and hatchability for easy supply of germplasms to the farmers and post harvest technology to produce various duck based products. Further, the locally available feed ingredients and alternate feed resources should be explored and evaluated to minimise the feed cost.

Conclusions: In India, there is ample scope for duck production to meet the demand of egg and meat of the country. Suitable duck breeds or varieties need to be developed for rural backyard duck farming. Comprehensive feeding packages for different types of ducks should be formulated for economic production of ducks eggs and meat. Scientific management practices should be evolved for reduction in labour input and clean egg and meat production. There is a need for establishment hatcheries and other infrastructures to promote duck farming at rural level for sustainable livelihood of the people.

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PRESS RELEASE



NECC appeal to the Government of India

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

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

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

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

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

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

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

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PRESS RELEASE

BIS in association with CLFMA organised Awareness & Implementation Webinar on “Indian Standards on Cattle Feed & Feed Ingredients”



AWARENESS & IMPLEMENTATION WEBINAR

INDIAN STANDARDS ON CATTLE FEED & FEED INGREDIENTS



On 16 March 2022, BIS in association with CLFMA OF INDIA organized an “Awareness and Implementation Webinar on ‘Indian Standards on Cattle feed and feed ingredients’ from 15:00hrs. to 17:00hrs.

Inaugurating the Webinar, Shri. Sanjay Pant, Deputy Director General (Standardization-II), BIS, emphasized the Role of Indian standards to strengthen the Cattle feed sector in India. He assured handholding by BIS at every step to support the Cattle feed industry in implementation and certification of Indian standards.

Ms Suneeti Toteja, Scientist E & Head, Food & Agriculture Department, BIS delivered Welcome & briefed on Programme Objectives.

Shri. Neeraj Kumar Srivastava, Chairman of CLFMA OF INDIA in his address to the participants, highlighted the need for effective implementation of Indian Standards both for Compounded Cattle Feed as well as Feed ingredients, in order to achieve the desired quality of the feedstuffs.

Dr. R. K. Singh, Ex. Director, Indian Veterinary Research Institute (IVRI), Izatnagar delivered Keynote address.

Ms. Nitasha Doger, Scientist D, Food & Agriculture Department, BIS, delivered presentation on the topic “Indian Standards on Cattle Feed and Feed Ingredients”. She briefed on BIS and its core activities in detail. She explained on the Scope of FADC, Standards Formulation Structure and its process, Animal Husbandry, Feeds &

Equipment, Sectional Committee FAD5, Indian Standards on Compounded Cattle Feeds, Important Requirements in Indian Standards on Compounded Cattle Feed, IS 2052:2009 Compounded Feeds for Cattle, Ingredients for Compounded Cattle Feed, Indian Standards on Feed Ingredients, Oil Cakes as Feed Ingredients, Grain By-Products as feed Ingredients, Feed Supplements, Requirements in Mineral Supplements, Agro Industries Bye Products as feed ingredients IS 14325, Bypass protein feed for cattle & requirements for by-pass protein feed, etc. Dr. V Sridhar - Senior General Manager - National Dairy Development Board (NDDB), Nagpur delivered presentation on the topic “New Developments in Indian Standards on Cattle Feed and Feed Ingredients”. Dr. V. Sridhar explained in detail on the Dairy Sector in India, challenges to continued growth, efficient feeding management, consequences of imbalanced feeding in early lactation, body condition score (BIS), efficient feeding management, present scenario for



reproductive disorders in India, importance of energy in reproduction, importance of protein in reproduction, role of vitamins and minerals, efficient feed management, revised BIS specification, Cattle Feed, Specification of DORB, Cotton Seed.

Shri. Shouvik Chanda, Joint Director, Scientist-D, BIS delivered presentation on the topic "Overview of BIS Conformity Assessment for awareness and implementation of Indian Standards on Cattle Feed and Feed Ingredients". In his presentation he covered BIS Act, BIS regulations 2018, Conformity Assessment Scheme of BIS, Overview of the

Certification Process, Overview of Information to be provided in Application, Product Certification, Process and guidelines, questions answered by products, manual essential features and advantages of BIS certification, essential features and advantages of bis certification, important development in product certification. BIS certificate on cattle feed and feed ingredients, etc. in detail. The registration for the Webinar was around 306 Nos & the Webinar was attended by around 256 participants with significant participation from micro and medium-scale industries.

PRESS RELEASE

Web Meeting of Maharashtra Co-operative Development Corporation, Pune along with CLFMA dated 9th March 2022 from 3:30pm to 5:30pm.

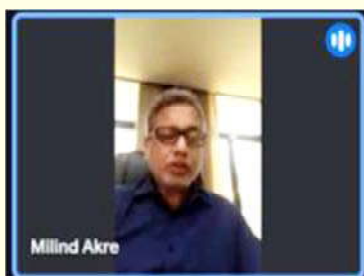
On 9th March, 2022 Maharashtra Co-operative Development Corporation, Pune along with CLFMA Organized Web Meeting from 3:30 pm to 5:30 pm.



CLFMA Chairman Mr. Neeraj Kumar Srivastava delivered the Welcome address and introduced CLFMA to the participants. He thanked all the participants, industry

colleagues, CLFMA Members, all eminent speakers, etc for joining the Web Meeting. Some

of the Eminent Speakers were Viz. Shri. Milind Aakre, Managing Director, MCDC who gave an introduction of Maharashtra



Cooperative Development Corporation. The Second eminent speaker, was Shri. Shrushri Siddhi Satpute, Regional Head Rest of Maharashtra and Goa of Receivables Exchange of India Ltd. (RXIL), Pune, who spoke on "Information of receivable discounting". The third and last eminent speaker



was Shri. Ravi Kantimahanti, Director, Agri 10 X, who delivered presentation on the topic "Digital Platform". Forum was opened for the Q & A Session, questions asked by the

participants were satisfactorily answered by the Speakers. The Web Meeting ended with the



Invitation For Web Meeting

We Maharashtra Cooperative Development Corporation, Pune Would like to invite the CLFMA Feed Miller Members for a web Meeting

Agenda of the Meeting

- Welcome and Introduction Shri Neeraj Kumar Srivastava
03:30 PM to 4:00 PM
- Introduction of MCDC Shri Milind Aakre
04:00 PM to 4:30 PM
- Information of Receivable Discounting Shrushri Siddhi Satpute
04:30 PM to 04:45 PM
- Information of Digital Platform Shri Ravi Kantimahanti
04:45 PM to 05:00 PM
- Question Answer Time
05:00 PM to 05:20 PM
- Vote of Thanks Smt Chandrika Venkatesh
05:20 PM to 05:30 PM

Link of Meeting

Meeting With CLFMA (Feed) Members

Wednesday, March 9 · 3:30 - 5:30pm

Google Meet joining info

Video call link: <https://meet.google.com/jxg-nitm-adh>



summarization and vote of thanks by CLFMA Executive Director, Ms. Chandrika Venkatesh. The Web Meeting in association with MCDC was appreciated by the participants. Almost 38 participants attended the Webinar. MCDC has shown interest to associate with CLFMA officially to connect CLFMA Feed Manufacturers with the FPOs' who are Maize growers.



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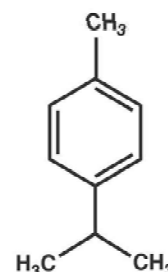
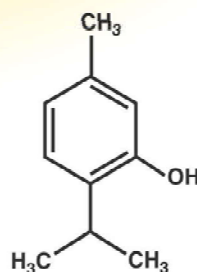
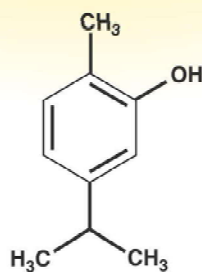


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PRESS RELEASE

Workshop on Feed Requirements for Livestock Sector: Opportunities and Challenges held on April 12, 2022 at Hyderabad

WORKSHOP ON FEED REQUIREMENTS FOR LIVESTOCK SECTOR: OPPORTUNITIES AND CHALLENGES

Date: April 12, 2022

Venue: Hotel Avasa, Hitech City Madhapur, Hyderabad

Organized by:



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

In India the livestock sector particularly poultry, cattle and aqua is growing at a rate of 8-10% and thereby the requirement of feed is also increasing, as it constitutes 65-70% of the production cost. In the recent past the industry has faced challenges with respect to availability and high cost of inputs viz. soyabean meal, maize etc. The potential feed requirement in the coming years is expected to increase further in view of changing food habits,

increase in protein demand etc. Technological interventions are urgently needed to ensure availability of enough quantities and good quality feed in cost-effective manner for the survival and growth of the animal husbandry sector.

In view of the above, All India Poultry Breeders Association and Biotech Consortium India Limited (BCIL) along with Animal Nutrition Society of India (ANSI) organised a knowledge sharing "Workshop

on Feed Requirements for Livestock Sector: Opportunities and Challenges” on April 12, 2022 at Hotel Avasa, Hyderabad. More than 80 participants from poultry industry, seed industry, scientists from research institutions and universities, nutritionists, officials from central and state animal husbandry department, media and other stakeholders participated in the workshop.

Dr. O. P. Chaudhary, Joint Secretary, Department of Animal Husbandry and Dairying, Government of India indicated that contributions of livestock sector in total agriculture and allied sectors has increased significantly. He indicated that the issue of supply and availability of soyabean meal and maize has been brought to the notice of the government as also price volatility. He assured that government is committed to support the livestock industry and several initiatives have been taken including permission to import GM soyabean meal. He appreciated this initiative and requested to send the recommendations to the department.

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

It was opined that all options including the use of GM crops and novel derivatives should be explored. They also stressed that adoption of GM crops be encouraged so as to increase the productivity which will bring benefit not only to farmers but also to the livestock farmers and industry. The industry



Suresh Chitturi - talking to media at the Feed Workshop

participants desired those imports may be permitted in the short term to meet the current demand and at the same time streamlining of policies and investments in research for facilitating use of GM crops for increasing productivity for tapping future potential.

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

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

Mr. Ram Kaundinya, Director General, Federation of Seed Industry of India and Dr. Paresh Verma, Executive Director -Bioseeds Division, DCM Shriram Limited, Hyderabad informed that India has been lagging behind in the area of GM crops despite highly successful experience with Bt Cotton, which turned India into second largest exporter of cotton in the world from an importing country. They highlighted several issues and sought urgent interventions from the Government to introduce well proven technologies in the country to meet the demand from livestock sector.

Senior representatives from US Grains Council and US Soyabean Council provided information on the

global scenario that included use of by-products such as DDGS as a source of high protein and high phosphors and also introduced tools such as nutritional calculator for improving the nutrition for the livestock industry.

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

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



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

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Immune responses of Poultry to Ranikhet (Newcastle) Disease Virus

Dr. K.L. Revappa, Dr. S.K. Maini, Dr. Suresh Sharma,

Vaccine Division, Vesper Pharmaceuticals, Soladevanahalli, Bengaluru – 560 107.

Introduction: Despite the advances made in the diagnosis of and vaccination for Newcastle disease since it was first described in 1926, the disease continues to negatively impact poultry producers by infecting birds worldwide.

Newcastle disease (ND) ranked as the fourth most important disease in terms of the number of livestock units lost for poultry species behind highly pathogenic avian influenza, infectious bronchitis, and lowly pathogenic avian influenza.

While humoral immunity from vaccination is critical to ND control, another important aspect, that is not a new concept, but is often neglected, is the differences in resistance to ND due to genetic variation..

Genetic resistance to ND has been observed with various lines within the breed of chickens and turkey and among breeds of chickens and ducks. It is important to note that each Newcastle disease virus may be better adapted to grow in one species versus another, like what is seen with PPMV – 1 (Pigeon NDV) strains in chickens.

While improving genetic resistance to ND through breeding more resistant strains appears to be feasible, logistically it is very difficult due to the involvement of multifactorial components. Perhaps when the efficiency of producing transgenic birds is improved more disease resistance breeds can be used for this purpose.

Innate immune response to NDV (Newcastle disease virus) Infection in poultry.

The innate immune response comprises factors that exist prior to the advent of infection, and are capable of exclusion or rapid response to microbes. The primary components of innate immunity of poultry are (1) physical and chemical barriers, such as feathers and skin, epithelia and production of

mucus; (2) phagocytic cells, including macrophages and natural killer cells; (3) Complement proteins and mediators of inflammation; and (4) cytokines. Overall, the innate immune response to virus infection is an immediate reaction designed to control and inhibit virus growth and spread, and aid in developing pathogen-specific protection through the adaptive immune response.

After the infection, the virus is first recognized by host sentinel proteins, including TLR (toll – like receptors) and NOD (nucleotide – binding oligomerization domain proteins), proteins producing rapid signaling and transcription factor activation that lead to production of soluble factors, including interferon and cytokines, the mediators of innate immune response, designed to limit and contain viral replication.

NDV of low virulence stimulates a lower innate immune responses compared with virulent NDV (VNDV) that induces significantly higher levels.

Antibody response to infection and Vaccination with NDV

In addition to bio-security and culling of infected birds, vaccinations are critical component to control ND. International and national vaccination control policies will depend on the factors affecting the sector or poultry production, while keeping with the OIE regulations (OIE, 2012).

The goal of vaccination is always sterilizing immunity, however, that has not yet been achieved with NDV Vaccines. At best, NDV vaccines induce an immune response that reduce or completely prevents clinical disease and mortality from ND, decreases the amount of VNDV shed into the environment, and increases the amount of virus needed to infect the vaccinated bird.

Mass application of live vaccines is often used due to the lower cost and faster application time compared to having to administer individual vaccines to each bird of a flock. The lentogenic B1, and Lasota vaccine strains of low virulence are commonly used worldwide, and can provide protection against VNDV if the vaccines are viable, administered correctly to healthy birds and time is allowed for an appropriate immune response to develop prior to the challenge virus. Unfortunately, conditions in the field are often less than optimal with mass application potentially reaching as little as 53% of the flock when the route of administration is spray and 60% when the route is through the drinking water.

Inactivated vaccines are often administered to layers and breeders to provide long lasting high antibody titers that can be passed to offspring to provide maternal immunity.

Because all NDV are in one serotype any NDV (avirulent) strain can be used as a vaccine and all vaccines should prevent clinical disease and death from ND. However, some studies have demonstrated that vaccines formulated with strains more similar to the challenge virus can decrease the amount of challenge virus shed in oropharyngeal swabs from vaccinated birds and potentially decrease the number of birds that shed virus.

In the chicken, IgM, IgY (avian IgG) and IgA antibodies are produced as part of the immune response. Antibodies are detected at the site of infection and in the blood starting at six days after infection or live virus vaccination and peaks 21-28 days after infection.

Antibodies neutralize the ND virus particles by binding and preventing attachment of the virus to the host cells.

Approximately 30% of the IgY and 1% of the IgM and IgA antibodies present in the hen's plasma will passively transfer to the offspring to provide maternal immunity and if the NDV antibody levels are high enough can provide protection until the levels fall below a protective level.

Herd immunity is another beneficial consequence of a successful vaccination programme as it provides some protection to suboptimal – vaccinated or unvaccinated birds in an otherwise well vaccinated flock. However, this outcome is only achieved with ND when greater than 85% of the flock have haemagglutination inhibition (HI) antibody titers greater than 8 after two vaccinations. Field results suggest that only birds with HI titers greater than 16 after multiple vaccinations will survive VNDV challenge as 66% of the flock succumbed with titers less than that more commonly, HI levels of 32 or higher are what are typically thought of being protective.

Cellular immunity induced by NDV

Cell-mediated immunity (CMI) is specific adaptive immunity mediated by T lymphocytes and has been suggested to be an important factor to the development of protection in chickens vaccinated against NDV and contribute to viral clearance.

The subsets of T-lymphocytes, including cytokine – secreting CD4+ T helper cells, and CD8+ cytotoxic T lymphocytes (CTL), constitute the principle cells of the CMI response. Unlike antibody measurement via ELISA or HI, testing for CMI is more labor intensive and requires more skilled procedures.

Cell-mediated stimulation following NDV infection is detected as early as 2-3 days post infection. More recent studies also confirmed CMI responses to NDV may be detected shortly after vaccination with a live NDV vaccine.

The results of research indicate that the antibodies (HI antibodies) are the key modulators of protection, but that CMI likely continues to decrease viral shedding through target killing of NDV infected cells.

Studies have compared CMI responses between birds receiving live versus inactivated NDV vaccines. Results indicate that CMI derived from Inactivated NDV vaccines take longer to develop and are not as robust as that from Live vaccines.

The virulence of the virus appears to play a role in CMI stimulation. It has been demonstrated that an earlier and shorter CMI induced by a less virulent

NDV vaccine strain, compared to stronger and longer CMI mediated by a more virulent vaccine strain. Further the more virulent strain persisted longer in the bird and therefore was able to increase magnitude and duration of CMI.

To conclude, NDV specific antibodies remain the primary mechanism of protection against virulent NDV, the contribution of CMI are important considerations in the face of field challenge.

As New vaccine strategies are employed to protect poultry against VNDV it appears obvious that combining both arms of the adaptive immune response provide the best protection of birds and decrease the risk of transmission to susceptible birds.

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Place	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
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Ongole	140	140	142	142	144	146	148	148	150	150	150	150	150	145	145	145	145	145	145	147	147	147	147	147	147	142	142	142	142	139	131	131
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	140	140	142	142	144	146	148	148	150	150	150	150	150	145	145	145	145	145	145	147	147	147	147	147	147	142	142	142	142	139	131	131
	140	140	142	142	144	146	148	148	150	150	150	150	150	145	145	145	145	145	145	147	147	147	147	147	147	142	142	142	142	139	131	131

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● **Product Pack:** 200gm Packet ● **Carton Size:** 200gm x 50

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Functional amino acids in gut health and microbiota balance in chicken

A.Kannan¹, M.Shanmugam², S.P.Yadav³ and S.Jayakumar³

^{1&3}Principal Scientists, ^{2&4}Senior Scientists

ICAR-Directorate of Poultry Research, Hyderabad. Email:akanna72@gmail.com

Introduction: Poultry do not require protein and require only amino acids present in protein. There are 22 amino acids in body protein and all are physiologically essential. However, some of the amino acids are synthesised by the animal in sufficient quantities to meet the requirements and are not dietary essential. Some amino acids are not synthesised or synthesised in very low amounts in the animal cells. These AA are called dietary essential amino acids which must be supplemented in diet. The essential amino acids for poultry are lysine, methionine, threonine, tryptophan, isoleucine, leucine, histidine, valine, phenyl alanine and arginine. In addition some consider glycine to be essential for young birds. In most practical poultry diets lysine, methionine and threonine are the critical amino acids.

However, recent studies show that some of the nonessential amino acids also play important roles in multiple signalling pathways. As a result of this function, they may be involved in intracellular protein turn over and gene expression regulation. Emerging evidence also suggests the role of these amino acids in growth, development, reproduction and gut health. Recently, Wu (2010) proposed the new concept of functional amino acids. He defined functional amino acids as "*the amino acids that regulate key metabolic pathways to improve health, survival, growth, development and reproduction of organism*". Supplementation of these functional amino acids may result in improvement in growth or prevent diseases.

Overview of gut health and its importance

Faster growth rate, better feed efficiency and lower disease incidence are the three important goals of modern broiler production. For attaining these goals

maintaining a healthy gut is very important. The ability of the GI tract to perform all the normal physiological functions and maintenance of intestinal homeostasis is important for healthy gut. The gut also should withstand all the challenges from infectious and other non-infectious stress for maintaining and improving the performance of birds.

Major components of gut health are effective digestion and absorption of food, a diverse microbiota, appropriate structure and function of gut barrier and effective function of immune system (**Figure 1**). The gut epithelial lining must provide effective barrier function which reduces exposure to toxins and infectious agents but allow absorption of nutrients. Gut health during healthy state and diseased state are given in **Fig 1**.

Nutrient absorption is one of the primary roles of the intestinal mucosa. Intestinal tract in chicken consumes 20 to 45% of oxygen utilised in the whole body due to higher rate of turnover of cellular protein. More than 70% of resident immune cells of the body also present in the intestine. Poor gut health in broilers has been associated with increased inflammation, malabsorption issues and infection. The overview of the four important components of healthy gut are given in detail below.

a. Nutrient digestion and absorption and function of gut epithelial barrier

Gut consists of a single layer of epithelial cells and underlying lamina propria, along with immune cells and muscularis layers. The secreted enzymes and nutrient transporting molecules present in gut help in nutrient digestion and absorption. Surface of epithelium which controls these processes is a function of the villus height and villus height & crypt

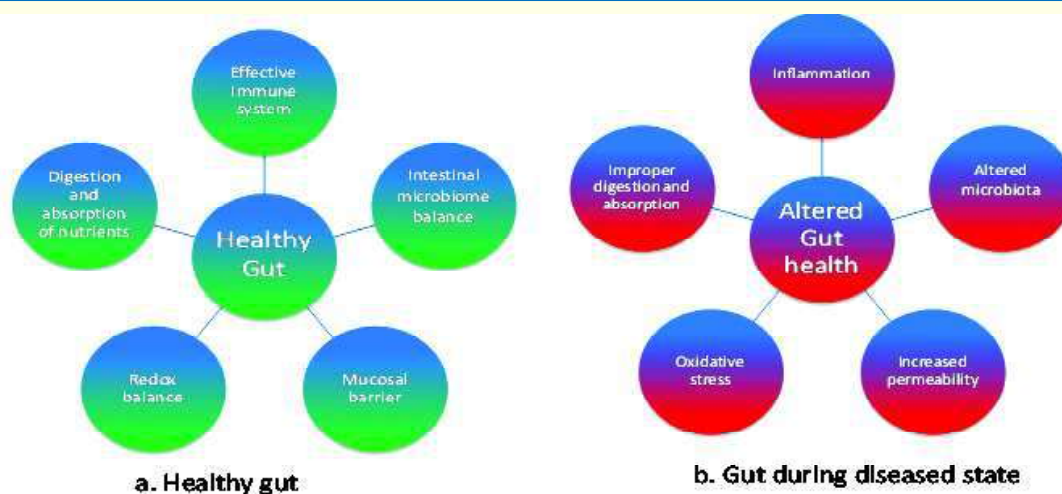


Fig 1. Gut health during healthy state and during diseased state

depth ratio. Alteration in villus height during any infectious or non-infectious challenges, affect the enzyme secretion and nutrient digestion and absorption. Mucus layer thickness, expression of genes encoding for mucins and number of goblet cells are important indicators of epithelial barrier function.

b. Immune system

Mucosal layer, epithelial cells, antimicrobial peptides and immune globulin A are the components of gut immune system. Mucosal layer prevents gut microbes to penetrate into the intestinal epithelium. During disease challenge high secretions of immunoglobulins and anti-inflammatory cytokines to maintain immune homeostasis and protect against harmful pathogens.

c. Oxidative stress

During aerobic cellular metabolism reactive oxygen species (ROS) are generated and if there is no antioxidant defense, ROS may alter macromolecules leading to cellular and tissue damages. Vitamins, total glutathione and antioxidant enzymes play crucial role in the response to remove these harmful ROS.

d. Microbiome balance

The gastro intestinal tract of chicken is densely populated with complex microbial communities (bacteria, fungi, protozoa, virus etc.). Bacterias are

the dominant microbes. Interactions between the intestinal microbiome and the host have significant impact in nutritional and health status as well as overall performance of birds. Competitive exclusion of pathogens, immune stimulation and production of short chain fatty acids, vitamins etc. to improve host nutrition are the important benefits these microbiome. Microbial balance is maintained when there is highly diversified population with high concentration of beneficial organisms and low levels of pathogenic ones.

Influence of functional amino acids on gut health

Historically the amino acids are studied for protein synthesis, muscle development and not for their role in immunity or metabolism. Recent research suggest that AA also work as precursors for essential molecule in the immune defense, antioxidant system cell signalling and gene expression (Wu, 2010).

Arginine, glutamine, threonine and tryptophan play important role for optimum gut health in broilers (Chalvon-Demersay et al., 2021). These amino acids act as energy sources, precursors of proteins and various functional molecules. These AA also alter gene expression and phosphorylation of protein. These AA also play a role in gut microbiome balance and diversity. Effect of these amino acids in improving gut health are summarised in **Fig 2**.

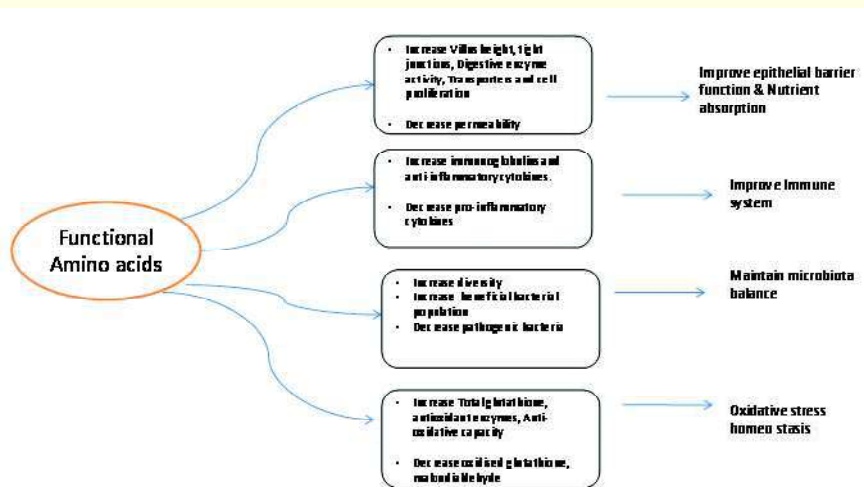


Fig 2. Role of functional amino acids in improving gut health

for scavenging reactive oxygen species and free radicals.

Influence of functional amino acids on gut microbiome balance

Some AAs especially tryptophan and arginine, can regulate intestinal microbiome composition and function. In broilers, arginine supplementation reduced the gut injury and normalised the ileal microbiome of *Clostridium perfringens* challenged chickens.

Glutamate or glutamine is used as substrate for ATP production in chicken gut epithelial cells. Threonine, which is present abundantly in mucins play important role in barrier function of epithelium (Bortoluzzi et al., 2018). Glutathione play important role in scavenging of free radicals thereby reduce oxidative stress in organisms. Glycine, glutamate and Cysteine are the three important AAs used as precursor for production of glutathione. When sulphur containing AA free diet is fed to monogastric animals, the concentration of glutathione decreases as compared to feeding well balanced diet indicating the compromised status during antioxidant stress challenges.

In pigs, role of leucine, glutamate, arginine and glycine in modulating gene expression and protein phosphorylation is well documented (Chalvon-Demersay et al., 2021).. In broilers, addition of dietary arginine reduces the disruption of intestinal mucosa by increasing mRNA expression genes of jejunum which are related to kinase activity during coccidial vaccine challenge.

Lysine, methionine and threonine supplementation in broilers improves the expression of AA and glucose transporters leading to improvement in nutrient absorption. Sulphur containing amino acids may also play a role in expression of a transcription factor in liver which controls the expression of the antioxidant enzymes and production of scavengers

Tryptophan and sulphur containing AA also play important role in maintaining optimal microbial population in stressed conditions. During transportation of chicken, tryptophan supplementation maintain optimum microbial population by reducing pathogenic organisms like *Clostrida*, *Enterobacteria* and increasing the population of beneficial bacteria like enterococci and lactobacilli.

In a study, Kumar et al (2019), observed that supplementation of total sulphur containing amino acids increased the alpha diversity of microbial population and microbial metabolism related to carbohydrate, lipids, AA and nucleotides.

Short chain fatty acids (SCFA), especially acetate and butyrate, are regulators of gut health and these are by products of microbial metabolism of carbohydrates. Amino acids serve as precursors for productions of acetate, butyrate and other similar SCFAs. Moreover, gut microbiota metabolise AA and release metabolites and these metabolites work as molecular intermediates between the microbial population and the host. Metabolites released from tryptophan also improve gut health (Roager and Licht, 2018). Some SCFAs like isobutyrate, 2-methyl butyrate and isovalerate produced in AA metabolism also play important role in gut health (Chalvon-Demersay et al., 2021).

Conclusions

A healthy gut is important for chicken to achieve maximum production with higher feed efficiency and low disease incidence. Functional AA improve GI tract health of animals due to their role as energy and functional molecule precursors, modulators of gut microbiome and signalling molecules. Under challenging conditions like withdrawal of antibiotics and stress conditions, these AA may be indispensable for improving health, production and welfare of chicken. In future, functional AA may be used as feed additives to improve gut health and production in poultry.

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National Conference on Poultry & Poultry Products “Creating an Economically Viable and Sustainable Poultry Industry” 21st March, 2022



Dr. Sanjeev Balyan, Hon'ble Minister of State of Fisheries, Animal Husbandry & Dairying Government of India

Under the aegis of CII and supported by Huvepharma SEA, the 'National conference on poultry & poultry products-creating an economically viable and sustainable poultry industry' was held in New Delhi on 21st March, 2022.

The conference could not have come at a better time for the embattled industry. It has been besieged with seemingly never-ending crises-COVID, bird flu, escalating feed ingredients and logistics cost, so on and so forth. The conference, the first in person, sit down one since COVID hit, served as a platform for the industry to come together, and collectively make representations to the government, policy makers to help alleviate problems faced by the industry.

In attendance were Dr. Sanjeev Kumar Balyan, Hon'ble Minister of State of Fisheries, Animal Husbandry and Dairying Government of India, Mr. Atul Chaturvedi, Secretary Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry & Dairying, Dr. O. P. Chaudhary Joint Secretary (NLM) Department of Animal Husbandry & Dairying, Government of India, industry titans and stakeholders of the industry.

A major and recurring theme in the proceedings was the size of the world population, which is projected to get to 10bn by 2050. More importantly, India will become the MOST populous nation in the world. Feeding this population is going to be a challenge considering the limitations in resources. Food production will have to be doubled, but it will have to be grown in the same amount of land, with lesser amount of water and probably with more expensive inputs. There were more questions than answers-questions to which this conference has paved the way for finding answers.



The industry was in agreement that the 'consumer' will emerge as a key consideration and newest stakeholder in the industry. Why? COVID has changed the manner in which consumers shop. Gone is the preference of making a visit to the wet market. It is replaced with clicking 'buy' on the phone, laptop, only after having checked all the label claims. Stores like Nandu's are a manifestation of what the consumers want-hygiene, traceability of meat, processing, storage conditions- the full experience.

Today, chicken is the most common meat served in Indian homes. With improving purchasing power, more disposable income, better awareness associated with benefits of animal protein consumption- its going to hold this position undisputed. So, what do we need to do today to ensure that we satisfy the burgeoning demand of tomorrow?

The panellists emphasised and re-emphasised about the nature of conducting poultry production- it has to be sustainable. Available resources cannot be utilised indiscriminately, with disregard to the ecosystem. Poultry production should be regenerative. And for it to be such requires a large-scale collective effort centred on small-scale farmer success and system-level collective impact.

Dr. Sanjeev Kumar Balyan, Hon'ble Minister of State of Fisheries, Animal Husbandry and Dairying Government of India, in his address mentioned that only if there is a farmer, there will be poultry. Integration of small and marginal farmers with poultry production is an area that needs attention. There is definitely a case here for better hand holding and integration of marginal, small & medium farmers with poultry production houses.



Mr. O. P. Singh, Managing Director, Huvepharma



Mr. O. P. Singh, Managing Director, Huvepharma



Hon'ble Guests



Audience



Speaker's of the Day



Speaker's of the Day



Speaker's of the Day



Audience

The need to guarantee feed safety was highlighted by several speakers. We are ultimately, what we eat...so if what we eat is not fed safe food, it makes its way up the food chain, creating a considerable risk to human health. It would serve the industry well to embrace the 'food safety culture'-a top down heightened consciousness towards feed safety.

This redirected the focus to food processing. Currently, in India, about 5% of poultry meat is sold in processed form, of which only about 1% undergoes processing into **value-added products** (ready-to-eat/ready-to-cook). The poultry processing industry in India is expected to expand at a CAGR of ~ 12% between 2018 and 2023. For this statistic to become a reality, food processing needs to be pushed and encourage for better promotion of chicken protein. Presentations were made by stakeholders showcasing the various capabilities currently available and those under development for the India market.

There is growing pollution from poultry waste. Poultry operations generate a lot of waste throughout various stages of production. The waste needs to be treated, processed and disposed off or repurposed to limit littering and pollution. Poultry waste management solutions were presented and discussed.

Disease management in poultry was also discussed aggressively. Especially because Avian influenza and other diseases continue to wreak havoc with the industry, eroding its value.

There has been a lot of evolution and innovation in enhancing poultry production efficiencies. One of the sessions deliberated on technology adaptations and innovations leading to increased quality of feeds in terms of nutrition, technology towards environmental control farms, hatchery technologies, automation in processing, innovations in packaging and integration of safety and hygiene that are the essential requirements to produce healthy and nutritious poultry products. The way forward is automation-to limit the degree of human involvement and thus, error, leading to better output. The world is looking to India to claim its rightful place on the world stage as a leading producer of poultry and value added products. As a low hanging fruit, Indian chicken meat should be promoted to targeted countries where meat is imported on a large scale. The panel discussed the deterrents in import of Indian poultry output. Perception, lack of image building and networking, sluggish lobbying were identified as some of the culprits. The answer to

which was that the industry should put up a united front. This was reiterated by Mr. Bahadur Ali, Founder and Managing Director IB Group. He said there is strength in numbers, better influencing and bargaining power too.

Mr. Ali expressed his concern about the volatility in pricing of corn and soya, which is upending the cost of production.

Mr. Ram Reddy, Managing Director Sneha Farms requested for FTAs with targeted countries which will act as a stimulus for exportability of hatching eggs, table eggs, value added chicken meat and egg powder.

A key announcement that was made by Dr. Sanjeev Kumar Balyan Hon'ble Minister of State of Fisheries, Animal Husbandry and Dairying Government of India, was to reactivate the Poultry Advisory Committee. This committee would serve as the conduit between the ministry and industry and function as an effective tool to compile efforts being made by both sides for the betterment of the industry.

Mr. Atul Chaturvedi Secretary Department of Animal Husbandry & Dairying, Ministry of Fisheries, Animal Husbandry & Dairying and Dr. O. P. Chaudhary Joint Secretary (NLM) Department of Animal Husbandry & Dairying, Government of India, both shared how various government schemes have fared and what new ones have been launched.

The conference presented an opportunity to look beyond problems-tap into opportunities that would shape the future of the poultry industry. As it turned out, there are limitless possibilities and untapped potential. One thing is for certain-the stage is set for explosive growth of the industry in the decades to come.

The principal sponsor of the conference was Huvepharma SEA. Huvepharma is a Bulgaria based multinational specialising in veterinary healthcare with an experience of over 50 years. They are the world's first carbon neutral approach company, revolutionizing the way poultry industry does business. To know more about Huvepharma please visit www.huvepharma.com.



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• 5-10 gm/pig/day

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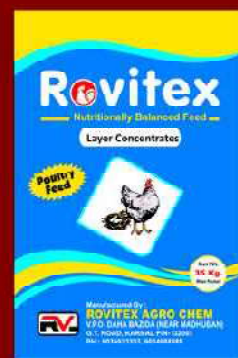
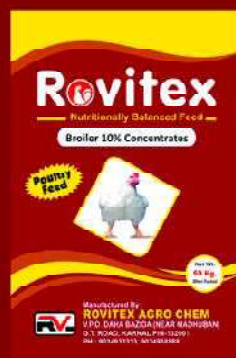
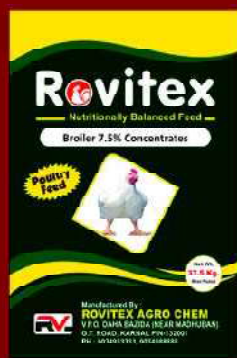
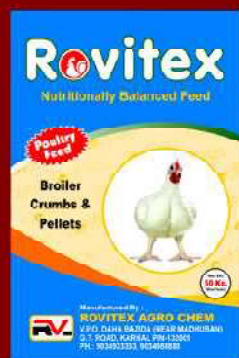
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- ❖ Broiler 3.5% Concentrates
- ❖ Broiler 2.5% Concentrates
- ❖ Broiler 1.5% Concentrates

Layer Concentrates:

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- ❖ Layer 10% Concentrates
- ❖ Layer 25% Concentrates
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Managing gut health, a multi-factorial approach

With the understanding of gut health growing every day, managing it properly has become more and more of a priority. One key point has been clear since the beginning: gut health is a complex multi-factorial concept, and as such improving and maintaining it requires a holistic approach. Luckily the tools to do so have evolved as well, and new methods emerge frequently.

BY BEN DEHAECK, DVM GLOBAL PRODUCT MANAGER ANTICOCIDIALS AND TER VAN DER VEKEN, GLOBAL PRODUCT MANAGER PROBIOTICS AT HUVEPHARMA

Two major gut health issues are coccidiosis and necrotic enteritis (NE). Although caused by different pathogens, there definitely is an interaction between the two challenges: the presence of coccidiosis is often an important predisposing factor for the development of NE. Because of this link, it is very likely that the current rise of NE problems in the field is linked to suboptimal coccidiosis control. The practical implication is that both challenges should be dealt with at the same time. However, monitoring the actual coccidiosis pressure is difficult and a challenge in itself. It is therefore crucial to have a good and validated coccidiosis control programme in place, including the use of anticoccidials and product rotation in order to maintain their efficacy.

The mentioned coccidiosis program above ties in with having a good NE control program, of which supporting gut integrity and its microbiota is a crucial part. With this goal in mind, probiotics form an interesting tool to achieve this, especially as the pressure on the use of classic antimicrobials is increasing. Depending on the strain selected, these viable beneficial bacteria are able to influence the gut and its microbiota in multiple ways. An example of this is minimising the risk of pathogens, such as *Clostridium perfringens*. A well-known probiotic to do so is B-Act®, which has proven its efficacy under many different conditions.



The probiotic recently obtained an extension to its current European approval for use in broilers and pre-laying birds, by adding turkeys and minor avian species to the list of registered species. The specific *Bacillus licheniformis* strain in B-Act® has a unique mode of action, based on the concept of competitive exclusion. This goes a lot wider than just competition for space and nutrients – even though *Bacillus* spp. are often only given credit for this. For example, its capacity to produce antimicrobial compounds should not be neglected. This unique mode of action allows the probiotic to mitigate challenges efficiently, which would have otherwise led to severe NE and dysbacteriosis. Keeping this and the possibility to combine the probiotic with Coxiril® (chemical anticoccidials) in mind gives B-Act® a competitive advantage, especially in those situations where producers might worry about not applying ionophores. Approaching gut health and its management as a multi-factorial challenge and dealing with it in a similar fashion is the way forward. This includes using multiple products to work on the same challenge from different perspectives, ensuring various aspects of general gut health effectively.

The well-known probiotic B-Act® recently obtained an extension to its current European approval for use in broilers and pre-laying birds, by adding turkeys and minor avian species to the list of registered species.

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Specialist for Biogas at the IFAT in Munich WELTEC BIOPOWER to Showcase Solutions for Generating Energy from Waste-water and Organic Waste

At this year's IFAT, the world's leading trade fair for environmental technologies in Munich, Germany, WELTEC BIOPOWER will present its efficient digestion procedure for the industry and municipalities. From 30 May to 3 June, the biogas specialist's sales team will be present in hall A4, stand 217, to answer all questions concerning the establishment and upgrade of anaerobic energy plants.

The range includes well-proven procedures from the field of biogas technology. The high savings potential of these procedures is demonstrated by the modernisation of the municipal sewage treatment plant in Bückeburg, Germany, which caters to a population of 33,000. Since the transition to anaerobic sludge stabilisation by WELTEC BIOPOWER in 2021, the plant operation under full load has become much more profitable. As the general contractor, WELTEC was in charge of the setup of the wastewater treatment for the city's sewage treatment plant. Apart from the earthworks, the establishment of the fundamnet and the electrical wiring, the work comprised the construction of a new static sludge thickener, an engine room for the cogeneration power plant, the control and pump station as well as a stainless-steel digester with a gas storage roof.

Thanks to the anaerobic wastewater treatment, the sludge volume has dropped by 35 percent, resulting in a significant reduction of transport and disposal costs. Furthermore, the produced digester gas can now generate some 465,000 kWh of electricity at full load. The operator is thus able to cover about 40 percent of the power demand and save two thirds of the electricity costs. „In view of the new greenhouse gas reduction targets and the surge in



As the general contractor, WELTEC was in charge of the setup of the wastewater treatment for the Bückeburg sewage treatment plant. Apart from the earthworks, the establishment of the fundamnet and the electrical wiring, the work comprised the construction of a new static sludge thickener, an engine room for the cogeneration power plant, the control and pump station as well as a stainless-steel digester with a gas storage roof.

energy prices, an anaerobic stage is an economically attractive solution for wastewater treatment operations, which also benefits from public funding", explains Jens Albartus, Director of WELTEC BIOPOWER. He adds: „Ultimately, a combination of wastewater treatment, heat and power generation and climate protection enables more efficient operation, especially of small and medium-sized sewage treatment plants."

A WELTEC plant in Piddlehinton, South West England, demonstrates how these goals can be reached with organic waste. Here, a mix of food leftovers, expired food from supermarkets and biowaste is fed into the biogas plant. Apart from

the substrate mix, the technical approach, too, is special. Prior to the feed-in and shredding, an unpacking machine separates the food from the packaging.

Another efficiency bonus: The exhaust heat from the cogeneration power plant is sold to a nearby feed producer, which also uses most of the power. The biogas plant operator supplies the surplus electricity directly to the power grid, thereby generating further income. The digestate from the process is in conformity with the requirements of UK industry standard PAS-100. Therefore, local farmers are able to use it as fertiliser. Following a capacity expansion in 2014 from 20,000 t of substrate input a year to 30,000 t, WELTEC BIOPOWER installed an additional digester and storage tank as well as GasMix mixing systems and a separation unit. A plant with these features would also support a switch to biomethane production.



A WELTEC plant in Piddlehinton, South West England, demonstrates how these goals can be reached with organic waste. Here, a mix of food leftovers, expired food from supermarkets and biowaste is fed into the biogas plant. Apart from the substrate mix, the technical approach, too, is special. Prior to the feed-in and shredding, an unpacking machine separates the food from the packaging.

At the IFAT trade show in Munich (A4.217), the WELTEC experts will be pleased to provide further information on various treatment and biogas technologies.



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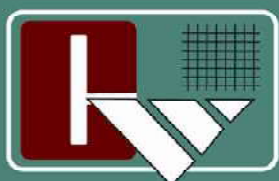
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NATIONAL EGG CO-ORDINATION COMMITTEE

DAILY / MONTHLY EGG PRICES DECLARED BY NECC AND PREVAILING PRICES AT VARIOUS PRODUCTION CENTRES (PC) AND CONSUMPTION CENTERS (CC) APRIL 2022

Name Of Zone / Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Average	
NECC SUGGESTED EGG PRICES																																
Ahmedabad	400	400	400	400	400	405	410	420	425	430	435	435	435	435	435	400	400	400	400	400	400	380	380	380	380	385	388	390	390	390	404.27	
Ajmer	351	331	331	331	331	334	351	365	365	365	358	350	340	340	340	330	325	320	330	330	315	300	300	300	303	307	313	324	319	300	-	331
Barwala	333	333	333	333	333	337	355	368	370	370	370	350	350	350	327	320	310	318	315	315	300	295	297	302	307	307	300	285	-	-	328.72	
Bengaluru (CC)	400	400	400	400	400	400	405	425	435	440	445	450	455	455	455	435	435	435	420	405	405	390	375	375	375	375	375	380	390	390	413.5	
Brahmapur (OD)	378	380	380	383	386	396	420	428	440	450	450	450	450	450	425	400	400	400	400	400	375	375	330	330	330	337	347	347	340	391.63		
Chennai (CC)	430	430	430	430	430	430	430	450	460	470	470	475	475	475	475	460	460	460	460	460	460	435	435	400	400	400	400	400	410	410	440.83	
Chittoor	423	423	423	423	423	423	423	443	453	463	463	468	468	468	468	453	453	453	453	453	428	428	393	393	393	393	393	403	403	403	433.83	
Delhi (CC)	350	350	350	350	350	350	365	380	390	390	390	390	380	380	380	380	365	350	340	340	340	340	330	330	330	330	340	340	330	310	354.67	
E.Godavari	365	365	365	365	365	368	393	403	413	423	423	423	428	428	400	400	380	380	380	360	360	360	325	325	325	327	332	332	332	315	372.67	
Hyderabad	350	350	350	350	355	360	373	385	395	400	405	410	415	415	385	385	385	385	355	340	320	320	320	300	305	310	315	320	320	-	357.86	
Ludhiana	333	333	333	333	333	333	339	361	367	367	367	359	356	350	350	338	335	328	321	321	321	311	301	301	301	304	308	308	308	-	331.72	
Mumbai (CC)	415	415	415	415	415	420	425	435	450	460	465	470	475	480	480	450	450	450	450	420	405	385	385	385	385	385	385	385	385	385	424.17	
Muzaffarpur (CC)	390	386	386	390	390	390	393	410	429	429	429	429	414	410	405	405	400	386	381	376	371	367	367	357	357	357	357	362	362	-	390.28	
Mysuru	400	400	400	400	400	400	420	440	440	440	445	450	452	457	457	457	435	435	435	420	407	407	390	375	375	375	375	382	394	-	416.55	
Nagpur	350	360	360	360	360	365	375	375	400	421	421	421	390	375	375	370	370	370	375	375	375	370	350	340	340	340	350	360	360	-	371.48	
Namakkal	400	400	400	400	400	400	420	420	435	435	445	445	445	450	450	430	430	430	430	430	410	410	380	380	360	360	360	380	380	380	409.83	
Patna	390	386	386	386	386	386	390	405	419	419	419	415	410	405	405	400	400	386	381	371	371	367	362	357	357	357	357	362	362	-	386.1	
Pune	400	400	400	400	400	400	402	405	420	440	450	455	455	460	465	450	450	450	450	430	410	390	370	370	370	375	375	375	380	380	414.73	
Ranchi (CC)	400	400	400	400	400	400	400	410	429	429	429	429	414	414	410	410	390	390	381	381	371	371	367	357	357	367	367	367	367	-	395.17	
Vijayawada	365	365	365	365	365	368	393	403	413	423	423	423	428	428	400	400	380	380	380	360	360	360	325	325	325	327	332	332	332	315	372.67	
Vizag	380	380	380	382	382	385	400	410	420	430	430	430	430	430	430	430	400	400	400	400	375	375	375	375	375	375	375	375	375	375	397.8	
W.Godavari	365	365	365	365	366	368	393	403	413	423	423	423	428	428	400	400	380	380	380	360	360	360	325	325	325	327	332	332	332	315	372.7	
Warangal	352	352	352	352	357	362	375	387	397	402	407	412	417	417	387	387	387	387	357	342	322	322	322	302	307	312	317	322	322	-	359.86	
Prevailing Prices																																
Allahabad (CC)	381	381	381	381	381	386	395	400	410	410	410	405	400	400	400	395	390	386	376	376	367	367	362	362	362	362	362	362	357	-	384.14	
Bhopal	355	355	355	355	355	355	355	375	382	410	410	410	385	385	370	360	360	360	360	350	350	350	350	345	345	345	345	320	345	-	361.97	
Hospet	360	360	360	360	360	360	360	365	385	395	400	405	410	415	415	395	395	395	395	380	365	365	350	335	335	335	335	340	350	350	373	
Indore (CC)	350	350	350	350	355	355	375	385	385	390	390	380	370	370	360	360	360	350	350	350	345	340	340	340	345	345	350	350	325	-	357.76	
Jabalpur	365	365	365	365	357	361	365	387	402	408	408	408	395	375	375	375	345	348	350	350	350	335	335	335	335	340	342	342	342	-	362.76	
Kanpur (CC)	371	371	371	371	371	371	381	395	400	400	400	400	386	386	386	386	371	371	371	371	357	357	362	357	357	357	357	357	357	-	374.07	
Kolkata (WB)	420	420	420	420	420	423	473	475	480	480	480	480	480	480	450	450	445	445	445	430	420	420	400	390	390	395	400	400	400	390	434.03	
Luknow (CC)	403	393	393	393	393	393	393	400	417	417	417	417	417	417	410	410	400	400	400	400	400	400	400	390	390	390	390	390	380	-	400.79	
Raipur	355	355	355	355	355	355	355	380	390	400	405	400	395	395	395	395	370	370	370	360	345	345	345	345	345	335	335	338	343	343	-	366.69
Surat	410	410	410	410	410	415	420	430	445	455	460	460	460	460	440	410	410	410	410	410	410	400	400	400	400	400	400	400	400	400	418.5	
Varanasi (CC)	400	400	390	390	390	390	400	417	417	417	417	417	400	400	400	400	383	367	367	373	373	367	357	357	357	367	367	367	357	-	386.69	



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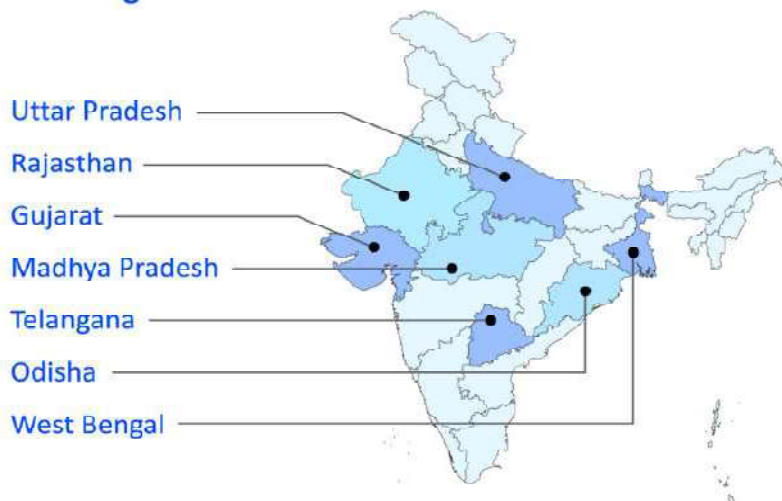
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Better Nutrition Through Biotechnologies

Block the Summer Shock by Nutritional Intervention

by **Dr Pooja Bhardwaj**, MVSc (Pharmacology & Toxicology) - pooja.oct24@gmail.com

One of the greatest challenges to production facing poultry farmers in the India is heat stress and the strain that it causes to the bird. Climatic conditions in India are such there is intense radiant energy for an extended period of time. Poultry create a large quantity of metabolic heat and accumulate additional heat from radiant energy. Heat production and accumulation, coupled with compromised cooling capability because of environmental conditions, causes heat load in the bird to increase to the point that body temperature rises, intake declines and ultimately the bird's productivity drops. Birds are 'heat stressed' if they have difficulty achieving a balance between body heat production and body heat loss



Dr Pooja Bhardwaj

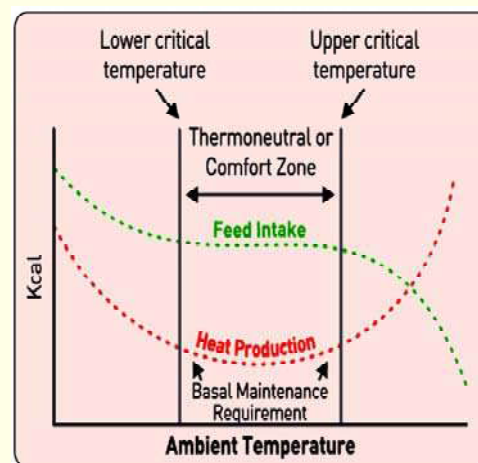
In this article we will discuss about nutritional management of heat stress.

Improved nutritional management practices.

1) Feeding Strategies for Heat Stress

During hot weather birds reduce feed consumption resulting in deficiency of some nutrients. Manipulating the ration such as increasing energy intake, should be done carefully and technically. Avoid using rancid fats & amino acids balance must be maintained by using vegetable protein sources rather animal protein. Measure feed intake per day/per week

regularly & adjust the level of critical nutrients according to intake. To encourage feed consumption during heat stress various feeding strategies can be employed like:



a) Feed Restriction: Feed restriction can be done to reduce the heat load when the ambient temperature is high. Gratification for 2 hours prior to the warmest period during the day to fix the FCR and reduce mortality without affecting body weight. One option is to complete the morning

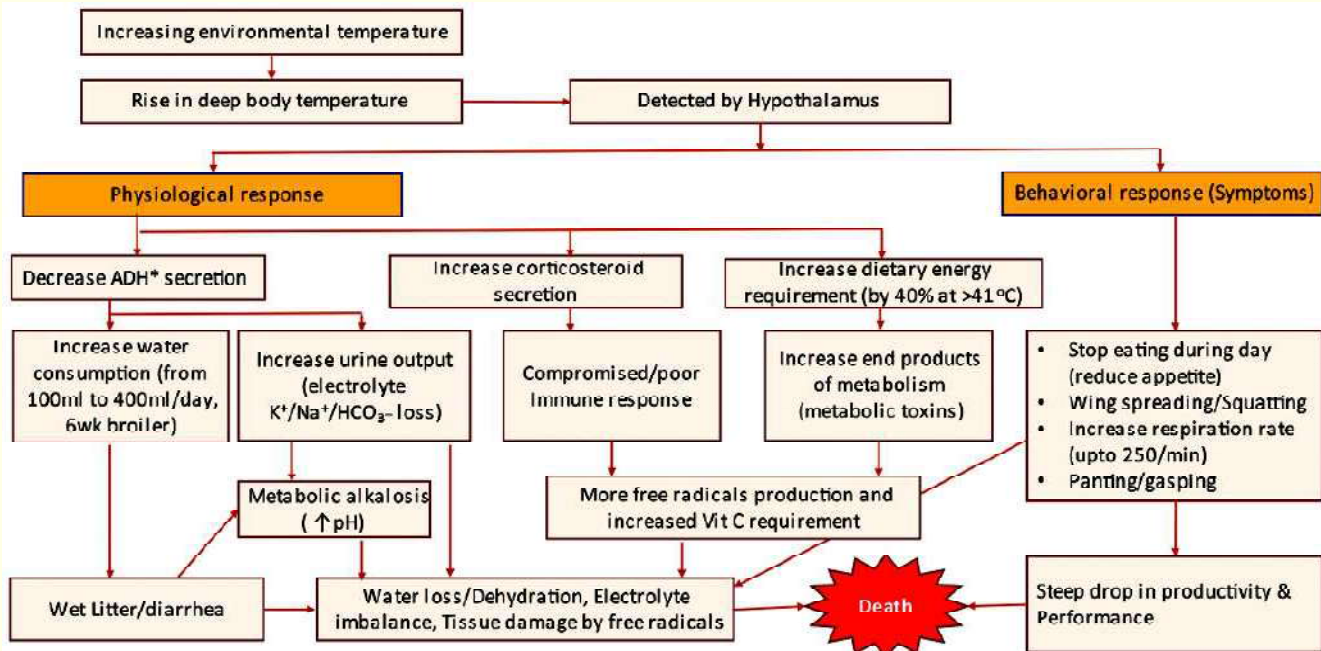
feeder cycle by 10:00 am. An additional advantage with this is the availability of calcium in the digestive system during shell formation at night and in the early hours of the morning so-called 'midnight snacks' are a good tool to give hens extra feeding time in the cooler parts of the night. A good strategy to take an unnecessary heat load off the birds is to withdraw feed 8 hours prior to anticipate time of peak temperature. One third of the daily feed ration should be given in the morning and two thirds in the late afternoon. Feeders should run empty at least once a day

Management of heat Stress

The strategies to minimize the effects of heat stress can be achieved by:

- 1) Genetic modification by developing heat - tolerant breeds
- 2) External environment management:-
 - a) Improved nutritional management practices.
 - b) Physical modification of the environment [shading, cooling)

Consequences of Heat Stress

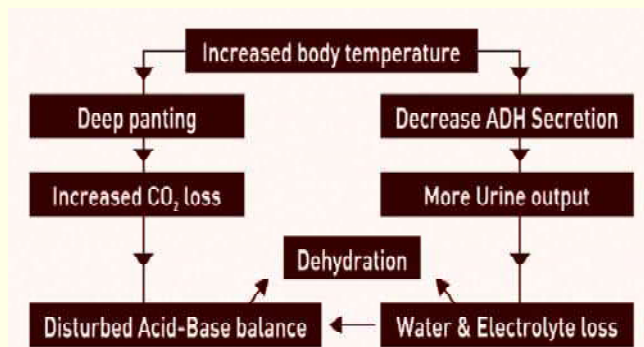


to enhance the appetite and to ensure that the fine particles of the feed [premixes, vitamins etc.] are consumed.

b) Free choice feeding: Poultry can adjust nutrient consumption by the need to select appropriate feed ingredients physiological needs. Feed with the rough shape particles will have a longer retention time in the digestive tract so will generate heat slower during digestion. In addition, feed consumption as

coarse particle encourages more water consumption than regular feed so that it can reduce the heat load to facilitate heat dissipation in evaporation. The feed texture should not be too fine. Oil/Molasses can also be used to avoid “dusty” feed and to increase palatability.

c) Wet feeding:

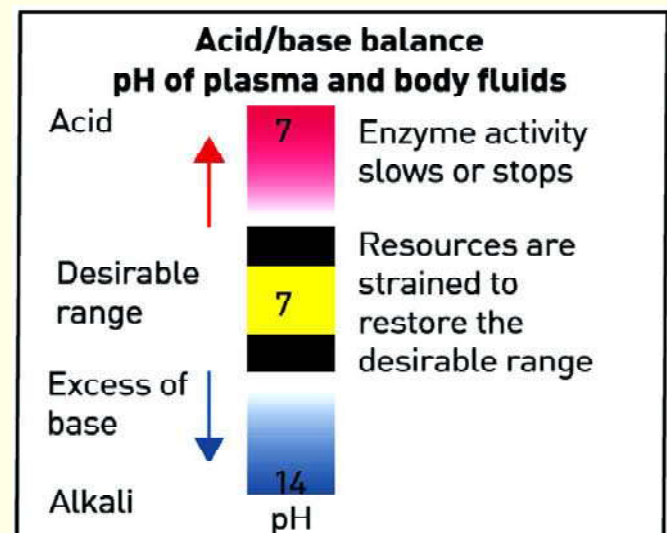


As shown in flow chart Prolonged panting causes increased CO₂ loss & changes acid base balance in body. Birds' metabolism also gets affected due to respiratory alkalosis & dehydration.

To overcome this imbalance acidifier & electrolyte can be supplemented in feed as wet feeding. This will also create optimal conditions for enzyme activity & digestion so that feed can easily digested and absorbed, which will improve body weight gain and FCR.

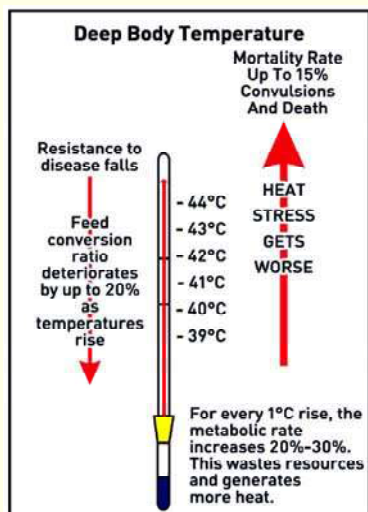
Advantage of use of acidifier for wet feeding

- Liquid acidifier moistens the feed without compromising the sterility of feed
- Acts as feed sanitizer
- Improves palatability of feed. Thus, improves voluntary feeding
- Improves digestion & absorption of feed by balancing the gut pH



d) Special Feed formula for summer

Increase dietary protein: In hot weather the need for maintenance energy is much lower than at an ideal temperature and birds respond by less feed consumption. With the reduction in consumption, there is often a



reduction in intake of essential nutrients such as protein, essential amino acids, minerals and vitamins, which can result into reduced body weight and egg production. So, to ensure feed intake of essential amino acids & vitamins, it is recommended that protein content of feed should be increased by 1-2 %. However, there is a possibility that

increasing dietary protein might be detrimental to the bird as more heat is produced during its utilization and that may well overload heat dissipation mechanisms (i.e., panting, blood circulation etc.)

Therefore, improving overall balance of the diet by amino acid supplementation appears to be more effective than increasing protein intake.

Increase nutrient density of the diet: To increase the energy content of the diet during hot weather, it is always recommended the use of supplemental fat. Dietary fat increases palatability of feeds and reduces the amount of heat increment that is produced during its utilization in the body.

Feeding calcium carbonate or oyster shells: Calcium content of the diet should be adjusted according to anticipated level of intake, such that each bird can consume the right amount per day. For laying hens, top dressing feed with oyster shell or large particulate limestone is beneficial and has the added advantage of stimulating feed consumption. Limestone and oyster chips may be provided at a rate of 625 g per 100 hens.

Supplements (Minerals and Vitamins): Imbalances acid-base is very common in heat stressed birds. Therefore, inclusion of various us compounds in the diet or water is a common practice to alleviate the adverse effects of heat stress. These include sodium bicarbonate, potassium chloride, calcium chloride, ammonium chloride and Research has proven that sodium bicarbonate at high temperature stimulates water and feed consumption & contributes to improved weight gain. Sodium bicarbonates can act as alternative source of

sodium & assists in maintaining healthier living environment with better condition. The addition of 8 g of sodium bicarbonate to the 100 liters of drinking water [or 35g per 25kg) can be useful in heat stressed birds to stimulate water consumption.

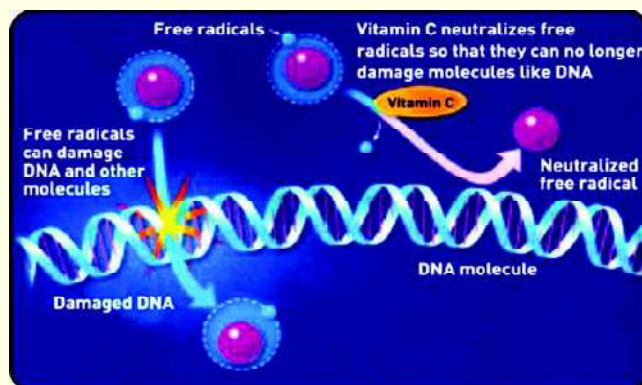
Vitamin C rich diet

Any stressors like heat stress may increase the chickens' need for vitamin C, since chicken is not able to synthesize enough vitamin C to meet increased physiological demands. Vitamin C plays crucial role in amino acid & mineral metabolism and synthesis of some hormones.

Vitamin C ameliorates heat stress induced problems such as poor immunity, feed intake, weight gain, oxidative stress, rectal and body temperature, fertility and semen quality, carcass weight and mortality in birds. Supplementation of essential herbs like *Ocimum sanctum*, *Withania somnifera*, *Embolica officinalis* & minerals can also help to overcome the heat stress.

Advantage of Vitamin C supplementation in feed

1. **Antioxidant:** Ascorbic acid can scavenge free radicals and reduce oxidative stress. It is also protecting the fat-soluble vitamins A and E as well as fatty acids from oxidation.



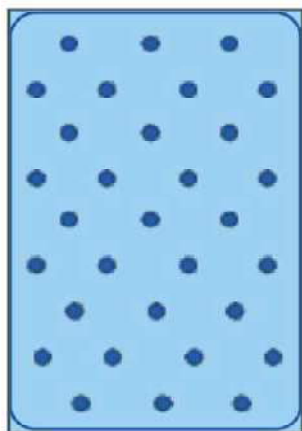
2. **Immune System:** Vitamin C makes the epithelial tissues in the mouth less permeable to bacteria. It also assists the white blood cells for proper function and so contributes in maintaining the immunity. Furthermore, it protects the immune system and reduces mortality in growing birds infected with IBD in a hot environment by protecting the lymphoid organs and bursal activity.

3. **Maintenance:** Vitamin C helps in hydroxylation & maturation of collagen fibers. Collagen is integral part of bone, cartilage & blood vessels. So, better maturation of collagen helps to improve egg shell quality in layers & dressing percentage in broiler.

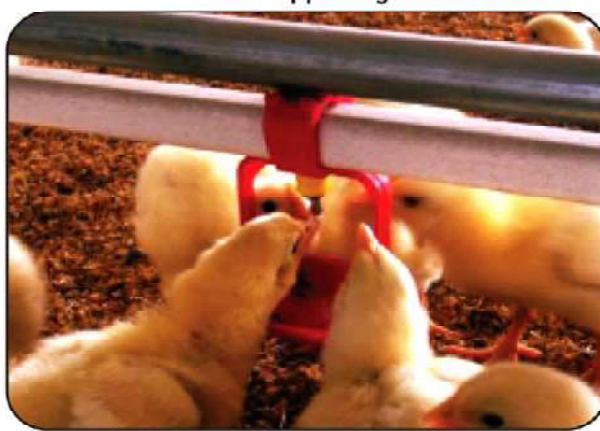
4. **Enhances iron absorption:** Vitamin C improves the absorption of iron by converting Fe into its bioactive form, which intern increases the hemoglobin level in body & limit the respiratory alkalosis to an extent.

Water Management

Ideal drinker distribution



Ideal nipple height



The availability of adlibitum clean, cool drinking water is very crucial during hot conditions. Any action which limits water intake will depress production.

The ideal drinking water temperature is 10-12°C. Ensure there are enough drinkers with even distribution throughout the shed at the right height. Water tank should be filled in every 4 hours with fresh & cool water.

a) Use of Vitamin C in drinking water to avoid Heat Stress: Vitamin C in drinking water can lower rectal temperature during the day time in chickens. The secretion and release of corticosterone can be reduced by Vitamin C supplementation. Supplementation of honey @ 20ml per liter of drinking water can decrease the frequency of panting and heart rate. Honey contains phytohormones that play a role in muscle contraction and relaxation of the heart and lungs.

b) Advantage of water acidification in summer: Water quality frequently changes from season to season in each location or area depending on the source. In summer the decreased underground water level results into increased pH & total dissolved solids [TDS] in drinking water leading to high water alkalinity and hardness. It is advisable to monitor water composition every six months and not only when the producer experiences poor flock performance. In summer as water consumption also increased, there is maximum threat of water borne diseases. Chlorination is an ideal tool to achieve highest water sanitization, but for proper chlorination water pH should be kept in acidic range. By using acidifier in drinking water both the problems can be solved as organic acids balance water pH in 5-5.5 range and due to their bacteriostatic action ensures the safety of drinking water.

By understanding heat stress and taking steps to prevent it, you will be keeping your birds comfortable and still loving the sunshine.

Vitamin C is necessary for various biosynthesis [collagen, 1,25-dihydroxy vitamin D and adrenaline] as well as for regulation of diverse reactions [secretion of corticosterone, regulation of body temperature and activation of immune system]. It has been reported that vitamin C enhances the antioxidant activity of vitamin E by reducing the tocopheroxy radicals back to their active form of vitamin E. Adult poultry under normal conditions are able to synthesize vitamin C to meet the requirement. However, it has been reported that vitamin C requirement is higher during stress and several reports have documented a beneficial effect of supplementing poultry feed with ascorbic acid.

Ascorbic Acid [Vitamin C] has been very useful as a supplement in poultry diets under stress, particularly under heat stress. In view of the fact that ascorbic acid of tissue synthesis is not sufficient at periods of stress, and that diets do not usually contain vitamin C, the birds are liable to suffer from vitamin C deficiency, if rations are not supplemented with vitamin C. It has been observed that supplementation of diets with ascorbic acid at required levels, especially under heat stress, improves growth, egg production, egg shell strength, fertility within (male and females) and hatchability of poultry eggs. The depressant effect of high temperature on performance often compels the technique of supplementing poultry diets to ensure optimum production. Therefore, it is necessary to adopt effective measures to control heat stress and its adverse effects on livestock. Vitamin C alleviates the side effects of stress, thus increased heat tolerance in birds, and improved chicken's response to cell functional immunity. Therefore, ascorbic acid could be included at the rate of 250mg/kg diet, 500mg/kg diet and 400mg/kg diet for day old chicks, Breeders or Layers and broiler chickens, respectively.



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