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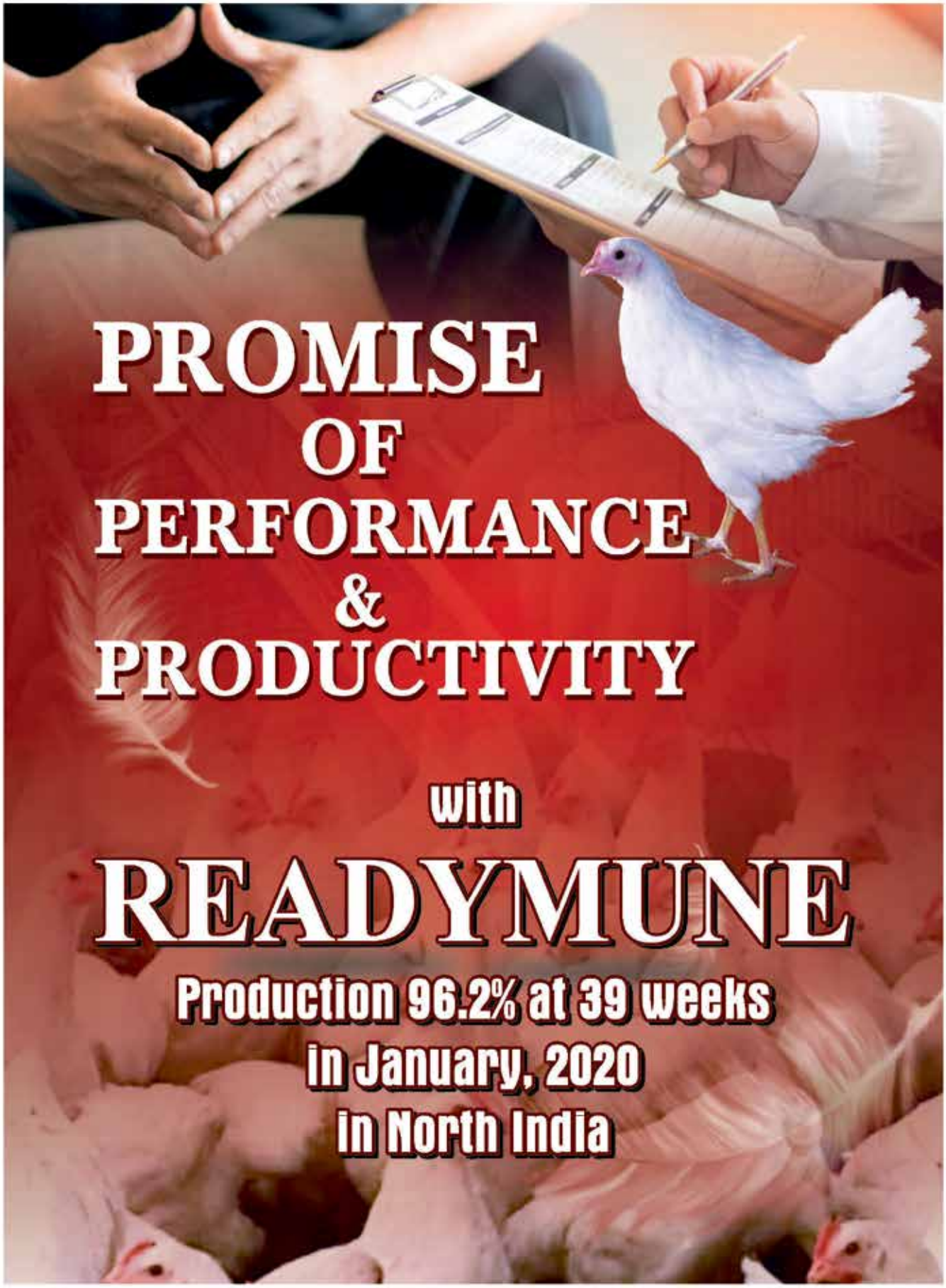
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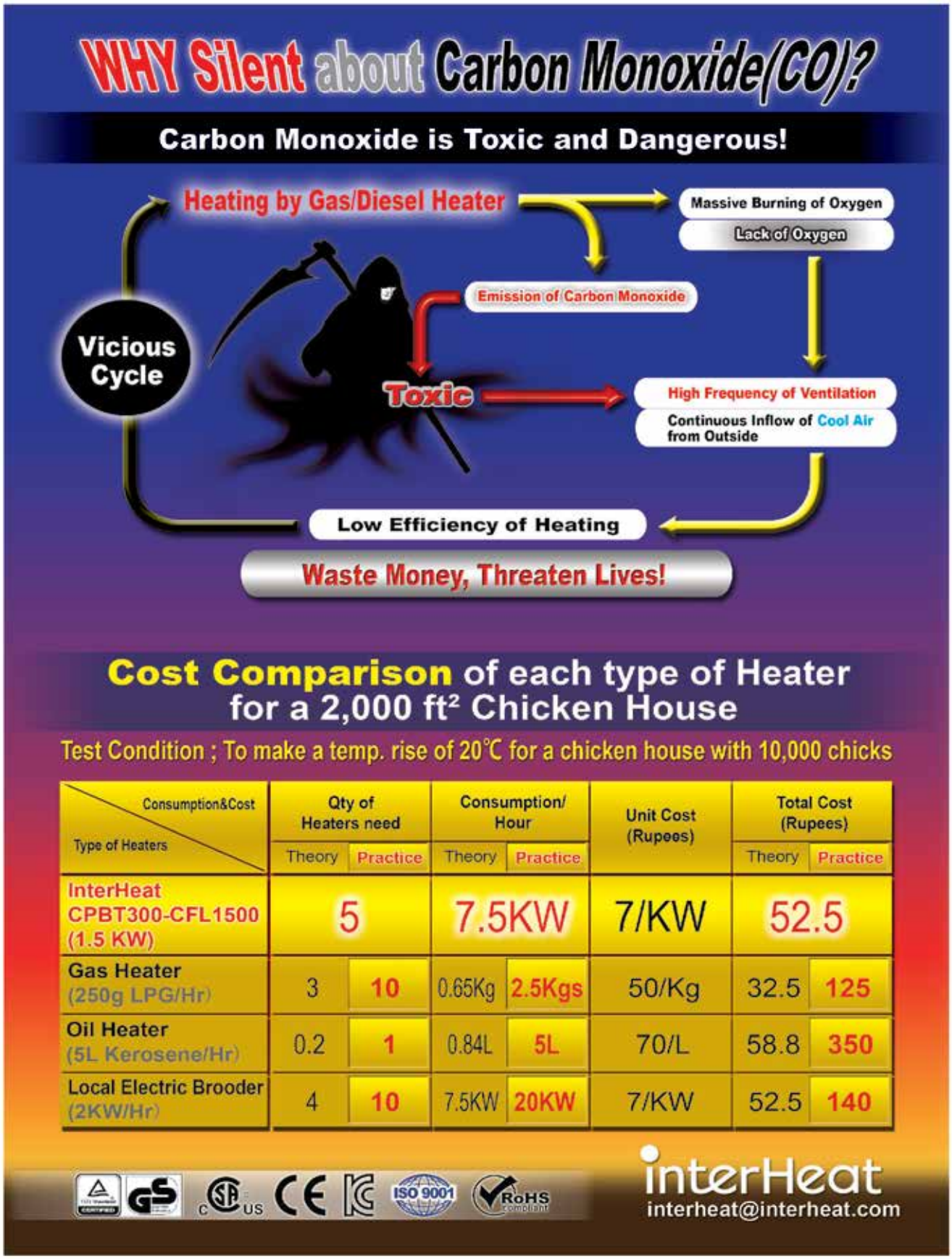
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POULTRY PUNCH MONTHLY

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EDITORIAL

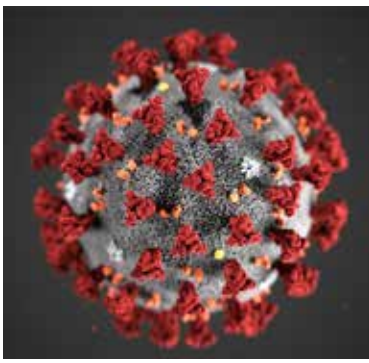
CORONA TAKES ITS TOLL, INDIAN POULTRY REGISTERS RS 24000 CRORE LOSS WITH SIX LAKH UNEMPLOYED

New Delhi:

The ongoing Corona Virus pandemic has severely affected the Indian poultry industry. In this process this sector posted a loss of whopping Rs 24000 crore and job loss of six lakhs. It should be noted that prior to this pandemic this poultry industry contributed 2 percent of the GDP. In January 2020 during the pandemic there was a rumor that chicken eggs and broiler meat too contributed to the propagation of Corona virus pandemic, which is scientifically proved that it is otherwise but still people went b the rumors. Thus poultry industry suffered colossal loss and now this industry seems to be completely devastated. Prior to this pandemic globally India ranked third in egg and fourth in broiler production.

So all together, the Indian poultry bore the brunt of rumors along with all other non-vegetarian items. Though not yet proved whether this pandemic originated from the non –vegetarian food or was manufactured in the Wuhan laboratory of China, still the rumors dealt a severe blow to the future survival of this industry.

The Indian poultry industry has entered its worst phase with no takers of egg and broiler meat across the Indian subcontinent. The poultry farmers are already facing the scarcity of feed and that they cannot feed the poultry birds in the farm. Inspite of the fact that the Indian Government on behest of the memorandum presented by the poultry associations had declared it safe after scientific scrutiny but the consumers could still not be convinced as they feared it a threat to life.



In the meanwhile, the traders and middlemen are charging exorbitant rates for all non vegetarian foods which include eggs and poultry meat in the market. The poultry farmers have requested the Government to declare the rates like the Government has done for the vegetables for the Indian market.

The supportive industries of poultry like: pharmaceuticals, equipment and feed manufacturers too are bearing the brunt of declining fortunes of this promising industry. The Corona pandemic has devastated the economy of all the countries on this planet.

Editor

Attention Readers

Now get POULTRY PUNCH MAGAZINE at your finger tips. The mobile application has been developed and you can download it from PLAY STORE in your mobile simply by typing THE POULTRY PUNCH and then install it in your mobile. Now when you click on the The Poultry Punch icon, you can go through the entire soft copy of the magazine in one go.
This way you can keep yourself updated on the latest know-how on poultry. The news and articles displayed are very informative.

Thanks

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AVIAGEN INDIA RESEARCH LABORATORY AWARDED R&D STATUS

■ **Udumalpet, India:**

Aviagen® India's Research Laboratory was recently officially recognised as a Research and Development (R&D) facility by the Department of Scientific & Industrial Research, Ministry of Science & Technology, Government of India.

Road to certification success

The rigorous certification process was led by Aviagen's Head of Veterinary Services Dr. Natarajan Kavitha and supported by Senior Management Advisor Dr. Kandasamy Udayasurian, who guided a research panel that helped ensure the program's success.

Paramount to certification were a well-defined and structured R&D program that leads to the development of innovative products and/or technologies, as well as a long-term R&D policy. Other qualifications included a separate and identifiable R&D infrastructure that is separate from other operations such as production and quality control. And, the laboratory must have qualified staff engaged exclusively in R&D and headed by a full-time, qualified expert.

Dr. Kavitha explained that the laboratory was built in 2016 according to a design specification that would enable the company to meet India's R&D registration criteria.

"Aviagen is committed to poultry health and welfare, and has extensive programs and procedures in place to take good care of our birds. While the registration and qualification process was thorough, detailed and complicated, I'm proud to say we passed," she commented.

She went on to say that the certification also allows Aviagen to extend its laboratory research to real-life trials in the field.

Dr. Bill Stanley, Aviagen's Director of Global Health Monitoring, joined the Aviagen India team in congratulating Dr. Kavitha and Dr. Udayasurian on their hard work that led to this achievement.

"This registration adds an important dimension to Aviagen India's role in promoting India's poultry industry."

About Aviagen

Aviagen® is a global poultry breeding company that develops pedigree lines for the production of commercial broiler chickens under the Arbor Acres®, Indian River®, and Ross® brand names. The Rowan Range® and Specialty Males® are specialty breeding stock from Aviagen that offer greater flexibility for customers to meet specific or niche market requirements. The company is based in Huntsville, Alabama, USA with a number of wholly-owned operations across the United Kingdom, Europe, Turkey, Latin America, India, Australia, New Zealand, and the U.S.A., and joint ventures in Asia. Aviagen employs more than 5,000 people and has a distribution network serving customers in more than 100 countries.

For further information, please visit www.aviagen.com.

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SRINIVASA DISTRIBUTES OVER 10 LAKHS OF EGGS & PLEDGES SUPPORT TO THE POOR AND THE NEEDY WITH SUPPLIES OF EGGS TILL THE END OF THE CORONA LOCKDOWN PERIOD

Egg Distribution in Andhra Pradesh (AP)

Egg Supply to Sanitation Workers

Egg distribution to Health Workers at Hospital in Telangana

Egg distribution in Telangana State, Narsapur

■ Telangana

Srinivasa Farms commitment in response to the COVID-19 pandemic reaches out to the community to feed the needy by donating eggs which not only provide the nutrition but also the much-needed immunity in these challenging times.

Suresh Chitturi, MD Srinivasa Farms has pledged to donate 5 Lakh eggs to the Telangana Govt, while meeting Sri. KT Rama Rao, Hon'ble Minister for IT & Municipal Administration, to help the poor and needy with nutritious food. Mr. Chitturi said that they stand committed to serve the community and have already donated 3 Lakh eggs in Andhra Pradesh villages and to the Police Personnel who are serving and protecting people during the lockdown period. Over 2 lakhs of Eggs have been donated in the villages of Telangana and in the capital, Hyderabad. The teams of Srinivasa Farms have all geared up to supply free egg distribution till the lockdown period in both states of Andhra & Telangana, as informed by Suresh Chitturi.

PROTEON PHARMACEUTICALS, THE PARENT COMPANY OF VETPHAGE PHARMACEUTICALS, JOINS EFFORTS TO FIGHT CORONAVIRUS

Mr. Nipun Gupta, Chief Commercial Officer at Proteon

- **Coronavirus has affected more than 4,70,000 people in the world and caused 21, 344 deaths**
- **Global lockdowns have been effective in arresting movement but to beat these epidemic countries need to ramp up testing**
- **WHO has asked countries to adopt its FITT strategy which is Find, Isolate, Test and Treat to put a stop to this outbreak?**

Mumbai, March 26, 2020: Poland based biotechnology Proteon Pharmaceuticals has joined efforts to fight the Covid 19 pandemic by tying up with leading research institutions of that country to set up new SARS-CoV-2 Coronavirus Detection Centre in Lodz, Poland. The new research facility will fast track the disease testing process in order to significantly improve the number of test conducted. Eventually it will result in fast diagnosis and stopping the Coronavirus spread.

The new SARS-CoV-2 Coronavirus Detection Centre in Lodz, Poland has been established to conduct large-scale tests for virus diagnosis. The new laboratory was created at a very fast pace with the involvement and cooperation of the Institute of Medical Biology of the Polish Academy of Sciences, the University of Lodz, the Medical University of Lodz and Proteon Pharmaceuticals. It is staffed by a team of microbiologists, geneticists, doctors and experts, including scientists from Proteon. The goal is to conduct as many tests as possible in the shortest possible time to fast track the entire process of diagnosis, isolation and treatment.

"Our parent company Proteon Pharmaceuticals is partnering other research institutions to put in place a highly qualified team of scientists and biotechnologists to work on improved testing mechanisms. India can also learn from this model and rope in private research institutions and labs in a major way to conduct efficient testing and research mechanisms to study about the virus. This is a good opportunity to learn from other countries' experience and implement proven solutions on our local ground as well.

Private players can help by doing home collection of samples to avoid contact with people and learn from Coronavirus Detection Centres like that of Poland to take appropriate bio-safety and bio-security precautions as well as allow only laboratories with real time polymerase chain reaction assay for RNA virus to conduct Covid-19 tests as well as culture the virus," said Dr Ramdas Kambale, Senior Vice President, Vetphage Pharmaceuticals.

"Quick and mass diagnostics is currently the most important tool for stopping the growth of coronavirus infections. If it is possible to detect a virus infection faster and on a larger scale, the infected people will be isolated sooner and receive appropriate treatment. This will translate into a decline in infection dynamics," says Prof. Jarosław Dastych, CEO of Proteon Pharmaceuticals S.A.

India which is currently in a lockdown of 21 days that has restricted public movement too can adopt the same measure in cooperation with Indian Council of Medical Research to create more and more Coronavirus Detection Centres so that more and more people are screened at a much faster pace. India's testing rate per one million people was lowest at 3 as of 13th March 2020.

In India, private lab testing has not become a wide scale operation yet and government institutes can only conduct 60,000 tests a week which is too low number for India's large population. Leading health experts have already asked India to be a little more aggressive in testing as it is the only way to emerge less scathed from this epidemic.

According to WHO Director-General Tedros Adhanom Ghebreyesus "Allowing people to stay at home and shutting down population is buying time and reducing the pressure on healthcare systems but this cannot contain the epidemic. To defeat it we need to attack the virus with aggressive testing and isolation of those affected so that they get proper treatment and do not spread it further".

UNIVERSITY TRIAL DEMONSTRATES THE BENEFITS OF NON-SYNTHETIC, NATURAL OREGANO ESSENTIAL OIL IN PULLET REARING

North Carolina State University, USA:

Feeding oregano essential oil (OEO) to pullets during rearing can help to improve flock uniformity, reproductive fitness and feed efficiency, according to research undertaken at North Carolina State University in the USA.

Rearing healthy, high quality pullets with a diverse and well-populated gut microbiome is important for lifetime performance. The complex gut microbiome of poultry species plays a crucial role in digestion, nutrient absorption and immune function. Early establishment of a diverse microbiome population assists with intestinal crypt and villi development, two important intestinal structures associated with feed digestion and nutrient absorption.

North Carolina State University researcher, Dr Ken Anderson, undertook a trial at the Piedmont Research Station in conjunction with feed additive manufacturer Anpario, to determine the effect of supplementing Orego-Stim Powder (a source of 100% natural OEO) in pullet feed throughout rearing on pullet performance and body confirmation.

Dekalb White chicks from day-old were allocated to one of two groups; either a control group with no additive in the feed, or a treatment group offered feed supplemented with 300g of Orego-Stim per tonne of feed.

"The results of the trial showed that OEO supplementation had a positive effect on pullet reproductive fitness, specifically in body development with increased shank length and a higher rear quarter percentage", explained Dr Anderson. "Additionally, whilst body weight did not differ between treatment groups as birds were grown to breed guidelines, flock body weight uniformity was less variable in pullets supplemented with OEO", he added. The trial also demonstrated optimised feed efficiency in pullets offered OEO in the diet, resulting in an improved FCR.

Emma Lund

Ken Anderson

Improved flock uniformity and reproductive fitness at the start of lay in pullets fed Orego-Stim is expected to result in more consistent egg sizes and improved lifetime performance.

"North Carolina State University is currently undertaking a trial working in conjunction with Anpario to determine to what extent managing early gut health with Orego-Stim has on laying performance" states Dr Anderson.

"High quality pullets are those which are both robust and resilient, and a high quality flock is one in which all the pullets are uniform in weight and achieve breed targets for body weight," explained Dr Emma Lund, Anpario's technical support coordinator.

"Meeting breed standards for body weight, supports optimum skeletal and muscular development which is associated with improved performance during early lay. Issues which arise during the rearing phase can impact bird's overall lifetime performance and ultimately producer profitability," said Dr Lund.

Orego-Stim is a 100% natural source of oregano essential oil, which has a proven, broad-spectrum antimicrobial effect as a result of its unique composition and the presence of non-synthetic compounds such as carvacrol, p-cymene and thymol.

POULTRY PRODUCTS DO NOT SPREAD CORONAVIRUS; POULTRY INDUSTRY SEEKS TO ALLAY CONCERNS OVER COVID 19

March 2020: With the coronavirus threat generating panic among the masses and significantly impacting poultry sales, the poultry industry in India has sought to allay concerns over the disease's association with chicken and other birds.

Union Minister of Animal Husbandry, Dairying and Fishing has admitted that the poultry industry was losing Rs 1500-2000 crore daily. Moreover, sales of companies that provide equipment to poultry industry like feeding systems, ventilators and water systems have also decreased in the past one month.

Officials from poultry feed companies have also admitted that sales of soybean and maize which are used in preparing chicken feed have dropped.

All of this is because the prices of chicken have plunged to Rs 10-30 per kg at farm gate level due to a slump in demand while the average cost of production is Rs 80 per kg as per All India Poultry Breeders

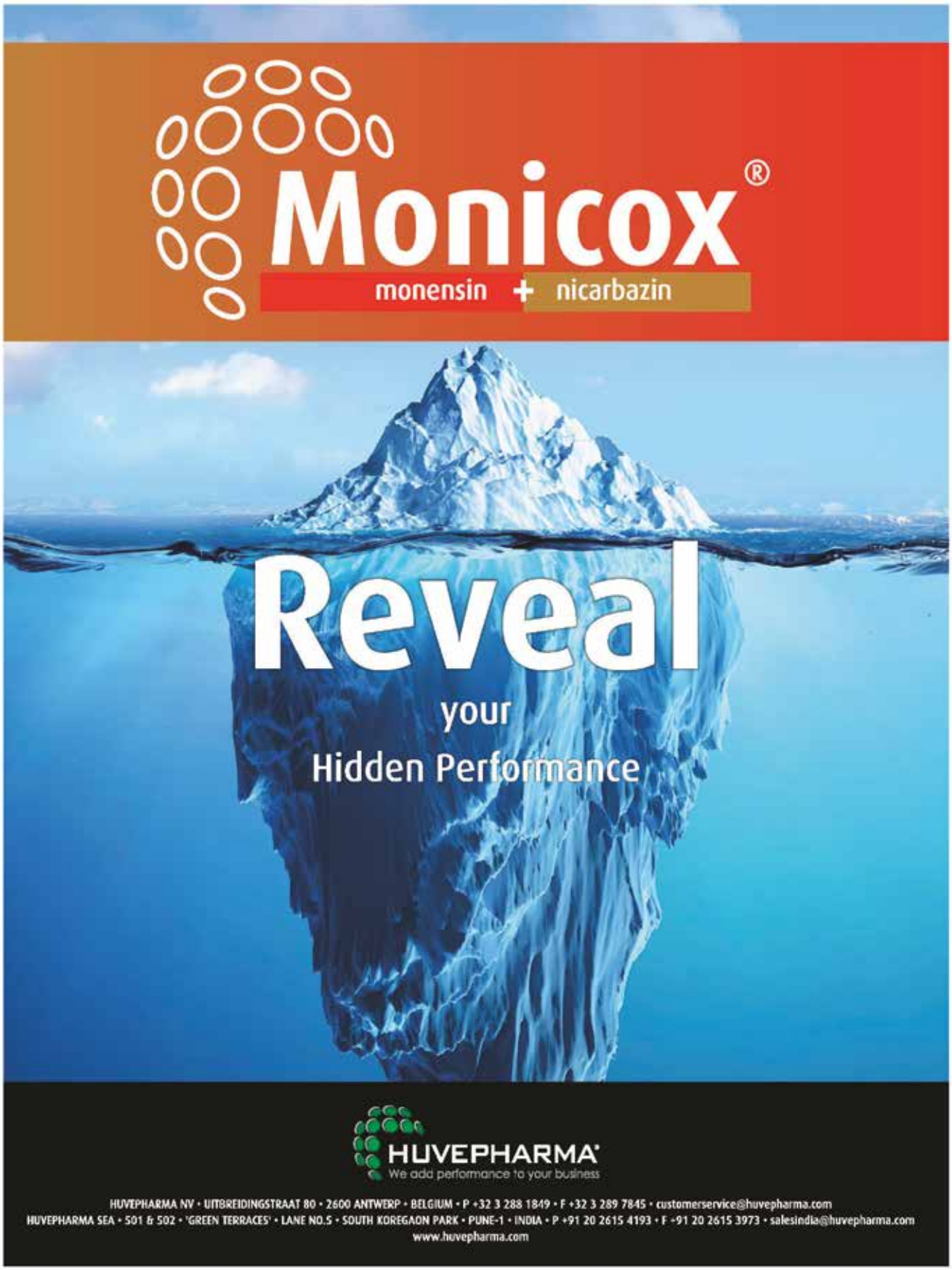
Association. This is because of the widespread rumors and fake news being circulated on social media platforms about how eating chicken can cause coronavirus.

"Although Coronavirus is a serious health threat, fake news and rumors about how consuming chicken or other meat products can spread the dreaded disease are being spread. All such claims are baseless.

COVID 19 is a respiratory disease which spreads primarily through contact with an infected person wherein saliva droplets generated from the mouth or nose during coughing or sneezing are exchanged.

It is important that people do not fall for false rumours and verify all such claims before believing in them," said Dr Ramdas Kambale, Senior Vice President, Vetphage pharmaceuticals, a leading provider of safe and antibiotic-free bacterial disease solutions for the poultry industry.

In a viral video a poultry farmer in Karnataka was seen burying hundreds of chickens alive after steep fall in prices due to coronavirus scare. The farmers whose poultry batch is ready are worried as they don't know what to do with the matured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birds. With no buyers the feeding cost increases day by day as usually they are ready for consumption in about 45 days.

Speaking on this issue Mr S.V Bhave, Chairman, CLFMA and MD, Berg and Schmidt India Pvt. Ltd said that "The poultry demand and consumption is generally high in the period before and after holi which is why farmers prepare accordingly raising more chickens than usual. However, due to the coronavirus crisis and the rumours and fake messages circulated over social media in its wake, the demand fell. This led to a decrease in price with small poultry farmers who depend on monthly sales for livelihood taking to the practice of distress selling. Poultry is not the only industry which has suffered as sales of mutton and fish have also gone down by 40%. It is important to address the rumors and educate people that poultry products are not responsible for the virus. I believe that if the virus spread is controlled, things will go back to normal".

In order to allay this fear and panic among public, Telangana Minister for industry, information technology and municipal administration KT Rama Rao along with minister of health E. Rajender,

Minister for Excise Srinivas Goud and Member of Parliament Ranjit Reddy went on to stage to eat chicken and egg dishes at an event conducted by National Egg Coordination Committee, Telangana

Poultry Breeders Association and Telangana Poultry Federation. This unique step was welcomed by the poultry industry to counter misplaced fears and rejuvenate supply.

Speaking on the importance of hygiene in poultry farms Dr Ramdas Kambale said, "Although chicken do not spread coronavirus, they often act as carriers of several bacterial diseases such as salmonella. To contain this, poultry farmers often used antibiotics for disease prevention which threatens the safety of poultry products and causes resistant bacterial diseases. This has prompted many countries to withdraw antibiotics from being used in animal production as well as set up regulatory authorities for selected antibiotics as well encourage the use of bacteriophages. Phages when consumed as part of animal feed keep the animals safe from bacterial infections. Moreover, they also do not damage the beneficial microbiome balance in animals. Phage therapy is now emerging as a useful tool in controlling bacterial infections among poultry while also encouraging growth of healthy poultry. This is why more and more poultry farms should encourage giving phages with chicken feed".

Coronavirus has affected approximately 194 countries in the world claiming the lives of 18,912 people so far and currently infecting around 296,000 patients. This has lead to massive preventions and containment drives by governments and world health bodies to stop this disease from further spreading.

About Vetphage Pharmaceuticals: It an innovative biotechnology company that is revolutionizing the approach towards bacterial disease protection in poultry. Through research and innovation in precision

biology, Vetphage has devised path-breathing antibacterial solutions for poultry industry that ensure microbiome protection and reduces the need for antibiotics. The solutions help improve animal health by rearing healthier poultry and fish, thereby resulting in better health of humans consuming meat, eggs and milk. Increasing environmental sustainability and eliminating unnecessary use of antibiotics is at the core of Vetphage's agenda.

About CLFMA (Compound Livestock Feed Manufacturers Association): The CLFMA OF INDIA, popularly known as CLFMA, is the ONLY, All-INDIA ASSOCIATION OF manufacturers of nutritionally balanced and scientifically compounded feeds for Cattle, Poultry, other animals, Fish and Prawns, and associated with LIVESTOCK INDUSTRY all over India. CLFMA is fully committed to manufacturing and supplying high quality; safe and conversion-efficient animal feeds to livestock farmers at prices affordable to them.

AN OPEN LETTER TO GOVERNMENTAL OFFICIALS WORLDWIDE

There is nothing more important to us than the safety and well-being of our colleagues, customers and communities. As a family company, we understand that the interconnectedness of our lives means that the actions we take within our business have an impact on countless others.

We share your concerns about the spread of COVID-19 globally. We are committed to doing our part to reduce COVID-19's impact as quickly as possible, while maintaining our supply and service to our world's livestock and crop producers.

Our business spans more than 120 countries, so we first began monitoring COVID when it emerged in China. In spite of the many challenges, our team in China has continued serving our customers, and we have been able to maintain production and continuity of supply due to the strict biosecurity controls that we had already established prior to COVID-19.

As COVID-19 expanded its reach, we responded by establishing a dedicated COVID-19 task force representing all regions of the world. Together, with a team of senior management, we review the latest information, including the recommendations of the World Health Organization and the Centers for Disease Control and Prevention, on a daily basis to adapt our approach to this dynamic and evolving situation.

A few of the specific actions we have taken to prioritize the safety of our team and the continuity of our service to our customers include:

1. COVID-19 company policy – Our policy addresses limitations on the travel of our team, including contractors and consultants, as well as other required practices to safeguard all of our sites. This is something we are reviewing daily and continually updating to ensure best practice.
2. Visitor screening form – A visitor screening form must be completed by any guest, including internal guests and truck drivers, before they are able to enter any of our facilities. This measure is a first line of defense to safeguard against any known risks.
3. Limitation of outside visitors – While we are maintaining some business-critical meetings, we are utilizing virtual meeting platforms as an alternative or are postponing visits to a future date. We are not allowing tours or visits to our facilities that are not deemed to be business-critical at this time. Truck drivers making deliveries or pickups are asked to stay within their cabs or as close to their trucks as possible, and any entry to our facilities must be approved following completion of the visitor screening form.
4. Enhanced cleaning protocols – In addition to our regular cleaning services, we have enhanced our procedures to occur at more frequent intervals and with greater attention to the disinfection of all surfaces.
5. Team member health – We are joining governments around the world in a shared effort to slow the spread of COVID-19 by asking our team members to work from home, if their function allows. Additionally, we have required that any team member who is feeling ill is not to return to the office until they have been free of a fever for more than 24 hours, without fever-reducing medications. Any high-risk exposure or confirmed case of COVID-19 necessitates a 14-day quarantine.
6. Operational continuity – Alltech operates nearly 100 manufacturing facilities around the world. Our global infrastructure enables us to shift production if necessary. We are working closely with all of our manufacturing teams to ensure operational continuity and service to our customers. We have implemented plans for all critical business units to work remotely, if required. As part of this, we continue to stress-test our systems and implement safeguards on the security of all data and technology.
7. Supply chain – We have been in contact with our key suppliers to review the status of all raw materials and have been reassured of continuity. While the majority of our materials and services are sourced in the Americas, we have built in contingencies globally, should the need to source from other geographies become necessary. Our global manufacturing and logistics capabilities position us favorably to continue to consistently serve our customers.

We have seen in other countries that food industries have been given essential industry status. As governments continue to shape their response to COVID-19, I hope you will support efforts to ensure a stable food supply.

To achieve this goal, the care and welfare of animals and crops must be of utmost importance. Feedstuffs, equipment for animal and crop production, and logistics are essential to ensure the certainty of our food supply. We ask that you implement any and all measures at your disposal to protect these vital functions until COVID-19 subsides.

We trust you value the importance of a safe, stable food supply. Thank you for your support as we seek, together, to provide security in this time of unprecedented uncertainty.

Sincerely,

Dr. Mark Lyons
President and CEO, Alltech

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NOVUS KNOWLEDGE FORUM CONDUCTS TECHNICAL SEMINAR ON 'OPTIMIZING FEED COST AND IMPROVING LAYING PERFORMANCE BY USE OF FEED ENZYMES'

Vijaywada/ Hospet

In an effort to share knowledge on how particular feed additives can impact poultry production, Novus International hostedseminars on 'Optimizing feed cost and laying performance by use of feed enzymes' in the cities of Vijaywada (Andhra Pradesh) and Hospet (Karnataka) on 26 and 29 February 2020 respectively.

Vijaywada and Hospet are prominent egg producing areas in India. With increases in size and the number of commercial layer farms, challenges of getting good quality feed raw materials at competitive price is increasing. Feed enzymes have become an important tool to improve the nutritional value of feed ingredients, reduce feed cost, improve litter quality, all while improving the bird's performance. Novus hosted these events with an aim to provide insight on how to offset recent challenges of increased feed cost and to improve profitability of layer farms.

The seminar received an overwhelming response with over 70 attendees from feed mills and farming businesses along with eminent knowledge/thought leaders from the poultry industry.

The keynote speaker in the seminar was Dr. D Chandrasekaran, a retired professor of animal nutrition in TANUVAS (Tamil Nadu Veterinary and Animal Sciences University). Having published more than 75 scientific articles in national and international journals, Dr. Chandrasekaran is a renowned thought leader, nutritionist and researcher in India and the subcontinent.

At the event Dr. Chandrasekaran talked about the increased challenges of availability and quality of feed raw materials due to increased animal population, overall increase in feed cost due to fluctuation in raw material cost and impact of feed cost on farm's profitability. He emphasized that using feed enzymes like protease, NSPase and phytase can help optimizing the feed cost and improve the nutritional value of feed ingredients. Depending on the corn/soy prices and the amount of substrate, the savings can be up to Rs. 600 to Rs. 700 per metric ton of feed. Feed enzymes are helpful in optimizing the feed cost while improving the performance in poultry birds, he said.

"We are committed to reducing feed costs, optimizing gut health and supporting a greater plane of nutrition for livestock and poultry production globally. Novus Knowledge Form is a part of our continuous customer education program and aligned to our commitment to our core axioms of Solution, Services and Sustainability," said Neeraj Srivastava, managing director-Novus South Central Asia.

The sessions were moderated by Dr. Rajesh Kharvi, senior marketing manager-minerals and enzymes, and Ms. Manisha Pahadiya product manager-feed quality and eubiotics) at Hospet and Vijaywada, respectively.

Anand Srivastava, Zonal head for South India and Sri Lanka, briefed the audience about Novus International and its strong presence and foundation in feed additive products based on science and research.

During the event, Dr. Milind Rainchwar, technical manager west and south India, explained that feed cost savings can be up to Rs. 700/metric ton by using Novus enzyme solutions owing to studies that show aggressive matrix values, capability to act at even low substrate conditions, thermal and gut stability. He talked about the key benefits of Novus enzyme solutions:

CIBENZA® DP100, CIBENZA® PHYTAVERSE® and CIBENZA® EP150.

"Novus believes in providing our customers solutions with demonstrable value. With our unique enzyme solutions for optimizing feed cost and farm's profitability, we are strategically well positioned to serve our customers and increase their profits. Novus phytase solution reduces the antinutritional effect of phytate by breaking it down to release phosphorous, calcium and sodium, while also delivering benefits in terms of energy, amino acids and proteins. Similarly, our protease enzymes are very effective in increasing the bioavailability of amino acids in the diet thereby reducing the feed cost, improving animal performance, and reducing nitrogen excretion in the environment," said Dr. Manish Kumar Singh, director-marketing for Novus South Central Asia.

"The focus of this seminar was to educate customers on the challenges of increasing feed cost and the role of enzymes in optimizing feed cost while improving bird's performance. I believe we have been successful. There was excellent feedback from the participants," said Sanjeev Khanna, director of sales (poultry) for Novus South Central Asia.

About Novus International, Inc. Novus International, Inc. is headquartered in Saint Charles, Missouri, U.S. and serves customers in over 90 countries around the world. A global leader in scientifically developing, manufacturing and commercializing animal health and nutrition solutions for the agriculture industry, Novus's portfolio of over 160 products includes ALIMET® and MHA® feed supplements, MINTREX® chelated trace minerals, CIBENZA® enzyme feed additives, NEXT ENHANCE® feed additive, ACTIVATE® nutritional feed acid, ACIDOMIX® preservative premixture, SANTOQUIN® feed preservative, AGRADO® feed antioxidant, and many other specialty ingredients. Novus is privately owned by Mitsui & Co. (U.S.A.), Inc. and Nippon Soda Co., Ltd. For more information, visit www.novusint.com.

NOVUS KNOWLEDGE FORUM CONDUCTS TECHNICAL SEMINAR

INDIAN POULTRY INDUSTRY AND SOCIETY

Dr D.K.Dey

From the Neolithic era to modern civilization the Mankind and Animals co-existed. While the domestication of animals started with the source of food in mind, wildlife, pet animals remained a part of our life and ecosystem. However factors like changing demographics, Re alignment of World order, WTO, Dominance of Social Media has challenged our conventional mind sets , values .

Modern civilization also leads to aspirational lifestyle; nuclear families led to dependence of Pet Animals worldwide, not surprisingly the Petcare segment alone contribute almost 38% of Global Animal Health market. Humanity has survived many epidemics and pandemics from Circa in the prehistoric age to different types of plague, yellow fever, Flu, Polio, AIDS, EBOLA, ZIKA to the Latest COVID 19.

In most of these epidemics/pandemics, Animals are the prime suspects who are assumed to be responsible, sometimes wrongfully. With the depleting agricultural land, depleting water resource, there is a tremendous pressure on Modern Animal Husbandry practice. Dependence of Animal Proteins like Milk, Meat, Egg, Aqua products are increasing. The geneticists are working relentlessly to develop productivity traits of livestock/poultry. Nutritionists are working on offering cost-effective Nutrition solutions to optimize Genetic potentials, Health Care professionals are working hard to develop an effective vaccine and other Animal Health Solutions.

The surge of Animal Husbandry activities and its commercial visibility has also drawn the attention of many NGOs/ Media thus creating too many hurdles for our industry. At times HUMAN WELFARE is sacrificed for the sake of ANIMAL WELFARE!! We must remind ourselves that for a country like ours we need to strike a healthy balance between FOOD SECURITY AND FOOD SAFETY.

COVID 19 – The Global pandemic has ruined the world economy – we are yet to ascertain the extent of the damage. But much before actual COVID 19 came to India, another human-made disaster – RUMOUR came to India and inflicted irreparable

damage to Indian Poultry Industry. The World will defeat COVID 19 for sure, India will be victorious against COVID 19 – but Indian Society and Indian Poultry industry could not fight the RUMOUR. I do not wish to blame any individual /organization in particular but let us admit that this is a collective failure.

Let us have a closer look at what happened – it started with Whatsapp rumour that spread across all forms of social media. We could hardly do anything. I have been closely monitoring the situation since December 2019. Why this rumour did not impact fish consumption much, it did not change Mutton Consumption, but it affected the Poultry?

The common man in Society, the House wives, Chicken /Egg consumers in general related these rumours to poorly managed Live Chicken outlets all across the Country, Egg trays in standard shops with litters, poor conditions of most of the Chicken transport vehicles, poor disposals of offal from Chicken shops forced them to distance from Egg / Chicken consumption. The so-called rumours and the poorly kept Egg /Chicken outlets triggered panic in the mind of consumers. We as a part of this industry could not anticipate this even if we have realized this later we did not have any antidote!

We need to find who gains the most from a disturbance of this magnitude in Poultry industry—Fish and mutton is also sold in similar unhygienic condition, why they were not affected as in case of Poultry?

Collective efforts such as chicken mela to promote chicken consumption and other initiatives did a bit but didn't warrant that we will be able to overcome another rumour like this. Not that we have been victims to these types of rumours for the first time – Hormones used in Chicken / Excessive use of antibiotics in Poultry / Chicken consumptions leads to impotence all these things. What can we do? Governments at the Centre, and the States have their own priorities. Poultry Industry in India has earned the status of World's leading Poultry Producing Country – now the onus is on us--

All the Producers – Be it Broiler integrators, Breeding Companies, Feed producers, Value Added Chicken producers, Layer Egg producers must improve the Marketing condition. A market is a place where consumers demands are met with – if we can get appropriately dressed Chicken in Supermarkets, Clean Eggs in Trays in Supermarket why not in small/medium outlets. It is needless to say the Supermarkets reach only to limited customers in the urban area – but the problem of unhygienic Chicken outlets is Nationwide.

Under the above, my 5 point suggestions are as follows

1. Accept the fact that Live Chicken will remain a Commodity in India – ensure Adequate Hygiene in the Marketplace
2. Boycott Traders using unhygienic transport vehicles, incentivize those who use cleaner vehicle
3. Similarly, boycott Chicken / Egg outlets who keeps the shop in unsanitary conditions, incentivize cleanershop
4. Appoint Chief Extension Officer – who can effectively reach out all the stakeholders in the Poultry Value Chain – from Producers toConsumers
5. Let us press for a serious enquiry and find out who is responsible for such wide sprayed rumours – is it some fringe elements or some organized groups?

It will take months to re build Indian Poultry Industry, let us work together, let all the stake holders work together and create a robust mechanism to defeat the rumours. Like any viral disease – we say Prevention is better than Cure, let us defeat the rumour before it defeats us.

NEW LEADERSHIP AT NOVUS AIMS TO ACHIEVE TOP MARKET POSITION IN "ANIMAL HEALTH THROUGH NUTRITION"

■ **SAINT CHARLES, MO:**

"My goal is to be one Novus; one company focused on our core strengths," Meagher said. "We have a great technology in the HMTBa molecule (found in the company's methionine product, ALIMET® as well as other products), we will seek new and innovative technologies, and we will continue to build upon our history of research and development by creating more products and solutions. Our resolute vision remains to help feed the world wholesome, affordable food in a sustainable manner."

Meagher said that while the novel coronavirus pandemic (COVID-19) has delayed the finalization and implementation of the company's new strategy, the plans he and his team have for the company are sure to be visible to customers when they are fully realized later this year.

Asthe company welcomes Meagher's return to Novus following the six-years he spent as the head of ag-tech start-up Agrivida, Novus alsocongratulated former CEO and President François Fraudeau on his retirement, in addition to that of long-time leader and advocate Jeff Klopfenstein, executive vice president and president of methionine business, who announced in March that he would retire from Novus and his 29-yearcareer with the company, effective April 1.

"I've been with the company since the very beginning," Klopfenstein said. "I've been active in its growth and expansion, and what we've achieved as a company has made me proud. Helping our customers to feed the world has been an honor and I wish everyone at Novus, and those in the animal agriculture industry, a bright future."

Klopfenstein will continue to work with Novus as a consultant for an agreed period of time.

As Meagher takes the reins, he acknowledged that these changes, coupled with anxiety about the pandemic, can be stressful but said he is confident that his new Executive Leadership Team is positive in its outlook and plans to move the company forward.

"My request is that we keep focused on serving our customers, working with stronger collaboration and maintaining an optimistic mentality towards our future," Meagher said."I am excited about the future of Novus because I know we have the right people in this company to make a difference."

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WORLD VETERINARY POULTRY ASSOCIATION (INDIA) CONFERENCE 2020

Lighting of Lamp by delegates on dais

■ **Bengaluru:**

World Veterinary Poultry Association (India) organized its first annual conference at **ICAR-National Institute of Animal Nutrition and Physiology (NIANP), Bengaluru** on 28th Feb 2020. Through this conference the association aimed to strengthen research and education in poultry production and harness the knowledge for the welfare of poultry farmers. It is imperative that the theme of this national conference "**Advances in Poultry Science for One Health** is very pertinent in today's context. The poultry industry is a high profit sector which however is highly susceptible to losses especially due to disease outbreaks. Such outbreaks pose a threat for other livestock species and humans too as some of the poultry diseases are of zoonotic importance. Thus there are increasing programs focusing towards one health initiative which aims to create common ground for several disciplines in order to establish more holistic approaches to diseases shared by more than one species. With this objective the WVPA (India) chapter paved the way to organize its first conference to focus on recent advancement and innovations in the field of poultry science. In total 279 delegates registered for this conference which was enlightened by eminent National speakers including four international speakers.

Dr Jeetendra Verma welcomed all the delegates and signified the importance of the conference. Prof S Abdul Rahman, Executive Director and Past President Commonwealth Veterinary Association was the chief guest. The eminent dignitaries were felicitated by Dr Shirish Nigam, Dr B. Barman, Dr P G Phalke and Dr S K Das with a special memento 'An Assamese FulamGamosa'

The presentations from the eminent speakers were positively helpful in designing new strategies to tackle the critical issues associated with poultry production paving

Dignitaries during the inaugural function of WVPA (India) Conference 2020 on "Advances in Poultry Sciences for One Health"

way for sustainable poultry production in the country. Few global and several national experts have attended this conference and deliberated. Dr Marcelo Paniago of Ceva Animal Health, Malaysia highlighted the current and future challenges of the poultry vaccine industry and solution for the near future. Prof Dr Abdul Rahman Omar from Universiti Putra of Malaysia elaborated on Immune Evasion Strategies of Poultry Viruses and its practical approach.

Global overview on epidemiology and its control of Newcastle Disease was shared by Dr Jose Luis Losada Torres of Hipra. An interesting topic on Black Soldier Fly (BSF) was delivered by Prof Dr Nadeem Fairoze. In his presentation he highlighted on reducing feed and production cost by poultry waste management into wealth with the help of BSF larvae. The outcome of the session was the awareness,which hasto be created amongst poultry entrepreneurs regarding adhering to strict biosecurity measures for prevention and control of diseases. Vaccination strategies for important prevailing diseases either with live/killed or new technology vaccines has to be adopted to prevent the spread of the diseasesand to curb possible mutation of the virus into a more virulent type causing more severe outbreak.Dr Marcelo enlightened on selection of ideal vaccine and DIVA abled vaccines and highlighted the mechanization like in-ovo technologies which is going to play an important role in the modern poultry industry.

Dr G Dinakar Raj of TANUVAS explained dilemma between investigator and investor in Avian disease diagnosis. Disease diagnosis should be based on virus isolation, serotyping along with molecular

Huge Gathering during the conference

Release of WVPA (India) 2020 Conference Compendium

disease diagnostic tools like PCR & RT-PCR etc. Dr Ong Shyong Wey, HIPRA, Malaysia spoke about Immune modulation and enhancement of immunity by the use of an adjuvanted solventlive coccidiosis vaccine for breeders and layers. He explained that addition of Montanide type of adjuvant against coccidiosis vaccine enhances the cellular immunity in poultry compared to non-adjuvant vaccine. Dr Sanjay K Gavkare, Ventri Biologicals, Venkateshwara Hatcheries Pvt Ltd., Pune elaborated effective approach for intervention of novel vvIBDV infection by development of Indianized immune complex vaccine "VIPx". Immune complex vaccines have emerged as promising solution to control infectious bursal disease (IBD) at its best. The speaker gave valuable insights on how the immune complex vaccines are advantageous as they were suitable for in-ovo vaccination. At the end of conference Dr E. Vijayakumar, MSD Animal Health, Pune spoke about Recombinant Technology for Newcastle Disease and Mareks Disease vaccine strains. In his presentation the comprehensive role of recombinant vaccines wasemphasized as control strategy.

More than 50 scientific research papers were selected in the form of posters from students and researchers all over the country. Dr B P Manjunath, Dr Binsila Krishnan, Dr Anjumoni Mech, Dr Jaydip Rokade and Dr S M Raywere the jury to evaluate the posters and the best three posters were selected and awarded. Rayala Reddy V got the best poster award, the second and third best posters were authored by Shwetha H.S. and Chandravathi T respectively. WVPA (India) proudly arranged special travel grants for all the student delegates from different Universities across the country.

Core organizing committee of WVPA (India) Conference 2020

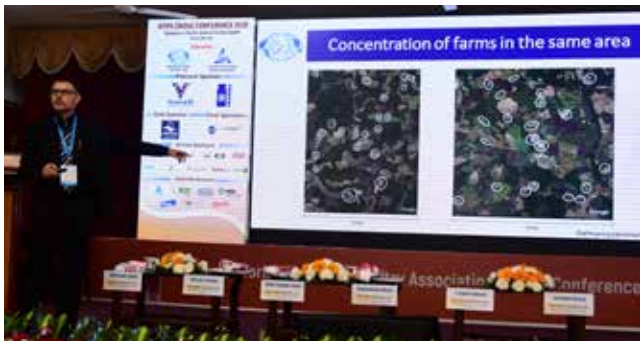
The compendium of the conference was released by the chief guest Dr S Abdul Rahmanand the dignitaries on the occasion. The compendium was edited by Dr V Sejian, Dr B Barman, Dr AV Elangovan, Dr J Verma and Dr R Bhatta. Dr Rahman in his presidential speech expressed the importance of biosecurity and proper vaccination in the poultry industries for growth and profitability. Dr Raghavendra Bhatta, Director ICAR- NIANP emphasised on the issue of climate change, AMR, phytogenics and in-ovo nutrition. Dr Shirish Nigam presented the report card of WVPA India Chapter Branch activity for the last year.

Dr D Nagalakshmi and Dr Kiran chaired the first Technical session with Dr M Kadam as moderator and Dr I David as rapporteur. Dr PS Mahesh and Dr SK Das chaired the second session along withDr P.K Malik and Dr G Ravikiran as moderator and rapporteur respectively. The third session was chaired by Dr G Devegowda and Dr R.U Suganthi which was moderated by Dr. Ashish Mishra and Dr Solomon Rajkumar was the rapporteur.

The session was anchored by Dr Arindam Dhali and Dr Shirish Nigam. Dr P G Phalke expressed vote of thanks to all the delegates, speakers and the organizing committee members. He expressed special thanks to Dr R Bhatta, Director NIANP and his team for their effortless planning and execution of the whole programme. Also expressed sincere thanks to Dr V Sejian the Organizing Secretary, and Joint Organizing Secretary Dr B Barman, and all other organizing committee members Dr A.V Elangovan, Dr P K Malik, Dr Atul P Kolte and Dr RU Suganthi and all Executive Members of WVPA (India) . To conclude World Veterinary Poultry Association (India) Conference 2020 ended successfully with a positive note to share recent scientific knowledge with stakeholders and the poultry industry.

WVPAS (INDIA) CONFERENCE 2020

Presentation by Dr Abdul Rahman Omar from Malaysia



Presentation by Dr Marcelo Paniago from Malaysia

Poster Presentation by students

Day report by the organizing seceretary WVPA (India) Conference 2020

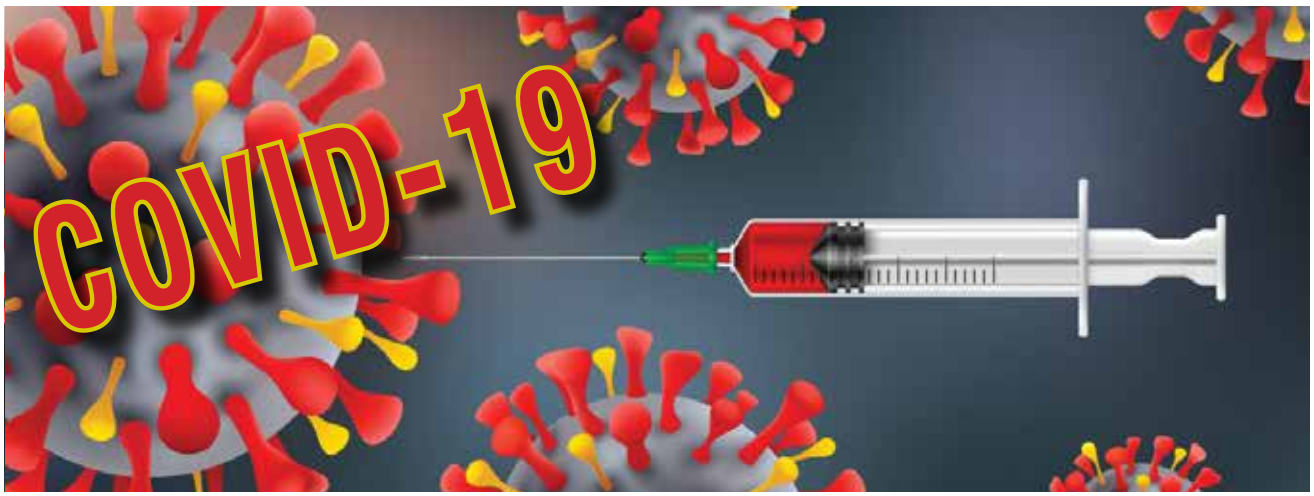
Best Poster Presentation Award I[st] to Mr Rayala V Poster Title: Performance & gut Integrity by broilers and detection of their residuens in meat by HPLC

Best Poster Presentation Award II[nd] to Ms. Shwetha H.S. Poster Title: Nano neutraceutical preparation, characterization and its effect on antioxidant enzymes and growth performance in broiler chickens

Best Poster Presentation Award III[rd] to Ms. Chandravathi T Poster Title: An outbreak of infectious bursal disease in commercial chicke

President WVPA (India) Dr Jeethendra Verma Felicitating the chief guest Dr Abdul Rahman

IIT GUWAHATI COLLABORATES WITH HESTER BIOSCIENCES LIMITED TO DEVELOP VACCINE AGAINST COVID-19



■ GUWAHATI/AHMEDABAD

Indian Institute of Technology Guwahati is collaborating with Hester Biosciences Limited, a pharmaceutical company based in Ahmedabad, Gujarat, to work on the vaccine development against COVID-19. The agreement between the two parties was signed on 15th April 2020.

The vaccine will be based on recombinant avian paramyxovirus based vector platform. The recombinant avian paramyxovirus-1 will be used to express the immunogenic protein of SARS-CoV-2. The recombinant avian paramyxovirus-1 expressing the SARS-CoV-2 protein could be used as a vaccine candidate for further study.

The avian paramyxovirus-1 has been explored as a vaccine vector for various animals and human pathogens. The avian paramyxovirus-1 has been used to express the immunogenic protein of human pathogens such as HIV, avian influenza virus, human parainfluenza virus, SARS-CoV. Similarly, it has also been explored as a vaccine vector for animal pathogens such as infectious bursal disease virus, infectious laryngotracheitis virus, bovine herpes virus, Nipah virus etc.

The team at IIT Guwahati is headed by Dr. Sachin Kumar, Associate Professor, Department of Biosciences and Bioengineering. The team has generated the recombinant avian paramyxovirus-1 based vaccine flatform for Classical Swine Fever and Japanese encephalitis. The role of the Institute is to produce the recombinant vaccine candidate.

Speaking about the vaccine for COVID-19, Dr. Sachin Kumar, Associate Professor, Department of Biosciences and Bioengineering, IIT Guwahati said, "It is too early to comment on the efficacy and immunogenicity of the vaccine, however, we will be able to reveal more details about this vaccine after the results of animal studies are obtained."

Speaking about the collaboration and role of Hester Biosciences Limited, Mr. Rajiv Gandhi, CEO and MD, Hester Biosciences Limited, said, "In the current pandemic situation of COVID-19, the world is looking at developing preventive and curative measures to safeguard mankind. IITG & Hester have collaborated to develop and manufacture a recombinant vaccine against COVID-19 disease as a preventive measure. Hester's involvement would be from master seed development up to release of the commercial vaccine"

He further added, "Hester has 23 years of experience in vaccine manufacturing on the veterinary side. It manufactures vaccines by using fermentation, tissue culture, continuous cell line and chick embryo origin methods. Hester is also currently working towards developing next generation recombinant poultry vaccines. Being in veterinary vaccine manufacturing, as well as working towards developing recombinant vaccines, Hester has a fairly good understanding and the capability to get into human vaccines, specifically into a vaccine against the COVID-19 disease."

IIT Guwahati and Hester Biosciences Limited expect the vaccine to be ready by the end of this year to start animal studies. The work is currently in its early stage of development.

Prof. T. G. Sitharam, Director, IIT Guwahati, is hopeful that the outcome of this important collaboration will be a win-win situation for the country and will lead to breakthrough results in prevention of COVID-19 as well as provide leads for vaccine developments against other diseases as well in immediate future.

CORONAVIRUS

DO NOT SPREAD BY EATING EGGS AND MEAT

DR. AMANDEEP SINGH (BVSc & AH, MVSc)
Veterinary Assistant Surgeon, Department of Sheep Husbandry,
Government of Jammu & Kashmir, India.
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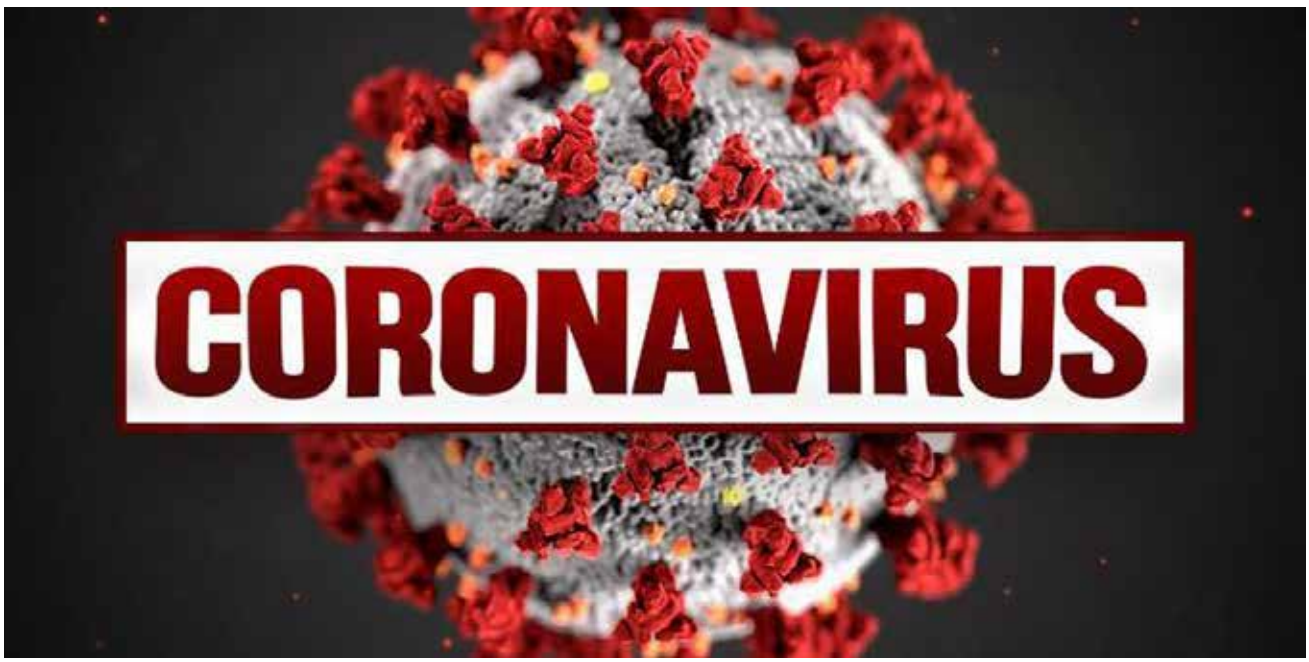

Since the coronavirus has resulted in pandemic, poultry industry in particular has faced its wrath. The Union Minister for Animal Husbandry and Dairying (India), Sh. Giriraj Singh, have stated that poultry industry in India is facing a net loss of Rs. 1500 to Rs. 2000 crore per day. The prices of eggs and poultry meat have reduced drastically varying from Rs. 180/kg to even at Rs. 10/kg at various places due to which the poultry farmers are in despair.

A net reduction of 70 percent have been witnessed in the prices of poultry products since coronavirus outbreak. Although the market prices of maize which is the key ingredient in poultry feed have fallen steeply but to no good hopes for the poultry producers, the consumers have also discontinued the consumption of poultry products due to coronavirus outbreak.

Many governmental organizations have time and again reported that the **coronavirus do not spread through consumption of poultry products**, still to add to information, the current article have been exclusively written to bust the myths and misinformation which was circulated through social media related to the consumption of poultry products and coronavirus spread.

Does coronavirus spread through eating eggs?

No, coronavirus does not spread through consumption of eggs. Although there are other pathogens like Salmonella, Mycoplasma, Chlamydia, reovirus, etc. which can spread through eating uncooked or raw eggs. It is always advisable to properly cook the eggs before consumption.

Does coronavirus spread through eating poultry meat?

No, coronavirus does not spread thr ough consumption of poultry meat. The other pathogens that spread through raw or uncooked meat are Salmonella, Campylobacter, Staphylococcus, E.

coli, etc. Do not purchase dead bird for consumption and always cook the meat properly (atleast 20 minutes over 80ºC) before consumption.

Does coronavirus spread from poultry to humans?

There are no reports of coronavirus spreading from poultry to humans. Neither it is reported in meat nor in eggs, which makes eggs and meat safe for consumption.

At what temperature coronavirus dies?

Various studies have reported that coronavirus loses its viability at temperatures more than 38ºC and let us suppose that even if it present in meat and eggs, such high temperatures of cooking can easily neutralize the virus rendering poultry products virus free.

How does eggs and meat affect immunity?

Eggs and meat boost the immune system of an individual due to the presence of Vitamin A which is required for strengthening immunity. Therefore, eggs and meat will help fighting coronavirus in a way.

Does government support consumption of poultry products in coronavirus outbreak?

Yes. Various governmental organization have time and again came up with advisory favoring consumption of poultry products. Animal Husbandry Commissioner (GoI), Food Safety & Standards Authority of India (FSSAI), National Egg Coordination Committee (NECC), etc. have stated the consumption of poultry products safe in coronavirus outbreak.

How to prevent foodborne diseases originating from consumption of animal products?

The following steps shall be taken for prevention of foodborne diseases:

- **Indian style of cooking** is very efficient in neutralizing most of the pathogens as it is based on moist heat treatment. It is advisable to properly cook foods of animal origin before consumption. Cooking the food for atleast 20 minutes over 80ºC is recommended.
- Cooked food should not be mixed with uncooked food as it leads to contamination.
- Avoid consumption of raw eggs, meat or milk as it leads to spread of diseases.
- Foods of animal origin should be properly refrigerated as it reduces the chances of microbial growth.
- Do not store foods of animal origin for a longer time.
- Buy food from a good, hygienic place following the guidelines of FSSAI.
- Apply good kitchen hygiene and practices for cooking the food like washing hands before cooking, washing utensils, cutting boards, dishes, etc. before and after cooking, cleansing the dishes with clean paper towel or dish cloth before eating, cleaning the kitchen tops and shelves regularly, covering the cooked food with lid, etc.
- It is advisable to rinse meat before cooking if purchased from roadside shop.
- In case of outbreak, report the disease to your doctor or health department.

How does discontinuing poultry products affect the poultry farmers?

Broiler birds reared for meat have rearing cycle of 28 to 42 days and layer birds reared for eggs lay first egg after intensive hardwork of 20 to 22 weeks. The costs associated with feeding, healthcare and labor are huge which takes a huge toll on poultry farmers. Poultry business is very sensitive in nature as any outbreak, be it related to poultry or not, levies a great loss on farmers. So, if we empathize with our farmers, we will get to know that all their hardwork goes in vain when any hoax call or misinformation spreads. In such inclement conditions, it becomes our responsibility to support our farmers so that they can breakeven their inputs incurred on poultry farming by searching and believing on the credible information.

What are the things to stay away from during coronavirus outbreak?

Misinformation, coronavirus infected individual, overthinking about coronavirus outbreak and unrequired outings.

Stay home, stay safe and enjoy poultry products with family!

UNDERSTANDING HEAT STRESS IN LAYERS:

Management Tips to Improve Hot Weather Flock Performance

Periods of high environmental temperatures, often accompanied by high relative humidity, are common in the summer months. Heat stress can profoundly affect the productivity of a flock. At environmental temperatures above 33°C, high mortality and large production losses are readily evident, but at less extreme temperatures, heat stress is often overlooked as a cause for poor growth or subtle losses in egg production and shell quality.

THERMOREGULATION OF THE HEN

Excess body heat is removed by four different mechanisms (see Figure 1).

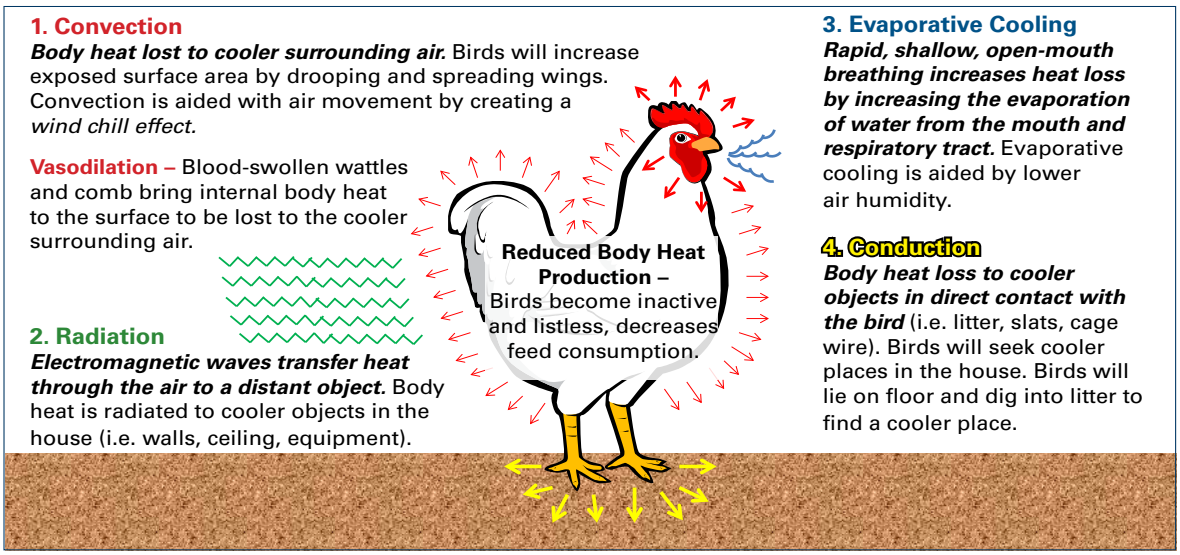

Figure 1. Heat loss mechanisms of the chicken.

Radiation, convection and conduction together are called sensible heat loss. The thermoneutral zone of the chicken is generally between 18–25°C. Within this temperature range, sensible heat loss is adequate to maintain the bird's normal body temperature of 41°C.

Above the thermoneutral zone, the efficiency of sensible heat loss mechanisms diminishes. At this point, the evaporation of water from the respiratory tract becomes the major heat loss mechanism of the bird. The evaporation of one gram of water dissipates 540 calories of body heat.

At temperatures above the thermoneutral zone, the bird has to expend energy to maintain normal body temperature and metabolic activities. This diverts energy away from growth and egg production, resulting in performance loss.

EFFECTS OF HEAT STRESS

- ↓ Feed intake
- ↓ Egg production
- ↓ Egg weight
- ↓ Shell quality
- ↓ Albumen height
- ↓ Growth
- ↑ Mortality (especially with acute heat stress)
- ↑ Cannibalism
- ↑ Immunosuppression
- ↓ Hatchability
- ↓ Fertility in roosters

Production losses occurring from heat stress depend on:

1. Maximum temperature to which the flock was exposed
2. Duration of high temperatures
3. Rate of temperature change
4. Relative humidity of air

Technical Update – UNDERSTANDING HEAT STRESS IN LAYERS

At high environmental temperatures, birds begin to have rapid, shallow, open-mouth breathing, called the gular reflex, to increase the evaporation of water from the respiratory tract. When panting fails to maintain body temperature, the bird becomes listless, then comatose and may die.

Flocks not previously acclimated to high temperatures typically suffer the greatest loss in production and mortality. Young birds exposed to high environmental temperatures are more thermotolerant later in life, due to the production of heat shock proteins.

RELATIONSHIP OF ENVIRONMENTAL TEMPERATURE AND RELATIVE HUMIDITY

Heat stress is the combined effect of temperature and relative humidity of air on the bird. This is known as the effective temperature. Increasing air humidity at any temperature will increase bird discomfort and heat stress. Producers should carefully monitor temperature and humidity at their location. Generally, during the daytime, the temperature increases and relative humidity decreases. The best method of cooling during periods of lower humidity is evaporative cooling (fogger, mister or cool pad).

During the evening when temperature decreases and humidity typically increases, the added humidity provided by foggers may increase heat stress. When the humidity is high, increased air movement using fans alone will reduce heat stress in open houses. Air movement produces a wind chill effect, which is a perceived decrease in air temperature felt by the body due to the flow of air.
A heat stress index table for commercial layers has been developed (Figure 2).

TEMPERATURE AND HUMIDITY STRESS INDEX FOR COMMERCIAL LAYING HENS
(HEAT STRESS INDEX = 0.6 X DRY BULB TEMPERATURE + 0.4 X WET BULB TEMPERATURE)

Relative Humidity (%)

Temperature °F	°C	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
68	20	63	63	63	64	64	64	64	65	65	65	66	66	66	66	67	67	67	67	68	68
72	22	64	65	65	66	66	66	67	67	67	68	68	69	69	69	70	70	70	71	71	72
75	24	66	67	67	68	68	69	69	70	70	70	71	71	72	72	73	73	74	74	75	75
79	26	68	69	69	70	70	71	71	72	73	73	74	74	75	75	76	77	77	78	78	79
82	28	70	70	71	72	72	73	74	74	75	76	76	77	78	78	79	80	80	81	82	82
86	30	71	72	73	74	74	75	76	77	78	78	79	80	81	81	82	83	84	84	85	86
90	32	73	74	75	76	77	77	78	79	80	81	82	83	84	84	85	86	87	88	89	90
93	34	75	76	77	78	79	80	81	82	83	84	84	85	86	87	88	89	90	91	92	93
97	36	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	93	94	95	96	97
100	38	78	79	81	82	83	84	85	86	88	89	90	91	92	93	95	96	97	98	99	100

Bird Comfort Zone (heat index < 70): No action needed; a good time to prepare for future hot weather.

Alert (heat index 70–75): Begin taking heat stress reduction measures in the flock; increase ventilation rate; increase fan speed and use foggers (run foggers based on relative humidity). Monitor bird behavior for signs of heat stress; ensure drinker and ventilation systems are functioning properly.

Danger (heat index 76–81): Heat stress conditions exist; take immediate measures to reduce heat stress in the flock. Increase ventilation rate in closed houses and use evaporative cooling based on relative humidity; in open houses run stir fans and misters. Adjust nutrient density of bird's diet to match any reduction in feed consumption. Move air over the birds at a minimum velocity of 1.8–2.0 meters/second. Periodically flush water lines with cooler water. Closely monitor flock behavior. Maximize nighttime cooling.

Emergency (heat index > 81): Extreme heat stress conditions exist; avoid handling birds for transfer or vaccination. Do not feed during the hottest part of the day. Decrease light intensity to reduce bird activity and body heat production.

Figure 2. Adapted from Temperature and Humidity Stress Index for Laying Hens. Xin, Hongwei and Harmon, Jay D., "Livestock Industry Facilities and Environment: Heat Stress Indices for Livestock" (1998) Agriculture and Environment Extension Publications. Book 163, Iowa State University.

THE EFFECT OF HEAT STRESS ON EGG SHELL QUALITY

Heat-stressed laying flocks often lay eggs with thinner, weaker eggshells because of an acid/base disturbance occurring in the blood as a result of panting (hyperventilation, gular reflex). As birds hyperventilate to lose body heat, there is excessive loss of CO_2 gas from their lungs and blood. Lower CO_2 in blood causes blood pH to elevate or become more alkaline. This condition is called respiratory alkalosis. The higher blood pH reduces the activity of the enzyme carbonic anhydrase, resulting in reduced calcium and carbonate ions transferred from blood to the shell gland (uterus). Increasing the amount of calcium in the diet will not correct this problem. Another contributing factor to thin eggshells is reduced intake of calcium as feed consumption drops, and an increased loss of phosphorus.

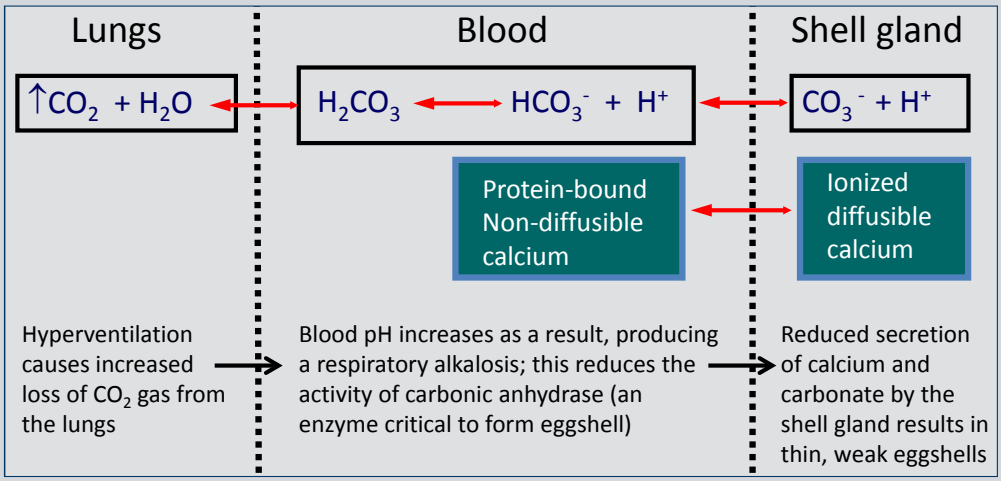

Figure 3. Demonstration of acid/base balance disruption caused by heat stress.

RESTORING THE ACID/BASE BALANCE

Potassium chloride, ammonium chloride or sodium bicarbonate (2–3 kg / MT of feed) can replace electrolytes lost during heat stress and encourage consumption of water. These treatments have shown beneficial in reducing mortality in acutely heat-stressed flocks.

DRINKER SYSTEM MANAGEMENT OF THE HEAT-STRESSED FLOCK

During periods of high environmental temperature, the flock has a high demand for drinking water. The water-to-feed consumption ratio is normally 2:1 at 21°C, but increases to 8:1 at 38°C.

- Drinking water must be available to heat-stressed flocks in the amount they require.
- Ensure that drinkers have sufficient water flow (> 70 ml/minute/nipple drinker).
- Ensure that sufficient drinker space is being provided and drinkers are functioning properly.
- For floor-reared flocks, providing additional drinkers can help accommodate the increased water consumption.
- Cooler water will help reduce the birds' core temperature and thus reduce the impact of heat stress.
- Cooling drinking water by flushing water lines during the afternoon has been shown to increase feed consumption and sustain egg production in heat-stressed layers.
- Plastic water lines rapidly equilibrate with the environmental temperature, making it difficult to cool water temperature below the air temperature, particularly at the end of long water lines.
- Keeping water below 25°C will help maintain higher water intakes and therefore encourage higher feed intake. Water temperature above 30°C will negatively impact water intake and have further negative impact on feed intake.

Technical Update – UNDERSTANDING HEAT STRESS IN LAYERS

- Use vitamin and electrolyte supplements in the drinking water to replenish the loss of sodium, chloride, potassium and bicarbonate in the urine. Electrolyte supplements are best used in anticipation of a rapid rise in environmental temperature.
- Drinking water from overhead water tanks can become hot if exposed to direct sunlight. These water tanks should be a light color, insulated and covered to avoid direct sunlight. Water tanks are ideally placed inside the house or underground (see Figure 12).

MANAGEMENT OF THE HEAT-STRESSED FLOCK

- Do not disturb the birds during the hottest time of the day (afternoon and early evening). Adjust work schedules and lighting programs so that routine work is done early in the morning or at night.
- Management practices that require bird handling, such as beak trimming, transfer and vaccinations (by eyedrop, wingweb or injection), should be done in the early morning hours.
- Use foggers and misters to increase the evaporative cooling during the day. Run the foggers for 2 minutes every 10 minutes. Fogger run times can be adjusted based on house temperature and humidity.
- Fogging the inlet air in negative pressure ventilation systems has a good cooling effect.
- Using roof sprinklers during times of extremely high temperature can remove heat from the roof and cool the inside of the house.
- Do not run the feeders during the hottest time of the day.
- Adjust fan thermostats so all fans run continuously during the night and early morning hours. The goal is to maximize nighttime cooling in the house to prolong the period of moderate temperatures the next morning.
- Increase the movement of air in open houses with stir fans. Ensure a minimum velocity of 1.8–2.0 meters/second in the bird areas.

Figure 4. Stir fans and foggers increase air velocity within the house and create a cooling effect.

- Caged birds are more susceptible to heat stress because they are unable to seek a cooler place and there is less opportunity for conductive heat loss in cages. The temperature within a cage can be much higher than the measured air temperature in the walkway. Increased air velocity within the cages increases the convective heat loss and removes trapped air between birds.
- Do not overstock cages; overcrowded cages allow less air flow between birds, reducing the effectiveness of ventilation and increasing the heat load in the house.
- Transport birds early in the morning or at night. Place fewer birds per transport crate and have empty crates on the truck to allow space for ventilation around the birds during the move.

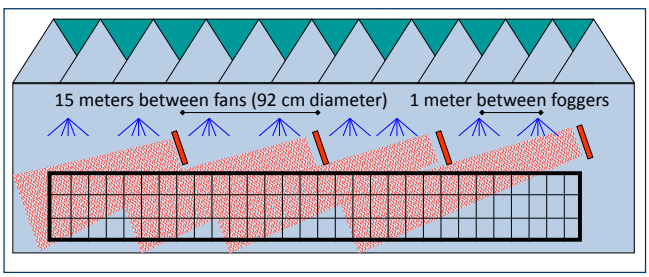

Figure 5. Placement of stir fans and foggers in open houses.

AMBIENT TEMP. (°C)	Air Movement (m^3 / hour per 1000 birds)											
	1 week		3 weeks		6 weeks		12 weeks		18 weeks		19+ weeks	
	W-36	HLB	W-36	HLB	W-36	HLB	W-36	HLB	W-36	HLB	W-36	HLB
32	340	360	510	540	1020	1250	2550	3000	5950	7140	4650–9350	9340–12000
21	170	180	255	270	510	630	1275	1500	2550	3050	4250–5100	5100–6800
10	120	130	170	180	340	420	680	800	1870	2240	2550–3400	3060–4250

Figure 6. Recommended ventilation rates for commercial layers (W-36 and Hy-Line Brown). For more information, see Hy-Line International Management Guides. Acknowledgment: Dr. Hongwei Xin, Professor, Department of Agriculture and Biosystems Engineering and Department of Animal Science, Iowa State University, Ames, Iowa, USA.

LIGHTING PROGRAMS FOR HEAT-STRESSED FLOCKS

- Adjust the lighting program to provide more morning light hours (and fewer afternoon light hours) to encourage feed consumption during the cooler period of the day.
- Use a midnight feeding of 1–2 hours to provide an additional feeding during the cool of the night to encourage feed intake during hot weather. (For more information on midnight feeding, see Hy-Line International Management Guides.)
- In extreme heat stress, lower the intensity of light during the hottest time of the day to reduce bird activity.
- Intermittent lighting programs have also been used successfully in heat stress conditions to encourage feed intake.

NUTRITIONAL MANAGEMENT OF THE HEAT-STRESSED FLOCK

Closely monitor the feed consumption of the flock during hot weather. It is important to rebalance the diet for other critical nutrients, particularly amino acids, calcium, sodium and phosphorous according to the birds' productivity demand (i.e. stage of production) and the observed feed intake. Insufficient amino acid intake is the primary reason for productivity loss during hot weather.

Several strategies may be employed to help to manage elevated temperatures and maintain higher levels of feed intake.

- Avoid feeding times during hot periods of the day and encourage as much consumption as possible in the early morning or evening.
- Normally a maximum 1 hour for feeder clean-out time is recommended, but this can be extended to 3 hours when the temperature exceeds 36°C.
- Consider adding a 1- to 2-hour midnight feeding.
- Alter feed particle size, either by increasing it or by feeding a crumble diet. With crumble diets in laying flocks, a supplementary source or presentation of large particle limestone is recommended.

Technical Update – UNDERSTANDING HEAT STRESS IN LAYERS

When formulating the diet for hot weather conditions, there are several things to consider:

- Formulate diets using highly digestible materials, particularly protein sources. Metabolism of excess protein is particularly heat-loading on the bird and exacerbates the ionic misbalance. Formulate to digestible amino acid targets and do not apply a high crude protein minimum in the formula. Synthetic amino acids can reduce crude protein in the diet without limiting amino acid levels.
- Increasing the proportion of energy contribution from highly digestible lipid, rather than starches or proteins, will reduce the body heat production resulting from digestion. This is known as heat increment and is lowest with the digestion of dietary fat.
- The phosphorous requirement increases during heat stress due to increased urinary excretion. Increases of up to 5% should be appropriate under heat stress conditions.
- The ratio of chloride to sodium in the diet should be between 1:1 and 1.1:1 in hot weather conditions, with a target dietary electrolyte balance (molar equivalence of Na+ + K+ – Cl-) of about 250 mEq/kg. Due to elevated electrolyte loss in hot weather, higher sodium levels may be required (0.02–0.03% more than in non-heat stress conditions). Care should also be given that water is not providing a significant level of chloride to the birds.
- Due to the reduced feed intake, vitamin and trace mineral intake is also reduced. Many of these micro nutrients, particularly B vitamins and antioxidants, may be beneficial to the bird in heat stress conditions. Vitamin C at 200-300 mg/kg of diet can be added to the diet to improve performance.
- Organic zinc may improve shell quality by assisting the activity of the carbonic anhydrase enzyme, as zinc is a key mineral element of this critical enzyme.
- Organic copper may also be helpful, by reducing the negative antagonism between inorganic copper and zinc sources during digestion.
- Do not use nicarbazin (anticoccidial drug) during hot weather, as it can increase heat stress-induced mortality.

VACCINATION CONSIDERATIONS DURING HEAT STRESS

- Adjust the amount of medications and volumes of water used for water vaccination to reflect the increased water consumption of the flock during hot weather.
- Water vaccinations during hot weather should ideally be administered within one hour.
- Use caution when spray vaccinating during hot weather. Newcastle and bronchitis vaccine reactions can occur in birds hyperventilating because of heat stress.
- Use caution when water vaccinating a flock during hot weather. Do not withhold drinking water from the flocks during hot weather. It is best to water vaccinate flocks just after the lights come on in the morning.
- Postpone vaccinations during periods of heat stress whenever possible. Heat-stressed birds have decreased immune function and may not respond as well to vaccination.
- Live vaccines are subject to accelerated deterioration when exposed to high heat. Maintain the refrigeration of live vaccines until the vaccines are administered. Bronchitis and AE vaccines are particularly heat-sensitive and titers can be lost rapidly.

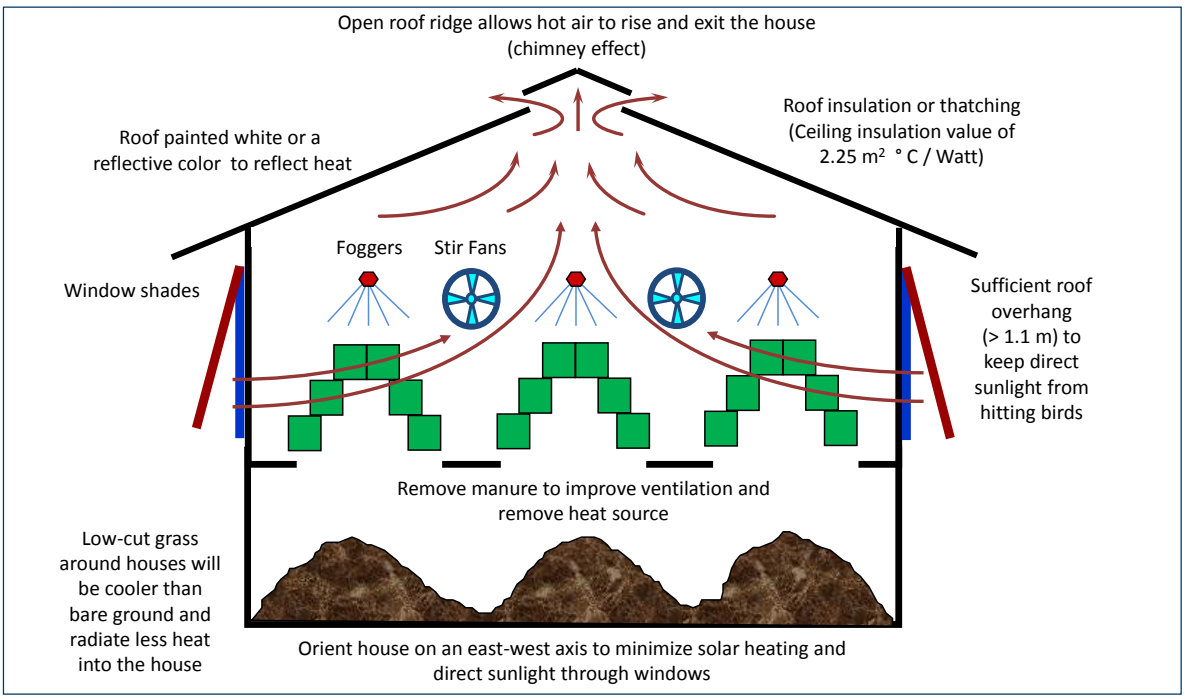

Figure 7. Open house design for reducing heat stress.

HOUSING CONSIDERATIONS DURING HEAT STRESS

The ventilation system should be checked to insure efficient operation prior to the arrival of the hot season.

- Clean and ensure function of fan louvers. Fan belts should be tightened or changed to avoid slipping or breaking during periods of high temperature. Air inlets must be adequate to supply the airflow needed to ventilate the house during warm weather. Inadequate inlet space will throttle down the fans and decrease airflow. Inlets should be kept clean and free of anything that might restrict the flow of incoming air. Use baffle boards to direct incoming air onto the birds.
- Thermostats should be checked for accuracy. An auxiliary power system must be in place in case of a power outage during hot weather.
- Check house static pressure settings in negative and positive pressure ventilation systems to ensure adequate and uniform airflow (12.5–30 Pa or 0.05–0.12 in. water).
- In houses equipped with evaporative cooling systems, the pads should be cleaned or replaced when they become clogged. Water flow over the pads should be uniform with no dry areas. Air will flow preferentially through dry areas since there is less resistance.
- Check the water filters and change if necessary. A clogged water filter restricts the flow of fresh drinking water into the house.

Figure 8. Use of thatching material (paddy straw, corn stalks, sugarcane tops) to reduce solar heating of the roof.

Figure 9. Porous window shades block direct sunlight from entering the house, but allow air to pass through.

- Clean spider webs and dust from window screens frequently to improve ventilation inside the house.

Figure 10. Sunlight should not shine directly on birds. Use sufficient roof overhangs or window shades to block sunlight.

Figure 11. Manure allowed to accumulate reduces ventilation in cages.

Figure 12. Having the water tank inside the house keeps the water cooler.

- Remove manure from the house before the hot season, if practical. Heat produced during the decomposition of manure contributes to the heat load in the house. The presence of large amounts of manure in shallow pit houses or under cage batteries restricts the movement of air.
- Environmentally controlled houses and curtain-sided houses that can convert to tunnel ventilation are ideal in areas subject to high environmental temperatures. Open houses should utilize stir fans and fogging systems.
- Insulated roofs reduce the radiation and conduction of solar heat through the roof to the interior of the house.
- Ensure the water system can accommodate the water demands for foggers and evaporative cooling systems, and increased bird water consumption. **The availability of drinking water to a heat-stressed flock should never be compromised.**

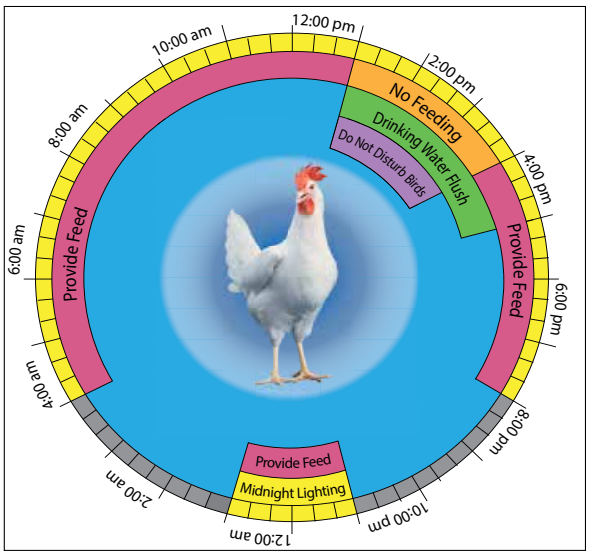

Figure 13. Management schedule during times of heat stress.

- Remove unneeded metal objects from around houses (i.e., machinery, vehicles, nest boxes, junk) that could radiate heat into open houses.

The key to minimizing the effects of heat stress is ***anticipating*** periods of high environmental temperatures, and implementing appropriate ***management*** and ***nutritional*** measures prior to the rise in temperatures.

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AVIAN CORONA VIRAL DISEASES

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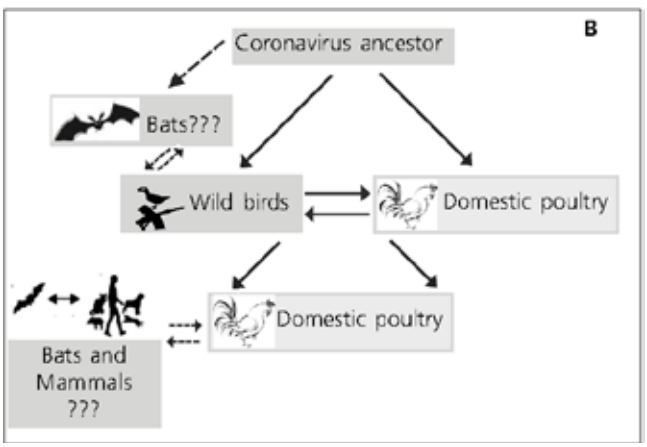
The word '**Corona**' has become a street popular language, it is so popular that even the people in remote areas of the villages speaks and make fun of it. Now everyone knows about the difference between virus and bacteria and become so familiar of these terms. No surprise that the children born in this period may named either COVID for male and CORONA for female child. Thanks to the news media and television media for their observations and creating awareness of this pandemic disease COVID-19.All the corona will not create serious infections, if only genetically modified or mutated to highly pathogenic strain then it will cause infection. The role of this corona virus causing respiratory infection in human was detected only in the year 1960.

But, the corona virus is not new to our poultry scientists. They are aware of corona virus as early as 1930's. Since nine decades poultry scientists are working on various aspects of its existence, behavior, pathogenesis, molecular biology, vaccine manufacturing and control of this virus.So far there is no history of causing infectious bronchitis in any scientist or the farmers working in poultry.

Coronaviruses (CoVs) are a large group of enveloped viruses with a single-strand RNA genome, which continuously circulate in mammals and birds and pose a threat to livestock, companion animals, and humans. CoVs harboured by avian species are classified to the genera gamma- and delta corona viruses. Within the gamma-CoVs the main representative is avian coronavirus, a taxonomic name which includes the highly contagious **Infectious bronchitis viruses** (IBVs) in chickens and similar viruses infecting other domestic birds such as turkeys, guinea fowls, or quails.

Similarly to other RNA viruses, coronaviruses (CoVs) are characterised by high genetic diversity driven by **mutation and recombination**, which can lead to the emergence of new viruses. Such new pathogens can have new features which even enable them to switch to new hosts . These newly created viruses can acquire zoonotic potential, as witnessed by the **Severe Acute Respiratory Syndrome (SARS)**, the epidemic from Southern China in 2003 caused by SARS-CoVs. This disease, termed "atypical pneumonia", was diagnosed in humans in 29 countries and had a nearly 10% mortality rate. In 2012, there emerged a subsequent disease caused by a novel coronavirus, the so-called **Middle East respiratory syndrome (MERS)** with even higher mortality rates. Both SARS- and MERS-CoVs crossed the species barrier from bats to humans through civet cats and camels as intermediate organisms. The current Novel Coronavirus covid-19 is the other face of SARS and hence called SARSII baffling the entire world.

Wild bird species serve as a natural reservoir of many emerging zoonotic pathogens and thus have a significant impact on public health. They are also the source of pathogens dangerous to domestic animals, and such infections could have socio-economic consequences.



Proposed epidemiology and transmission of IBV among wild birds and poultry (Adopted from Woo et al.,2009)

Avian coronavirus **(IBV)** is a coronavirus which infects birds, causing the associated disease, **infectious bronchitis (IB).** It is a highly infectious avian pathogen which affects the respiratory tract, gut, kidney and reproductive systems of chickens.

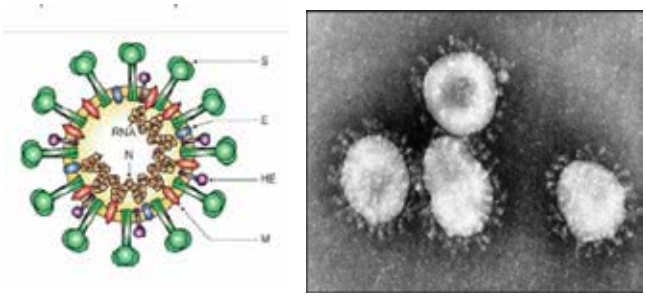
IBV affects the performance of both meat producing and egg producing chickens and is responsible for substantial economic loss within the poultry industry.

Host Specificity

The domestic fowl (*Gallus gallus)* and pheasant (*Phasianus spp.*) are considered to be natural hosts for IBV but, other IBV-like coronaviruses have been identified in nondomestic avian species including pheasant, peafowl, turkey, teal, geese, pigeon, penguins quail, duck, and Amazon parrot. Antigenic similarities between

turkey coronavirus (TCoV) and avian infectious bronchitis virus (AIBV) have also been demonstrated. Antibodies to IBV have been demonstrated in humans with close contact to poultry, but the virus has not been reported to cause human clinical disease

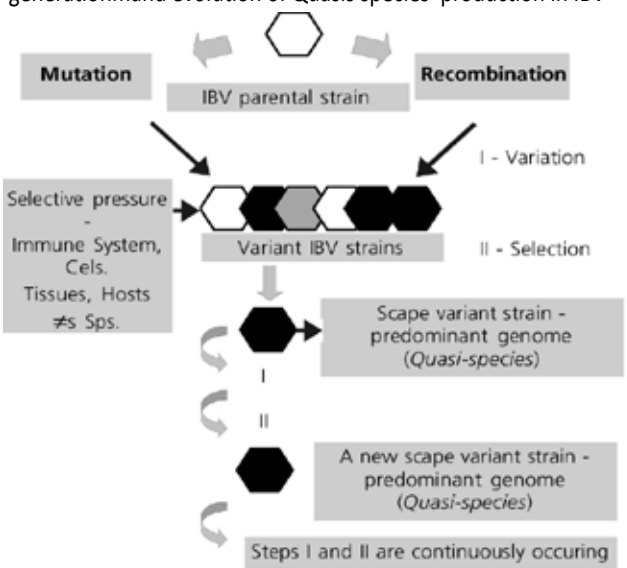
The Corona Virus

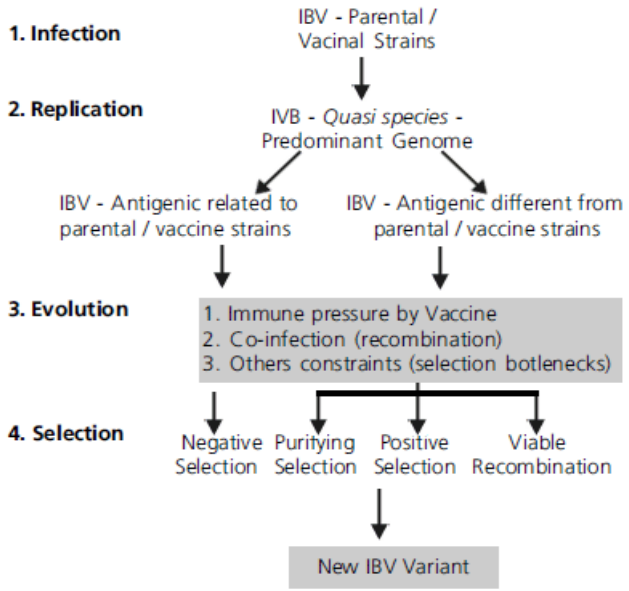


Coronaviruses are a group of viruses that have a halo, or crown-like (corona) appearance when viewed under an electron microscope.(Photo courtesy of the CDC)

Avian Coronaviruses are enveloped positive-strand RNA viruses that replicate in the cytoplasm.They have a distinctive set of club-shaped spikes on their envelope, and the spike protein (S) is the primary determinant of cell tropism and pathogenesis, being responsible (and apparently sufficient) for receptor binding and fusion . However, other envelope proteins are present: the M protein, the E protein, and (in some coronaviruses) an HE protein . The coronavirus S protein is categorized as a class I fusion protein, based on the presence of characteristic heptad repeats as such, it shows features of the fusion proteins of influenza virus (HA), retroviruses (Env), and paramyxoviruses (F and HN), for which there is extensive characterization at the structural and biophysical levels.

Genetic and phenotypic variations are common features in the evolution processes of Infectious bronchitis virus strains lead to evolution of important antigenic and pathogenic variable strains. The role of mutation, recombination and selection in the generationmand evolution of Quasis species production in IBV

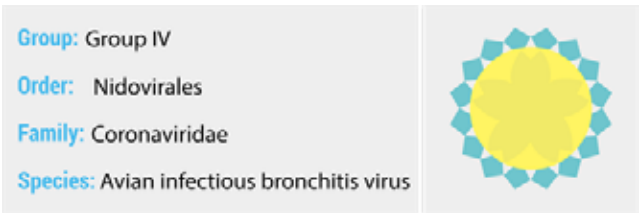




Schematic diagram of evolution of possible pathways and emergens of new antigenic variant / serotype from parental strain of IBV(Adopted from Lee2002)

Infectious bronchitis virus (IBV)

IBVis a coronavirus that causes an acute and highly contagious disease in chickens. The virus can cause substantial economic losses throughout the poultry industry worldwide. It can affect the upper respiratory tract and the reproductive tract, and some strains can cause nephritis.



IBV is the prototype species of the Coronavirus family, Gamma coronavirus genus, classified in the order Nidovirales, and it is the type species of the genus coronavirus of the domestic chicken *(Gallus gallus).* Infectious bronchitis (IB) was first observed by Schalk and Hawn (1931) in North Dakota in the United States in 2- to 3-week-old chickens. However, the nature of the infectious agent was not determined at that time and was assumed that IB was mainly a disease of young chickens.

Hence, the disease was named "infectious bronchitis of young chicks." Five years later, it was demonstrated that the causative agent of this disease is a virus, which was named IBV (Beach and Schalm, 1936). Since that initial discovery, many different serotypes, defined by neutralizing antibodies, and genetic types, based on the deduced amino acid sequence (from the nucleic acid sequence) of the spike gene, have been described around the world.

Transmission:

The virus is transmitted via the respiratory secretions, as well as faecal droplets from infected poultry. Contaminated objects and utensils may aid transmission and spread of the virus from one flock to another. Evidence of virus was shown in trachea, kidney, and Bursa of Fabricius 24 hrs following aerosol transmission. The nature of IBV persistence remains to be elucidated; however, detection of the virus in the caecal tonsils (up to 14 weeks) and from faeces (20 weeks) after infection might suggest a role of faecal shedding in viral transmission and persistence.

Incubation Period of IB

Generally the short incubation period for IBV varies with infective dose and route of infection. For example, while infection via the tracheal route may take a course as short as 18 hours, ocular inoculation leads to an incubation period of 36 hours

Pathogenesis and Pathology

The virus replicates to high titer first in the respiratory tract (ciliated epithelial cells); this is followed by viremia (within 1–2 days of infection), which distributes the virus to many organs. The virus can cause extensive damage to the ovaries, oviduct, and the kidneys, but this is dependent on the properties of individual virus strains. The intestinal tract is another site of primary infection, but damage usually is minimal.

The most frequent gross pathologic finding is mucosal thickening within The upper and lower respiratory tract, with serous or catarrhal exudate in the nasal passages, trachea, bronchi, and airsacs. In very young chicks, the main bronchi may be blocked with caseous yellow casts. Pneumonia and conjunctivitis occur in some cases.

Fig: a).Chick gasping for breath, b).inflammation of larynx and c) Nephritis

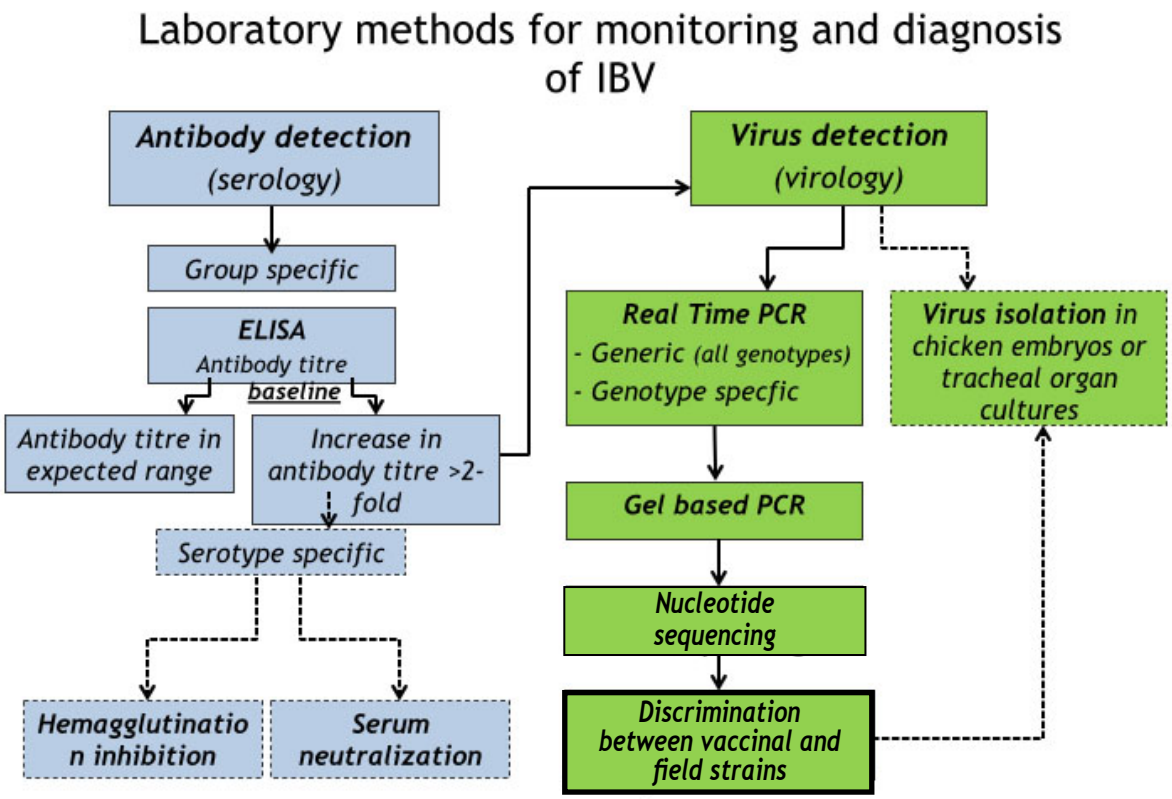
Clinical Signs of Infectious Bronchitis

- gasping
- coughing
- sneezing
- tracheal rales
- nasal discharge
- wet eyes

In laying birds, ova can be congested and sometimes ruptured, with free yolk in the abdominal cavity. Desquamation of respiratory epithelium, edema, epithelial hyperplasia, mononuclear cell infiltration of the submucosa, and regeneration occur in various combinations. Repair processes begin after 6–10 days, and are complete in 14–21 days. Some virus strains affect the kidney, causing interstitial nephritis.

Poor egg shall quality, rugged appearance, thin shells and watery albumin. In hatching eggs curled and stunted embryos are common

Shortening of oviduct in pullets causing "False Layers with normal Ovary.Cystic oviduct distended with watery fluid



Diagnosis

Virus neutralisation, HI or ELISA test for measuring antibody are helpful. Virus isolation in embryos or chicken kidney cell cultures and/ or PCR are necessary for a definitive diagnosis. Curling, stunting and death of embryos can be seen in inoculated embryonating eggs. Respiratory signs and lesions with kidney lesions give a presumptive diagnosis.

Tracheal swabs or fresh samples of trachea are most useful for virus detection or isolation. Direct immunofluorescence staining of tracheal tissue smears is useful in the diagnosis of early cases before secondary bacterial infection has occurred.

Virus Isolation-genome detection

- RT–PCR – is used with specific primers to detect the genome of the virus in tracheal samples or inoculated embryonated eggs or tracheal organ cultures.
- RFLP, – which recognizes the genome of the IBV and is used to determine the genotype.
- IBV typing by nucleic acid sequencing.
- IBV typing by real–time RT–PCR.

Vaccination programs for Infectious Bronchitis (IB) vaccines

No general vaccination rule can be applied. Each vaccination program must be adapted to the demands of the field situation.

Some considerations have to be taken into account when applying IB vaccines:

- At what age protection against Infectious Bronchitis (IB) is most needed.
- The field viruses present will determine which vaccines (protectotype) to choose.
- Interference with other (live) vaccinations must be avoided (IB vaccine viruses can interfere with for example Newcastle disease vaccine viruses).

Layers and breeders – The aim of vaccination is to protect the oviduct as IB infections may result in false layers, drops in production and changes in the internal and external quality of the eggs.

- In this context vaccination of young chickens is often done at an early age (first day(s) of life), and especially in broilers focusing on inducing enough protection so as to cover the whole fattening period. In layers and breeders the programs are focused in protecting the oviduct during the first weeks of life with modified live attenuated vaccines. Later on during the production period immunity needs to be broad and long lasting, and inactivated vaccines are often used.

Broilers – Vaccination is focused on reducing the economic losses caused by IB infections as these are reflected in weight loss and general poor performance of the flock.

In general milder live vaccines (Ma5) can be used from 1 day of age onwards. A period of 2 weeks should be left between the applications of 2 live vaccines. The inactivated vaccine is usually used at around 16 to 20 weeks of age. A period of 4–6 weeks should be left between the last live IB vaccine and the inactivated vaccine..

EGG DROP SYNDROME (EDS)

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Introduction:

Egg drop syndrome (EDS) is caused by multiple viruses in laying hens. The disease is characterized by production of thin shelled and shell-less eggs in apparently healthy birds and leads to a sudden drop (10-40%) in egg production or a failure to achieve a normal peak in production. It cannot be detected at early stage of the diseases, hens will eat the shell-less eggs and the only evidence that may remain is the membranes, which is a sign that is easy to miss. The Clinical signs include diarrhea and loss of colour of shell, yolk pigment along with production of thin-shelled eggs and mortality is usually negligible.

Host susceptible: Ducks and geese are the natural hosts for the EDS virus and are asymptomatic carriers. Chickens of all ages and breeds are susceptible but the disease is most severe in broiler breeders and brown-egg layer strains. EDS can be distinguished from Newcastle disease and influenza virus infections by the absence of illness, and from infectious bronchitis by the eggshell changes that occur at or just before the drop in egg production.

Etiology: EDS is caused by EDS virus which is belong to adenovirus. The incubation period is varied from three to five days and the course of the disease is four to 10 weeks. The virus is resistant to wide range pH range 3–10 and to heating for 3 hr at 56°C (132.8°F). This virus is destroyed by the use 0.5 percent formaldehyde.

Transmission of disease: Disease transmitted in various ways

Clinical Signs: Affected birds show severe drop in egg production with abnormal egg. The discoloration of egg colour, thin shelled egg laid, dullness, anorexia.

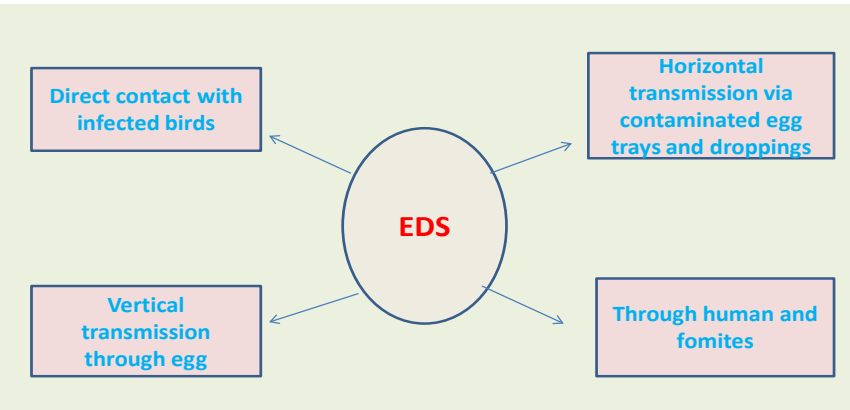
Post Mortem Lesions: on necropsy the reduce the size of oviduct with inactive ovaries, their severe exudates deposition around shell gland

Diagnosis:

- On the basis of clinical sign such thin shelled egg, decrease egg production.
- Duck atadenovirus A can be isolated in embryonated duck or goose eggs, and in cell cultures.
- Viral nucleic acids can be detected by PCR, ELISAs or immunofluorescence.
- Serological tests such as hemagglutination inhibition, ELISAs and serum neutralization are used.

Treatment and prevention of EDS

There is no specific treatment for EDS.



In prevention: they followed biosecurity measures in the farm

- Proper cleaning and disinfection of all equipments such as egg trays and feeder in the farm.
- Contaminated water should be chlorinated.
- Composting of residual material infected birds.
- Proper disposal of dead bird.
- Proper vaccination of birds against egg drop syndrome inactivated vaccine with oil adjuvant and is given in growing period especially at 14 – 18 week of age birds.

IMPORTANT FACTS AND VARIOUS PREVENTIVE MEASURES IN CONTEXTTO PANDEMIC COVID-19 IN INDIAN SCENARIO

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COVID-19/ Novel Corona virus

The 2019 novel corona virus (named as COVID-19) is a new virus that causes respiratory illnesses, ranging from common cold to acute respiratory syndrome. It can spread from person-to-person and was first identified in the 1st week of January 2020 during an investigation into an outbreak in Wuhan, China. It belongs to the family of viruses such as SARS (Severe Acute Respiratory Syndrome) and MERS (Middle East Respiratory Syndrome).

Point of emergence

Corona viruses are a large family of viruses which can cause illnesses in animals such as camels, cattle, cats, and bats. Similar to MERS and SARS, these coronaviruses can rarely infect people and then spread between people. Numerous studies in China report a link to an animal market in the city of Wuhan where the virus is suspected to have emerged from an animal source in this market.

Risk outside China

Although the virus originated in a small city in China, it is now rapidly spreading across the entire country. Moreover, several cases have been reported in 165 countries outside China (till 17 March 2020) such as the USA, Australia, Thailand, Japan, Italy, Iran, Spain, UK, France, India and Sri Lanka. According to data from the WHO as on 17 March 2020*, more than 1 lakh cases have been confirmed in 161 countries outside China which takes the global count to 1.8 lakh confirmed cases and more than 7150 deaths. WHO has assessed COVID-19 as **very high** risk across the globe including China.

Pattern of spread of COVID-19 pandemic worldwide and case fatality rate (as on 17 March 2020, as per WHO)

Method of spread

According to the WHO and Centres for Disease Control and Prevention (CDC), the other corona virus MERS and SARS, spread through respiratory route via droplets which can be transmitted through a sneeze or cough. This suggests that the mode of transmission of the novel corona virus might be similar. Hence, transmission between people can occur through droplets, by coming in close contact with the patient or by sharing objects of personal use. However, the exact mode of transmission of the 2019 novel coronavirus is not known.

Signs and Symptoms-

According to the CDC, the patients suffering from COVID-19 have reported symptoms of mild to severe respiratory illnesses such as cough, fever, shortness of breath, pneumonia and diarrhoea and vomiting, in some cases.

Preventive Measures to be Followed

In severe cases, pneumonia in both the lungs is also seen (WHO was alerted following severe cases of pneumonia in Wuhan which lead to the identification of the novel corona virus), which can eventually prove fatal. The symptoms are mostly similar to flu and flu-like diseases caused by other respiratory viruses.

Preventive Measures to be Followed

- Avoid close contact with people who are sick.
- Avoid touching your eyes, nose and mouth with unwashed hands.
- Wash your hands often with soap and water for at least 20 seconds.
- If soap and water are not available, use an alcohol-based hand sanitizer.
- Stay at home and take sufficient rest
- Cover your mouth with tissue when you sneeze or cough
- Sneeze into your elbow if you don't have access to tissue/ handkerchief
- Discard used tissues in a bin
- Disinfect objects/surfaces you touch
- Seek medical attention in case of fever, cough or difficulty in breathing.

How do you differentiate between normal flu and coronavirus symptoms?

If someone comes with a respiratory disease, it is very difficult to distinguish between flu and coronavirus by just looking at the symptoms. This is the reason that makes diagnosis important. Your doctor may recommend lab tests (such as sputum and/or throat swab) to detect the virus and know if the symptoms are due to influenza virus, corona virus or other respiratory viruses. If you have a sore throat, it's more likely a cold than flu or coronavirus, in general.

Treatment and Vaccination

As of 17th March 2020, there is no specific medicine recommended to prevent or treat the virus. The treatment in people infected with the coronavirus is aimed at relieving the symptoms and providing supportive care to the patient. Also, antibiotics work only against bacteria and not against viruses. As COVID-19 is a viral infection, antibiotics should not be used as a means of prevention or treatment till there is secondary infection. There is currently no vaccine to protect against COVID-19*.

Can a person infected with coronavirus recover completely and be no more infectious?

Yes, in fact, about 80% of people have recovered from the disease without needing special treatment.

Age susceptibility

There are reports of neonates, teenagers, young adults and older people falling prey to the new coronavirus in China. So, it goes without saying that people of all ages can be infected by the novel coronavirus. However, older people & those with pre-existing

	Cold	Flu	Coronavirus
Time between catching the virus and beginning to show symptoms	1-3 days	1-4 days	2-14 days
Symptom onset	Gradual	Abrupt	Gradual
How long do symptoms last	7-12 days	3-7 days	Mild cases:~2 weeks. Severe or critical disease: 3-6 weeks
Major symptoms			
Fever	Sometimes	Common	Common
Runny nose	Common	Sometimes	Less Common
Sore throat	Common	Sometimes	Less Common
Cough	Common	Sometimes	Common
Body Ache	Rare; if occurs, mild	Common	Less Common
Difficulty Breathing	Rare	Rare	Common

medical conditions might be more vulnerable to suffer from an infection and become severely ill.

Zoonosis of disease

At present, there is no evidence that pets such as dogs and cats can get infected with the virus and lead to transmission to humans. However, it is always wise to wash your hands with soap and water after contact with pets to lower the risk of infection.

Status of disease in India

According to the Ministry of Health and Family Welfare (MOHFW), as on 17th March 2020, there are 129 confirmed COVID 2019 cases across India. It is reported that 13 people have been cured of the disease and 1 person died from coronavirus.

Indian Government response to prevent coronavirus

The Ministry of Health and Family Welfare (MOHFW), Government of India has issued a helpline number (+91-11-23978046) to seek any help or solve any query related to coronavirus. The Government has also released helpline numbers of states & union territories for corona-virus.In case of any queries, you can also mail at the helpline Email Id for coronavirus– ncov2019@gmail.com. The Government has also appealed to passengers who have travelled to China since 1st January, 2020, to please come forward for self-reporting to the call centre and visit the nearest health facility if experiencing fever, cough or breathing difficulties, and also inform their doctor about the travel history.

Can wearing a medical mask all the time protect against Novel Coronavirus?

Simple medical masks can prevent your nose or mouth from coming in contact with infected droplets. But, not everyone needs to use a mask. WHO says that use masks only if you're sick and have symptoms like cough or difficulty breathing. If you're healthy and taking care of a person suspected of COVID-19 infection, you must wear a mask.

What should I keep in mind while using a mask?

Masks will be effective only if you combine its use with frequent hand-washing with soap and water or alcohol-based hand sanitizer. You must clean your hands before wearing a mask and after removing it. Ensure that your mask covers your nose, mouth and chin perfectly without leaving any gaps between your face and mask. Avoid touching the mask while using it. If you do, wash your hands immediately. Dispose of the mask in a closed bin. Remember to remove the mask from behind without touching the front of the mask.

Prevention is best cure for COVID-19

PREBIOTICS AS FEED ADDITIVE IN POULTRY NUTRITION

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Introduction

Prebiotics are a general term to refer to chemicals that induce the growth or activity of microorganisms (e.g., bacteria and fungi) that contribute to the well-being of their host (Schloss, 2014). Prebiotics can alter the composition of organisms in the gut microbiome and it is also defined as "a nondigestible food ingredient that beneficially affects the host by selectively stimulating the growth and activity of one or a limited number of bacteria in the colon (Roberfroid, 2007). From various studies the ability of prebiotic to be used as alternative feed additive has already been proven and thus started to play a decisive role in nutrition of poultry. The uses of prebiotics in diets for poultry have been shown improvement in bird's immunity and increasing performance.

Mode of action Prebiotica

Prebiotics may have beneficial effects on the animal's physiology by selectively stimulating beneficial microbiota in the digestion system. This may have beneficial effects in reducing the incidence of enteric pathogens. The mode of action of prebiotic is ability and adhering competition of represents colonization in the intestinal mucous membranes to prevent adhesion and invasion of pathogens like Salmonella and Campylobacter and, which is a key performance parameter, inhibition of their colonization and replacement of already adhered ones. There is evidence that the principal mechanisms of prebiotics is immunomodulation, that includes selective growth of lactic acid-producing bacteria, resulting in an increasing in the concentration of short chain fatty acids (SCFA) like propionate, acetate, and especially butyrate which is the preferred energy source of colon oocytes and stimulates gut integrity (Alloui *et al.,* 2013). High fermentation activity and high concentration of the SCFA is correlated with a lower pH, which is associated with a suppression of pathogens and increased solubility of certain nutrients (Józefiak *et al.,* 2004). Fermentation products such as SCFA increase after prebiotic supplementation as a result of oligosaccharide fermentation by resident microbiota.

Effects of prebiotics on nutrients digestibility

Prebiotic supplementation improved the digestibility of protein as well other nutrients and fat in a maize-soybean meal based diet, but had no effect on the performance of broiler chickens. Boilers fed prebiotics based diets had improved dry matter digestibility compared with control group (Yun *et al.,* 2017). These results infer that dry matter digestibility was improved due to an increase in the beneficial microorganism, such as Lactobacillus. Moreover, the prebiotic induce changes in the intestinal mucosal structure and to improve gut health. In a various study it was found that the birds receiving chito-oligosaccharide (Prebiotic) had better nutrient digestibility of dry matter, crude protein, energy, calcium, and phosphorus as compare to control (Li *et al*., 2007). Supplementation of prebiotic to broiler chickens enhances the intestinal mucosal structure, including increase in the length of villus.

Effects of prebiotics on productive performance

Supplementation of prebitic in the diets of poultry positively improved feed intake, body weight gain and feed conversion ratio as compared to non-supplemented birds. From various study it was also found supplementation of prebiotic in starter phase and grower phase of poultry it had increased feed intake and body weight as well as reduced mortality rate of broiler chickens (Abdel Raheem *et al.* 2012). The dietary supplementation of probiotics and prebiotics improved body weight gain and feed conversion ratio of broilers at 28 days of age (Yun *et al*., 2017). Thus overall performance of birds increases with supplementation of prebiotics either alone or in combination of probiotics.

Effect of prebiotic on microbial populations

It is generally known that the beneficial gut bacteria play an important role in host metabolism, nutrient digestion, growth performance and health of the host poultry. Prebiotics are current strategies with great potential to modify and manipulate the gut microbial population. A number of studies have demonstrated that dietary inclusion of mannanoligosaccharide (MOS) can increase intestinal numbers of beneficial bacteria such as lactobacilli and bifidobacteria, whilst decreasing E. coli (Baurhoo *et al.,* 2007). Supplementation of dietary MOS inhibits growth of intestinal pathogenic microorganisms through binding to cell walls of bacteria and preventing the bacteria from attaching to intestinal epithelial cells.

Effects of prebiotics on carcass criteria

Certain types of prebiotics have been used as feed additives to improve animal performance and enhance

carcass criteria. From various animal experimental study it was reported that there is a significant increase ($p<0.05$) in the carcass weight and dressing % as well as in the absolute weight of the immune organs (bursa and thymus) and vital organs weight, in prebiotic supplemented broilers group.

Conclusion

Generally, it can be recommended that prebiotic components have the potential to be considered as an alternative to in feed-antibiotic and improving productive performance and health status of poultry. Nevertheless, there is still further research under standardized conditions needed to evaluate the exact mechanism of action and to determine the optimal dietary inclusion level in order to optimize growth performance, nutrient digestibility and maintain healthy birds.

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HOW BACTERIOPHAGES AND FEED ADDITIVES ARE TRANSFORMING THE POULTRY SECTOR

Nipun Gupta, Supervisory Board Representative, Vetphage Pharmaceuticals Pvt Ltd.

According to a recently concluded study it was established that most of the antibiotics used in the poultry industry are increasingly losing their efficacy against pathogenic microorganisms. Similarly, the use of antimicrobial agents in animal husbandry for therapeutic has been linked to the development of resistant bacteria. If the usage of antibiotics is not restricted in poultry there are chances that they may come in the final product that is eggs and meat which can further lead to increase in antibiotic resistance.

The global poultry market was valued at US$ 267,332.3 million in 2018, and is expected to exhibit a CAGR of 3.0% over the forecast period 2019–2027, in terms of revenue. Rapid growth in consumer demand for livestock products in emerging economies such as China and India, owing to rising poultry meat and egg production and consumption is expected to fuel growth of the global poultry market. On the other hand, the Indian poultry market, consisting of broilers and eggs was worth INR 1,750 Billion in 2018. The market is further projected to reach INR 4,340 Billion by 2024, growing at a CAGR of 16.2% during 2019-2024.

Consumers these days are very health conscious and choose to consume animal products which have been raised in a safe environment. This is why poultry farms need to take strict measures in prevention and control of infectious diseases by ensuring cleanliness and healthy diet. However, it is difficult to keep poultry farms and stock completely disease free as new disease agents can emerge from time to time. Contracted diseases can reduce the egg production and growth rate of flocks which will in turn impact the economic output. Moreover, genetic changes in the birds have also made them more susceptible to diseases. Rising demand coupled with the need for greater generation of meat products, increasing awareness about the need for better hygiene and the rise of a more conscious consumer is gradually ushering in a series of changes in poultry rearing practices.

Rising awareness about the need to reduce Antibiotics usage

According to a recently concluded study it was established that most of the antibiotics used in the poultry industry are increasingly losing their efficacy against pathogenic microorganisms. Similarly, the use of antimicrobial agents in animal husbandry for therapeutic has been linked to the development of resistant bacteria. If the usage of antibiotics is not restricted in poultry there are chances that they may come in the final product that is eggs and meat which can further lead to increase in antibiotic resistance. This is because all microorganisms have an inherent capacity to resist some antibiotics which is why excessive use of antimicrobial agents has caused rapid surge and development of AR.

Antibacterial resistance is the ability developed in bacteria to combat against antibacterial agents.However, the main reason because of which antibiotics for animals are used is that they help treat infectionsand indirectly help in their growth and development. Chicken is

Bacteriophages are natural micro-organisms made up of only genetic material namely DNA and RNA plus protein. Moreover, they also do not damage the beneficial microbiome balance. These naturally occurring organisms only eliminate selected bacteria. More and more companies are embracing bacteriophages instead of antibiotics when it comes to poultry production.This is largely because bacteriophages are safe as they are only able to infect bacterial cells not human or animal cells. Without the presence of their bacterial host they become inactive within 48 hours. In comparison to antibiotics a single phage can destroy a multiple bacterium by multiplying in bacteria itself which is why fewer doses are required per administration.

one of the most farmed animal species in the world which makes it a leading contributor to the poultry industry. Nonetheless, use of antimicrobials in chicken plus other animal production will accelerate the development of AR in pathogens which poses danger to human beings.

This is because when an antibiotic is used in improper way, it may leave behind some bacterial strains that resist the drug which can multiply and become the dominating population. This dominating population can also be transferred to others. These resistant bacteria can transfer from poultry products to humans when they consume meat contaminated with these pathogens. This has prompted many countries to withdraw antibiotics from being used in animal production and set up regulatory authorities for selected antibiotics as well encourage the use of bacteriophages. This has also led to a surge in demand for healthier and safer alternatives to antibiotics for disease prevention and control.

Bacteriophages as a Better Alternative

Bacteriophages have emerged as a viable alternative to reduce antibiotic usage in poultry rearing. Bacteriophages are natural micro-organisms made up of only genetic material namely DNA and RNA plus protein. Moreover, they also do not damage the beneficial microbiome balance. These naturally occurring organisms only eliminate selected bacteria. More and more companies are embracing bacteriophages instead of antibiotics when it comes to poultry production. This is largely because bacteriophages are safe as they are only able to infect bacterial cells not human or animal cells. Without the presence of their bacterial host they become inactive within 48 hours. In comparison to antibiotics a single phage can destroy a multiple bacterium by multiplying in bacteria itself which is why fewer doses are required per administration. Moreover, phages also do not dissociate from bacterial targets once irreversibly adsorbed.

Phage Therapy is now emerging as a useful tool in controlling bacterial infections and at the same time is encouraging the growth of healthy poultry. With the use of Artificial Intelligence, it can be determined whether the phages are lytic or not as only lytic phages are used in animal health. This is because lysogenic phages are dormant and embed themselves in the bacterial cell wall to live off it without destroying it. On the other hand, lytic phages cause lysis which is destruction of bacteria.

The Need for Quality Feed

When it comes to chicken it takes less than three hours for the feed to be digested and absorbed. To compensate for the relatively short digestive tract and rapid digestion transit time, high-performing birds need easily digestible nutrient-dense feed where nutrients are critical. The rates of genetic change in growth and feed efficiency over the years have also changed the physiology of the birds. Nutrient requirements and nutritional management have therefore changed to harvest maximum of the genetic potential of the new strains. The high genetic potential of current poultry strains can only be achieved with properly formulated feeds that are protein and energy-dense.

Moreover, the feed additives to use for destruction and prevention of bacterial infection in farmed animals as well as transmission to humans must be regulatory approved as well as should eliminate pathogens. It should also be non-toxic with no side effects on poultry and must be easy to apply and use. Other things which poultry farm owners and managers must keep in mind are the composition and quality of feed, nutrient value, digestibility, moisture retention, palatability as well as any possible hazards that long term consumption may cause.

QUALITY CONTROL RATION FOR POULTRY

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Quality control term is defined as monitoring of commodity quality so as to maintain high standards at different levels from production to its utilization. Quality control of feed stuff can play a vital role in the development of feed manufacturing industry and also for maximum exploitation of the production efficiency. It is essential at all stages in the production compound feed so that animals could get wholesome balanced and nutritious feed.

Introduction

- Quality control term is defined as monitoring of commodity quality so as to maintain high standards at different levels from production to its utilization.
- Quality control of feed stuff can play a vital role in the development of feed manufacturing industry and also for maximum exploitation of the production efficiency.
- It is essential at all stages in the production compound feed so that animals could get wholesome balanced and nutritious feed.

Importance of quality control of feed ingredients and finished feeds:

The quality control of feed ingredients and finished feed are:

1. Agronomic practices
2. Processing of raw materials,
3. Storage conditions
4. Anti-nutritional factors
5. Variation in composition
6. Purchase considerations
7. Certificate of analysis
8. Computation of feed formulations and adulteration

Organizations and Acts:

The Quality control of feed is regulated by the legislation;

The Bureau of: Indian standards (BIS), New Delhi. BIS is a statutory institution established under the BIS Act, 1986 to promote harmonious development of the activities of standardization, marketing and quality certification of goods and attending to connected matters in the country.

Objectives of the animal feeds society committee

1. To Describe the feeds accurately
2. To lay down standards on feed ingredients
3. To lay down standards for compounded feed formulations and mineral mixtures for cattle, poultry, pigs, laboratory animals etc.

Implementation of quality control programme, requires knowledge of various feed ingredients and their processing methods, effective inspections, sampling of commodity, training personnel, instructions to quality control personnel, ingredient standards, laboratory procedures, consistency of the feed ingredient quality and reliability of materials supply.

Quality control of raw materials:

Feed ingredients are suitable for inclusion in the compounded feeds and also to indicate the maximum proportions in which they can be included.

1. Preliminary inspection of raw materials
2. Chemical tests
3. Toxicological tests
4. Analytical procedures
5. Quick and spot test

1. Preliminary inspection of raw material

Physical inspection are their;

1. Colour, odour, texture , density of the materials
2. Evidence of wetting
3. Storage pests
4. Evidence of damaged or broken kernels etc
5. Presence of adulterants':such as stones ;dirt or other foreign materials
6. Evidence of presence of rat faecal pellets or hair etc
7. Moisture should not be more than 10%

2 . Chemical tests: This indicates possible constraints on usage due to the presence of excessive content of crude fiber, fat or total ash. Additional tests should be carried out on materials with high ash content, to-determine acid insoluble ash.

Amount of acid insoluble ash = amount of sand and dirt present

3. Toxicological tests: Some ingredient contain endogenous toxic substance which may at low concentration adversely affect feed aversion and palatability any at higher concentration, even result in the -death of the animals.

- eg. Gossypol in cotton seed
- Glucosinolates in rape seed
- Cyanogenetic glycosides linseed and cassava
- Mycotoxins (Aflatoxins) in maize, groundnut cake etc.

4. Analytical procedures: Standardisation of analytical methods is required. The procedures of carrying out feed analysis are available from AOAC (association of official analytical chemists), AACC (American association of cereal chemists) and BIS (Bureau Indian standards)

5. Quick and spot test: many times the quick decision in assessing the quality is required. These tests are mainly to identify the contaminants/ adulterants toxins etc.

Eg- Allergens, oxalates, fiber, mannans, biogenic animals, cyclopropenoid fatty acid, lipoxygenase, lectins, saponins, pectins.

Possible adulterants in commonly used feed ingredients:

INGREDIENT	POSSIBLE ADULTERABTS
Maize	Cobs, cob , sand
Jowar	Sand
Soybean meal	Hull
GNC	Urea
Rice bran	Sand, husk , fiber saw dust
Calcite	Sand, magnesium
DCP	Calcite powder, rock, phosphate
Mineral Mix	Sand, cheap, minerals
Meat & bone meal	Sand, leather meal, blood meal

Physical Evaluation

Physical evaluation is easy but rough in nature. One must be highly trained to identify the changes in the nature of the raw material/feeds. The physical evaluation includes examining the colour, taste, smell, sound and touch.

Colour: Change in the normal colour of the feed ingredients indicates the maturity state of the grain, storage conditions, presence of toxins, and contamination due to sand, possible use of insecticides/fungicides which gives dull and dusty appearance. Black coloured fish meal indicates the rancidity of fish oil. Dark brown colour of meat meal indicates over cooking.

Common adulterants of different feed ingredients-

Feed ingredients	Adulterant
Groundnut cake	Groundnut husk, urea, non-edible oil cakes
Soybean meal	Urea, hulls, saw dust
Deoiled rice bran, wheat bran	Ground rice husk, saw dust
Fish meal	Common salt, urea, crustaceans, feather meal
Mineral mixture	Common salt, marble powder, sand, lime stone
Meat and bone meal	Sand, leather meal, blood meal, rock phosphate
Shell grit	Sand, dust
Molasses	Water Cobs, cob dust, sand
Rice broken	Marble, grit
Dicalcium phosphate	Calcite powder, rock phosphate

Most commonly used spot tests

Constituent	Test	Remark
Thiram (Pesticide in maize)	100g sample+ 50m1 chloroform shake (5min). Filter the contents with Whatman filter paper 1. Add few crystals of cuprous iodide to filtrate and shake	Filtered chloroform extract turns amber to brown colour with in 1 -2 min indicative of thiram
Mahua cake	In water extract of test feed add conc. H_2SO_4	Violet or pink colour indicate the presence of Mahua cake
Linseed meal	Test feed is treated with 1-2 drops or more of dilute H2SO4 in microtest tube. The mouth of test tube is covered with a disk of filter paper moistened with a drop of reagent	Depending upon the amount of HCN produced a more or less intense blue colour appears
Common salt	To 1g sample, add 100m1 distill water, stir & filter.	White turbidity indicates presence of salts
Leather meal	Pick up brown to black particles from sample and place on Petridis, add 3-5 drops of ammonium molybdate, stand for 5-10min	No colour change
Fish meal quality (presence of NPN)	Put 2-3g of test sample in a 100m1 beaker and add 1 0-15m1 distill water stir. After 2-3 min, add 3-5 drops of test extract on white porcelain plate and add 2-3 drops of mercuric-potassium iodide alkaline solution	Heavy orange colour indicates presence. of NPN. intensity of orange colour of precipitate depend on, amount of NPN
Decomposition test (animal and marine products)	5g test sample in 250m1 flask. Prepare cork, to fit 2.25" of filter paper strip pinned to bottom & moistened with saturated lead acetate. Add 50m1 dilute H_2SO_4 (5m1 acid + 45m1 distill water) & insert cork. Stand for 16hour.	Test paper darkens quickly, if sample is badly decomposed
Hoof or horn	Place 2-3 particles of amber colour test sample into a evaporating dish, add 5m1 glacial acetic acid, stand for 60 min	Test particles if hard and tough –hoof and horn ,soft and swollen gelatin
Urease activity in soyabean meal	Spread the sample uniformly on petridish, glazed paper with white background. soybean meal Spray cresol red (0.1 % solution) and thymol blue (0.1% alcoholic solution) reagent mixture (80m1 cresol red, 20m1 glycerol/sorbitol, 2g urea and few drops of thymol blue) and examine for colour.	Inadequate heat treatment- particles turn red within a minute. Adequate heat treatment- Few particles (<10%) slowly develop red coloration.

Size: Size of the grains governs its energy and protein due to proportional decrease/ increase in seed and its coat. Smaller the grain lower will be the nutrient contents due to more proportion of seed/grain coat. To evaluate the weight of cereals about 100grains or fixed volume is taken. Higher weight indicates a higher ME value. This technique is called Test Weight.

Homogeneity: Presence of contaminants like other grains, broken grains, husks, weed seeds, infested seeds is viewed. In the oil seed cakes, closer observation will reveal the presence of fibrous material like hulls in de-oiled groundnut cake, rice polish contaminated with husk. Presence of clumps in oilseed meals indicates inadequate cooling of the cake before packing. Clumps may contain fungal growth. Clumps in mineral ingredients are not suitable for premixing.

Smell: Standing near the stock immediately indicate any difference from the normal smell. Musty odour indicates the beginning of fungal contamination or boring insects. To detect rancidity in oil rich feed ingredients this is the best method. Odour of petroleum products is suggestive

of excessive pesticide or fungicides. Leather smell of meat meal indicates adulteration with leather meal.

Taste: Each ingredient has a different taste; any change in the taste like bitterness in grains and oilseed cakes indicates the presence of mycotoxin. The level of salt can be detected by tasting. Bitter taste of rice polish indicates rancidity of fatty acids.

Touch: Feeling the raw material indicates dryness. Clumps can be found out by inserting the hand inside the bag. The clumps may be due to high moisture content, improper storage, packing of fresh warm solvent extracted meal that crumble on application of light pressure. Clumps formed due to excess moisture will be very hard.

Sound: Dry grains on pouring down or biting will produce sound of spilling coins, indicative of optimum moisture in grains. Common adulterants in feeds and fodders: The feed ingredients should be checked for possible adulterants (Table 1). Adulteration is defined as the admixture of a pure substance with some cheaper and low quality substance, done intentionally usually to make money. The common contaminant or adulterant is husk or sand. Winnowing is the best method to detect husk in the feedstuff. Sieving can be done to differentiate contaminants based on particle size. To detect for the presence of sand a weighed quantity of grain is soaked in water and then by sieving with hand, the grains can be separated. The remaining water is decanted and the settled sand is weighed to assess the level of contamination. Low CP and high CF in oil seed meals is indicative of adulteration with fibrous material. The high CF alone is indicative of adulteration with urea and or some inferior quality oil seed meals like mahua, castor or karanja cake. The amount of acid insoluble ash is a good guide to the amount of sand or other dirt which may be present. Determination of peroxide content and free fatty acid in oily materials is indicative of rancidity and duration of storage, respectively.

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ARTIFICIAL INSEMINATION IN POULTRY

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Introduction

Artificial Insemination (AI) is biotechnological procedure is very common in farm animals and also poultry breeding programmes. It most widely used in dairy cattle, horses, pig and poultry. It main aim to transfer the desirable character from male to many progeny (Cooper, 1977; Rutz and Xavier, 1998; Foote, 2002; Gee *et al.,* 2004; Blanco et al., 2009; Dhama *et al.,* 2007; Bakst and Long, 2010). A.I also improves the reproductive efficiency of poultry. The first time A.I. used in dog by Spallanzani and Bonnet in 1784 and this technique was first successfully used in birds by Ivanov in 1907 produced fertile chicken eggs using semen recovered from the vas deferens of cock. An intravaginal insemination technique was first used by Quinn and Burrows, 1936. Thereafter, with the support of recent advances in science and technology AI is playing a major role in up gradation of the poultry production in many countries (Surai and Wishart, 1996; Rutz and Xavier, 1998; Dhama *et al.,* 2007). The AI technique in poultry shows better fertility than natural mating and also boost up the rate of genetic improvement by increasing selection differential, wherein one highly selected sire is mated with thousands of females (Chaudhury, 1996; Gill *et al.,* 1999; Gee *et al.,* 2004; Dhama *et al.,* 2007). This technique is most extensively used in commercial turkeys.

Artificial insemination technique: Most widely used of AI in poultry was practiced by Quinn and Burrows (1936). The technique involves combined action of applying pressure on the abdomen along with evertion of vaginal orifice. The procedure is called by different names as crackling, venting or everting the hen. With the aid of straws or syringes semen (80-100 million spermatozoa) is deposited in the vaginal orifice (to the depth of 2-4 cm or as close as possible to the sperm storage tubules). The depth of insemination actually depends upon the species of the bird and length of vagina. Usually, AI is carried out in the late afternoon (Brillard and Bakst, 1990) because at this time the incidence of the hard-shelled eggs in the uterus of the hens is rare.

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Methods of semen collection: In different birds the anatomical variation in the phallic region primarily leads to the variation in semen collection techniques. In order to have a good AI programme the first step should be to have a good quantity of semen from a good donor bird. It is necessary to develop a simple as well as effective method of collection of semen as well as insemination for making use of the potential role of birds in poultry research as well as production (Burrows and Quinn, 1937; Chelmonska *et al.,* 2008). To achieve this, semen should be collected from the donor birds in such a way that the required amount is obtained without environmental contamination. Three or four times milking of the male birds should be done in order to check quantity as well as colour of semen. Preservation of semen becomes useless in cases if there is refusal in production of semen by the male birds 10 days after handling or if there is discolouration of the semen which is normally white (Gee and Sexton, 1990; Tselutin *et al.,* 1995). Unlike

domestic animals which can be trained easily to mount a dummy and ejaculate, birds are tricky especially wild birds which are usually in flight. The usual methods followed for collection of semen from birds are as follows:

- **Co-operative approach:** As the name implies this technique needs co-operation from the donor birds which can be achieved by an external stimulus which are of behavioral, for example voice, nest, food (Hamerstrom, 1970). The lead point of this technique is that there is no stress and injury free on the bird as there is no bird handling involved. The major advantage of this technique is that the quality of semen is good without contaminants like feaces and urine. However, the quantity of the semen obtained will be less which is the drawback of this technique. The co-operative approach technique showed promising results with artificial vagina in case of Muscovy ducks (Gvaryahu *et al.,* 1984), Emu (Malecki *et al.,* 1997) and with female dummy in case of Houbara bustard (Jalme *et al.,* 1994), quail (Chelmonska *et al.,* 2008) and ostrich. Uses of dummy or teaser females require a special mention in this regard (Rybnik *et al.,* 2007)
- **Electro-ejaculation:** This technique is commonly employed for ducks and geese, psittacines and pigeons. Anaesthesia is a mandatory in this technique and contamination with urine is a major drawback (Harrison and Wasmund, 1983; Betzen, 1985; Samour *et al.,* 1985)
- **Abdominal massage technique:** This is the mostly widely accepted and used technique technique (Burrows and Quinn, 1935) which is yet a non invasive method (Howell and Bartholomew, 1952; Birkhead *et al.,* 1995). In chickens and turkeys it involves massaging of the cloacal region in order to achieve phallic tumescence (Burrows and Quinn, 1935). Properly restrained donors are stroked gently in the back region behind the wings which stimulates most males with phallic engorgement at which state the cloaca can be squeezed to collect the semen (Cooper, 1977). There may be however damage to the phallic as well as cloacal regions due to additional cloacal strokes thereby contributing to semen contamination (Malecki *et al.,* 2008). For investigation of the physical as well as biochemical characteristics of the semen of broiler chicken attempts have been made. Abdominal message method has been used for collection of semen of certain indigenous poultry birds like Kadaknath (Shinde *et al.,* 2012)

Semen has to get diluted with suitable diluents in order to: (i) Increase semen volume, (ii) Increase in number of birds inseminated by per unit volume of semen and (iii) Finally, it prolongs the sperm survival for both short and long term preservation of semen in vitro. Semen with proper diluents would be economically viable and effective for insemination in birds. Using the semen diluents, the services of a superior male can be used maximally by the AI technique. Hence, the major objective of the diluent is to improve the reproductive efficiency of cock and to reduce the cost of AI. However, variations exist between the males of different breeds/species of fowl with respect to the physico-biochemical characteristics and fertilizing ability of their spermatozoa.

Semen dilution: After collection semen, the dilution of semen is done to prevent the spermatozoa start losing integrity as results reduced fertility. Within 30-45 min of collection it is useful to dilute semen with appropriate diluents used. The excellent levels of fertility with chicken as well as turkey semen in vitro for 24 h or more. The volume of semen is increased by dilution thereby helping to retain integrity of cells and buffering the detrimental effects that use to arise on storage. Ideal extenders and their careful handling are required in general if semen need to be stored (Koohpar *et al.,* 2010). Semen has to get diluted with suitable diluents in order to: (i) Increase semen volume, (ii) Increase in number of birds inseminated by per unit volume of semen and (iii) Finally, it prolongs the sperm survival for both short and long term preservation of semen in vitro. Semen with proper diluents would be economically viable and effective for insemination in birds. Using the semen diluents, the services of a superior male can be used maximally by the AI technique. Hence, the major objective of the diluent is to improve the reproductive efficiency of cock and to reduce the cost of AI. However, variations exist between the males of different breeds/species of fowl with respect to the physico-biochemical characteristics and fertilizing ability of their spermatozoa. Hence, it is not possible to develop a master semen diluent for all the avian species. This necessitates breed/species specific semen diluents for avian species for short term preservation (Mohan *et al.,* 2011).

Advantages of artificial insemination in birds:

- A increase in mating ratio utilizing appropriate semen diluents compared

to natural mating where usually one cockerel mates with six to ten hens

- Use of older males from outstanding performers for improving the genetic identity of flock can be used for several generations. Whereas, under natural mating their useful life is limited
- Use of valuable male birds that have been unable to mate naturally due to injured in the leg
- Preferential mating of birds can be eliminated it leads to poor fertility problems. Whenever fertile eggs are needed laying cages are no longer problems. AI solves the problem of using colony cages with several hens and one rooster that usually decreases the fertility rate (Surai and Wishart, 1996)
- It is reduced chance of transmission of infectious and contagious diseases, apart from those transmitted through semen, from tom (adult male of turkey) or cock to the hens as there is no physical contact (Chaudhury, 1996)
- Breeding experiments can be facilitated. Chickens, turkeys, guinea fowl, ducks, geese and quail are used in intra-species and inter-species insemination experiments. Reciprocal crossing of wild geese with domesticated geese has been performed
- Semen can be transported easily and at a large scale because transportation of birds from one region to another is difficult task.
- Prevention of vertically and sexually transmitted diseases can be achieved in a poultry flock if properly certified and good quality semen is used (Das *et al.,* 2004)
- AI can serve as a good means for conservation of endangered avian species (Blanco *et al.,* 2009). As of now there are approximately 1,308 species of avian which are marked either as endangered or threatened (Bird Life International, 2013)
- As far as the production of hatching eggs are concerned reduced libido in case of poultry birds is a costly problem for which AI is practiced for overcoming such problem

Points for successful A.I. programme

- Semen samples should be free from transparent fluid, which is released from the lymph fold present in cloacal region. This fluid is found rich of calcium ion which causes the agglutination of the spermatozoa resulting into a rapid loss of fertilizing ability in fowl. Thus, for AI, to maintain high fertility it is advisable not to collect semen contaminated with excessive amounts of transparent fluid
- AI must be conducted with fresh semen as it has become easy to collect semen in poultry and seeing proximity of hen in large breeding farms. In certain instances cryopreservation of poultry semen is recommended but it may prove less fertile, for the purpose of this utilization of frozen semen (Gill *et al.,* 1999; Foote, 2002).
- Birds can be fasted 5-7 h before the scheduled AI so that there will not be any fecal matter which obstructs the AI
- Handling of the birds should be done away from the nest to prevent breakage of eggs and also handling should be gentle to prevent trauma
- Conditioning of wild birds is necessary so to have a smooth AI programme because unconditioned birds may struggle which will hinder the transport of sperm to the ovum
- Immediately after AI, food item which is favorite for the bird can be provided so as to make a conditioned reflex phenomenon (Staley *et al.,* 2007)
- One/two inseminations per week prior to onset of egg laying should be carried out in chicken

Pathogens/diseases transmitted during artificial insemination in birds

The faulty handling and lack of knowledge hygiene it leads to the semen contamination with harmful microbes (or pathogens) which could be transferred between the bird/hen and their progeny (Guy *et al.,* 1995; Lombardo, 1998; Lierz, 2008). Moreover, the unscientific management of breeder flocks kept for semen collection will be promotes the Sexually Transmitted Diseases (STDs). For developing suitable birds for AI procedures, factors such as the health parameters of the breeder/parent stock and free from pathogens such as Avian leukosis virus (ALV), Chicken anemia virus (CAV), Mycoplasma, Salmonella, Campylobacter and others need to be efficiently monitored (Corrier *et al.,* 1999; Buhr *et al.,* 2005; Dhama *et al.,* 2007, 2008a; Kabir, 2010).

Sexually transmitted diseases (STDs)/ microbes through semen: Cloaca is dual functions of excretion as well as transfer of gametes are served by the avian. During copulation between cock and hen, microbes may get directly transmitted as because intestinal microbes can get incorporated into ejaculate (Sheldon, 1993).

Salmonella (Salmonella Gallinarum causing Fowl Typhoid and Salmonella Pullorum causing Pullorum Disease), *Salmonella* causing huge mortality in birds transmission by semen from hen/ cock to their progeny(Reiber *et al.,* 1995; Donoghue *et al.,* 2004; Dhama *et al.,* 2007; Kabir, 2010). These microbes present in the semen can also cause male infertility. *Mycoplasma meleagridis* in turkeys is predominantly transmitted vertically from parent stock. M. iowae, mostly spread in lay, occurs following unskillful artificial insemination. *Campylobacter-positive* semen, could provide a route in addition to fecal-oral, for transmission of *Campylobacter* from rooster to the reproductive tract of hen i.e., vertical transmission between dam and offspring (Cox *et al.,* 2002; Tomar *et al.,* 2006). Diseases like avian influenza, Newcastle Disease (ND), duck plague and turkey rhinotracheitis (Pneumovirus) had also been reported in transmission through semen (Senthilkumar *et al.,* 2003; Dhama *et al.,* 2005, 2007, 2013a). Transmission of Chicken anaemia virus (CAV), Eastern equine encephalitis virus and avian leucosis via semen is also possible (Hoop, 1993; Dhama *et al.,* 2007, 2008a). Semen can also be contaminated with vertically transmitted microbes such as Egg drop syndrome-76 (EDS-76) virus, Avian encephalomyelitis (AE) virus, Avian Reovirus (ARV), Avian leukosis virus (ALV) etc. (Smith and Fadly, 1994; Segura *et al.,* 1988; Senthilkumar *et al.,* 2003; Dhama et al., 2007).

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PHYTOACTIVES (NUBIOTIC) AS ALTERNATIVE TO ANTIBIOTIC GROWTH PROMOTERS IN BROILERS

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The withdrawal of sub therapeutic doses of antibiotic growth promoters not only affects or reduces productive performance, but also increases morbidity and mortality in poorly maintained flocks (Dibner and Richards, 2005). Moreover, the use of antibiotic growth promoters has been criticized due to its possible role in the occurrence of antimicrobial resistance in humans and drug resistivity issues in poultry.

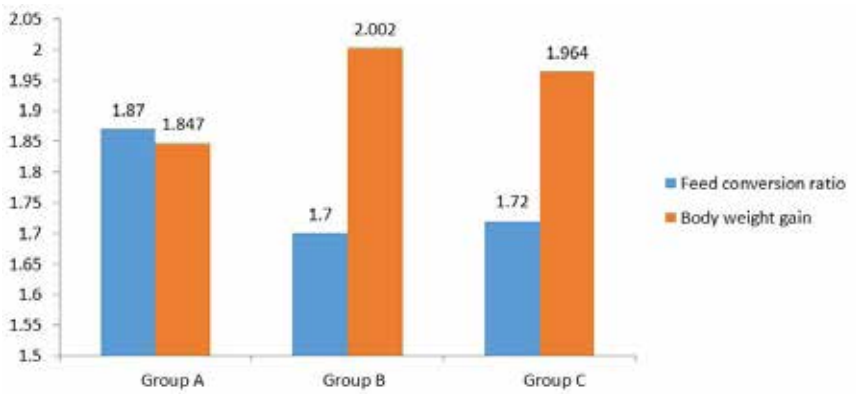
Abstract

An experiment was conducted to evaluate the efficacy of a phytobioactive growth promoter in broiler chickens. A total of 450 'Cobb 500' day-old broiler chicks were randomly divided into three groups of 150 birds each, viz. A, B & C .The groups were further subdivided into triplicates of 50 birds each. Group A served as control, Group B chicks were supplemented with Phytoactives (Nubiotic) from day 7 till day 28 @1ml/Litre of drinking water and Group C chicks supplemented with antibiotic (Lincomycin @5ppm). Average body weight and feed intake was recorded on day 0, 11, 29 and 42. The mean body weight was significantly ($p<0.05$) higher in birds of group B (2039.17±113.2g) as compared to Group A (1882.65±102.6 g) and Group C (1998.34±107.9g). The FCR in birds of group A was 1.87, group B was 1.70 and in group C was 1.72. It was concluded that the growth promoting potential of phytoactives is at par with antibiotics without affecting the food chain.

Key words: Phytoactives, Growth promoter, Body weight gain.

Introduction Antibiotic growth promoters (AGPs) have widely been used to improve performance and feed utilization amongst food animals. These antibiotics are used as prophylactic agents in sub therapeutic doses , for promoting growth, improving feed conversion rate and general well being of meat producing animals as well as poultry

Graph 1. Feed conversion ratio and body weight gain of different groups



(Chattopadhyay MK, 2014; Khodambashi Emami *et al*., 2012; Barcelo D, 2007 Harms *et al*., 1986). Nevertheless, such sub therapeutic doses are accompanied with adverse effects too. The withdrawal of sub therapeutic doses of antibiotic growth promoters not only affects or reduces productive performance, but also increases morbidity and mortality in poorly maintained flocks (Dibner and Richards, 2005). Moreover, the use of antibiotic growth promoters has been criticized due to its possible role in the occurrence of antimicrobial resistance in humans and drug resistivity issues in poultry. There is a growing concern over the transmission and proliferation of resistant bacteria via the food chains.

With the ban of AGPs as growth promoters in European union and the increasing consumer demand for antibiotic free meat, the use of AGPs in poultry production remains limited. Various other strategies to promote growth and enhance feed conversion have also contributed substantially to the poultry industry. Organic acids, phytogenic feed additives (botanicals, or PFAs), probiotics (direct-fed microbials, or DFMs) and prebiotics have all been identified as potential antibiotic replacements (Dhama et al.,2018. The use of phytobioactives as AGPs in poultry production also opens a better horizon with maximum efficacy and no residual effects, in a cost effective manner, without affecting the food chain or inducing drug toxicity (Patterson and Burkholder, 2003; Akinleye et al., 2008; Huyghebaert et al., 2011)

Keeping in view the potentials of phytobioactives and the limitations of AGPs, this study was undertaken to access the efficacy of a essential oil based AGP as a replacement to the antibiotic growth promoter, Lincomycin.

Materials and Methods The experiment to access the efficacy of a herbal growth promoter against traditionally used AGP was conducted at Puja poultry farms, Chilkana road, Saharanpur. A total of 450 'Cobb 500' day- old broiler chickens were randomly divided into three equal groups (n = 150), namely Groups A, B and C, which were sub divided into triplicates of 50 birds each to get triplicate results. The study was carried out for a period of 42 days. Chicks of Group A served as control and were given standard diet without any kind of supplements, chicks of Groups B were supplemented with Nubiotic (Oregano oil, Thyme oil, Cinnamaldehyde, prebiotics, probiotics and amino acids) from day 7 till day 28 in drinking water @1ml/Litre of drinking water and Group C were supplemented with antibiotic (Lincomycin @5ppm). Phytoactives (Nubiotic) and antibiotic (Licomycin) incorporated in the drinking water for chickens from day 7 to day 28 is outlined in Table 1. All the birds were reared under deep litter system in well constructed and hygenic poultry shelters. Commercial feed and fresh tap water were provided *ad libidum*. Routine vaccination was done against Newcastle disease and Infectious bursal disease. Body weight was recorded four times during the study on days 0, 11, 29 and 42, respectively. One-way ANOVA was done to find out the significant variation in body weight gain among different treatment groups by using SPSS 17.0.

Results and Discussion

The mean body weight of different groups at Day 0, 11, 29 and 42 is presented in Table II. The mean body weights of birds in group A (control) were 191.15 g,

Table 1.Classification of Groups

Groups	Treatments
A	Control group with normal drinking water
B	Drinking water supplemented with Phytoactives (Nubiotic) @1 ml/Litre of drinking water
C	Drinking water supplemented with Antibiotic (Lincomycin) @5ppm

Materials and Methods The experiment to access the efficacy of a herbal growth promoter against traditionally used AGP was conducted at Puja poultry farms, Chilkana road, Saharanpur. A total of 450 'Cobb 500' day- old broiler chickens were randomly divided into three equal groups (n = 150), namely Groups A, B and C, which were sub divided into triplicates of 50 birds each to get triplicate results. The study was carried out for a period of 42 days. Chicks of Group A served as control and were given standard diet without any kind of supplements, chicks of Groups B were supplemented with Nubiotic

Cinnamaldehyde has shown to have potent immunomodulatory effect (potentiated immune response) and improved gut integrity with enhanced growth (Awaad et al.,2014; Toghyani et al.,2011). Actives of Cinnamaldehyde might have maintained gut integrity, protected against pathogens and contributed towards better growth. Multiple actions of Thymol include reduction of pathogenic microbiota, boosting of the antioxidant system due to polyphenol constituents (Abdulkarimi et al. 2011)increasing feed utilisation and enhancing immunity (Youssef et al., 2017; Ghazalah & Ali 2008; Zhang et al., 2005).

Table II. The mean body weight of broiler chickens

Groups (n=150)	Body weight (g/bird) (Mean±SD)			
Day	Day 0	Day 11	Day 29	Day 42
Group A	35.43±1.64[a]	191.15±8.60[a]	976.73±41.9[a]	1882.65±102.6[a]
Group B	36.76±1.67[a]	212.57 ±9.54[b]	1182.32±57.4[b]	2039.17±113.2[b]
Group C	34.65±1.60[a]	218.16±11.12[b]	1202±58.2[b]	1998.34±107.9[c]

n= no. of broiler chicken in each group
Values with different letters within the same column differ significantly (p<0.005).

976.73 g and 1882.65 g at day 11, 28 and 42, respectively. The mean body weight of group B chicks, supplemented with herbal growth promoter (Nubiotic), was 212.57 g, 1182.32 g and 2039.17 g at day 11, 28 and 42, respectively. The mean body weight of birds of group C, supplemented with antibiotic growth growth promoter (Lincomycin), was 218.16 g, 1202.42 g and 1998.34 g at day 11, 28 and 42, respectively. There was significant difference in body weight at day 11, 29 and 42 between supplemented groups and non supplemented group. However, no significant difference was observed at day 11 and day 29 for body weight between group B and group C. The body weight was significantly higher in group B birds compared to group A and group C at day 42. The same may be due to long lasting effects of essential oils than the AGPs. The cumulative FCR was better in group B as compared to group A and group C. This may be attributed to better effect of essential oils on digestion and feed utilization. The encouraging results of chicks in group B may be sequele to the phytobiotics, essential oils and amino acids present in Nubiotic (Oregano oil, Thyme oil, Cinnamaldehyde, prebiotics, probiotics and amino acids).Such effects of essential oils and phytobioactives have also been documented by Mpofu *et al.* (2016)); Li *et al.*, (2015); Khodambashi *et al.*,(2012) and Zhang *et al.*,(2005).

The present formulation of phytobioactives along with probiotics and prebiotics seems to have acted as an immunomodulator, antioxidant and antibacterial, suppressing the growth of pathogenic microbiota. Previous studies have also documented the use of probiotic supplementation for countering enteric bacterial infections (Tellez et al., 2012; Dhama et al., 2011; Nava et al., 2009; Willis and Reid, 2008 and Vicente et al.,2007).

Considering the vast antimicrobial, antioxidant, antiviral, immunomodulatory and antiparasitic potentials of *Oregano (Alagawany et al.,2018)*, it appears to have improved feed intake and feed conversion, enhanced digestion and expanded productive performance. Cinnamaldehyde has shown to have potent immunomodulatory effect (potentiated immune response) and improved gut integrity with enhanced growth (Awaad *et*

Table III. Total body weight gain of broiler chickens supplemented with vitamins

Groups	Average weight gain		
n=150	Group A	Group B	Group C
From day 1 to 11	155.72	175.81	183.51
From day 11 to 28	785.58	969.75	984.24
From day 28 to 42	905.92	856.85	795.94
Feed conversion ratio	1.87	1.70	1.72
Body weight gain	1847.22	2002.41	1963.69

n= Number of broiler chickens in each group®

al.,2014; Toghyani *et al*.,2011). Actives of Cinnamaldehyde might have maintained gut integrity, protected against pathogens and contributed towards better growth.

Multiple actions of Thymol include reduction of pathogenic microbiota, boosting of the antioxidant system due to polyphenol constituents (Abdulkarimi *et al*. 2011)increasing feed utilisation and enhancing immunity (Youssef *et al*., 2017; Ghazalah & Ali 2008; Zhang *et al*., 2005).

Conclusion

With the ban on the use and increasing awareness of the limitations of antibiotic growth promoters in poultry , use of essential oils based formulation resulted in better growth rate , better FCR and a antibiotic free broiler production . Essential oils and phytobioactives lead to a decrease in the pathogenic microflora, improved gut ecology, better digestibility of the nutrients as well as contributed towards alleviation of oxidative damage and a healthy poultry.

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MONTHLY EGG RATES

APRIL 2020

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
Ahmedabad	345	345	345	345	350	350	360	365	370	373	373	373	373	373	373	373	380	390	400	410	420	425	425	425	400	350
Ajmer	200	200	200	225	260	265	265	265	265	265	240	240	250	255	260	270	300	312	320	322	324	324	314	300	300	300
Asansole	-	-	-	-	358	358	358	358	358	-	333	333	333	333	-	343	357	390	408	408	415	415	420	420	410	410
Barwala	211	211	211	235	270	275	275	275	275	275	250	250	250	255	260	274	294	308	315	318	320	320	310	302	302	302
Bengaluru (CC)	345	350	350	350	355	360	370	380	390	400	400	400	400	400	400	400	400	405	415	420	420	420	420	420	420	360
Brahmapur (OD)	375	230	230	340	340	340	340	350	350	310	310	310	310	310	310	310	330	355	362	370	375	377	377	377	377	342
Burdwan (CC)	315	300	300	400	400	400	400	375	375	325	325	335	335	338	338	343	363	383	393	393	415	420	420	420	420	420
CC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							-
Chennai (CC)	360	360	370	380	380	395	410	440	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	400
Chittoor	353	353	363	373	373	388	403	433	443	443	443	443	443	443	443	443	443	443	443	443	443	443	443	443	443	393
Delhi (CC)	235	235	235	245	270	300	300	300	300	300	300	285	285	285	285	290	300	320	335	340	340	340	340	340	340	340
E.Godavari	345	345	345	345	345	345	345	345	345	345	345	280	280	282	290	298	318	345	350	360	365	367	367	367	367	335
Hyderabad	335	335	335	340	345	350	355	360	365	365	365	365	365	365	365	375	385	395	400	405	410	410	410	410	350	300
Ludhiana	256	256	215	215	236	283	283	283	283	283	283	258	268	268	268	284	286	303	313	317	318	323	323	323	313	303
Midnapur (KOL)	315	300	300	400	400	400	400	375	375	325	325	335	335	338	338	343	363	383	393	393	415	420	420	420	420	420
Miraj	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							-
Mumbai (CC)	395	395	395	395	400	400	405	410	415	420	420	420	420	420	420	420	430	440	450	455	460	465	465	465	445	395
Muzaffurpur (CC)	-	-	286	286	286	300	300	309	309	309	300	300	300	305	305	309	319	333	357	371	371	381	381	381	376	305
Mysuru	345	350	357	357	362	367	380	405	415	425	425	425	425	425	425	425	425	425	435	440	440	440	440	440	440	368
Nagpur	150	150	150	200	240	250	265	270	270	270	265	260	270	275	280	330	350	365	380	385	380	375	360	350	320	300
Namakkal	345	350	350	355	365	380	400	410	420	420	420	420	420	420	420	420	420	425	430	430	430	430	430	430	380	300
Patna	281	286	286	286	262	295	295	309	309	309	286	286	305	309	309	315	324	348	371	381	381	381	371	366	367	367
Patna (CC)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							-
Pune	410	410	410	390	390	390	390	390	395	395	395	395	395	395	395	405	415	430	445	450	455	460	460	460	445	420
Ranchi (CC)	-	-	-	-	-	357	357	357	357	357	343	343	333	333	338	338	343	357	381	390	390	395	395	395	386	386
Vijayawada	345	345	345	345	345	345	345	345	345	345	345	345	345	345	345	345	345	345	350	360	365	367	367	367	367	335
Vizag	345	345	345	345	345	345	345	345	345	345	345	345	345	345	347	350	355	365	365	370	375	375	375	375	375	375
W.Godavari	345	345	345	345	345	345	345	345	345	345	345	280	280	282	290	298	318	345	350	360	365	367	367	367	367	335
Warangal	338	338	338	338	343	348	353	358	363	368	368	368	368	368	368	368	378	388	398	403	408	413	413	413	413	353
West godavari	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							-

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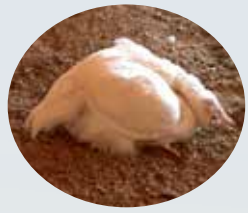

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