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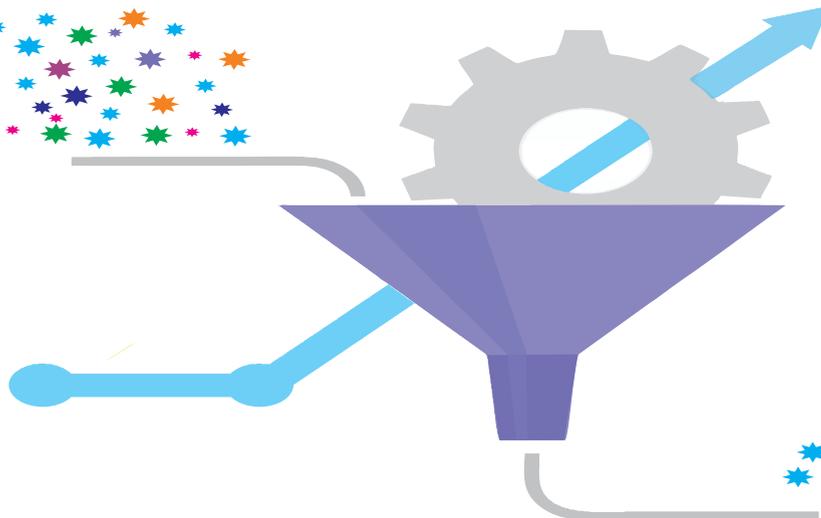
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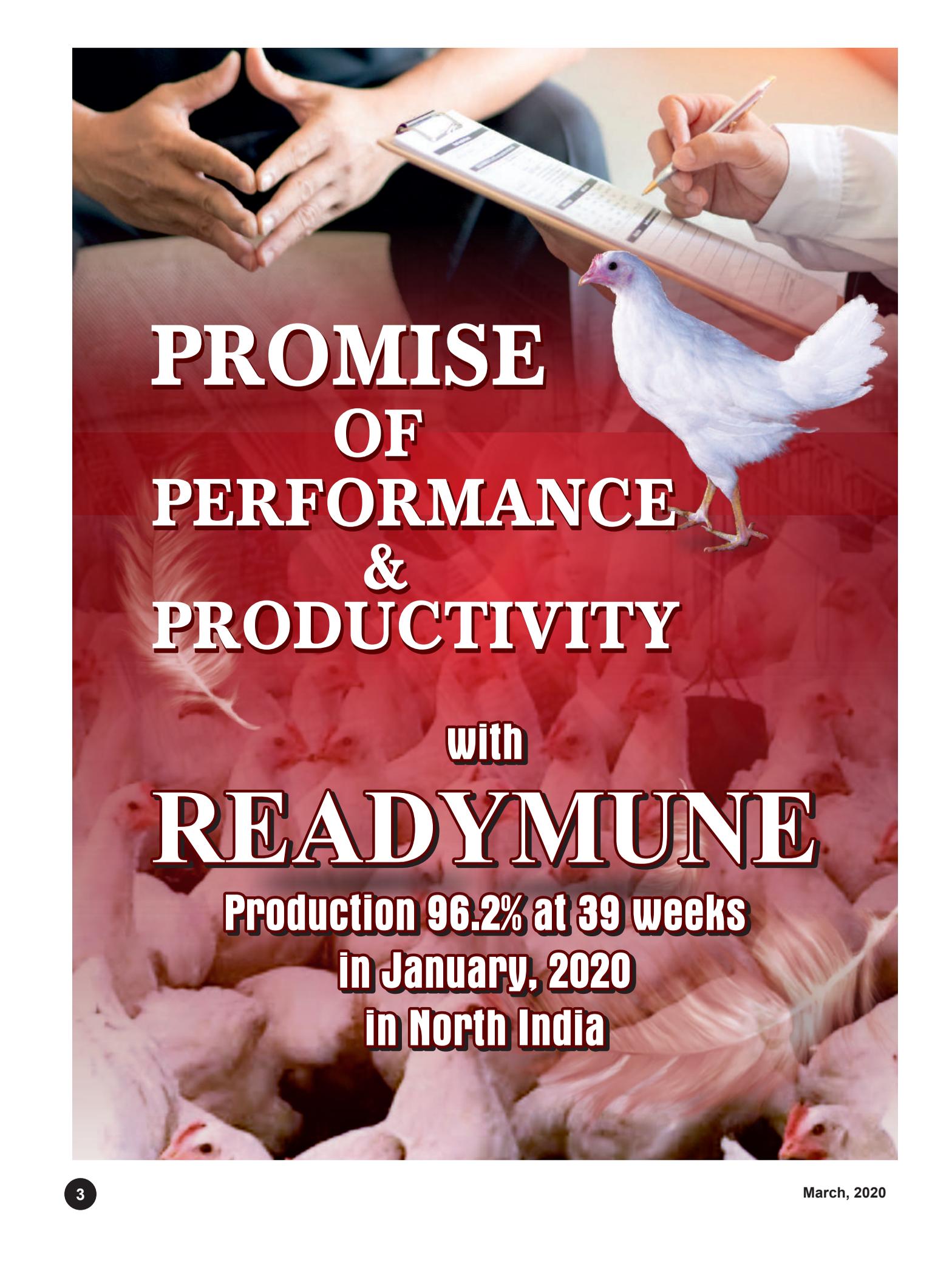
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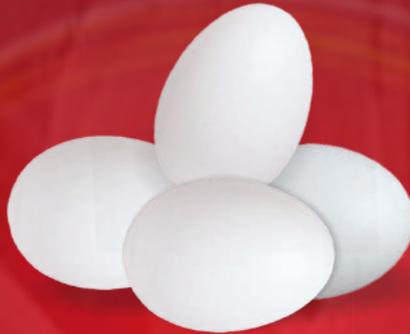


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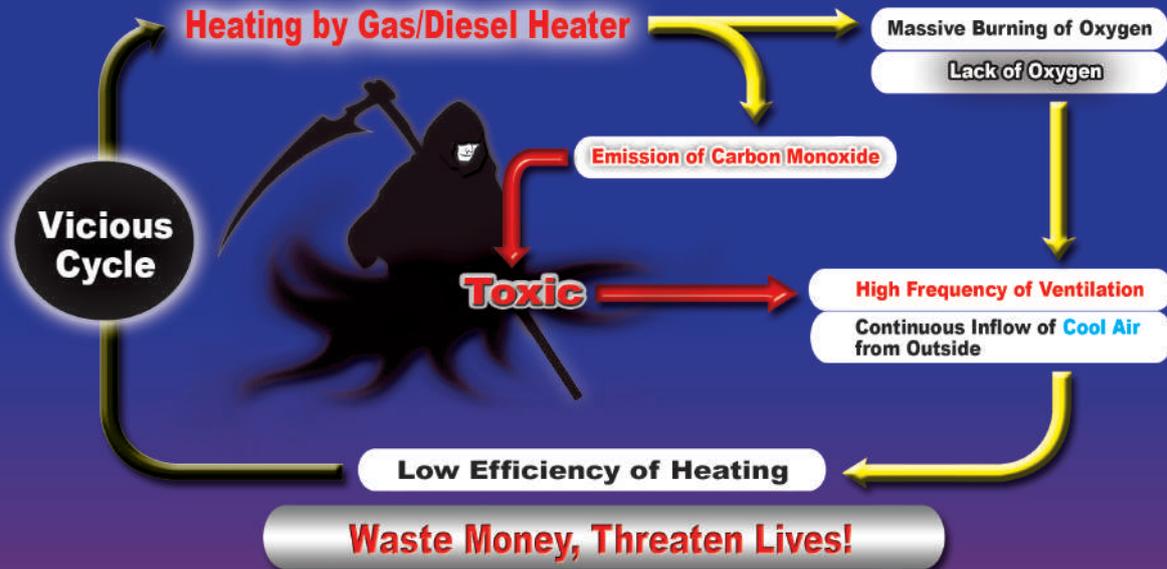


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Cost Comparison of each type of Heater for a 2,000 ft² Chicken House

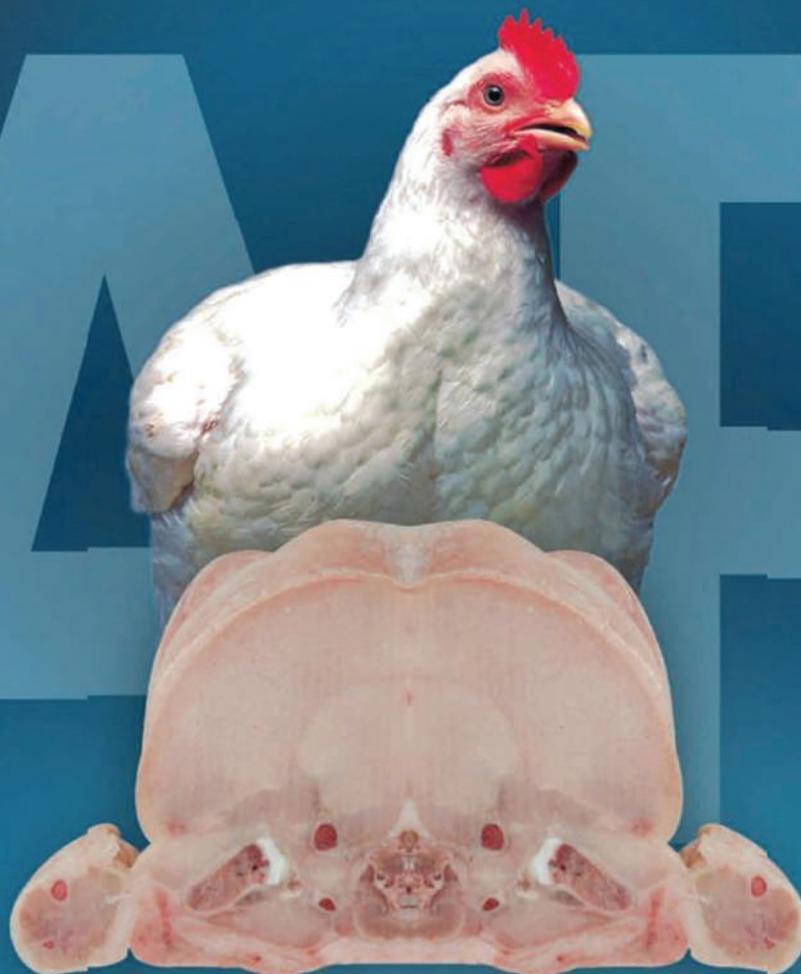
Test Condition ; To make a temp. rise of 20°C for a chicken house with 10,000 chicks

Consumption&Cost Type of Heaters	Qty of Heaters need		Consumption/ Hour		Unit Cost (Rupees)	Total Cost (Rupees)	
	Theory	Practice	Theory	Practice		Theory	Practice
InterHeat CPBT300-CFL1500 (1.5 KW)		5		7.5KW	7/KW		52.5
Gas Heater (250g LPG/Hr)	3	10	0.65Kg	2.5Kgs	50/Kg	32.5	125
Oil Heater (5L Kerosene/Hr)	0.2	1	0.84L	5L	70/L	58.8	350
Local Electric Brooder (2KW/Hr)	4	10	7.5KW	20KW	7/KW	52.5	140



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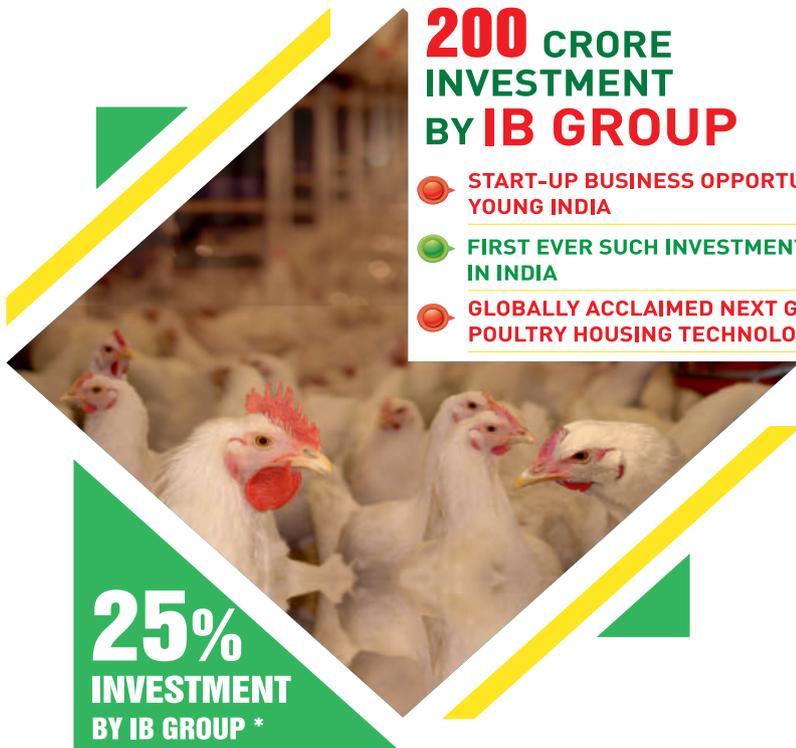
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EDITORIAL

CORONA VIRUS THREAT TO INDIAN POULTRY

Corona Virus epidemic that originated from China, has reached scores of global countries causing mortality as well. The entire economic situation of the global economy has drastically deteriorated with a sharp plunge.

The Poultry industry in India long with diverse sectors, have borne the brunt of Corona Virus menace. As believed that this virus started with consumption on non vegetarian food, so people in India have just took to strict abstinence against non vegetarian food.

The Indian poultry is actually on the verge of collapse and this has raised an alarm for survival across this industry. The Corona virus has created such a scare that the poultry fraternity approached the ministry and they issued a letter that Corona Virus is not linked to poultry and that the consumption is safe.

The poultry farmers have massively cut down the production of eggs and broiler birds. The problem of the present remaining stock is still a problem as there are no takers in the market. The poultry farmers have suffered huge financial losses and are in a very pitiable situation.

Regarding the present state of affairs of the poultry industry, the problem here solely lies on the rumors and misinformation that has seen the economic crash in this industry. The advertisement and communication channels should be activated to the optimum level to disseminate the vital information regarding the delinking of poultry to corona virus and its consumption as safe. All the associated sectors in poultry production like the feed manufacturers, pharmaceuticals, equipment manufacturers and the likes are also adversely affected.

Firstly the entire poultry industry along with its associations should initiate an awareness drive highlighting the safety of egg and broiler meat consumption, which should be seconded by the support of the government in dissemination the right information regarding the safety of poultry consumption.

Editor



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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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CEVA INNOVATION SUMMIT - JAIPUR INDIA 2020



■ Jaipur

Ceva Polchem successfully organised the 2nd Indian Innovation Summit in Jaipur on February 6, 2020. Eminent Key Opinion Leaders (KOLs) in India participated enthusiastically in this event. Apart from that, few selected KOLs from Bangladesh were also invited for the event. The program was also an opportunity to bring together regional Ceva Polchem Distributors to offer them a deeper understanding of Ceva's poultry vaccine aspirations and to get them aligned on techno-commercial policies. The summit was well compered by Dr. Ripil Kharbanda, BU Head, vaccines with proactive support from Mr. Sankaran Vinayagam, BU Head, Feed additives & Disinfectants.

The event took off graciously with the traditional lamp lighting ceremony followed by a welcome speech by Stephane Bordier to narrate Ceva's signature concept of "C" the future. A galaxy of international speakers from Ceva corporate and HQ graced the event with their insightful presentations followed by the panel discussion.

Dr. Christophe Cazaban, Poultry Scientific Director-SID presented an update on the global situation of Avian Influenza with a special reference to H9 LPAI which has become a major complicating pathogen among broilers and layers. Later, Dr. Marcelo Paniago, a most sought after Ceva's speaker

by Indian vets, explained the value of ND protection with the use of Vectormune ND as a long term policy to mitigate shedding risk of vvND strains. Dr. Marco Aurelio Lopes, Corporate Marketing Poultry Manager explained as to how hatchery vaccination is a future of broiler industry and how best it can help in control of vvIBD effectively. Dr. Chalermchai Skulphuek aka Tose introduced Ceva's internationally acclaimed C.H.I.C.K. program that ensures 100% hatchery vaccinated day old chicks.

Lastly, a very important topic was covered by Milind Limaye. He shared his experience on the unending battle with pathogens to improve hatchery hygiene standards

continually as a critical factor in successful hatchery vaccination.

Nitin Sahasrabudhe proposed a vote of thanks before the audience proceeded to attend a very heartening cultural program.

It was not only an intense brainstorming session on 6 Feb but it was followed by an excursion tour on 7 Feb for the participants who enjoyed visiting historical landmarks of the city such as Amer fort, Jantar Mantar Observatory and Hawa Mahal.

KOLs and Ceva experts got a rare opportunity to jointly explore the challenges and opportunities in front of Indian poultry industry that is evolving every passing year.

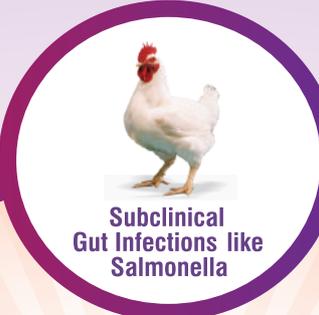




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KEMIN MAKES STRONG PRESENCE AT “PASCHIM BANGA POULTRY MELA”



■ Kolkata

Once again, Kemin’s Animal Health platform has marked its strong presence in the “Paschim Banga Poultry Mela” held at Kolkata (India) between 12th and 14th February 2020. The special attraction of our booth was the creatives in English and Bengali languages

which indeed added on to its uniqueness. Moreover, conveying the message in the local language has helped in efficient branding and as well as in making the message clear even to the small farmers.

We had an amazing opportunity to showcase the new Kemin logo and vision to our customers in a common trade

forum through all the aspects starting from booth design to give away, leaflets, booklets, attire, etc. It was a great opportunity to exhibit the utilization of natural resources in a sustainable way for a highly efficient animal protein production. On to the next expo tale, soon!



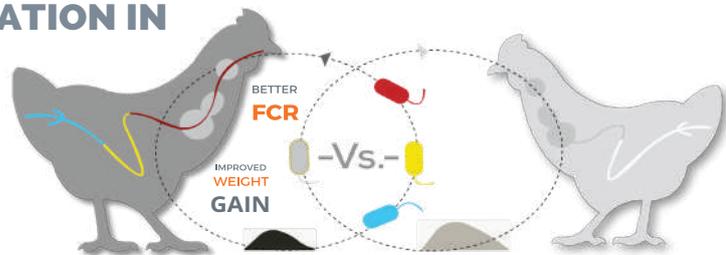


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PFI SUBMITS MEMORANDUM TO SAVE POULTRY INDUSTRY

■ Sonipat

The president of poultry Federation of India Mr Ramesh Kumar Khatri presented a memorandum to the Deputy Commissioner of Sonapat, Dr Ansaj Singh on behalf of the Federation, which was forwarded to the Prime Minister of India Mr Narendra Modi, to save the poultry Industry which is on the verge of destruction.

After submitting a memorandum to the Deputy Commissioner, Mr khatri expressed apprehension that Government of India is planning to reduce the imported duty on chicken leg and this decision would destroy the poultry Industry of the country .He was of the view that by reducing the duty, the poultry industry would not be able to survive for long as it has suffered a huge loss since last one year as the prices of raw material had increased manifold.

He further said that if the import duty which was being levied 100 percent at present, if reduced would adversely affect the poultry Industry. He further maintained that if the American chicken industry would be promoted then it would be very difficult to save the self made poultry farming sector worth Rs one lakh crore and providing job opportunities to over two crore people of India.

The PFI president asserted that the import duty should not be lowered from 100 percent



to save the poultry sector. He expressed reservation and pointed out that that the raw material, including the prices of maize, Bajra and oil seeds had increased substantially, which had adversely affected the poultry industry. while detailing out the loss in the sector, he apprised that the cost of production of an egg is pegged at Rs four and 10 paise and the whole sale price of an egg in the market is Rs 3.50 per egg, thus the industry is facing acute loss since last one year. He urged that a level playing field be given to the industry. He also demanded that the feed of Bajra and Maize be provided at lower import duty as India was the largest consumer of the raw material. He further said that the poultry sector had great hope from the Prime Minister Mr Narendra Modi, as he had done a lot for the farmers in the country. With a view to double the farm income ,a number of schemes had been launched including

Prime Minister Farmers “Samman Scheme,” besides providing remunerative prices of their produce .Under the Scheme a sum of Rs 6000 were being given to the farmers in three installments in a year. About 12 crore farmers were getting benefit from these innovative schemes. He revealed that about 26crore eggs were being produced in India daily and about 50lakh units were working in the country and about 4 crore people were engaged in this sector throughout the country including medicine and equipments.

He hoped that the Prime Minister would protect the interests of poultry farming community and urged that the import duty should not be reduced from 100 percent rather it should be interested to save farming community of the country without any political pressure to be exerted during the visit of present of America Donald Trump.



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KEMIN HOSTS NATIONAL ROAD SAFETY WEEK



The Safety Pledge

■ Gummidipundi

The Ministry of Road Transport & Highways, Govt. of India had announced the observance of 31st National Road Safety Week between 11th-17th January 2020. Kemin organized a 4-day road safety awareness campaign in its Gummidipundi factory premise. Various programs related to road safety were organized to edify employees and drivers about safety, driving rules and cautions.

Road safety week is a national event aimed at raising public awareness about traffic rules and ultimately to reduce casualties due to road accidents. It is unfortunate that millions lose their life or get injured in road accidents, mainly, due

to lack of awareness about traffic rules or behaviour of ignoring them. Therefore, to make people more aware of the traffic rules and to persuade them to follow rules while on road, Road Safety Week is observed every year.

The event started with employees taking the road safety pledge, followed by eye check-up camps. Interactive sessions on Motor vehicle Insurance and Defensive Driving Training Program for drivers were conducted. All employees and drivers took active participation in the campaign from day one. The event has given an insight to all the participants on the importance of road safety rules and effects of failures and violations were addressed. Road safety posters were

stuck on all the vehicles as part of the awareness campaign.

The event was concluded with the message to take similar care and concern throughout the year. Mr. Murugan, Sr Manager, Process Engineering, shared the importance of defensive driving skills to wheel off any threat even if we are not at fault. Road safety campaigns are an important tool to recognize the behaviour of road users. The results of road safety campaigns depend primarily on the manner of communication and the effectiveness of the campaign. Road Safety Week is a chance for us to comprehend the preciousness of life and make people understand what could be done to save our own life as well as the life of others on the road.



Eye Check Campaign



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KEMIN CHAMPIONS LEAGUE – “WHY SHOULD ONLY KIDS HAVE ALL THE FUN?”



The much-awaited “Kemin Champions League” was held on Friday 24th Jan 2020 with great zeal and excitement. The program began with the flag hoisting ceremony by Dr Suresh, President, which set the tone for the rest of the events. This was entailed by outdoor and indoor games wherein the participants participated with

full verve and vigour. It was a delight to see the excitement with which the employees challenged themselves to attempt a variety of games like Cricket, Volleyball, Ring ball, Tug of War, Table Tennis, Arm Wrestling and many more.

Remembering the good old days at school, sitting in the sun, with colour-coded

caps, basking with our tanned skin and cheering for our mates. Seems like going down the memory lane! We re-lived those moments during the sports meet. It was a day filled with fervour and exhilaration, amidst thrills and cheers. The spirit writ large on each of participant’s faces were “Why should only kids have all the fun!?”





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VENTRI BIOLOGICAL CONDUCTS GRAND TECHNICAL SEMINARS ON LAUNCHING OF VH MGK WITH THE TITLE OF “MYCOPLASMA CONTROL PROGRAM – LONG TERM PERSPECTIVE”

■ Bangalore, Namakkal, Coimbatore, Amritsar, Hyderabad, Pune, Nashik, & Karnal

Ventri Biologicals, the vaccine division of Venkateshwara hatcheries PVT Ltd, had conducted series of Technical Seminars on “Mycoplasma Control Program –Long term perspective” in connection with launching of VH MGK (Inactivated vaccine against Mycoplasma gallisepticum) at Bangalore, Namakkal, Coimbatore, Amritsar, Hyderabad, Pune, Nashik, & Karnal along with Poultry Farmers and Technical Consultants during the period of December 2019 to March 2020.

Mr. Deepak Khosla (GM Marketing) welcomed and facilitated the speaker and delegates. He has given brief introduction on how to control mycoplasma in a long perspective in co-ordination with PDRC-PDDL, VENCO and Ventri Biologicals team. He also stated that Ventri Biologicals Division, with world class facilities, in association with Georgia University, came with the highly immunogenic inactivated vaccine against M. gallisepticum with the brand name of VH MGK.

The resource persons for the Seminar was Dr. Sanjay Gawkare, GM, Production Ventri Biologicals Division, Pune, Dr.M.M.Chawak, GM, Poultry Diagnostic and Research Centre, Pune & Dr.Prakash Reddy, DGM, Technical Services, Ventri Biologicals, Bangalore.

Dr. Sanjay Gawkare gave a detailed account on status of mycoplasma problem in Indian poultry Industry. He has emphasized on how mycoplasma causes severe economic losses and practical difficulties associated with its control. He insisted that chemical program followed by the inactivated vaccine will be the smart approach for India.

He explained about effectiveness of bacterins against M.gallisepticum and how it reduces the vertical transmission with the help of detailed reports of the trials conducted on broiler parent flocks. He introduced the VH MGK, Ventri Biological's inactivated vaccine against M.gallisepticum. The vaccine contains F strain of M.gallisepticum (the only vaccine with F strain) and unique VISA 15 adjuvant. F strain is the most effective in inducing the immunity and replacing the wild strain in a flock and VISA 15 ensures long duration of immunity. He advised 3 doses of VHMGK

in broiler breeder schedule (13th week, 18th week & 40th week) and chemical program with any one of the three antimycoplama antibiotics (Tiamulin, Tilmicosin and Tylosin) from first week to 12th week.

Dr. M.M.Chawak explained that M.gallisepticum is the most prevalent and pathogenic species in India which warrants effective vaccines to be included in control measures and even though some flocks show serologically positive for M.syniviae, most of the strains are non pathogenic.

Dr. Prakash Reddy interacted and clarified the doubts asked by customer in regard to mycoplasma and other respiratory diseases.

Dr. Vishwas Sagajkar, DGM Marketing, informed the customers about technique of Pipped Embryo Test and its importance in tracking down mycoplasma status in breeders & progeny. Pipped Embryo Test is a part of Venkys Hatchery Hygiene Programme.

Bangalore, Namakkal & Coimbatore (26th, 27th & 28th December 2019):



Veterinary consultants, Poultry Breeder farmers attended the technical seminars. Mr. Deepak Khosla (GM marketing), Dr. N. Baburaj, (DGM, Marketing, South Zones), Mr. Lokesh (ZM South zone, Karnataka), Dr. Vijayanand (ZM South zone, Namakkal) and Mr. Chinnaraj (ZM South zone, Coimbatore) welcomed and facilitated the speakers and delegates at their respective venues. Mr. Deepak Khosla briefed on how to control mycoplasma in a long perspective. Dr. Prakash Reddy & Dr. M.M.Chawak clarified the doubts raised by the farmers and consultants. Dr.N.Baburaj expressed vote of thanks.



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Amritsar (24th January 2020):

Veterinary consultants, Poultry Breeder farmers attended the technical seminars. Mr. H.S.Padda, (DGM, Marketing, North & East zones), Mr. Raju tanna (ZM North zone, Chandigarh) welcomed and facilitated the speakers and delegates at their respective venues. Dr. Prakash Reddy explained about effectiveness of bacterins against M. gallisepticum and how it reduces the vertical transmission and introduced VHMKG. Mr. H.S.Padda expressed vote of thanks.

Hyderabad (6th February 2020):



Veterinary consultants, Breeder Associates and Broiler Integrators from Hyderabad and surrounding area attended the technical seminars. Mr.Deepak Khosla (GM Marketing), Dr. N. Baburaj, (DGM, Marketing, South Zones) and Mr. Suneel Sharma (AGM South Hyderabad) welcomed and facilitated Speaker and delegates. Mr. Deepak Khosala briefed on how to control mycoplasma in a long perspective. Dr. Prakash Reddy explained in detail about mycoplasma control in Indian context and introduced the VH MGK. Dr. M.M.Chawak clarified the doubts raised by the farmers and consultants. Mr. Suneel Sharma expressed vote of thanks to all participants.

Pune & Nasik (18th, 19th February 2020):

Poultry farmers, Veterinary consultants from Pune and Nasik area attended the technical seminars. Mr. Deepak Khosla (GM Marketing), Dr. Hemant murade (DGM Marketing, West & Central) and Mr. Ram Ghate (ZM, Marketing West zone) welcomed and facilitated the Speakers and delegates. Mr.Deepak Khosla welcomed



all the guests. Mr. Deepak Khosala briefed on how to control mycoplasma in a long perspective. Dr. Sanjay Gavkare explained in detail about mycoplasma control in Indian context and introduced the VH MGK. Dr.Prakash Reddy and Dr.M.M.Chawak participated in the discussion with the customers.

Karnal (4th March 2020):

Poultry farmers, Veterinary consultants from Pune and Nasik area attended the technical seminars. Mr. Deepak Khosla (GM Marketing), Mr. H.S.Padda (DGM Marketing, North & East) and Mr. Sashibushan (ZM, Marketing North zone Delhi) welcomed and facilitated the Speakers and delegates. Mr. Deepak Khosla welcomed all the guests. Mr. Deepak Khosala briefed on how to control mycoplasma in a long perspective. Dr.Sanjay Gavkare explained in detail about mycoplasma control in Indian context and introduced the VH MGK. Dr.Prakash Reddy and Dr. M.M.Chawak participated in the discussion with the customers.

Dr. A.Kandasamy (AGM Technical Service), Dr. Vinit Deshpande (Senior Product Manager) and Mr. Ranjith kumar (Product Manager), Ventri Biologicals Division attended all the seminars and interacted with the farmers.



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BIOCHEM PHARMA PARTICIPATES IN NEPAL POULTRY INTERNATIONAL EXPO-2020



Team Biochem Pharma-Nepal

■ Bharatpur, Nepal

Biochem Pharma participated in Nepal Poultry International Expo-2020, which was held in Feb 28, Feb 29 & 01 Mar 2020 in Chitwan Expo Center, Bharatpur, Nepal. The team received a

goodresponse from the visitors at the exhibition.

The growth rate of Nepal's Poultry production of commercial sector is 17-18 percent annually. Its contribution to overall GDP is 4 percent and is further encouraging and increasing. Moreover it has created

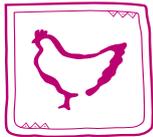
multiplier effect to other industries.

Additionally it is emerging as a strong industry, directly employing and engaging 70, 000 people. The Poultry industry for the country seen mounting with Increasing:-

- Trend in production and productivity
- Increasing tendency of consumer favouring white meat
- Popularity of poultry meat without regard to caste/creed/age
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- Availability of broiler meat and eggs in all urban centers and even in small market areas,
- Quarantine act, meat act for quality control Organised private sector and good coordination between government stakeholders in opening slaughterhouse in near future, rapid financial turnover.
- Increasing inflow of tourists, rapid urbanization,
- Changing food habits of urban inhabitants,
- Availability of comparatively cheaper labor.

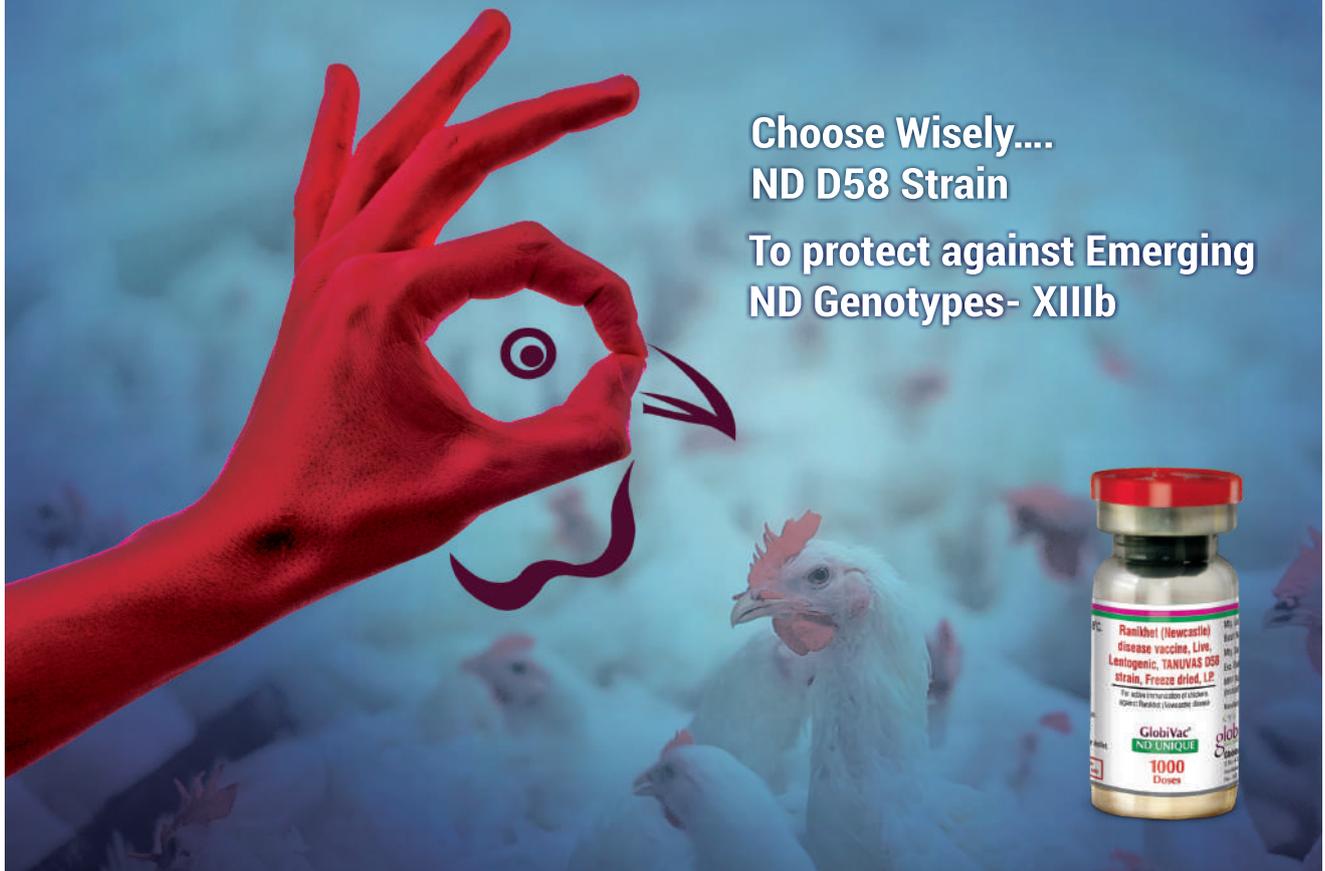


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GRAND PARTICIPATION OF INDIAN HERBS AT KOLKATA INTERNATIONAL POULTRY FAIR 2020

■ KOLKATA

INDIAN HERBS, the pioneer and market leader and No.1 Company in Herbal Animal Health Care Products Industry since 1951, showed its strong presence in KOLKATA INTERNATIONAL POULTRY FAIR 2020 held at Eco Park, Major Arterial Road, New Town, Kolkata from 12th to 14th February, 2020 with its Technical and Marketing team. The sales and marketing team gave a warm welcome to the customers and consultants. The company has won best prize for its attractive, well designed stall and warm hospitality to the visitors.

The awareness about reducing the usage of antibiotic is increasing day by day amongst the poultry farmers and consultants. INDIAN HERBS is helping the industry in producing antibiotic free chicken and eggs by providing natural solutions. The focus of INDIAN HERBS is on Food Safety through Feed Safety.

The development of Veterinary Ayurveda has tremendous impact on animal health care. It has increased productivity in livestock, poultry and fish farms. The contribution of INDIAN HERBS is commendable for economic upliftment of rural farmers through better animal health and productivity. The farmers are now able to afford safe and effective treatment of their animals at a very low cost and the farming has become more profitable and rewarding.

INDIAN HERBS is the originator of concept of Veterinary Ayurveda. INDIAN HERBS was the first company to harness the rich treasure of herbs by developing phytogetic

products on modern scientific lines. It offers unique phytogetic alternatives for synthetic products with better efficacy at lower cost which are free from side effects and residual toxicity. The company is catering to wide range of animal species including poultry, ruminants, equine, swine, pets, aquatic and other animal species for more than six decades. The products of INDIAN HERBS are useful to produce antibiotic and residue free chicken and eggs.

INDIAN HERBS has developed and introduced unique formulations for use in poultry industry as natural alternatives of synthetic products in important segments such as Choline (BioCholine), Vitamin C (Herbal C), Natural Vitamin C with Chromium (HeatBeat), Vitamin E (E-Sel Power), AGP (Herbionic FS), Respiratory Antiseptic (Animunin), Immune Potentiator (ImmuPlus), Metabolic Stimulant and Liver Tonic (LivoLiv-DS & LivoLiv 250), Coccidiosis (ZeeCox), Methionine (HerboMethione Plus), Lysine (HerboLysin), Natural Calcium (MagaCal), Male Vitality and Breeding Efficiency Optimizer (ProLivid), Optimum Ovarian Function (OVIMAX) Anti-stress & Adaptogen (StressCheck), Renal Tonic (NephTone) etc. The products are not only most economical and ecofriendly but also improve the quality of feed, productivity and profitability.

These products are being used by the leading institutions in India and abroad with excellent results. The products are successfully being exported to more than 50 countries across four continents including Asia, Europe, Latin America and Africa. INDIAN HERBS has also received the certificate from EXPORT INSPECTION

COUNCIL OF INDIA, Ministry of Commerce and Industry, Govt. of India and was the first Herbal Company to get this recognition.

The R&D Centre of INDIAN HERBS, which is approved by the Ministry of Science & Technology, Govt. of India since 1986, is well equipped with the best available state of the art modern facilities for standardization and quality control of herbal products.

Scientific evaluation on herbal products in comparison to synthetic products is a continuous process at INDIAN HERBS. Regular field trials and research studies at universities are being conducted on these products in India and abroad to ensure consistently best quality and efficacy of its products. More than 200 scientists have been awarded Masters and Doctorate degrees for their research work which has resulted in publication of more than 1000 research papers in the eminent national and international scientific journals. INDIAN HERBS has the distinction of getting more than 22 Patents in USA, Europe, India etc. and many Patents are pending in USA and other countries for innovative research on herbs and herbal products.

The stall of INDIAN HERBS attracted a large number of visitors, including feed millers, integrators, large farmers, consultants, nutritionist and distributors etc. All the queries of the visitors were answered by the technical team of INDIAN HERBS to their best satisfaction.

INDIAN HERBS is committed to foster the wellbeing of animals through nature's bliss and caters antibiotic free, residue and resistance free, environment friendly, cost effective phytogetic solutions for animal healthcare.



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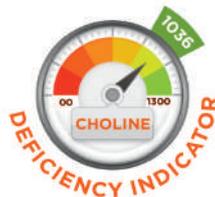
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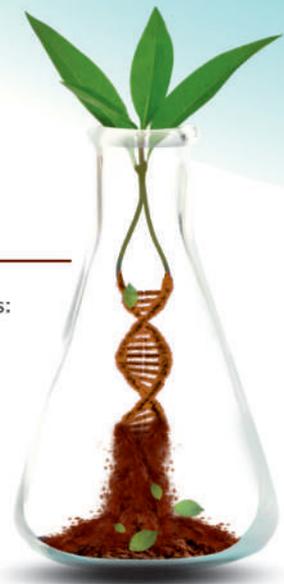
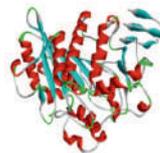
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INNOVISTA FEEDING SOLUTIONS HIGHLIGHTS NUTRITIONAL INNOVATIONS AT POULTRY MELA, KOLKATA

■ Kolkata

Innovista Feeding Solutions has gained broad based popularity in the animal nutrition space for their novel concepts in alternative growth promoter product lines. During the Poultry Mela in Kolkata, the biggest livestock expo in eastern India held between the 12th to 14th of February 2020, Innovista Feeding Solutions Pvt Ltd came up with fresh concepts in the alternative growth promoters segment with their specialty essential oils product offers which were witnessed and praised by over 8,000 poultry delegates who attended the show.

Innovista's novel invention Curcumol (purified and fortified turmeric oil with sesquiterpenes) which is already a popular brand across all segments in breeders, broilers and layers has laid the foundation for new vistas in the animal nutrition space.

Other brands from Innovista viz. Allivis, Nativol, and Garcin also drew attention of farmers/nutritionists who seek a change from the conventional antibiotics being used for ages in such food producing animals with overall regulatory restriction being imposed on indiscriminate use of feed antibiotics.

"We are upbeat about our innovations in alternative growth promoters using essential oils and it gives me great joy to witness that not only the farming community but also our competition is looking up at us for such new innovations! Such high hopes from the industry has raised our benchmark and we strive hard to make our product offers more effective and affordable for our farmers," said Dr. Sekhar Basak, Managing Director, Innovista Feeding Solutions. We differentiate from others in our process technology and R & D that makes our products unique and offers holistic benefits over conventional antibiotics used in our industry, he added.

The selfie stand at Innovista booth with the slogan "Adding Wings To Your Business" was found very attractive by visitors, was a major crowd puller and went viral on social media for the next few days.



Top Integration companies from East India



Dr. B. Maity, Shalimar Group



Dr. Dharendra kumar, a renowned poultry consultant



Dr. LN Mishra, Venkys, East Zone



Dr. Supratim Panda with Jr. Panda



Mr. Amiya Nath, Sales Director, Japfa Comfeed



Mr. Manoj Shrivastav, SM Enterprises, Patna



Mr. Ratnakar Shetty, Ace Feeds Pune



Mr. Sarwar CEO, Avon Animal Health, Bangladesh

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AVIAGEN INDIA APPOINTS SENIOR TECHNICAL MANAGER



Dr. Venkatesh strengthens customer operations with in-depth knowledge of poultry feed and nutrition

Udumalpet, India. – Aviagen® India has named Dr. Gunasekaran Venkatesh as its Senior Technical Service Manager, Feed and Nutrition,

effective immediately. Dr. Venkatesh will work with customers to improve the health and welfare of their flocks by optimizing management practices combined with advice on feed and nutrition.

A native of Hanur, Dharmapuri, Tamil Nadu, Dr. Venkatesh earned his Master's in Veterinary Science (Gold Medallist) at Tamilnadu Veterinary & Animal Sciences University, Chennai, India.

He started his career in 2006 with Alltech, a U.S.-based company that develops feed additives for use in agriculture. Over the next 13 years he became a well-respected poultry sales professional in the field of poultry nutrition and feed additive business management.

"I'm excited to become a part of the Aviagen India team, and have always been interested in providing nutritional support to poultry clients, focusing on improving performance, as well as the bottom line for customers by realising the genetic potential of poultry breeding stock. Since my long-time goal has been to work for a poultry breeding company, and so joining Aviagen seems like a dream-come-true," commented Dr. Venkatesh.

Dr. Joshua, Regional Technical Manager

for Aviagen India, added, "We are delighted to welcome Dr. Venkatesh to our customer support team. He will enhance service to our customers and provide useful recommendations for feed formulation and management. With so many customers formulating their own feed, it's important that we give them the right advice for getting the best out of the Ross 308 AP bird. Dr. Venkatesh supports bird health and welfare with this valuable skill."

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 4,600 people and has a distribution network serving customers in more than 100 countries.

ILDEX VIETNAM 2020 RESCHEDULED

Due to the disruption caused by Coronavirus (COVID-19) across the region, we, VNU Exhibitions Asia Pacific have taken the tough decision to move the dates of ILDEX Vietnam 2020 to July 22-24, 2020.

We have been monitoring the COVID-19 situation closely over the past weeks. We have also been receiving multiple enquiries from exhibitors and visitors on the event

with indicating their concerns on health and safety as well as the increasing of the travel bans and travel restrictions around the world.

This decision was also based on the advice of authorities and related associations. In addition, the exhibitor survey result indicated that eighty five

percent of exhibitors would like to delay ILDEX Vietnam 2020.

Moving the event to July also gives us confidence that we can deliver ILDEX Vietnam to our international standard and maximize business opportunities to all parties.

ILDEX Vietnam is thus re-scheduled in July 22 - 24, 2020 at SECC, Ho Chi Minh City.



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ALLTECH GLOBAL FEED SURVEY REVEALS FIRST PRODUCTION DECLINE IN NINE YEARS



The 2020 Alltech Global Feed Survey estimates world feed production has declined by 1.07% to 1.126 billion metric tons, with the top nine countries producing 58% of the world's feed production.

■ Bangalore

The 2020 Alltech Global Feed Survey estimates that international feed tonnage decreased by 1.07% to 1.126 billion metric tons of feed produced last year, due largely to African swine fever (ASF) and the decline of pig feed in the Asia-Pacific region. The top nine feed-producing countries are the U.S., China, Brazil, Russia, India, Mexico, Spain, Japan and Germany. Together, these countries produce 58% of the world's feed production and contain 57% of the world's feed mills, and they can be viewed as an indicator of overall trends in agriculture.

Dr. Mark Lyons, president and CEO of Alltech, shared the survey results via public livestream from Alltech's global headquarters in Nicholasville, Kentucky.

"2019 presented extreme challenges to the feed industry, with one of the most significant being African swine fever. The regional and global implications are reflected by the Alltech Global Feed Survey and the decline in global feed production, said Lyons. "While pig feed production is down in affected countries, we are

noting increased production both in other species as producers work to supplement the protein demand, and in non-affected countries as exports ramp up. The damage caused by ASF will have long-term implications, and we expect that the top protein sources will continue to shift as our industry adapts to the shortage."

The global data, collected from 145 countries and nearly 30,000 feed mills, indicates feed production by species as: broilers 28%; pigs 24%; layers 14%; dairy 12%; beef 10%; other species 6%; aquaculture 4%; and pets 2%. Predominant growth came from the layer, broiler, aqua and pet feed sectors.

Regional results from the 2020 Alltech Global Feed Survey

North America: The U.S. is the largest feed-producing country globally with an estimated 214 million metric tons (MMT), with beef (61.09 MMT), broilers (48.525 MMT) and pigs (44.86 MMT) as the leading species. North America saw steady growth of 1.6% over last year. Canada produced 21.6 MMT with pigs (8.23 MMT), broilers (3.25 MMT) and dairy (4.2 MMT) leading

species feed production.

Latin America: As a region, Latin America saw 2.2% growth to 167.9 MMT. Brazil remained the leader in feed production for the region and third overall globally, with the primary species for feed production being broilers (32.1 MMT) and pigs (17.0 MMT). Brazil, Mexico and Argentina continue to produce the majority of feed in Latin America with 76% of regional feed production.

Europe: Europe remained relatively stagnant with a slight increase of 0.2% over last year. The top three feed-producing countries in Europe are Russia (40.5 MMT), Spain (34.8 MMT) and Germany (25.0 MMT), with pig feed production leading the way in all three countries. The ruminant sector was hit the hardest as both dairy and beef numbers are estimated to be down by 4% and 3%, respectively. This was offset primarily by strong growth in the aqua (7%) and layer (3%) industries.

Asia-Pacific: The Asia-Pacific region saw feed production decrease by 5.5% in 2019, primarily due to African swine fever

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and large declines in pig feed production. China’s feed production declined by almost 20 MMT of feed overall to 167.9 MMT and fell from the top feed-producing country globally to second, behind the U.S. India and Japan remained in the top nine feed-producing countries, with similar production compared to 2018 with 39.0 MMT and 25.3 MMT, respectively, while Vietnam declined by 7%.

South Asia: The total feed production in South Asia (India, Bangladesh, Sri Lanka and Nepal) accounts to 45.65 MMT, witnessing 2.53% growth over 2018. India ranks fifth in the top nine feed-producing countries of the world, producing 39 MMT. The Indian poultry sector observed growth, producing 24.9 MMT, and aquaculture showed a significant rise, with feed production of 2.28 MMT. Dairy feed production decreased to 11.58 MMT, a dip of 2.1% over 2018, due to rising raw material prices.

South Asiacycountrywide breakdown of total feed production

Country	2018 Production (MMT)	2019 Production (MMT)	Variance%
India	38.72	39.00	0.60
Bangladesh	4.80	5.70	18.75
Nepal	0.93	0.95	2.15
Sri Lanka	0.97	0.93	-4.12

Africa: Africa continued strong growth with a 7.5% increase in overall feed production, with all the primary species seeing positive growth. The top five feed-producing countries in the region account for 75% of Africa’s feed production, and they are South Africa, Egypt, Nigeria, Morocco and Algeria. The region’s primary species include broiler, layer and dairy, and combined, they account for nearly half of feed production estimates in the region.

Notable species results from the 2020 Alltech Global Feed Survey

- Pig feed production was greatly impacted by African swine fever, with an 11%

decrease. The primary producing region for pig feed remains Asia-Pacific, but it also experienced the largest decline of 26%, with China (-35%), Cambodia (-22%), Vietnam (-21%) and Thailand (-16%) experiencing large decreases. Europe, North America and Latin America remained relatively stable compared to last year, within a percentage point’s worth of gain or loss. While Africa is a small region from a tonnage standpoint for pig feed, it showed a large increase of 29%.

- In the poultry sector, Asia-Pacific is the leader in both broiler (115.2 MMT) and layer (73.1 MMT) feed. In Latin America, total broiler production amounted to 60.8 MMT, with Brazil leading the region with 32.1 MMT followed by Mexico with 10.5 MMT, while Mexico’s layer feed production increased by 11% to 7.05 MMT and surpassed Brazil. Russia leads Europe with 10.86 MMT of the total region’s 56.3 MMT of broiler feed and 5.3 MMT of the region’s total of 33.5 MMT of layer feed. In North America, the U.S. accounts for 94% of the broiler feed with 48.5 MMT, while layer feed in Canada increased by 460,000 metric tons.

- Europe leads global dairy feed production with 34% followed by North America (21.8%), Asia-Pacific (17.6%) and Latin America (15.3%). The top dairy feed-producing countries are Turkey (6.5 MMT), Germany (5.2 MMT), Russia (4.2 MMT), the U.K. (3.8 MMT), France (3.4 MMT), the Netherlands (3.3 MMT) and Spain (3.2 MMT).
- North America continues to lead global beef feed production with 62.3 MMT, followed by Europe (21.9 MMT) and Latin America (13.9 MMT). For the 2020 Alltech Global Feed Survey, the beef feed production estimation was recalculated to improve its accuracy. The new estimate takes into account the average days on feed and intake as a percentage of body weight in the feedlot. Last year’s estimation was also

recalculated to reflect this formula change for a proper year-on-year comparison.

- Overall, aquaculture feeds showed growth of 4% over last year. Per ton, Asia-Pacific grew the most with an additional 1.5 MMT. The primary contributors were China, Vietnam and Bangladesh. Europe’s decrease is in large part due to decreased feed production in Russia, which is primarily due to an increase in imports.
- The pet food sector saw growth of 4% with the largest tonnage increases in Asia-Pacific (10%), Europe (3%) and Latin America (6%). By country, increases were seen in China, Indonesia, Portugal, Hungary, Ecuador and Argentina.
- Top five fastest growing countries in poultry feed production globally

Country	Growth
Canada	15%
China	11%
UK	8%
South Africa	6%
Mexico	6%

During the live presentation, Dr. Lyons was joined by a panel of industry experts, including Jack Bobo, CEO, Futurity, USA; Matthew Smith, vice president, Alltech, U.K.; Bianca Martins, general manager, Alltech, Mexico; and Brian Lawless, North America species manager, Alltech, USA. The group discussed the trends behind the data and the implications for the global market. Topics ranged from consumer demands to the adoption of new technology.

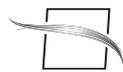
The Alltech Global Feed Survey assesses compound feed production and prices through information collected by Alltech’s global sales team and in partnership with local feed associations in the last quarter of 2019. It is an estimate serving as a resource for policymakers, decision-makers and industry stakeholders.

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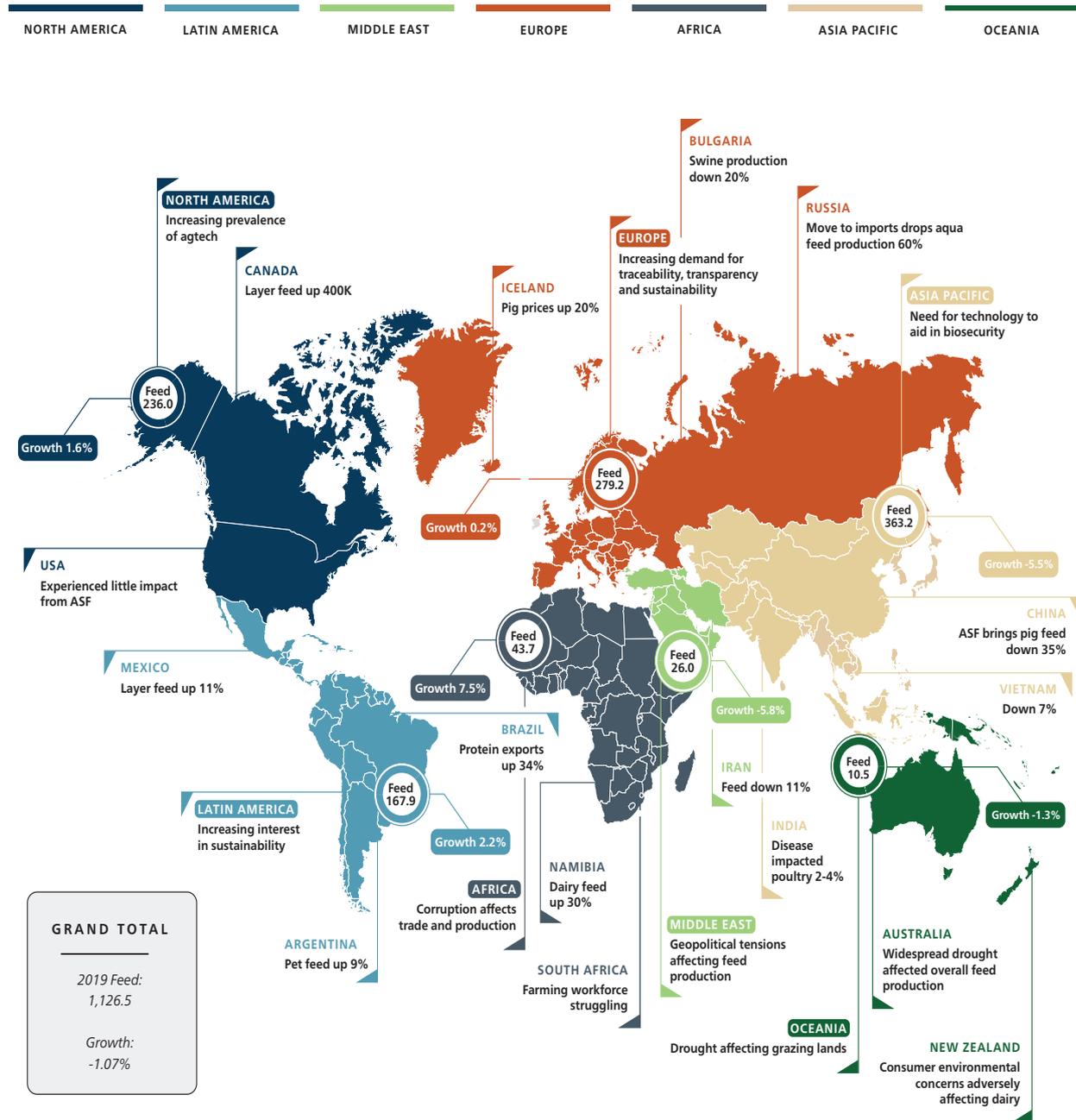
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TECHNICAL SEMINAR AT CHITWAN, NEPAL BY VENKYS' (INDIA) PVT. LIMITED.



Venkys' (India) Ltd conducted Technical Seminar on 27th February 2020, at Hotel Jungle crown, Baghmara, Chitwan, Nepal. Technical seminar was arranged to discuss about two subjects mainly "Mycoplasma Control Program –Long term perspective" second on "Optimize utilization of fat and oils in poultry Nutrition".

This seminar was attended by broiler breeder, layer farmer, Feed Millers and consultants from Nepal poultry industry.

Mr. Biplab Deb, Zonal Manager, Venkys (India) Ltd, introduced Dr. Prakash Reddy and Dr. Sunil Nadgauda and also welcomed all the guests, poultry farmers, feed millers and technical consultants.

Dr. Prakash Reddy, Deputy General Manager (Technical Services), Ventri Biologicals, India provided the insight on Mycoplasma Control Program –Long term perspective.

In his talk Dr. Prakash Reddy emphasized upon importance of killed vaccination in mycoplasma control, selection of proper vaccine and schedule of vaccination. He also briefed about economic importance of mycoplasma in poultry. He told about importance of control of

viral disease like New castle disease & infection bronchitis in poultry along with mycoplasma control for profitable poultry farming.

He insisted that chemical program followed by the inactivated vaccine will be the smart approach for India. He explained about effectiveness of bacterins against M.gallisepticum and how it reduces the vertical transmission with the help of detailed reports of the trials conducted on broiler parent flocks. He introduced the VH MGK, Ventri Biological's inactivated vaccine against M. gallisepticum. The vaccine contains F strain of M.gallisepticum (the only vaccine with F strain in India). F strain is the most effective in inducing the immunity and replacing the wild strain in a flock. He advised 3 doses of VHMKG in broiler breeders at 13th week, 18th week & 40th week and mycoplasma prevention program with suitable anti-mycoplasma drugs up to 12 weeks.

Dr. Sunil Nadgauda, Deputy General Manager (Nutritional Services), Venkys (India) limited, shared his experience and knowledge on "Optimizing utilization of fat and oils in poultry Nutrition".

Dr. Sunil Nadgauda emphasized on how fat

and oil play crucial role in poultry nutrition. He mentioned that due to high energy density, fats and oils are important energy sources in feed formulation. However, energy is a major cost component in high performing birds. Nutritional emulsifiers can be used to improve fat digestibility and thus improve the energy efficiency, leading to lower feed costs.

He mentioned in his talk that, in first 14 to 21 days of age of broilers, bile salts as well as lipase secretion is very less, hence digestion of oil/fat is very poor. Oils/fats that we are offering through the feed are more than the natural digestion capacity of broilers. Hence, we need to give additional external source of more hydrophilic emulsifier through feed for improving the digestibility as well as absorption of fats through small intestine of broilers.

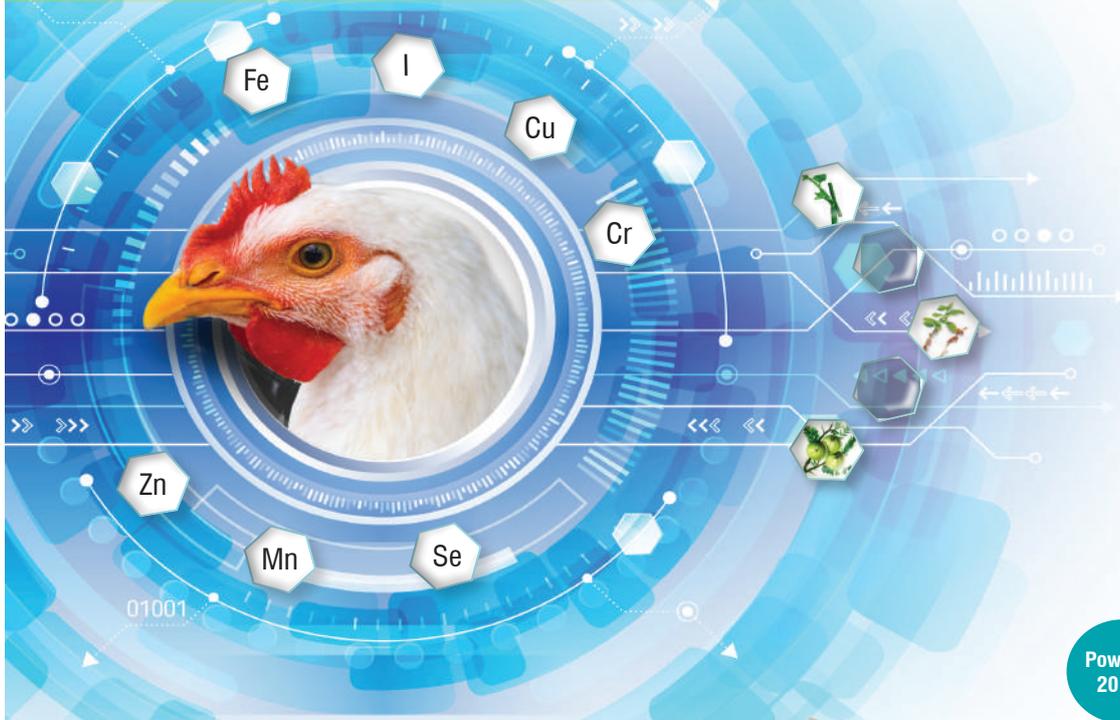
Dr. Sunil Nadgauda explained that, Glyceryl Polyethylene Glycol Ricinoleate (GPEGR) is one of the best hydrophilic emulsifier currently available in the market. This non-ionic nutritional emulsifier is stable in broad pH range and at high temperatures making it most suitable for pelleted feeds. PEGR is uninfluenced by salts or minerals in the intestinal tract giving it an edge over traditional lecithin based products. Based on this fact he introduced product "EMULSO-V".

EMULSO-V" is PEGR based unique nutritional emulsifier with high HLB value capable of emulsifying all types of fats/oils in water (O/W) recommended at the dose rate of @250 to 300 gm per ton of feed with reduction of 32.8 Kcal energy from per kg of feed.

Mr. Jeevan Kunwar, Regional Sales Manager, Venkys India Limited, Nepal expressed vote of thanks.



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INTERFACE PHARMACEUTICALS MAKES A STRONG IMPRESSION AT NEPAL POULTRY EXPO



MR. S.K. MALHOTRA RECEIVING TROPHY FOR PARTICIPATION FROM MR. GUNA CHANDRA BISHT POPULARLY KNOWN AS SWAMI JI CHAIRMAN OF AVINASH GROUP AND CHAIRMAN NEPAL POULTRY FEDERATION

■ Bharatpur, Nepal

Interface Pharmaceuticals Pvt Ltd participated in a big way at Nepal Poultry Expo held at Bharatpur, Nepal from 28th February to 1st March'2020.

There was overwhelming response at the stall and a number of satisfied customers all over Nepal visited the stall. A big group of veterinarians who were already prescribing or using products participated in discussion with Interface staff. They were more interested in how best results can be achieved out of our products and what is new in R&D.

This is a known fact that when researchers are working for more productivity out

of birds then the birds have to be protected throughout life. People already using our immunotherapy program informed us that they are getting a higher productivity than the standards. They will be using our products continuously and forever.

They were also informed by Interface staff that by doing immune-therapies in broilers they can get FCR as low as 1.35 kg for 2 kg BW, in layers 10-30 eggs extra (depending on what they are getting out of flock) and 5-15 chicks extra in the breeder flocks. There was no major bacterial or viral outbreak at these farms, during last five years due to their continuous use of our products.



MR. PUSHP RAJ DAHAL FORMER PRIME MINISTER OF NEPAL ALONG WITH MR. GUNA CHANDRA BISHT (SWAMI JI) AT INTERFACE STALL



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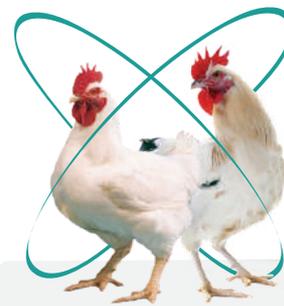


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DOCTORS FROM VENKATESHWARA HATCHERY IN DISCUSSION WITH MR. S.K. MALHOTRA



DR. DOUGHLUS GREAVES FROM HYLINE U.S. WITH MR. MANAN MALHOTRA



DR. I.P. DHAKAL FORMER VICE CHANCELLOR AGRICULTURE UNIVERSITY WITH INTERFACE MANagements



DR. SUBIR SINGH AND OTHER DOCTORS OF AVINASH GROUP AT INTERFACE STALL



FARMERS OF NEPAL IN DISCUSSION



FULL VIEW OF INTERFACE STALL



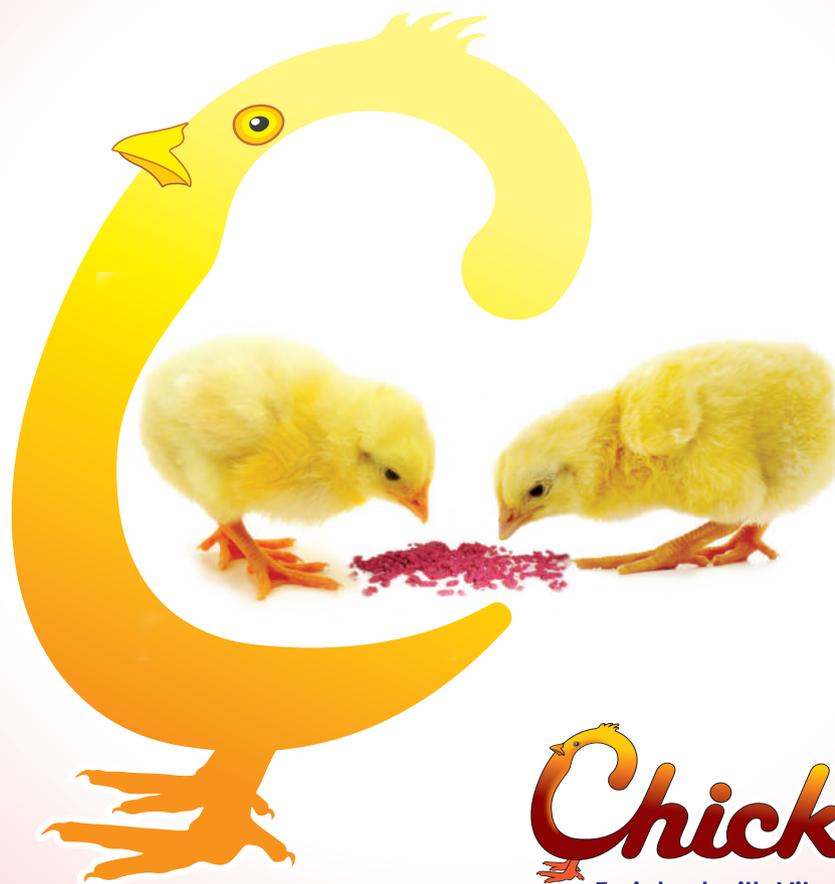
INTERFACE STALL AT NEPAL POULTRY SHOW



MR. DHRUB MANADHAR & MR. DEEPAK KHANAL AT INTERFACE STALL



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MR. GUNA CHANDRA BISHT (SWAMI JI) AT INTERFACE STALL



MR. PUSHP RAJ DAHAL FORMER PRIME MINISTER OF NEPAL ALONG WITH MR. GUNA CHANDRA BISHT (SWAMI JI) AT INTERFACE STALL



MR. S.K. MALHOTRA IN DISCUSSION WITH EMINENT FARMERS OF NEPAL



SWAMI JI AND MR. MANAN MALHOTRA IN INFORMAL DISCUSSION



MR. SHOBHA RAM OLI IN DISCUSSION WITH MR. S.K. MALHOTRA



SWAMI JI IN FRIENDLY CONVERSATION WITH MR. MANAN MALHOTRA CHIEF OPERATION OFFICER INTERFACE

**A HUMBLE TRIBUTE TO
Dr. SUSHIEL AGRAWAL**

With profound grief, we hereby inform that our respected Chairman, Dr. Sushiel Agrawal left for his heavenly abode on 13th March, 2020 due to cardiac arrest. We pray to God Almighty to give eternal peace to his soul.

Dr Sushiel Agrawal has made outstanding contribution for the development of Veterinary Ayurveda as a science and succeeded in establishing it in more than 50 countries. He spearheaded a team of scientists to do intensive research on herbs and developed many innovative products for safe and better animal health care.

INDIAN HERBS will ever remain indebted to him for his contribution to its outstanding growth as a global company. He was also associated with many social organizations and supported them with exemplary devotion for achieving their causes. Above all, he was a great human being. His vision and advices will continue to guide us in our future endeavors and ventures.

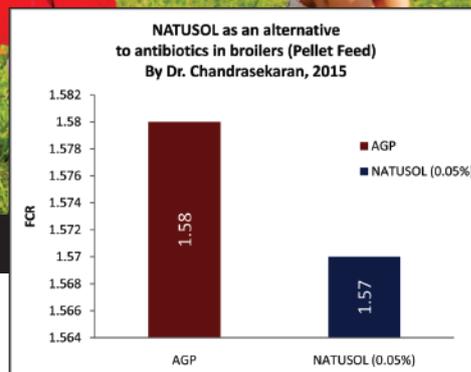
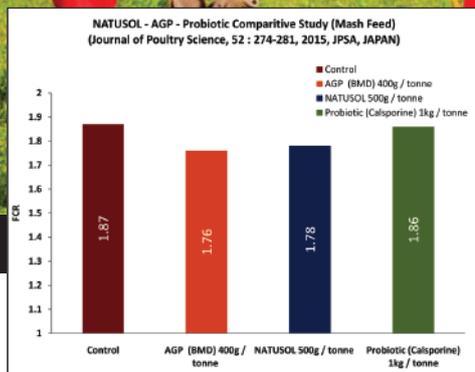
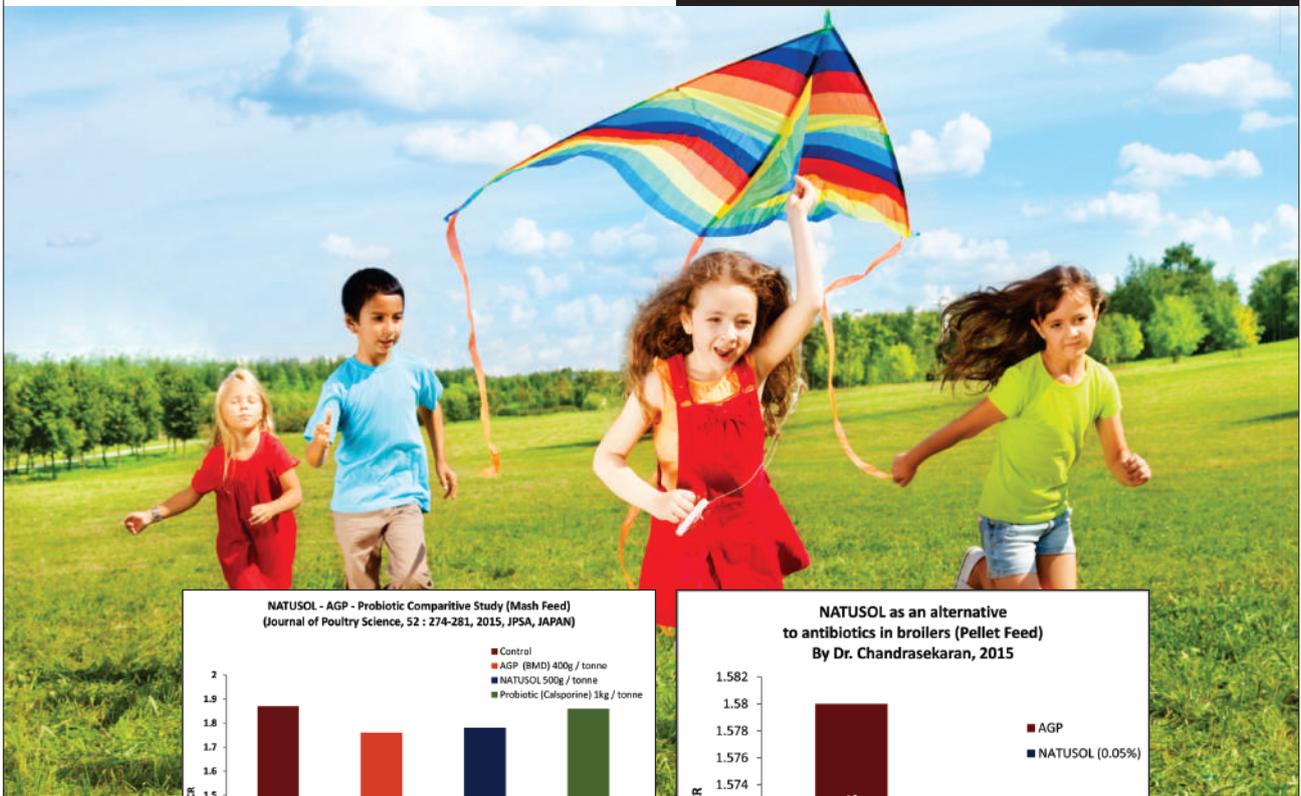
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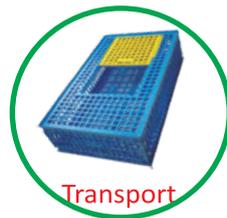
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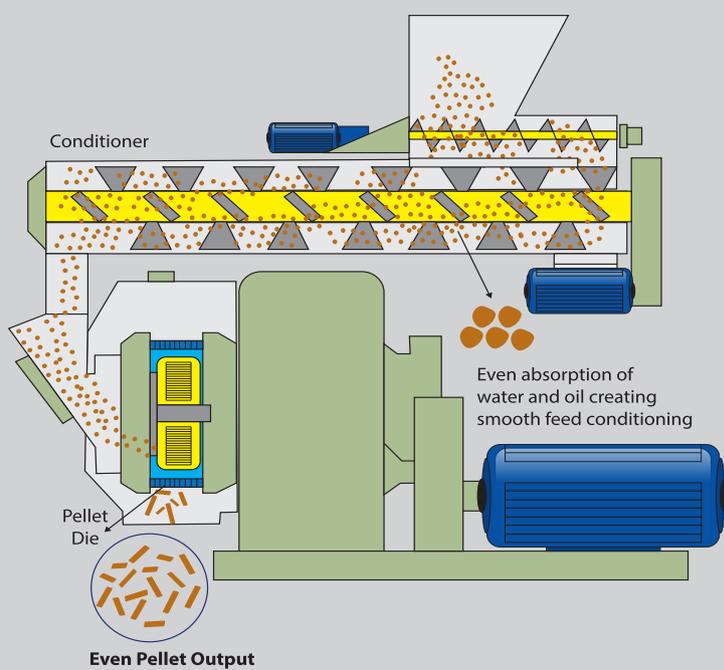
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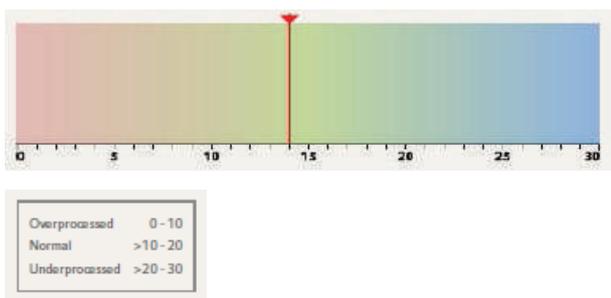
AMINORED® 2.0: New measure of Soy feeding value

Pradeep Krishnan and Girish Channarayaptna, Evonik SEA Pte Ltd, Singapore



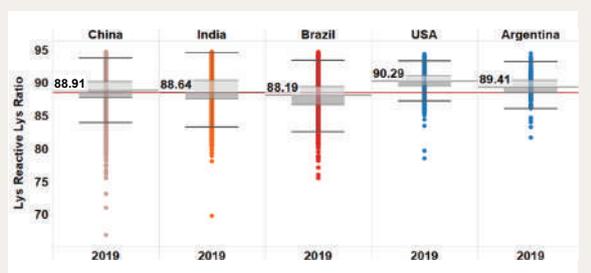
Given the popularity of soybean meal (SBM) as a protein source in animal feeds, it is necessary for ingredient quality control programs to apply appropriate assays to determine if SBM is under or over-processed.

AMINORED® 2.0, a novel near infrared (NIR) based tool, allows soy producers/ feed millers to detect and classify soy products according to the degree of process conditions ranging from raw soybeans to highly over-processed SBM. AMINORED® 2.0 will deliver data on well-established quality parameters used by the feed industry like Trypsin Inhibitor activity (TiA), protein solubility in potassium hydroxide (KOH-PS) and Protein Dispersibility Index (PDI). These parameters are combined with Evonik’s leading position in amino acid analytics, especially the reactive lysine assay to design a new parameter – the Processing Condition Indicator (PCI). PCI values for soy quality are color coded in the AMINORED® 2.0 report with values ranging from 0-30.



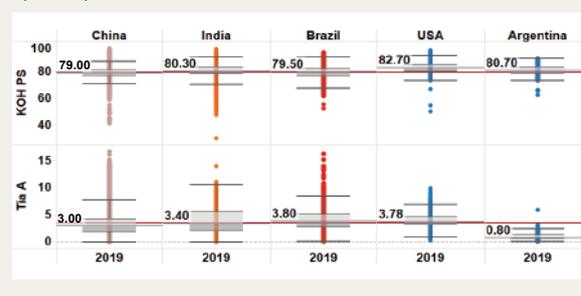
For adequately processed SBM, recommended reactive lysine to lysine ratio is ≥ 90 . The data from 2019 (Fig 1) reveals the median value around 90 for most of the SBM origins.

Figure 1: Lysine to reactive lysine ratio of SBM from different origin (2019)



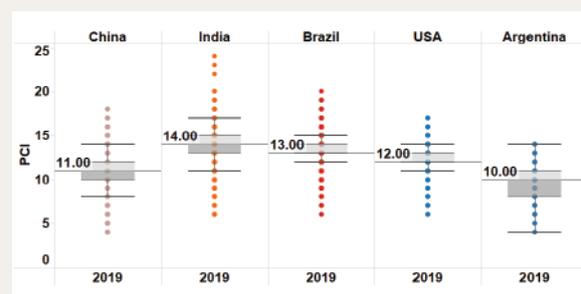
Adequately processed SBM shall have KOH solubility as high as possible (73-85%) while keeping TIA values within the targets (<4 mg/g of protein; Fig 2)

Figure 2: TIA and KOH-PS of SBM of different origin (2019)



Even though PCI value has a broad range for adequately processed SBM (10-20; Fig 3), ideally values shall not be too close to the lower or upper range.

Figure 3: PCI of SBM of different origin (2019)



Benefits for the end user - Using NIR analytics to estimate the PCI of soy sample via AMINORED® 2.0 service will offer a fast, reliable and practical solution to make an informed decision about the quality of Soy product.

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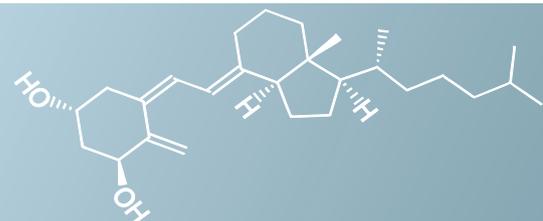
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DIFORMATES: A MOST SUITABLE REPLACEMENT FOR ANTIBIOTICS

Anant Deshpande* and Christian Lückstädt

*ADDCON Asia Ltd. India

■ Introduction

Discovery of antibiotics is one of the greatest benefits to mankind. Millions of lives have been saved across the world ever since the use of antibiotics came into practice. Initially the use of antibiotics was restricted only to humans, until the practice of intensive farming came into existence in the 1950'S and their routine use in animals for prophylactic purposes began. In 1963, the emergence of the first resistant bacteria was described (Watanabe et al., 1963). In 1969 a committee of government experts in the UK concluded that the use of antibiotics in animals had contributed to antibiotic resistance in humans. In 1975, further UK research linked the prolonged use of antibiotics to shedding of *Salmonella typhimurium* and its development of resistance to: Virginiamycin, Bacitracin, Flavomycin, Nitrovin, Tylosin, Sulphaquinoxaline, Ampicillin, Chloramphenicol and many more antibiotics. These resistant bacteria proliferate in the animal and are transmitted to other animals. Transfer of the bacteria from animal to human is possible through many routes. Humans can also get infected by eating meat from animals with resistant bacteria. In 2015, antibiotic-resistant pathogens were estimated to cause over 50,000 deaths a year in Europe and the USA. The toll is projected to rise to 10 million deaths per year worldwide by 2050 (O'Neill et al., 2016). Sensing trouble, some countries have already imposed a ban on the use of prophylactic antibiotics in livestock feed and many more are in the process. However, without the use of antibiotics in animal farming, the productivity of the animal is compromised and hence there is an absolute necessity

to look into suitable replacements. The following review deals with the use of effective replacements to antibiotics in the form of diformates - the double salts of formic acid; phytogetic compounds and their efficacy against bacterial pathogens. Available data show that these substitutes not only effectively control pathogenic bacteria but also improve productivity far more effectively than antibiotics.

Review

Overuse of antibiotics, the development of resistant bacteria and its ill effects on the human population eventually leading to the ban on prophylactic use of antibiotics in animal farming, is currently the hottest topic of discussion everywhere. The ban on prophylactic use of antibiotics in animal farming is well deserved, however, looking at the bacterial challenges in the animal farming, it is imperative to have some kind of a tool to control the bacterial infections and improve the performance of the farmed animal. Organic acids are looked upon as the most promising alternative to the antibiotics (Papatsiros and Billinis, 2012), as in addition to its antimicrobial property, organic acids provide many extra benefits such as improving the intestinal health, optimising the intestinal pH and thereby improving the nutrient digestibility. Organic acid controls the development and growth of mold and bacteria by the virtue of its inherent antimicrobial property and are in use as a preservative in food industry since ages. Since half-a-century they also have been used in the animal industry, much of it to control the mold and bacteria in the feed, in order to improve the hygiene of the feed and thereby to improve the performance of the animal. The current article focuses more on to the role and

advantages of organic acid in the control of pathogenic bacteria in the gastro-intestinal-tract (GIT) of chicken/swine.

The antimicrobial mode of action of organic acid is explained as a two-way action; one is the bacteriostatic effect by the dissociated molecule of organic acid, which inhibits the growth of microbes due to lowering of the pH in its surrounding area and the other is bactericidal action by un-dissociated molecule of organic acid which occurs when the organic acid molecule penetrates through the cell wall of the gram-negative bacteria and then dissociates inside the bacteria altering the pH in the bacterial cytoplasm. Though this mode of action is well documented by various scientists, the information on the various other aspects of organic acids which influence its efficacy is not so widely disseminated up to the end user, leading to the inaccurate use of organic acids, subsequently resulting into the inconsistency in the results as compared to the antibiotics.

Knowing that the pH in the GIT of the animal is different in different areas and that the pathogenic bacteria like *E. coli* and *Salmonella* spp. thrive and multiply in the lower GIT where the pH is favourable for their growth, the efficacy of the organic acids to control the bacteria depends on various factors such as the type and the form of organic acids used, the concentration and amount of acid reaching to the small intestine and the method of application. Though there are many organic acids available, each has a specific molecular structure and varied efficacy and a different MIC (Minimum Inhibitory Concentration) for different bacteria. Formic acid has the strongest antibacterial activity as compared to the other acids and has the lowest MIC

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compared to other acids (Table 1; Strauss and Hayler, 2001).

Table 1: Minimal inhibitory concentration (MIC) of formic acid (modified after Strauss and Hayler, 2001)

Bacteria	MIC (%)
Salmonella typhimurium	0.10
Escherichia coli	0.15
Listeria monocytogenes	0.10
Campylobacter jejune	0.10
Clostridium botulinum	0.15
Clostridium perfringens	0.10
Pseudomonas aeruginosa	0.10
Staphylococcus aureus	0.15

It has been seen that the liquid acids have very little or no role when the focus is the control of pathogenic bacteria in the lower gut, as more than 90-95% acid gets digested before reaching the small intestine. It has been seen in such a study, that only 5.5% of the formic acid reaches to the small intestine when used at a dosage of 0.5% liquid formic acid (85% active ingredient) in compound feed (Kirsch 2010).

Similar results were observed earlier by Maribo et al. (2000) when the authors only detected 4.4% of active ingredients in the small intestine by using a dosage of 0.7% liquid formic acid in the diet. Moreover, the liquid acids are corrosive so it is not practical to use these acids as such. All pure liquid organic acids are corrosive products. Even if these liquid acids are sprayed on a carrier, the product can remain corrosive.

Salts of organic acids, like calcium propionate, sodium formate or sodium benzoate generally referred to as single salts, as it has one molecule of mineral and one molecule of acid in its structure, seemed to be a good option to add active ingredients in a solid and non-corrosive form, it also helps in reducing the buffering capacity of the compound feed. Studies have shown that organic acid salts led to lower E. coli counts in the ileum and higher Lactobacillus counts in the colon of piglets (Bosi et al. 1999)

Although no much data is available on

the amount of acid reaching to the small intestine when used in the form of single salts, quite encouraging data is available on the diformates- the double salt of formic acid (one molecule of mineral and two molecules of formic acid), which shows about 85% of the formic acid enters the small intestine when used in diformate form (Figure 1).

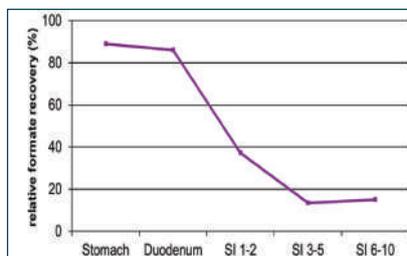


Figure 1: Recovery of diformate in the GIT (after Mroz et al., 2000)

As the amount of formic acid reaching the small intestine (SI) is quite high, one can see well documented results with diformates at much lesser dosage as compared to the single salts.

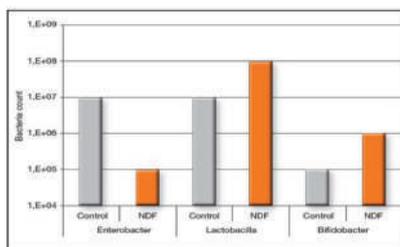


Figure 2: Effect of sodium diformate (traded as Acidomix DF +) on gut microflora in poultry (after Lückstädt and Theobald, 2009)

The availability of higher amounts of active ingredients in the gut will have an influence on the overall gut microflora. Such a study showed (Figure 2) that the number of pathogenic bacteria has been lowered by about 99% whereas the number of beneficial bacteria is improved by one log (Lückstädt and Theobald, 2009).

Tests against intestinal pathogens, including Salmonella, have shown that

diformates have significant antimicrobial activity in broiler chickens (Table 2). Keeping bacterial pathogens under control reduced the probability of causing a disease outbreak.

Table 2: Salmonella profile (in % positive) in naturally contaminated broiler in Spain fed with or without sodium diformate (NDF) – after Lückstädt and Theobald, 2009

	Control	AcidomixDF+ 0.3%
Crop (microbiol.)	20	0
Intestine (microbiol.)	20	0
Faeces (microbiol.)	25	0
Meat (serol.)	0	0

In further studies with 0.3% of sodium diformate, carried out at a university in Taiwan, the positive effects on pH in the upper GIT and the improvement in digestibility of protein and fat were seen (Table 3).

Table 3: pH-values and digestibility coefficients in broiler fed with or without sodium diformate (NDF) till 35 days (after Lückstädt and Mellor, 2013)

	Control	AcidomixDF+ (0.3%)	Difference (%)
pH in crop	4.24	3.96	-0.28 units
pH in stomach	2.94	2.58	-0.36 units
Protein digestibility (%)	61.6	63.3	+2.7
Fat digestibility (%)	90.5	91.1	+0.7

A subsequent trial in the Ukraine, with the addition of 0.2% / 0.1% kg of sodium diformate showed an improvement of 6% in the average daily weight gain against a positive control consisting of an acid blend on carrier with the same dosages, while the FCR was improved by more than 5% (Table 4). Furthermore, this NDF-inclusion reduced the mortality by more than 21%. Finally, the productivity index (EBI) was increased by almost 13%, thus leading to a more cost-effective production.

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Table 4: Sodium diformate vs. positive control in commercial broiler in the Ukraine (2013)

	Positive control	AcidomixDF+ (0.2/0.1%)	Difference (%)
Weight, day 20 (g)	931	970	+4.2
Final weight (kg)	2.550	2.700	+5.9
ADG (g)	60	63	+6.0
FCR	1.84	1.74	-5.4
Mortality	2.8	2.2	-21.4
EBI	315	356	+12.8

Though it has been well established that the diformates by the virtue of high formic acid content and with an ability to reach the small intestine in maximum concentration, exhibits excellent antibacterial and growth promoting results, the fact remains that the organic acids are more efficient in

controlling the Gram-negative bacteria and show limited activity on the Gram-positive pathogenic bacteria.

In order to have a true antibiotic replacement agent, the combination of diformates with some other sustainable resources which show efficient antibacterial activity against Gram-positive bacteria would be of great advantage.

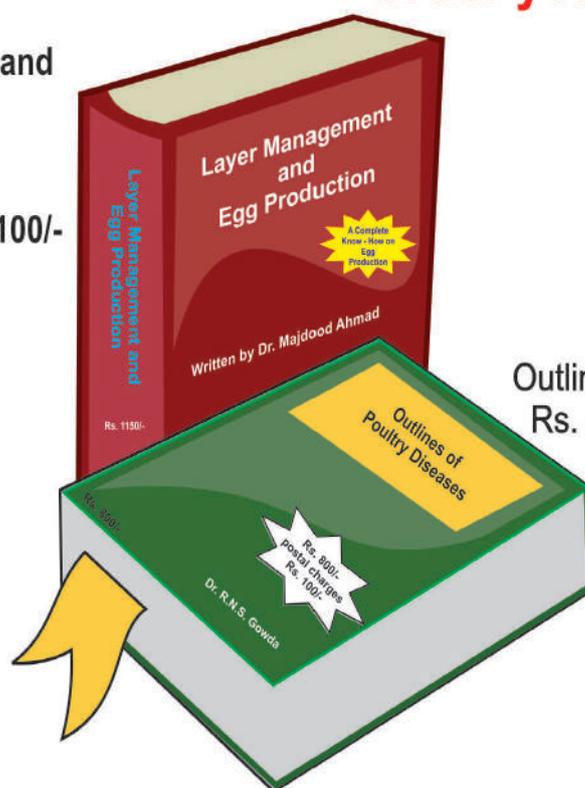
Work on such 3rd generation acidifier is currently carried out. The data available on the combination of diformates with the plant extracts (traded as Formi Alpha), containing different alkaloids (which show excellent activity against the Gram-positive pathogenic bacteria) are quite encouraging.

From a trial done in Germany in 2015 it was seen that the combination of

diformates with the plant alkaloids can, next to the regular impact of diformates on performance and digestibility, considerably reduce Streptococci spp. incidences – and have therefore also a demonstrated impact against Gram-positive bacteria. Furthermore, data are available which show a positive impact on intestinal health, in such a form that the lesion score caused by Clostridia infection is significantly improved.

This and some more data that is available until now, assures that the antibiotics can be definitely replaced with safe and sustainable alternatives for prophylactic use. Such sustainable products will be helpful in improving the performance of the animals with no disadvantage to mankind and environment.

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ADDRESSING THE SUPERBUG CONCERN:



Dr. Ramdas Kambale, Sr.VP, Vetphage Pharmaceuticals

He identified phages as virus-like organisms that could kill bacteria without any harmful effects and also coined the term “phage therapy”. However, the discovery of antibiotics put to rest any research or interest in phages. As bacteria evolve and develop resistance to existing antibiotics, the superbug concern has once again ignited research and experiment in phages. In fact, apart from treating bacterial infections, phages can also make our food supply safer.

PHAGE THERAPY COULD BEAT DRUG RESISTANT ILLNESSES

In 2008, a superbug caught from a New Delhi hospital claimed the life of a Swedish patient. British scientists who found this “superbug” in New Delhi’s public water supply, named it New Delhi Metallo-beta-lactamase-1 after the Indian capital, causing much hue and cry in India. The drug resistant gene including its new variants has since been found in over 100 countries including in one of the last “pristine” places on Earth -- a Norwegian archipelago close to the North Pole! The spread of this superbug that was found to be resistant to all available antibiotics on Earth is a distressing sign.

One of the leading healthcare challenges of our times is the emergence of “superbugs” which are nearly impossible to treat. These ‘superbugs’ or drug-resistant microorganisms are claiming an increasing number of lives every year. If the superbug threat is not dealt with, the deaths from drug-resistant infections could increase to a whopping



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Reference : Trial conducted by Dr. S. S. Chauhan, Ph. D. Thesis, Jan 2019. Effect of various feed supplements on the performance of Broiler Chickens at G. B. Pant University of Agriculture & Technology, Pant Nagar, Uttarakhand.

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In a recently concluded study it was established that most of the antibiotics being used in the poultry and aquaculture industry for farmed animals are increasingly losing their activity against pathogenic microorganisms. Moreover, the use of antimicrobial agents in animal husbandry has been linked to the development of resistant bacteria. If not kept in check use of antibiotics during poultry production can threaten the safety of such products through microbial residues as well as help spread microbial resistance. 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. This is largely because phages 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.

10 million every year by 2050 from around 700,000 currently. In fact, medical researchers have pointed out that the burden of such resistant infections is comparable to that of tuberculosis, HIV/AIDS and influenza put together. This has prompted researchers and medical experts to look for viable alternative treatments and has elicited fresh interest in an age-old intelligence, called phage therapy.

Can Phage Therapy be the potential answer?

Bacteriophages also called phages are bacteria-attacking microorganisms that devour selected bacteria without causing any harm to the host. Phages are all around us on our hands, our eyelids, animal intestines as well as in the soil but they don't hurt us. They are natural organisms made up of only genetic material namely DNA and RNA plus protein. Microbiologist Félix Hubert d'Herelle identified and explained the role bacteriophages can play in treating bacterial infections way back in 1917. He identified phages as virus-like organisms that could kill bacteria without any harmful effects and also coined the term "phage therapy". However, the discovery of antibiotics put to rest any research or interest in phages. As bacteria evolve and develop resistance to existing antibiotics, the superbug concern has once again ignited research and experiment in phages. In fact, apart from treating bacterial infections, phages can also make our food supply safer.

Phage researchers today also have the technological tools needed to rapidly analyze the genomes of bacteria and phages, and find effective treatment pathways. In 2019, a 62-year-old man in Minnesota was told by his doctors that he would have to have his leg amputated after over 10 years of failed treatments including multiple antibiotics and 17 surgeries to cure a stubborn infection. However, in his quest to find potential alternative treatment, led him to an organization that specialized in treating with phages. The man became the 14th person worldwide to be treated with phage therapy and ended up getting rid of his chronic infection.

Phage Therapy in rearing healthy poultry

Poultry is one of the fastest growing segments of the agricultural sector in India today. While the production of agricultural crops has been rising at a rate of 1.5 to 2 percent per annum that of eggs and broilers has been rising at a rate of 8 to 10 percent per annum. As a result, India is now the world's fifth largest egg producer and the eighteenth largest producer of broilers. Nonetheless the bigger question is whether or not they are fit for consumption.

In a recently concluded study it was established that most of the antibiotics being used in the poultry and aquaculture industry for farmed animals are increasingly losing their activity against pathogenic microorganisms. Moreover, the use of antimicrobial

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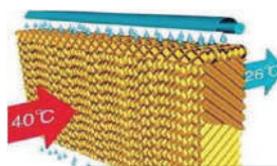
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agents in animal husbandry has been linked to the development of resistant bacteria. If not kept in check use of antibiotics during poultry production can threaten the safety of such products through microbial residues as well as help spread microbial resistance. 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. This is largely because phages 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.

Phages when consumed as part of animal feed keep the animals safe from bacterial infections. Moreover, they also do not damage the beneficial micro biome 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.

How we Identify and use Phages

Proteon Pharmaceuticals, one of the pioneering organizations working to introduce phage therapy in animal husbandry, has the most advanced Artificial Intelligence-supported technology to determine whether phages are lytic or not. When dealing with phages it is important that

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 the bacteria.

Protean produces phage-based feed additives for destruction and prevention of bacterial infection in farmed animals. These feed additives

when administered prophylactically help prevent infection in poultry and can also therapeutically reduce preexisting infections such as Salmonella. Furthermore, given to poultry mixed with water, it is easy to apply and use. Its results are scientifically verified and based upon well-understood mechanisms of action, meaning that it works reliably across diverse farm environments.



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An organic mineral is a combination of a metal ion with an organic molecule called 'ligand' such as amino acids, proteins, polysaccharides, yeast, or organic acids. Specifically, the metal ion is bound to the organic ligand

through multiple attachments (either ionic or covalent) with the metal ion occupying a central position in the structure (Kincaid, 1989, Nelson, 1988).

Animal Trace Mineral Requirements aren't Static:

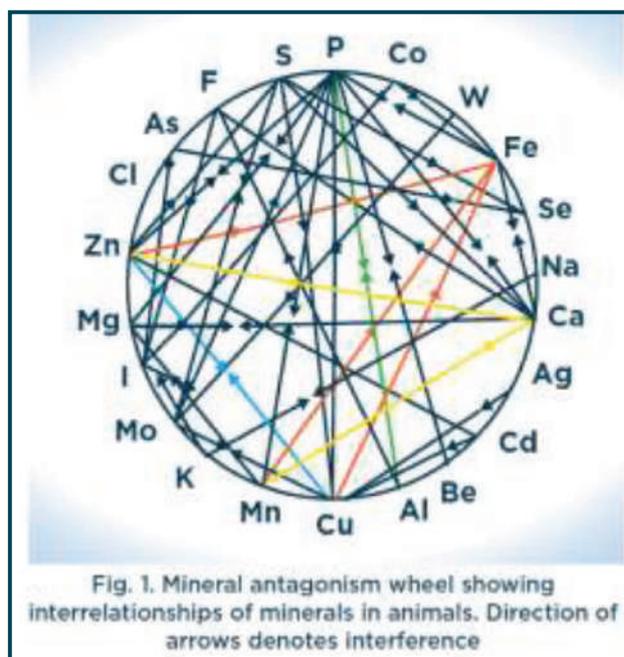
Poultry feeds must be formulated to provide all the necessary animal's mineral nutrient requirements if optimum growth and production is to be achieved. The exact minimum dietary requirement of trace minerals for every animal is though not a given, constant value as it depends on various influencing factors such as genetic developments, age, reproductive state and health of the animals, housing system and management of the farm. Still today, official recommendations of requirements by official Research or Animal Nutrition organizations such as the National Research Council (NRC), CVB (CentraalVeevoeder Bureau) or genetic breeding companies remain under discussion. Some were defined in the 1990s and it can be questioned if they are therefore adapted to modern breeding systems/breeds and production.

To determine the correct inclusion rates for animal feeds to achieve optimum production results, it is vital to consider some factors that influence the needs of the animals. Broilers now have different carcass characteristics and are grown to increasingly large sizes, so a healthy and stable skeletal structure becomes even more important. The increased egg output of modern layer strains means that egg shell quality has become more critical as hens are laying at an earlier age with corresponding reductions in both mature body weight and daily feed intake.

More is less –interactions and antagonisms:

Due to the simplicity of their molecular structure, trace minerals within inorganic sources are very susceptible to binding with other feed ingredients such as other minerals or more complex molecules like phytate, making them no longer useful for your animals (Fig.1). This results in less mineral supply to effectively support the animal

performance. In addition, phytic acid is able to form complexes with trace minerals that are very stable and highly insoluble, rendering the minerals unavailable for absorption. High concentrations of calcium increase the phytic acid-mediated antagonism on trace mineral bioavailability. The macro minerals calcium and phosphorus are antagonistic. Calcium suppresses zinc and manganese availability, while phosphorus is antagonistic with zinc.



Unfortunately, many of the NRC trace mineral requirement values are based on research from the 1960's and 1970's and many nutritionists believe these recommendations are inadequate to support the needs of modern poultry strains and also as a cheap 'insurance' against poor performance and due to concerns with the consistency of quality of ITMs. One of the paradoxes of this practice is that dietary antagonisms can actually be increased, so more can actually be less and environmental depositions of trace minerals are also increased.

ITMs tend to dissociate in the low pH environment of the upper gastrointestinal tract of the bird. When the dissociated trace mineral reaches the more neutral pH of the small intestine, it is susceptible to various nutrient and ingredient antagonisms that impair absorption and thus reduce the bioavailability.

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Not All Organic Trace Minerals (OTM) are same:

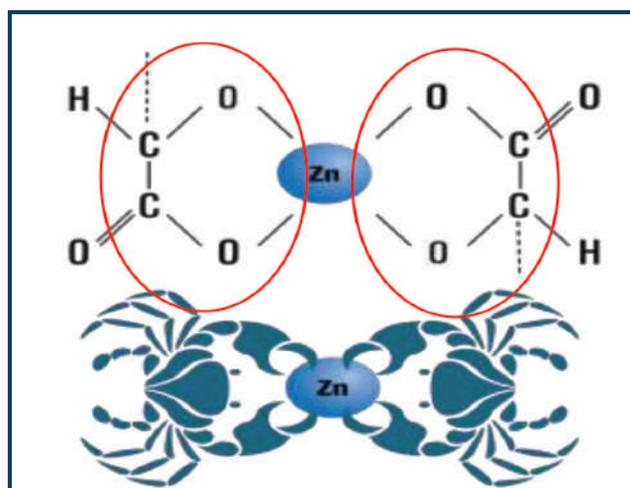
The differences between various organic minerals are based on mainly the type of the ligand or organic molecule that attach with the metal and the type of bond between the ligand and the mineral.



In its role as a ligand in MHMTBa chelated trace minerals, HMTBa (2-Hydroxy- 4-MethylThioButanoic acid or the hydroxy analog of methionine), appears to have an advantage over other ligands, such as methionine, proteinates, and carbohydrates, in terms of stability and maximising the availability of trace minerals. The structure of HMTBa-chelated trace minerals has been fully defined by a variety of assays, including X-ray crystallography. HMTBa-chelated trace minerals contain two molecules of HMTBa – chelating one molecule of either zinc (Zn) manganese (Mn) , or copper (Cu).

Understanding Chelation:

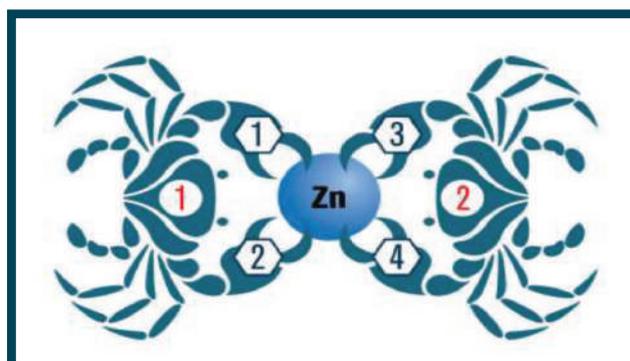
The word Chelation arrived from the Greek word “Chela” which means “Pincer”. When a ligand connects to a metal atom at 2+ points, it forms a chelate. To form a stable chelate, multiple ligands need to connect to the metal. If only one ligand connects to the metal, it is technically a “metal complex” rather than a “chelate”



(Kratzer F.H., & Vohra P. 1986. *Chelates in Nutrition*. CRC Press Inc.)
 when two five member rings connect to the metal with two points of contact it forms the most stable complex found in nature.

Bis-Chelates:

A bis-chelate has very specific characteristics to ensure that the metal has maximum protection. In addition to have a 2:1 ligand to metal ratio, the most important characteristic is that it must have a neutral charge. Bis Chelates have 2 chelate rings. Bis-chelates are formed when 4 atoms connect to the metal in the center. A mono-chelate does not exist. As previously mentioned, a molecule with only one ligand and a metal is a “metal complex.”



THE 4 ATOMS AROUND THE METAL SHARE AN ELECTRON TO CREATE A MOLECULE WITH A NEUTRAL CHARGE.

The most stable chelation rings are those formed by hydroxy acids

When the HMTBa-chelated trace mineral molecule reaches the site of mineral absorption in the small intestine, the combined influence of the pH of the unstirred water layer (pH 2) of the intestinal mucosa and the higher binding affinity of the mineral receptor on the intestinal cell membrane breaks the bonds of the molecule, freeing the trace mineral. The free trace mineral and the HMTBa are then absorbed separately across the epithelium of the small intestine for utilisation in the animal.

The HMTBa ligand, a lipophilic organic acid is absorbed by diffusion or by a carrier system and converted to L-methionine by the animal. Biochemical and growth performance experiments have demonstrated that the HMTBa from HMTBa chelated trace minerals has the same methionine value as unchelated HMTBa. Therefore, in all feed formulations, the trace mineral-HMTBa chelate can replace a portion of the supplemental synthetic methionine.

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Measuring the Bioavailability of OTM:

Intrinsic, extrinsic, and luminal factors can affect mineral bioavailability (Nelson, 1988; Ashmead, 1993). The variable reports of organic mineral bioavailability in animal systems are likely due to interactions among these factors. Tissue mineral experiments often provide useful data in mineral availability, but these experiments measure only a fraction of the mineral that is taken up by the animal. Minerals are absorbed by the small intestine, and then distributed via the bloodstream to other tissues. Therefore, tissue mineral levels only measure the mineral that is distributed to those particular tissues, and as such may not reflect total mineral uptake. The tissue mineral experiments measure only the amount of mineral that has entered into the particular tissue, rather than the total mineral delivered to that particular tissue.

The solution to this problem is to use of biomarkers like Metallothionein (MT) in the animal in the small intestine where minerals are absorbed. Metallothionein's expression is regulated by Zinc status. When zinc is absorbed by a cell, it must be bound up quickly into protein, because free zinc is toxic. The cell therefore responds to zinc uptake up synthesising MT mRNA (as an intermediate) and then MT protein. The MT protein is then able to bind up to 7 zinc atoms, (for Cu its 10) until it is needed by other enzymes in the cell. Research has shown in many tissues from a wide range of species, MT mRNA and protein expression increase when more zinc is taken up, and decrease when less zinc is taken up. Therefore, metallothionein mRNA or protein expression is often used as an indicator of the zinc status of humans and animals and to evaluate the bioavailability of different zinc sources.

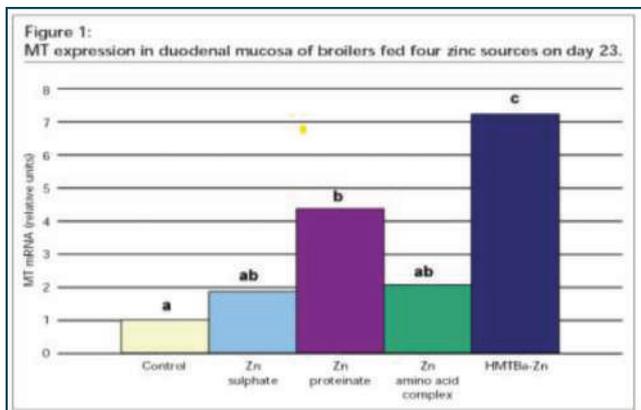
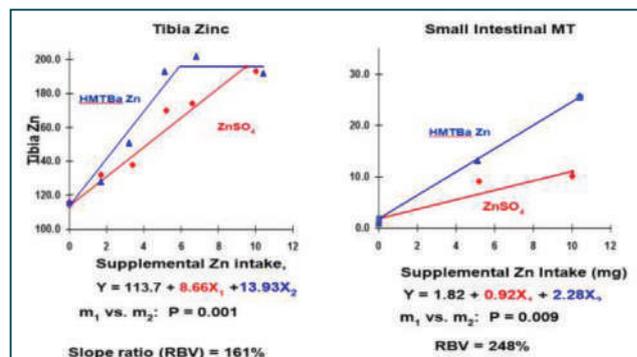


Figure 1 shows an example of using small intestinal metallothionein mRNA expression as an indicator of zinc bioavailability. In this experiment, broilers were fed control diets or diets supplemented with 40 ppm zinc from the indicated sources. Because zinc absorption occurs in the small intestine, differences in metallothionein expression here would be expected to more closely represent relative bioavailability than tissue zinc levels would. Measuring tissue minerals or mineral dependent biomarkers can be the easiest and most straightforward measures to generate a quantitative estimate of mineral bioavailability.

It seems likely that some OTMs truly will not be more bioavailable than ITMs, due to their inability to stay chelated or complexed in the low pH environment of the upper GI tract. On other occasions, however, true differences in bioavailability could be masked by experimental design.

Using tibia zinc content as the measure of bioavailability, indicated that the bioavailability of zinc methionine relative to zinc sulphate ranges from 117% to 206% in broiler chicks, depending on the diet matrix.

Figure 2: It seems likely that some OTMs truly will not be more bioavailable than ITMs, due to their inability to stay chelated or complexed in the low pH environment of the upper GI tract. On other occasions, however, true differences in bioavailability could be masked by experimental design. Using tibia zinc content as the measure of bioavailability, indicated that the bioavailability of zinc methionine relative to zinc sulphate ranges from 117% to 206% in broiler chicks, depending on the diet matrix.



A study of Zn-HMTBa performed (Figure 2) on the linear portions of the dose response curves indicated that the zinc from this source was approximately 160% or 250% as available as the zinc from zinc sulphate, depending on the response variable measured (tibia zinc; or the small intestinal expression of the zinc responsive biomarker, metallothionein; respectively).

Less is more – reduce and replace

Many people are using 'reduce and replace' – replacing all or some of the ITMs with organic trace minerals (OTMs) to avoid the problem of antagonisms and reduce environmental deposition of trace minerals. A potential advantage of OTMs is that the binding of the organic ligand(s) to the mineral should provide stability of the complex in the upper gastrointestinal system, thereby minimising mineral losses to antagonists and allowing the complex to be delivered to the receptor sites of the small intestine for improved mineral uptake.

Summary:

Only by truly understanding the structure and consistency of a given OTM source and by rigorously investigating its bioavailability through a variety of methods you can be assured of the predictability and consistency of the animal's responses to OTM supplementation. With new research and extensive commercial experience proving the superior bioavailability of HMTBa chelated trace minerals, you can now formulate to reduce overall supplementation of trace minerals, without compromising (and sometimes increasing) performance while reducing excretion into the environment.

The superior bioavailability of HMTBa-chelated trace minerals helps producers and nutritionists address key production challenges including gut health, nutrition, structural integrity and protection against oxidative stress, which contribute to better control of wet litter syndrome, bone and egg shell strength and footpad dermatitis.

Considering the risk of mineral loss, combined with the profits you might be throwing away, the value is clear. You can't afford not to re-evaluate your current program and consider the alternative solutions that chelated trace minerals provide.

**The references are available on request
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CARGILL WORLD MYCOTOXIN SURVEY, JANUARY – DECEMBER 2019

Cargill Team

Agricultural commodities are now originating from all corners of the globe & spreading threat of mycotoxins through animal feeds produced worldwide. Minimizing the risk of mycotoxins from the field where crops are grown to animal feed and eventually food is a complex process that starts with prevention at the farm and requires a great deal of effort at every step in the food production chain (Jouany 2007). Consequently, it is assumed that it is not possible to completely eliminate more than 300 known mycotoxins from contaminated agricultural commodities. Customers have to take precautionary measures to eliminate mycotoxin risk.

Mycotoxins are secondary metabolites of low molecular weight produced by a wide range of fungi. There are over 300 species of fungi that produce mycotoxins. Aflatoxins (AF), zearalenone (ZEN), ochratoxin A (OTA), fumonisin (FUM), trichothecenes such as deoxynivalenol (DON), and T-2 toxin are some of the mycotoxins that can significantly impact the health and productivity of livestock and poultry species. These toxins are found as natural contaminants in many feed ingredients of plant origin like cereals, seeds, fodder etc. Hence mycotoxins seem to be the most relevant with respect to feed contamination and have a significant economic impact in the animal industry. Fungi grow wherever temperatures and humidity are optimal, and unfortunately weather conditions at harvest time, and/or harvesting practices (such as leaving cut grains in the field before recovery) often promote contamination of cereals, grains and legumes with mycotoxins. There is a great deal of variability in mycotoxin contamination from place to place, and from year to year, depending on local weather and humidity at the time of harvest. With regional weather becoming more unstable and extreme due to climate change, mycotoxins diversity and contamination levels are only expected to rise in the future.

Agricultural commodities are now originating from all corners of the globe & spreading threat of mycotoxins through animal feeds produced worldwide. Minimizing the risk of mycotoxins from the field where crops are grown to animal feed and eventually food is a complex

process that starts with prevention at the farm and requires a great deal of effort at every step in the food production chain (Jouany 2007). Consequently, it is assumed that it is not possible to completely eliminate more than 300 known mycotoxins from contaminated agricultural commodities. Customers have to take precautionary measures to eliminate mycotoxin risk.

Through deep local relationships backed by broad global expertise, Cargill helps customers make their most important animal nutrition and well-being decisions. Cargill is a total solutions provider, providing species-specific products and services that serve an animal's holistic needs through their entire lifecycle.

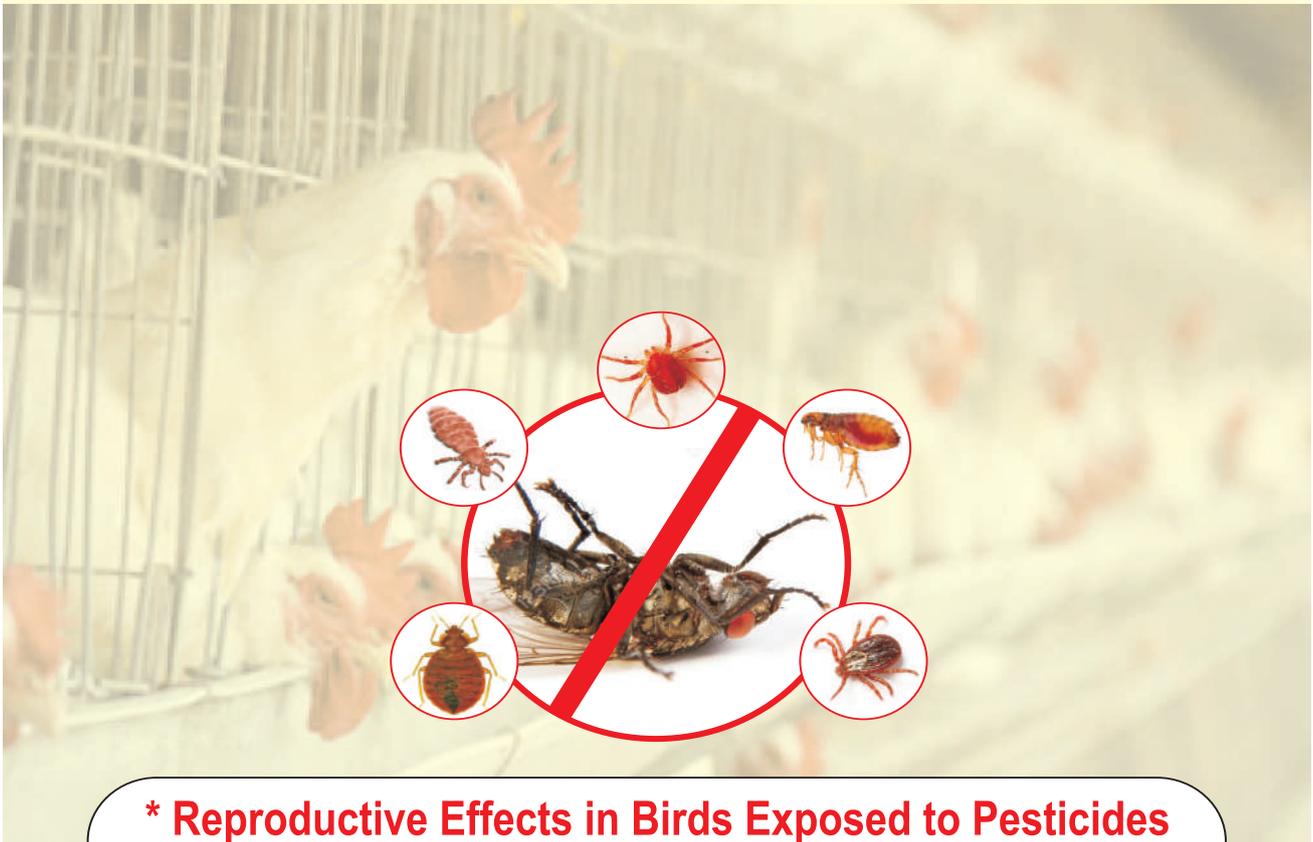
Cargill World Mycotoxin Survey brings mycotoxin contamination pattern data to its customers, in order to help them better manage their mycotoxin risk, and thus, improve their feed and food safety and keep their control plan cost under control. As mycotoxin contamination in raw materials can change over time, Cargill made a priority of always displaying fresh data.

Cargill World Mycotoxin Survey, 2019 consists mycotoxin results of 2,82,277 commodity samples sourced from more than 55 countries. 170 ingredients covering entire gamut of ingredients used in poultry, cattle & swine have been chosen for analysis. All ingredients have been analyzed for 6 mycotoxins predominantly, which pose serious threat on poultry, cattle & swine species. All analysis has been done locally & compiled centrally in form of World Mycotoxin Survey.

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The Complete Litter Control



*** Reproductive Effects in Birds Exposed to Pesticides and Industrial Chemicals**

- * Acute Mortality
- * Sub-lethal Stress
- * Reduced Fertility
- * Eggshell Thinning
- * Suppression of Egg Formation

* D. Michael Fry - Department of Avian Sciences, University of California, Davis, California - Environ Health Perspect 103(Suppl 7):165-171 (1995)

Stop Pesticides

Improve Farm Productivity



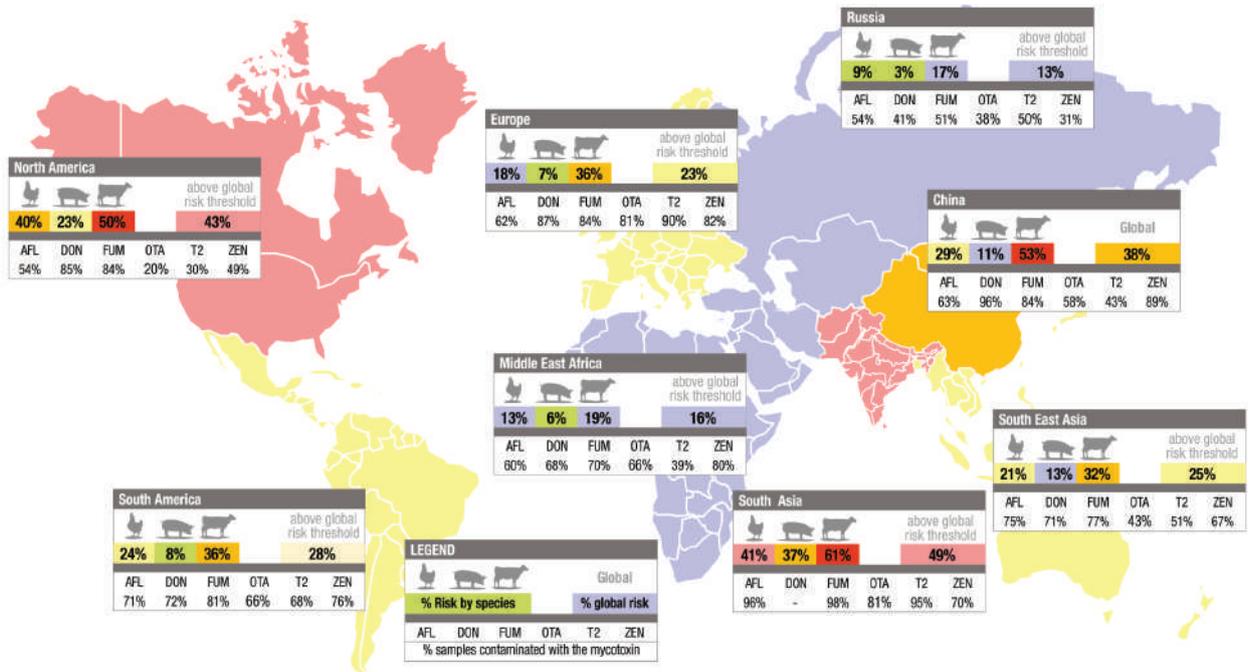
Administrative & Marketing Office :
A 2 Basant, Prarambha Society, 135/4 Erandavana, Pune - 411 004.
Email - anshumanindustries@gmail.com Customer Care : 07350002037

CARGILL WORLD MYCOTOXIN SURVEY

January - December 2019

PERIOD Jan - Dec 2019 **ANALYSIS NUMBER** 282 277

INGREDIENTS 170+ **COUNTRIES** 55+



CARGILL RECOMMENDED RISK THRESHOLDS

Risk thresholds (ppb)	AFLA	FUM	OTA	T-2	DON	ZEN
Global	10	1000	25	50	200	75
Poultry	20	1000	50	50	300	100
Swine	20	3000	50	150	750	500
Ruminant	1	3000	150	100	250	100

RISK LEVELS

Mycotoxin toxicity risks are expressed in % of samples above the defined threshold. Risk qualifications are described according to the scale below :

- Extreme risk 50 – 100 % of samples above risk threshold
- Severe risk 40 – 50 % of samples above risk threshold
- Very high risk 30 – 40 % of samples above risk threshold
- High risk 20 – 30 % of samples above risk threshold
- Moderate risk 10 – 20 % of samples above risk threshold
- Low risk 00 – 10 % of samples above risk threshold

DISCLAIMER
 Sampling and in a minor extent analytic, induce variability in Mycotoxin level data. Also mycotoxin toxicity depends on farm management and environment. This information is indicative and may not reflect 100% the real situation. Cargill cannot accept responsibility for any issues resulting from the use of such information.



**RESTING THE
IONOPHORES
TO PROLONG
THEIR EFFICACY**

with

ZeeCox

Multistage Phytogetic Anticoccidial



After three cycles of using the same ionophore the number of resistant oocysts increases
When ionophore is rotated with **ZeeCox** or is part of shuttle programme it leads to recovery
of sensitivity of ionophore

USAGE

- ✓ Powerful multistage phytogetic anticoccidial for prevention of coccidiosis as well as to prevent litter oocyte recycling
- ✓ Improves survival rate and ensures better performance indices
- ✓ Advantages of 'no resistance development' and 'no withdrawal period' are additional benefits
- ✓ Promotes development of natural immunity and potentiates host immune response
- ✓ For production of residue free meat and eggs

FEED INCLUSION RATE

Broilers : 750 g - 1kg / ton of feed
Layer chicks : 500 g / ton of feed

To be given throughout the rearing period.
ZeeCox successfully replaces ionophores and can be a part of shuttle/rotation program.
Additional benefits of higher body weight gain at 1 kg/ton of feed inclusion rate in broilers.

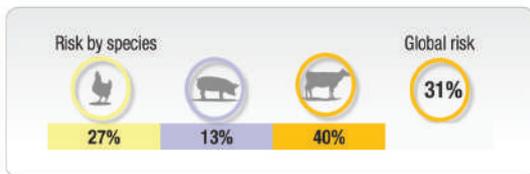
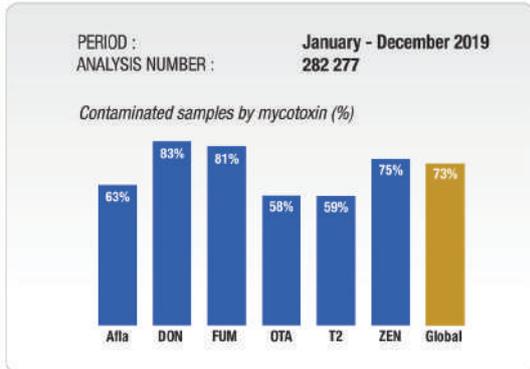
PRESENTATION

10 & 25 kg Bag

INDIAN HERBS SPECIALITIES Pvt. Ltd.

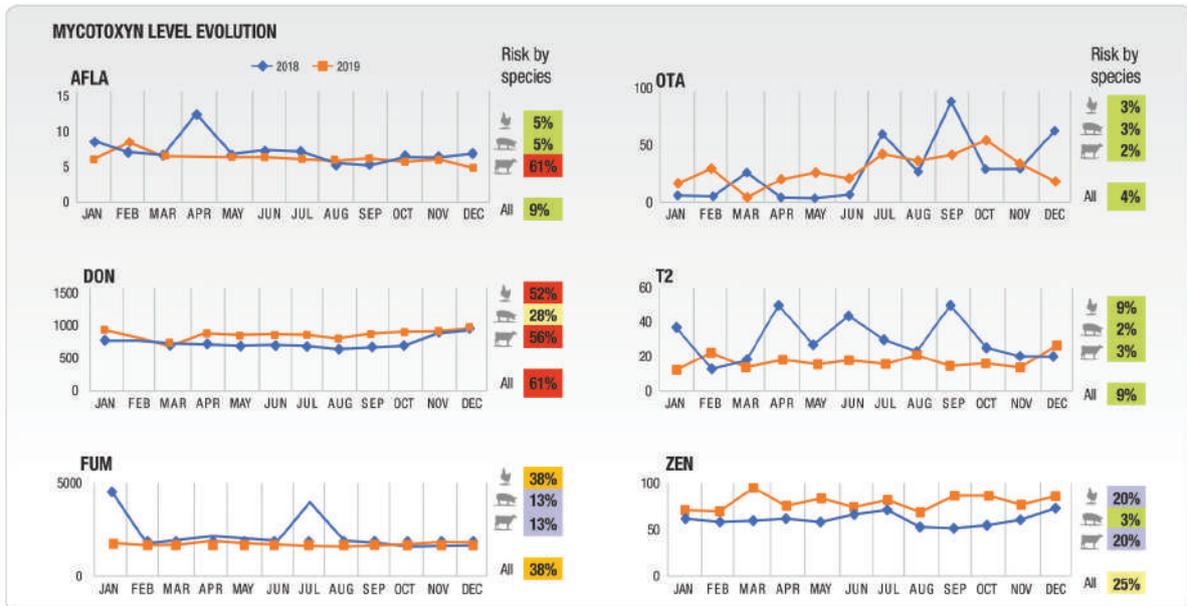
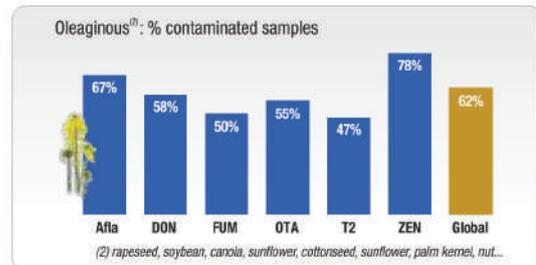
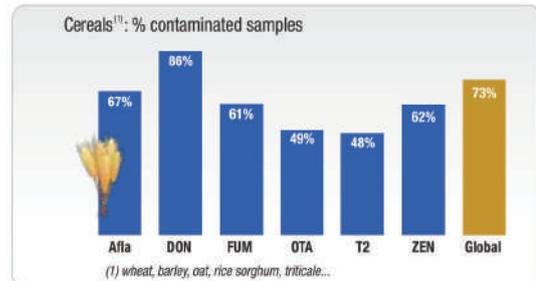
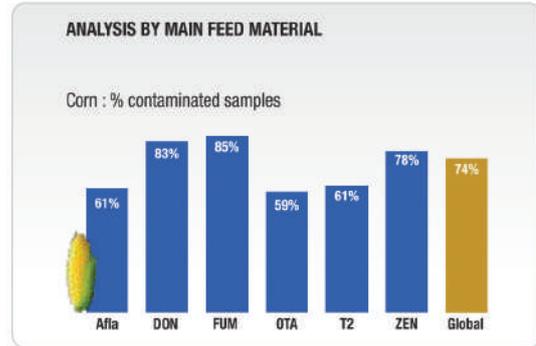
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Phase - 1, CHANDIGARH (U.T.) - 160002, Ph. No. 0172 - 5011470, 4181014, +91 9023247217
E-mail : ihspl@indianherbs.org Website : www.indianherbs.org

World



FOCUS

- High DON (83%), FUM (81%) and ZEN (75%) contamination rate
- Extreme Afla risk for ruminant species
- Extreme DON risk for ruminant and poultry species.
- High risk for swine species





The Pioneer Manufacturer of Poultry Equipments in India for Over Five Decades, involved in designing, manufacturing and supplying of poultry equipments.



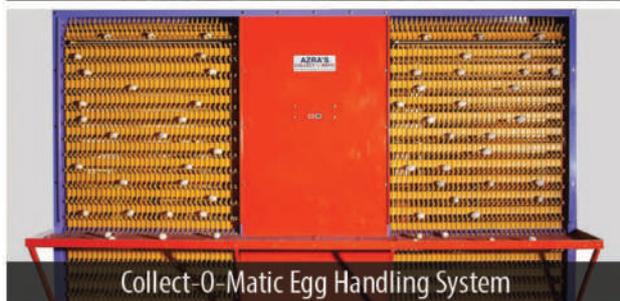
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Tel. : +91 80 22262117 / 22257514 Fax : +91 80 222572773, Email : azapoultry@gmail.com, Website : azras.in

India

PERIOD : January - December 2019
ANALYSIS NUMBER : 1 299



Contaminated samples by mycotoxin (%)

AFLA	96%	OTA	81%
DON		T2	95%
FUM	98%	ZEN	70%

Risk by species



41%



37%



61%

Global risk



49%

FOCUS

- High Afla (96%), FUM (98%), OTA (81%), T2 (95%) and ZEN (70%) contamination rate
- Extreme Afla risk for all species
- Very higher FUM risk for poultry species, high FUM risk for swine and ruminant species



ANALYSIS BY MAIN FEED MATERIAL

CORN	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	228		50	39	47	1
Number samples	242		50	51	59	1
% contaminated samples	94%		100%	76%	94%	100%
Average of contaminated (ppb)	46		4 300	19	25	4
Maximum (ppb)	300		13 480	134	158	4

CEREALS ⁽¹⁾	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	356		26	28	21	11
Number samples	366		27	29	23	15
% contaminated samples	97%		96%	97%	91%	73%
Average of contaminated (ppb)	74		1 213	15	41	22
Maximum (ppb)	300		5 330	140	140	64

(1) wheat, barley, oat, rice sorghum, triticale...

OLEAGINOUS ⁽²⁾	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	120		55	40	56	2
Number samples	125		58	57	56	4
% contaminated samples	96%		95%	70%	100%	50%
Average of contaminated (ppb)	19		290	10	37	30
Maximum (ppb)	120		1 130	50	138	43

(2) rapeseed, soybean, canola, sunflower, cottonseed, sunflower, palm kernel, nut...

MYCOTOXIN LEVEL EVOLUTION





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Email : kamsarpoultryequipments@gmail.com

China

PERIOD : January - September- 2019
ANALYSIS NUMBER : 48 245



Contaminated samples by mycotoxin (%)

AFLA	5463	OTA	58%
DON	96%	T2	43%
FUM	84%	ZEN	89%

Risk by species



FOCUS

- High DON (96%), FUM (84%) and ZEN (89%) contamination rate
- Extreme AFLA risk for ruminant species
- Extreme DON risk for ruminant species and poultry species
- high DON risk for swine
- Severe FUM risk for poultry species



ANALYSIS BY MAIN FEED MATERIAL

CORN	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	7 403	11 764	181	7	1	8 641
Number samples	11 803	12 142	210	13	15	9 641
% contaminated samples	63%	97%	86%	54%	7%	90%
Average of contaminated (ppb)	4	668	1 599	6	3	73
Maximum (ppb)	400	7 213	5 600	11	3	9 802

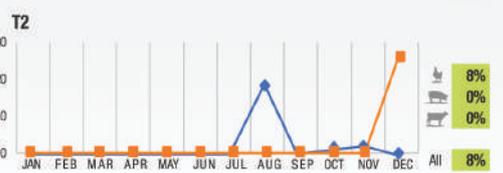
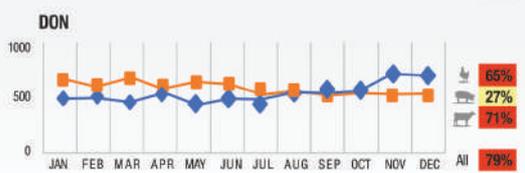
CEREALS ⁽¹⁾	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	2 602	4 263	1	12	0	2 447
Number samples	3 937	4 391	7	15	14	2 877
% contaminated samples	66%	97%	14%	80%	0%	85%
Average of contaminated (ppb)	7	590	28	3	0	55
Maximum (ppb)	150	4 600	28	14	0	8 801

(1) wheat, barley, oat, rice sorghum, triticale...

OLEAGINOUS ⁽²⁾	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	710	469	2	2	0	768
Number samples	1 280	673	7	3	7	842
% contaminated samples	55%	70%	29%	67%	0%	91%
Average of contaminated (ppb)	9	269	610	3	0	79
Maximum (ppb)	73	1 300	1 190	4	0	4 603

(2) rapeseed, soybean, canola, sunflower, cottonseed, sunflower palm kernel, nut...

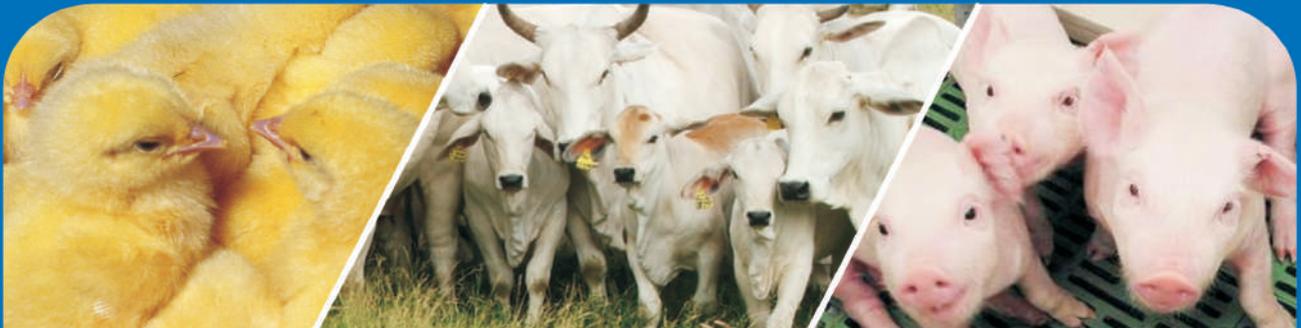
MYCOTOXIN LEVEL EVOLUTION



CARGILL WORLD MYCOTOXIN SURVEY Jan - Dec 2019

Polaris

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The Roxell Feeding System comes with superior technology plus it also saves your cost. Its large feeding surface which offers optimal eating comfort & its low pan edge gives birds a easy access to the feed. Its unique pan with high anti-waste rim eliminates practically all feed waste & the control unit ensures a fast and frequent delivery of fresh feed, leading to superior hygiene & outstanding feed conversion rates.

It offers percentage wise more birds per pan. Roxell Feeding System helps in increasing the stocking density without having to add feeder lines thus saving your costs.

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TERMOTECNICA PERICOLI new performance enhanced line of EOS/EWS fans are an upgrade model of the ever popular and successful EOS50 with an increased diameter (from 50 to 53") in the same standard body/housing delivering an improved flow performance by 10% & at the same time reducing the energy cost by 30%. This New EOS 53 is truly an innovative fan which covers your every ventilation requirement.

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The LUBING Floor-watering system for broilers consists of the following elements:

- ◆ Water supply
- ◆ Drinking elements
- ◆ Breather unit
- ◆ Suspension

The Lubing Drinking system ensures constant supply of simple, reliable, fresh and clean drinking water to your livestock. It requires no maintenance and cleaning. It also helps trouble free rearing of livestock, thus improve rearing results.



Polaris

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Maharashtra (India)

+91 9860730309, +91 9970870098

sales@polarisequipment.in
vikasbhat@polarisequipment.in

www.polarisequipment.in



PERIOD : **January - December 2019**
 ANALYSIS NUMBER : **42 763**

Contaminated samples by mycotoxin (%)

AFLA	62%	OTA	81%
DON	87%	T2	90%
FUM	84%	ZEN	82%

Risk by species Global risk

18% **7%** **36%** **40%**

- FOCUS**
- High DON (87%), FUM (84%), OTA (81%), T2 (90%) and ZEN (82%) contamination rate
 - Severe DON risk for ruminant, very high risk for poultry species
 - Extreme Alfa risk for ruminant species



ANALYSIS BY MAIN FEED MATERIAL

CORN	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	4 207	4 932	2 001	679	1 089	1 648
Number samples	7 018	6 131	2 370	958	1 231	2 192
% contaminated samples	60%	80%	84%	71%	88%	75%
Average of contaminated (ppb)	3	440	796	16	26	82
Maximum (ppb)	450	75 830	50 000	4 521	950	13 000

CEREALS ⁽¹⁾	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	795	7 051	251	342	276	1 028
Number samples	1 025	7 527	288	380	288	1 255
% contaminated samples	78%	94%	87%	90%	96%	82%
Average of contaminated (ppb)	1	558	135	2	25	35
Maximum (ppb)	25	43 255	1 000	12	165	9 000

(1) wheat, barley, oat, rice sorghum, triticale...

OLEAGINOUS ⁽²⁾	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	603	483	73	141	96	454
Number samples	848	798	262	198	209	588
% contaminated samples	71%	61%	28%	71%	46%	77%
Average of contaminated (ppb)	2	238	73	6	15	90
Maximum (ppb)	300	3 200	500	150	117	1 652

(2) rapeseed, soybean, canola, sunflower, cottonseed, sunflower, palm kernel, nut...

MYCOTOXIN LEVEL EVOLUTION

AFLA Risk by species 2018: Poultry 0%, Ruminant 0%, All 2%

OTA Risk by species 2018: Poultry 1%, Ruminant 1%, All 1%

DON Risk by species 2018: Poultry 39%, Ruminant 16%, All 51%

T2 Risk by species 2018: Poultry 13%, Ruminant 2%, All 13%

FUM Risk by species 2018: Poultry 17%, Ruminant 4%, All 17%

ZEN Risk by species 2018: Poultry 9%, Ruminant 1%, All 12%

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EMAIL: raghavulumv@gmail.com, info@bluestarpoultry.in
M.V.RAGHAVULU, PROPRIETOR

PERIOD : January - December 2019
 ANALYSIS NUMBER : 17 749



Contaminated samples by mycotoxin (%)

AFLA	60%	OTA	4366
DON	68%	T2	39%
FUM	70%	ZEN	80%

Risk by species



Global risk

19%

FOCUS

- High FUM (70%) and ZEN (80%) contamination rate
- Extreme Afla risk for ruminant species
- High FUM risk for poultry species
- High ZEN risk for poultry and ruminant species



ANALYSIS BY MAIN FEED MATERIAL



CORN	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	749	1 032	1 244	942	541	1 067
Number samples	1 336	1 514	1 507	1 484	1 439	1 500
% contaminated samples	56%	68%	83%	63%	38%	71%
Average of contaminated (ppb)	12	307	1 612	230	19	69
Maximum (ppb)	500	6 000	25 000	5 100	600	1 400



CEREALS ⁽¹⁾	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	235	323	102	176	118	317
Number samples	324	388	262	284	316	376
% contaminated samples	73%	83%	39%	62%	37%	84%
Average of contaminated (ppb)	5	209	199	114	12	55
Maximum (ppb)	150	1 900	3 521	5 600	139	830

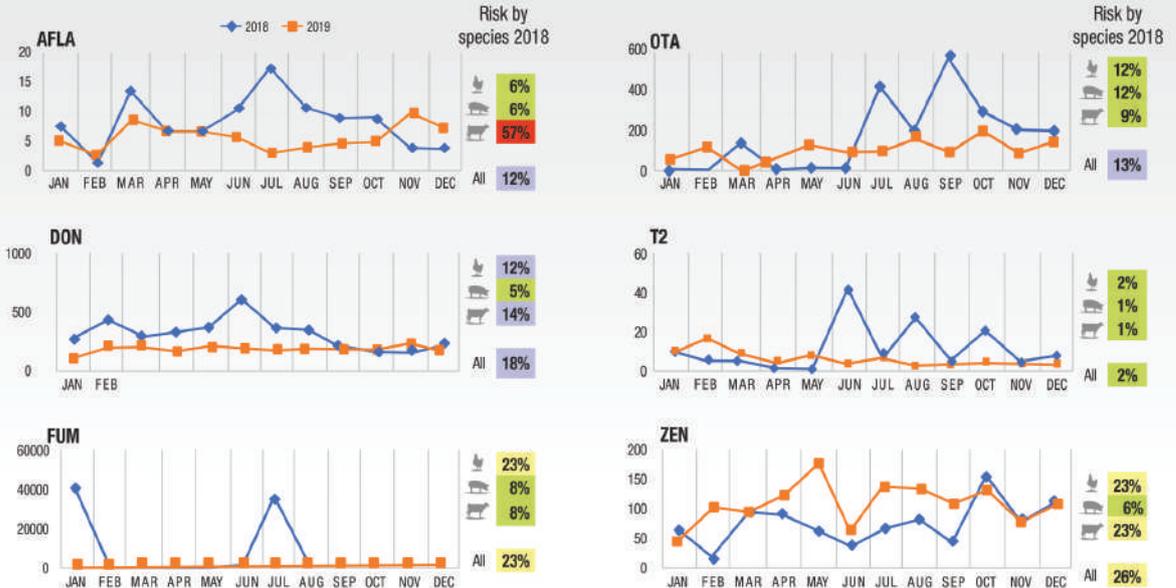
(1) wheat, barley, oat, rice sorghum, triticale...



OLEAGINOUS ⁽²⁾	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	713	720	691	816	453	1 041
Number samples	1 184	1 143	1 154	1 176	1 103	1 148
% contaminated samples	60%	63%	60%	69%	41%	91%
Average of contaminated (ppb)	7	110	321	68	10	221
Maximum (ppb)	265	2 751	46 000	5 100	407	1 830

(2) rapeseed, soybean, canola, sunflower, cottonseed, sunflower, palm kernel, nut...

MYCOTOXIN LEVEL EVOLUTION



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North America

PERIOD : **January - December 2019**
 ANALYSIS NUMBER : **78 609**



Contaminated samples by mycotoxin (%)

AFLA	54%	OTA	20%
DON	85%	T2	30%
FUM	84%	ZEN	49%

Risk by species



FOCUS

- High DON (85%) and FUM (84%) and contamination rate
- Extreme Afla risk for ruminant species
- Extreme DON risk for poultry and ruminant species; severe DON risk for swine species
- Severe FUM risk for poultry species
- High ZEN risk for poultry and ruminant species



ANALYSIS BY MAIN FEED MATERIAL

CORN	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	10 650	17 568	15 515	22	109	1 324
Number samples	20 687	21 309	18 321	142	385	2 165
% contaminated samples	51%	82%	85%	15%	28%	61%
Average of contaminated (ppb)	3	1 279	1 534	2	89	234
Maximum (ppb)	292	24 816	49 328	10	460	4 618

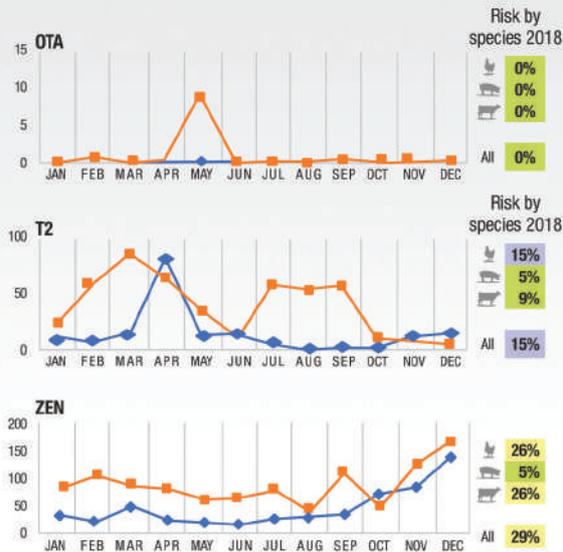
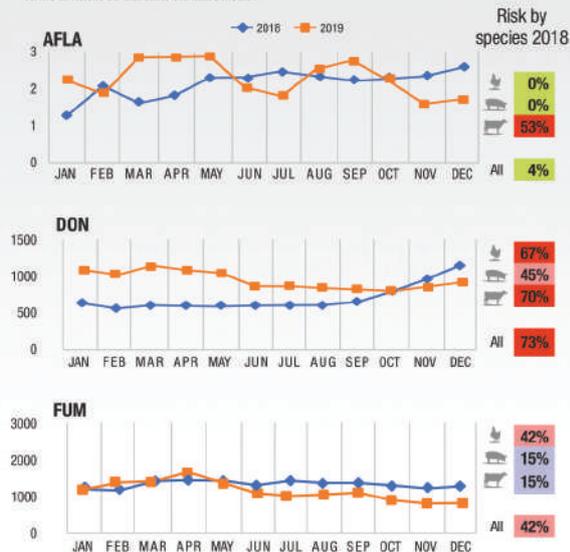
CEREALS ⁽¹⁾	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	236	10 661	0	-	5	177
Number samples	338	12 009	43	-	9	1 909
% contaminated samples	70%	89%	5%	-	56%	19%
Average of contaminated (ppb)	4	1 139	3 700	-	42	71
Maximum (ppb)	17	14 700	5 000	-	60	592

(1) wheat, barley, oat, rice sorghum, triticale...

OLEAGINOUS ⁽²⁾	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	1 503	9	9	9	10	47
Number samples	1 809	51	51	12	14	59
% contaminated samples	83%	18%	18%	75%	71%	80%
Average of contaminated (ppb)	6	298	79	2	47	195
Maximum (ppb)	200	1 100	200	5	168	1 204

(2) rapeseed, soybean, canola, sunflower, cottonseed, sunflower, palm kernel, nut...

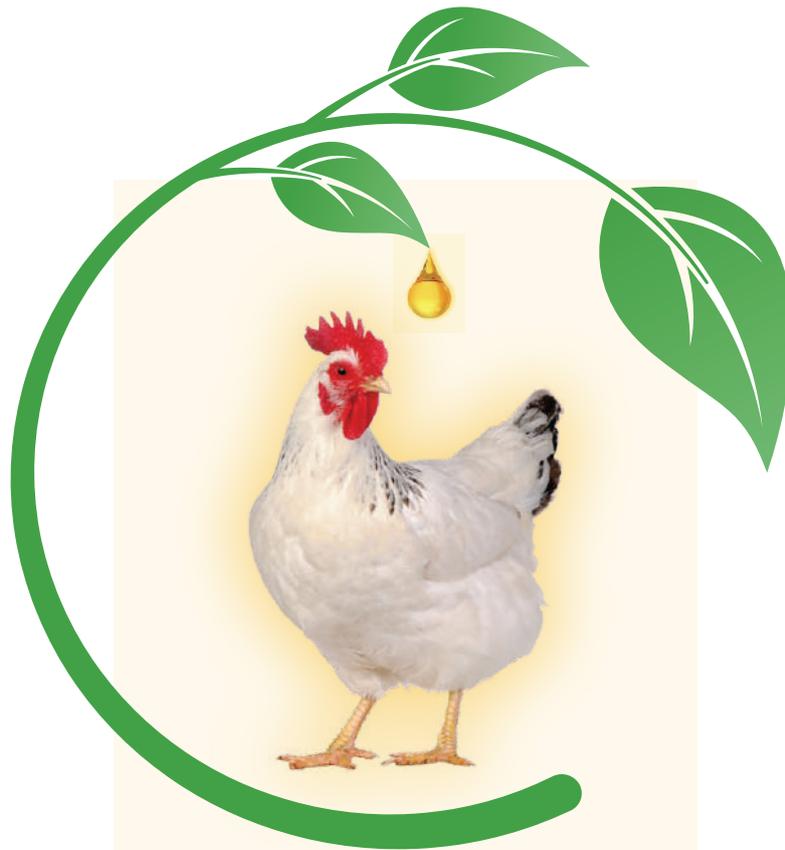
MYCOTOXIN LEVEL EVOLUTION





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CHENNAI - 600 032. INDIA

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Russia

PERIOD : January - December 2019
 ANALYSIS NUMBER : 16 188



Contaminated samples by mycotoxin (%)

AFLA	54%	OTA	38%
DON	41%	T2	50%
FUM	51%	ZEN	31%

Risk by species



Global risk



FOCUS

- Important Afla (54%), FUM (51%) and T2 (50%) contamination rate
- Severe Afla risk for risk for ruminant species
- Very high DON risk for ruminant species; high DON risk for poultry species

ANALYSIS BY MAIN FEED MATERIAL



CORN	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	289	275	350	243	411	132
Number samples	485	511	462	488	562	439
% contaminated samples	60%	54%	76%	50%	73%	30%
Average of contaminated (ppb)	8	591	1 078	8	127	50
Maximum (ppb)	350	2 590	6 910	198	689	409



CEREALS ⁽¹⁾	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	759	413	50	484	603	201
Number samples	1 557	1 783	389	1 719	1 809	1 655
% contaminated samples	49%	23%	13%	28%	33%	12%
Average of contaminated (ppb)	4	353	206	6	49	34
Maximum (ppb)	39	2 220	1 980	51	1 010	299

(1) wheat, barley, oat, rice sorghum, triticale...

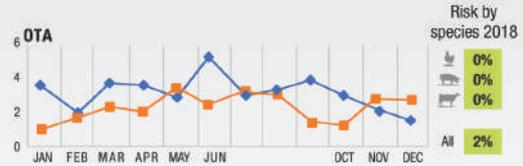
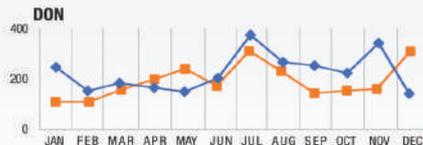


OLEAGINOUS ⁽²⁾	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	172	437	42	210	305	349
Number samples	320	665	99	473	597	541
% contaminated samples	54%	66%	42%	44%	51%	65%
Average of contaminated (ppb)	4	484	87	5	27	53
Maximum (ppb)	28	2 290	600	25	210	802

(2) rapeseed, soybean, canola, sunflower, cottonseed, sunflower, palm kernel, nut...



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Central & South America

PERIOD : **January - December 2019**
 ANALYSIS NUMBER : **47 480**

Contaminated samples by mycotoxin (%)

AFLA	71%	OTA	66%
DON	72%	T2	68%
FUM	81%	ZEN	76%

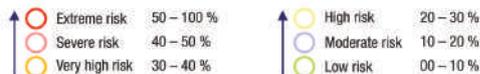
Risk by species

Global risk **28%**

Poultry: 24%
 Ruminants: 8%
 Global: 36%

FOCUS

- High AFLA (71%), DON (72%), FUM (81%) and ZEN (76%) contamination rate
- Extreme Afla risk for ruminant species
- Very high DON risk for poultry and ruminant species
- Extreme FUM risk for poultry species
- Very high ZEN risk for poultry and ruminant



ANALYSIS BY MAIN FEED MATERIAL

CORN	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	5 812	4 997	6 134	1 641	1 735	4 300
Number samples	8 476	7 152	7 198	2 319	2 400	5 697
% contaminated samples	69%	70%	85%	71%	72%	75%
Average of contaminated (ppb)	5	524	2 442	47	22	155
Maximum (ppb)	580	8 000	60 000	7 100	1 000	4 958

CEREALS ⁽¹⁾	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	2 389	2 376	1 124	506	483	980
Number samples	3 077	2 954	1 474	826	703	1 249
% contaminated samples	78%	80%	76%	61%	69%	78%
Average of contaminated (ppb)	5	372	319	7	12	47
Maximum (ppb)	425	6 000	3 335	500	74	811

(1) wheat, barley, oat, rice sorghum, triticale...

OLEAGINOUS ⁽²⁾	Afla	DON	FUM	OTA	T2	ZEN
Number contaminated samples	743	314	228	242	192	463
Number samples	1 137	580	515	485	462	578
% contaminated samples	65%	54%	44%	50%	42%	80%
Average of contaminated (ppb)	80	110	183	119	18	197
Maximum (ppb)	495	700	1 253	2 589	170	1 700

(2) rapeseed, soybean, canola, sunflower, cottonseed, sunflower, palm kernel, nut...

MYCOTOXIN LEVEL EVOLUTION

AFLA (2018: 4%, 2019: 69%, All: 7%)

DON (2018: 31%, 2019: 12%, All: 40%)

FUM (2018: 53%, 2019: 18%, All: 53%)

OTA (2018: 4%, 2019: 4%, All: 4%)

T2 (2018: 4%, 2019: 1%, All: 4%)

ZEN (2018: 33%, 2019: 3%, All: 41%)

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CROWN OF SOUTH INDIA

South East Asia

PERIOD : January - December 2019
ANALYSIS NUMBER : 29 942



Contaminated samples by mycotoxin (%)

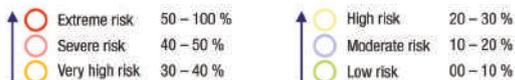
AFLA	75%	OTA	43%
DON	71%	T2	51%
FUM	77%	ZEN	67%

Risk by species



FOCUS

- High ALFA (75%), DON (71%), FUM (77%) contamination rate
- Extreme Alfa risk for ruminant species. HIGH ALFA risk for poultry and swine species
- Very high DON risk for poultry and ruminant species
- High FUM risk for poultry species



ANALYSIS BY MAIN FEED MATERIAL

CORN	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	4 460	2 372	2 551	396	932	1 890
Number samples	5 620	2 944	2 731	1 249	1 873	2 582
% contaminated samples	79%	81%	93%	32%	50%	73%
Average of contaminated (ppb)	20	1 167	1 434	4	20	245
Maximum (ppb)	235	19 000	44 000	139	400	6 000

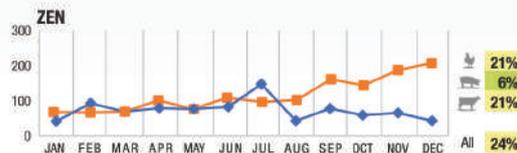
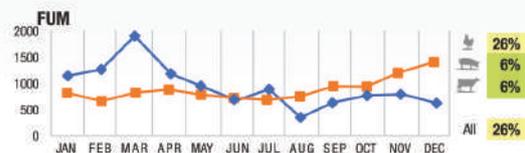
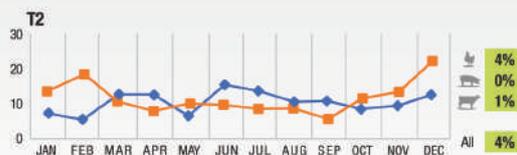
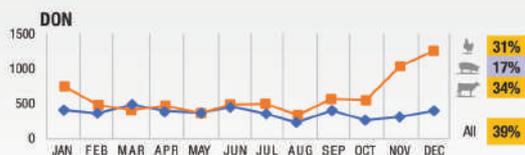
CEREALS ⁽¹⁾	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	609	896	345	462	219	779
Number samples	1 201	1 301	641	813	441	1 314
% contaminated samples	51%	69%	54%	57%	50%	59%
Average of contaminated (ppb)	5	256	114	4	23	42
Maximum (ppb)	116	4 450	1 250	34	146	883

(1) wheat, barley, oat, rice sorghum, triticale...

OLEAGINOUS ⁽²⁾	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	747	393	412	254	328	623
Number samples	1 206	944	904	736	641	1 052
% contaminated samples	62%	42%	46%	35%	51%	59%
Average of contaminated (ppb)	10	172	108	5	26	87
Maximum (ppb)	200	1 540	1 560	163	145	1 400

(2) rapeseed, soybean, canola, sunflower, cottonseed, sunflower, palm kernel, nut...

MYCOTOXIN LEVEL EVOLUTION



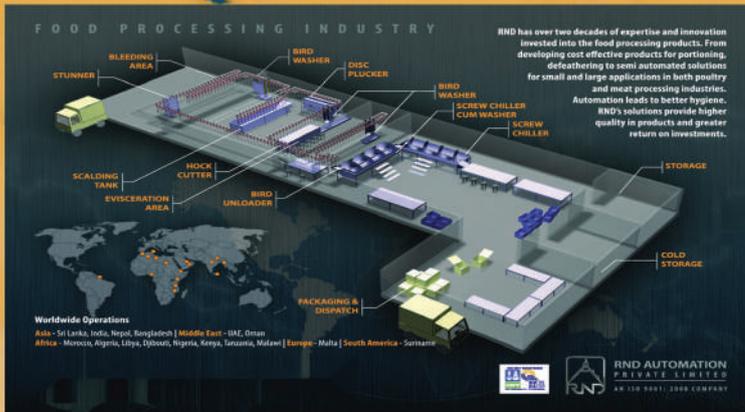


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Technical Update



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).

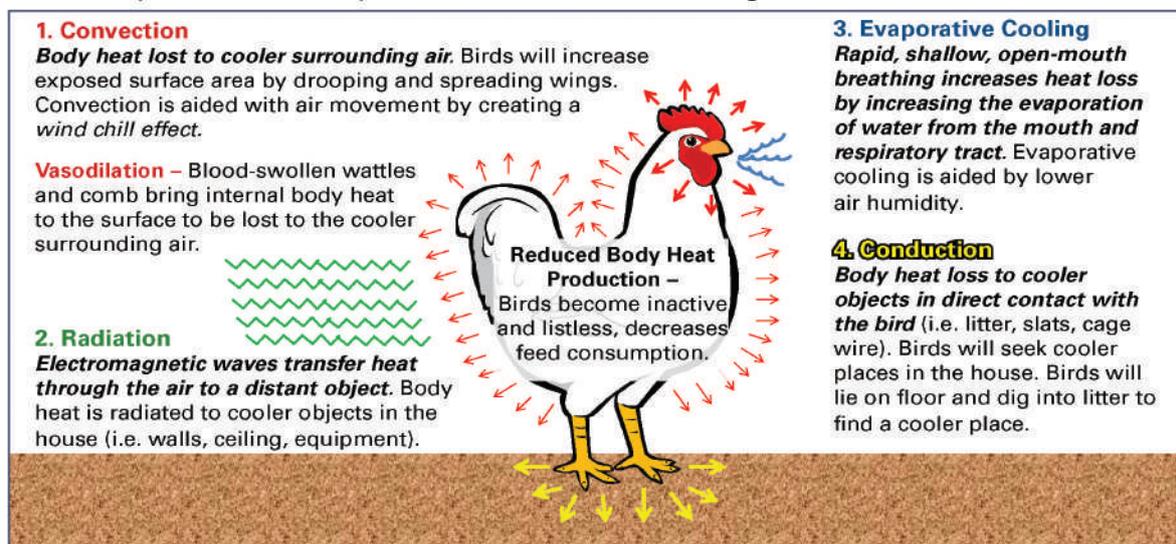


Figure 1. Heat loss mechanisms of the chicken.

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

- 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



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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).

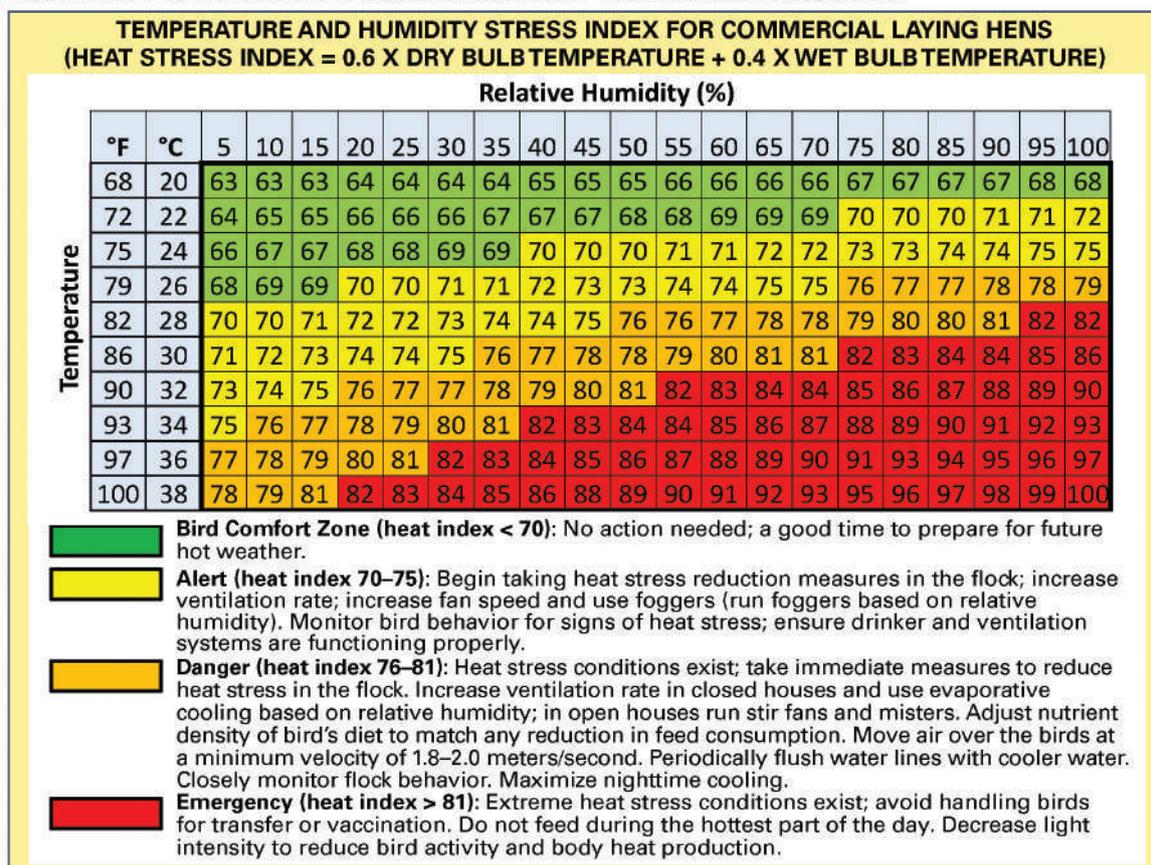


Figure 2. Adapted from *Temperature and Humidity Stress Index for Laying Hens*. Xin, Hongwei and Harmon, Jay D., "Livestock Industry Facilities and Environment: Heat Stress Indices for Livestock" (1998) Agriculture and Environment Extension Publications. Book 163, Iowa State University.



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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.

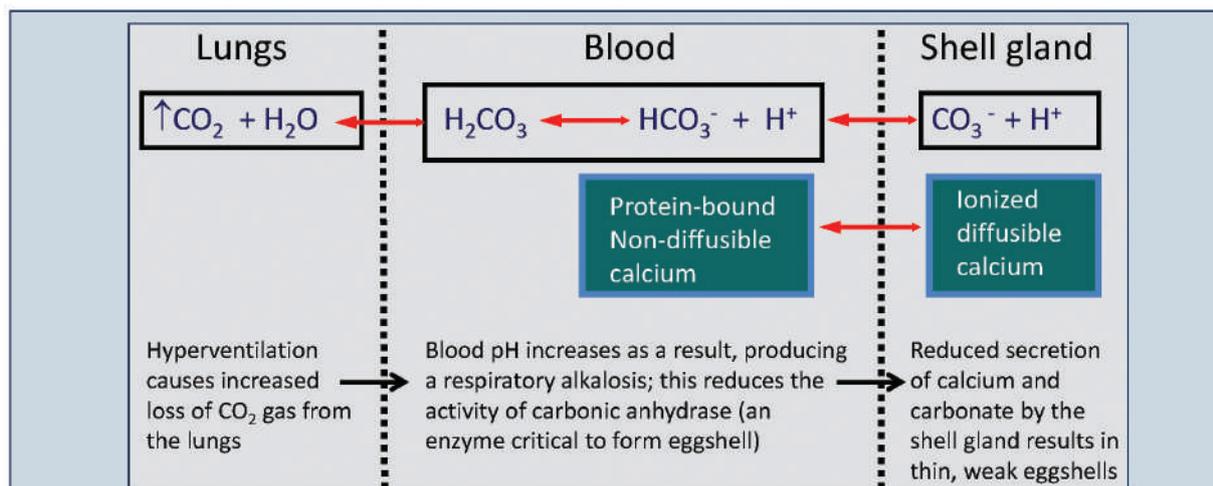


Figure 3. Demonstration of acid/base balance disruption caused by heat stress.

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

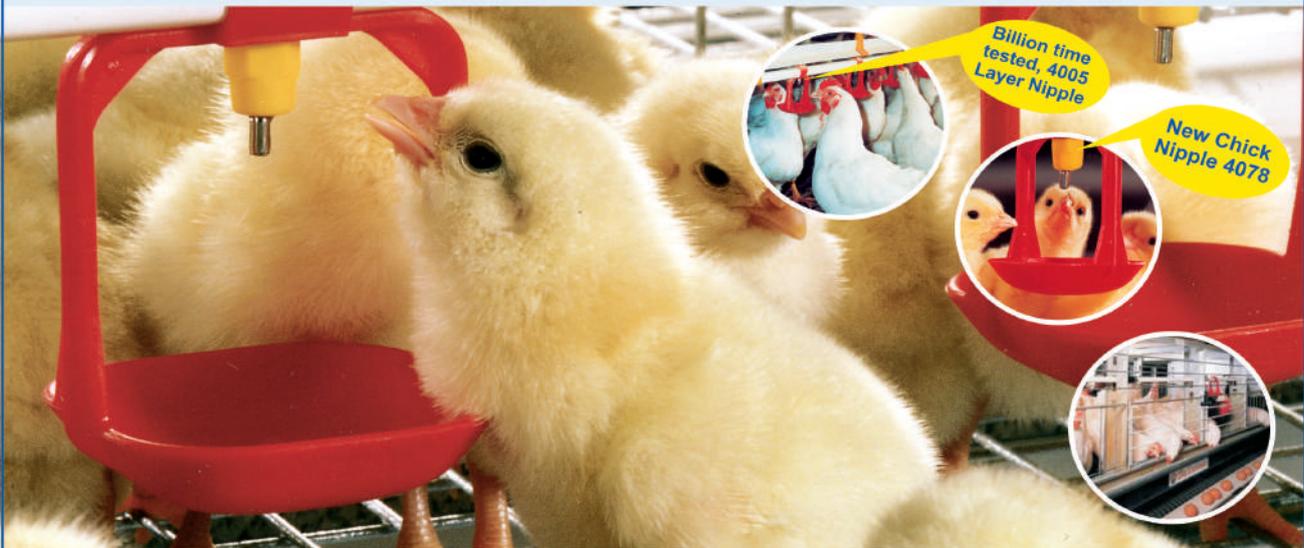
During periods of high environmental temperature, the flock has a high demand for drinking water. The water-to-feed consumption ratio is normally 2:1 at 21°C, but increases to 8:1 at 38°C.

- 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.

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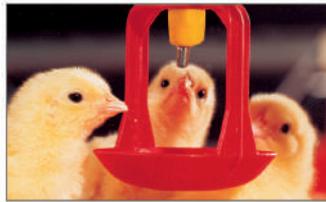


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Technical Update — UNDERSTANDING HEAT STRESS IN LAYERS

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

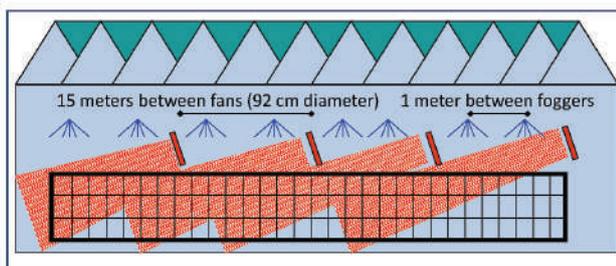


Figure 5. Placement of stir fans and foggers in open houses.

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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.

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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 $\text{Na}^+ + \text{K}^+ - \text{Cl}^-$) 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.

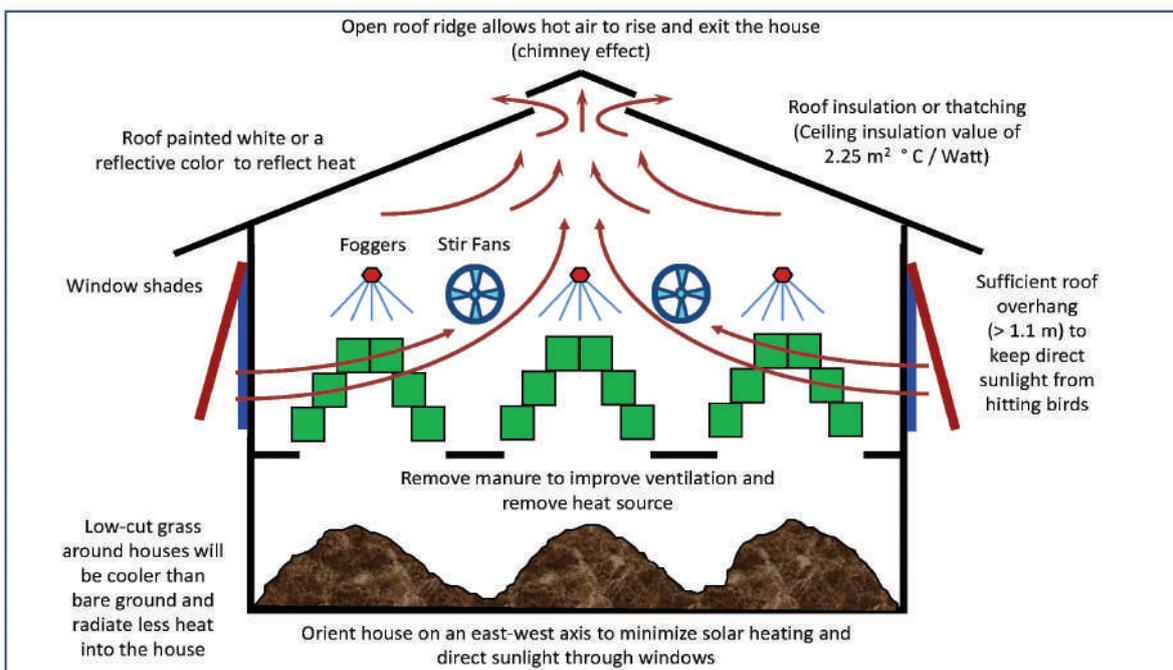


Figure 7. Open house design for reducing heat stress.

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



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

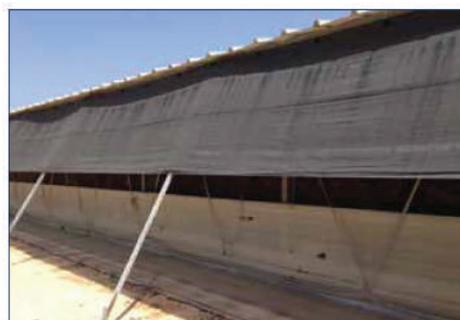


Figure 9. Porous window shades block direct sunlight from entering the house, but allow air to pass through.



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

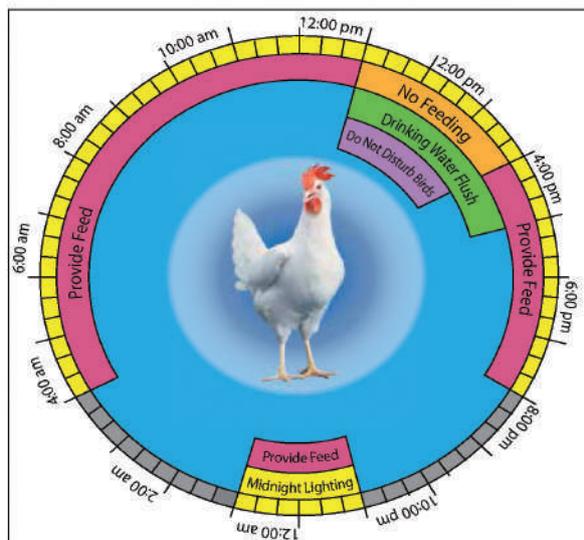


Figure 13. Management schedule during times of heat stress.

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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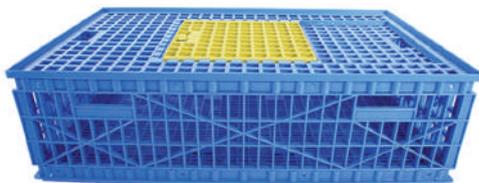
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Name Of Zone \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ahmedabad	365	365	365	340	340	340	340	342	345	348	348	348	348	348	310	310	280	280	250	250
Ajmer	300	300	290	280	280	280	280	294	299	299	285	275	265	265	245	229	221	216	200	-
Asansole	395	395	395	380	375	365	365	365	370	370	370	370	370	350	347	332	324	310	285	-
Barwala	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	216	216	216	-
Bengaluru (CC)	360	360	360	340	340	320	320	325	330	335	335	335	335	335	315	315	290	290	250	235
Brahmapur (OD)	347	347	347	315	315	315	318	323	329	332	332	332	332	322	285	260	200	200	-	-
Burdwan (CC)	393	393	393	363	363	363	363	378	378	378	380	380	380	380	350	340	330	320	300	275
CC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chennai (CC)	375	375	375	350	350	330	330	330	330	330	330	330	330	330	300	300	270	270	230	230
Chittoor	368	368	368	343	343	323	323	323	323	323	323	323	323	293	293	263	263	223	223	223
Delhi (CC)	325	315	310	310	310	295	295	300	305	305	305	305	305	290	275	260	245	235	235	235
E.Godavari	340	340	340	310	310	310	313	316	321	324	324	324	324	290	290	290	290	225	225	225
Hyderabad	316	316	295	295	275	275	280	285	290	295	295	295	295	275	275	250	210	210	210	210
Ludhiana	313	308	303	303	293	288	288	288	295	295	295	295	295	285	278	278	253	243	226	-
Midnapur (KOL)	393	393	393	363	363	363	363	378	378	378	380	380	380	350	350	340	330	320	300	275
Miraj	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mumbai (CC)	370	370	370	350	350	330	330	335	340	345	350	350	350	350	330	330	305	305	285	265
Muzaffarpur (CC)	362	362	357	352	352	348	343	343	348	348	348	346	338	338	319	309	300	286	286	-
Mysuru	375	375	375	345	345	325	325	330	335	340	341	341	341	341	320	320	295	295	250	235
Nagpur	300	295	285	280	275	275	275	275	275	275	280	270	260	250	228	215	180	-	-	-
Namakkal	348	348	328	328	308	308	308	313	318	323	323	323	323	290	265	265	265	195	195	195
Patna	357	352	343	343	343	339	339	339	343	343	343	333	328	324	295	286	262	257	257	257
Patna (CC)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pune	374	374	374	350	350	340	330	330	335	340	345	345	345	335	325	315	305	300	280	250
Ranchi (CC)	376	376	371	371	367	367	367	367	367	367	367	357	357	338	328	328	314	290	286	286
Vijayawada	340	340	340	310	310	310	313	316	321	324	324	324	324	290	290	290	290	225	225	225
Vizag	350	350	350	350	350	350	350	350	355	355	355	355	355	355	300	300	300	300	275	275
W.Godavari	340	340	340	310	310	310	313	316	321	324	324	324	324	290	290	290	290	225	225	225
Warangal	319	319	319	298	298	278	278	283	288	293	298	298	298	278	278	253	253	213	213	213
West godavari	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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