Networking Nationally from Hyderabad

POULTRYLINE

Readership — Poultry Wide

VOLUME - 20 | ISSUE - 3 | ANNUAL SUBSCRIPTION RS. 500/- | MARCH 2020 | Rs. 50/-

Trust Forms The Core Of Our 'BONDS'...

When it comes to setting higher benchmark of performance as compared to other chelated mineral sources; producers across the world spread over 100 countries, trust MINTREX®.

MINTREX® is the only globally available bis-chelate where one molecule of metal is attached to two molecules of HMTBa (2 hydroxy-4-methylthio-butanoic acid) by strong bonds. The unique, stable and neutrally charged structure of MINTREX® minerals lead to higher absorption, bioavailability and production performance as compared to other mineral sources. The uniqueness of MINTREX® minerals has been recognized by various international bodies like EU and AAFCO by classifying them as a distinguished class of minerals.

Zn 80% Methionine Value

Cu 78% Methionine Value

Mn 76% Methionine Value

Building 'BONDS' Stronger

www.novusint.com

15 Years MINTREX 2004-2019 ANNIVERSARY

TMO and TMO Plus
(For 'Trace Mineral Optimization' in Poultry)

NOVUS®

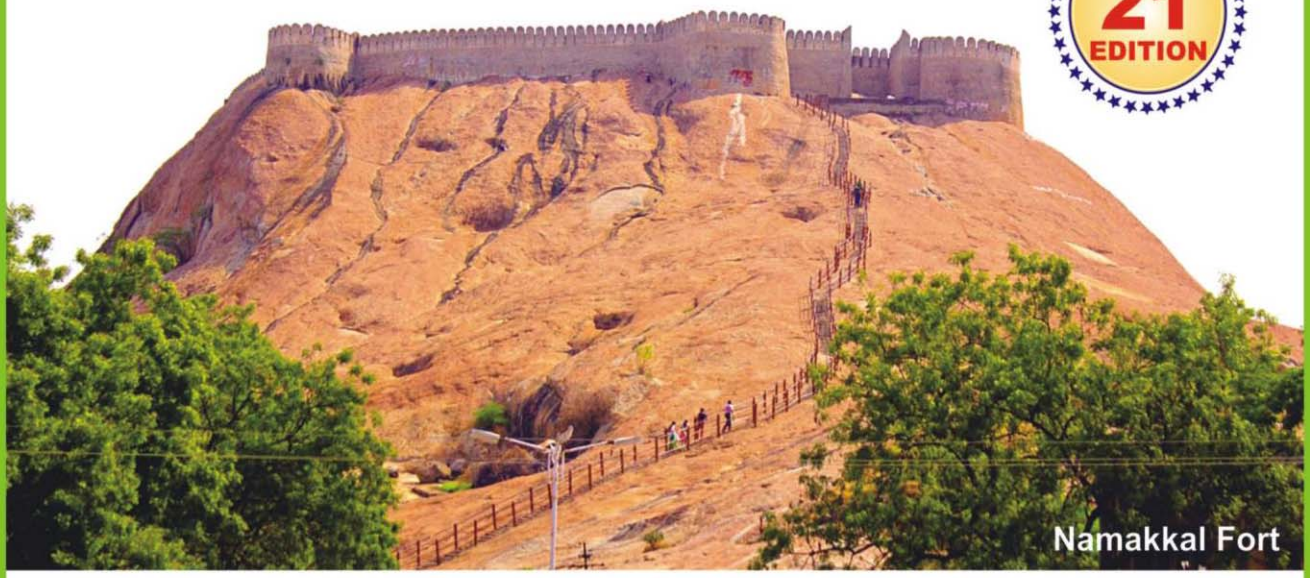
*TMO and TMO Plus standard premix from Novus contains MINTREX® chelated minerals as a source of Zn, Cu and Mn

INDIA POULTRY EXPO 2020

(Opportunities for all)

PEOPLE FOR POULTRY
Dedicated to
HUMAN HEALTH & POULTRY WEALTH

21st EDITION



NAMAKKAL

(Tamilnadu)

SEPTEMBER 2020

(Dates & Venue will be announced soon)

Contact : **TEZASVI EVENTS**

2-1-444/16, 1st Floor, O.U.Road, Nallakunta, Hyderabad - 500044.

Ph: 040-2761 0027, M: 98493 68003, 96442 33397

Email: tezasvievents@gmail.com

chembond
Animal Health

Previte™ Alpha D3

The purest bioactive Vitamin D3 metabolite in the industry !

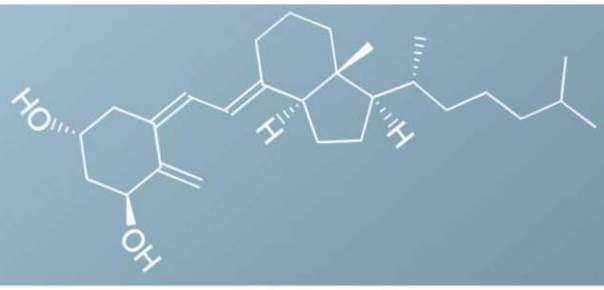
Prevents T.D. & lameness

Improves hatchability in breeders

Higher production

Reduces egg breakage

Previte™ Alpha D3, available in concentrate and premix form, is formulated with the purest, BP grade 1alpha(OH)D3 to offer a highly bioactive and safe product that will result in major gains via improved quality, productivity and significantly higher returns.



Redefining Vitamin D3 Nutrition....

Chembond Chemicals Limited
Chembond Centre, EL-71, MIDC Mahape,
Navi Mumbai - 400 701. INDIA
Tel.: +91 22 6264 3000 Fax: +91 22 2768 1294
E-mail: info@chembondanimalhealth.com | www.chembondanimalhealth.com

Vetphage Pharmaceuticals
a Proteon Pharmaceuticals Company

Protect your poultry flocks from *Salmonella*

BAFASAL® is an **award-winning feed additive** utilizing **bacteriophages** which **selectively eliminate *Salmonella* Enteritidis and *Salmonella* Typhimurium bacteria.**

BAFASAL+G® is an enhanced version of BAFASAL®. In addition to *S.* Enteritidis and *S.* Typhimurium, **BAFASAL+G® acts against *Salmonella* Gallinarum** which frequently causes illness and mortality in **breeder and commercial egg layer flocks.**

BAFASAL® and BAFASAL+G® support Bird Health and Performance.

BAFASAL® is a winner of prestigious international innovation awards - the Gold Medal at the Brussels Innova Fair and a Silver Medal at the Paris Innovation Fair.

PROTEON PHARMACEUTICALS S.A.

PROTEON is an innovative biotechnology company. PROTEON uses **precision biology** for **microbiome protection** to improve animal and human health, increasing environmental sustainability and eliminating the unnecessary use of antibiotics.

CONTACT US

VETPHAGE PHARMACEUTICALS PVT. LTD.
A Proteon Pharmaceuticals company
216, Blue Rose Industrial Estate, Western Express Highway, Borivali (East), Mumbai, Maharashtra 400066. India

TECHNICAL SUPPORT:
Dr. Ramdas Kambale
Tel: +91 98203 93342 Email: rkambale@vetphagepharma.com

Visit us at www.vetphagepharma.com

activo®

Secondary plant compounds for better feed efficiency

Activo

- Microencapsulated for use in feed
- Slow and gradual components release

Activo liquid

- Liquid form for use in water line
- Fast application in acute situations

Activo Product Line – Innovations in Feed Efficiency

Nowadays several scientific studies confirmed the positive effect of secondary plant compounds on daily gain and feed conversion when they are used in animal nutrition. In addition, there are more and more reports being published describing antimicrobial effects.

ew | nutrition

www.ew-nutrition.com

VOL.20 ISSUE 3 MARCH 2020

POULTRY LINE
పౌల్ట్రీలైన్

CONTENTS

TEJASVI PUBLICATIONS
2-1-444/16, 1st Floor, O.U.Road, Nallakunta, Hyd. - 500 044.
Ph: 040-2761 0027, Cell : 98493 68003, 63096 77047
www.tezasvipublications.com
E-mail : tezasvipoultryline@gmail.com
tejasvi_poultryline@rediffmail.com

Printed, Published and Owned by B. Kalyan Kumar, Printed at Karshak Art Printers, 40, A.P.H.B. Blocks, Vidyanagar, Hyderabad - 500 044. India.
Published at 2-1-444/16, 1st Floor, O.U.Road, Nallakunta,Hyd-44. Editor: B. Shiv Shankar.

INDEX OF ADVERTISEMENTS

Poultry Biosecurity

Contributed by technical team of Rossari Biotech Limited AHN Division - ***Mr. Edward Menezes, Dr. Anish Kumar, Dr. Sachin Bhadane, Dr. Vishal Surve, Dr. C. Seenivasan, , Dr. Aashaq Hussain, Ms.Tanaya Deo***

The impact of disease on poultry production is one of the major limiting factors to successful performance in the poultry industry. The economics of that production lends itself to larger sites and more dense populations in specific or limited geographical areas. This has many advantages in reducing the costs of live haul, movement of feed and equipment, and flock supervision. However, such densely populated poultry areas present the industry with a daunting challenge in preventing the introduction and persistence of significant disease threats or at least limiting their adverse effects on successful production.

These developments have led to the development of the new 'science' of biosecurity. The term has received various definitions over the last few years but the main philosophy of the approach is to apply this to any procedure or practice that prevents or limits the exposure of a flock to the adverse effects of disease-causing organisms. This may include general on-farm hygiene requirements, vaccination programmes, medication regimes, disease monitoring and the effective use of disinfectants

The successful implementation of a biosecurity programme requires considerable technical input. Biosecurity can be directed towards specific targeted organisms or a more generic disease control strategy. While the scope and impact of biosecurity measures may be obvious for large-scale poultry production, its significance for small poultry-keeping situations must not be overlooked; either in their own right or as sources of infection for large commercial flocks

Practical biosecurity on the farm requires an accurate assessment of disease challenges and their impact on production. Hazard analysis and critical control point (HACCP) principles are frequently used as a starting point in such assessments but practical implementation of targeted interventions is the secret of success, using properly informed risk assessment and risk management. As a result, an effective biosecurity programme is so much more than just a printed cleansing and disinfection procedure. The concept of biosecurity covers a whole range of procedures and interventions that can, when effectively combined, reduce the impact of disease.

CONCEPTS OF BIOSECURITY:

This concept starts at the genetic level. Rapidly growing poultry strains have a relatively naïve immune system and much current genetic improvement is aimed at improving intrinsic disease resistance in modern breeds. The focus is on liveability and birds that may be refractory to certain disease challenges. Much recent activity has been in developing a more robust immune system to respond generally to a range of disease challenges.

Other approaches are aimed at the development of specific resistance markers for specific diseases (e.g. Marek's disease). Future work will attempt to focus more on body systems, such as the respiratory tract to reduce the impact of respiratory pathogens and the gastrointestinal tract to strengthen intestinal integrity

A second major area relates to environmental control and management. Here, as in many other areas of biosecurity, stockman ship and effective husbandry methods are of paramount importance. This requires the ability of the stockperson to identify health and ill health in flocks under his/her care and respond accordingly. Much of this response requires an assessment of environmental effects, especially in the areas of air quality and litter condition as well as the provision of high-quality feed and clean drinking water. Optimal environmental control reduces insults to the respiratory tract by noxious factors such as

ammonia, carbon dioxide, excessive humidity and dust but also helps to excrete unwanted microbiological loads from the house

Vaccination and medication programmes are very significant contributors to an effective biosecurity programme and are an excellent illustration of the importance of an integrated approach. As an example, efficient vaccines are available for Salmonella control but their efficacy is enhanced by an effective strategy of cleansing and disinfection and vermin control to reduce overall challenge pressure and allow the vaccine to work most effectively

Another significant area is where the vaccination programme is delivered in a coordinated manner designed to prevent generalized infection with agents active in a particular geographical area and contribute to an effective control strategy for a whole region. Examples here are infectious bronchitis, Newcastle disease, Gumboro disease and avian pneumovirus infection. As with many of the other areas, vaccines must be properly applied, in accordance with manufacturers' directions and on the basis of expected challenges, based on accurate diagnostic monitoring

Medications administered at strategic times can prevent clinical and subclinical effects of secondary disease challenges. This requires accurate diagnosis of targeted pathogens, pretreatment testing and appropriate use of products with a narrow spectrum but known efficacy for the target organisms. The final and major component of any biosecurity programme remains the effective use and application of cleansers, sanitizers and disinfectants. The aim is to use the right product applied in the right way at the right concentration and as part of a complementary programme.

THE NEED OF BIOSECURITY:

The range of disease-causing organisms requiring control varies in their type and impact. At one end of the scale such measures can be the basis for national and international emergency disease control strategies implemented or enforced by national governments. This is clearly important in the control of lethal, highly contagious diseases such as avian influenza and Newcastle disease. However, similar procedures are essential in successful disease control in many other areas, including:

- Control of highly virulent diseases of significant economic impact at a national level (e.g. Gumboro disease, infectious bronchitis, avian pneumovirus infections)
- Reduction of challenge by ubiquitous 'common' organisms known to reduce productivity (e.g. Coccidiosis, *Escherichia coli)*
- Reduction or elimination of immuno suppressive diseases that render birds more susceptible to other diseases or environmental effects (e.g. Marek's disease, Chick anaemia virus (CAV), Gumboro disease, Haemorrhagic enteritis virus (HAV))
- Reduction of contamination of poultry and poultry products with agents of public health significance (e.g. *Salmonella*, *Campylobacter*).

With this broad requirement for control measures aimed at a range of pathogens there is a need for a focused programme of interventions. This requires a detailed knowledge of the diseases and infectious agents any biosecurity programme is attempting to control. There is a direct relationship between where that infectious agent multiplies in the bird and its mode of transmission from one bird to another, or from one site to another.

- Enteric diseases are spread via droppings and litter such that control of faecal spread and effective terminal cleansing and disinfection at depletion are the critical areas
- Vertically transmitted infections, such as mycoplasmas and some *Salmonella* serotypes, require an approach that encompasses the breeder farm, egg hygiene, hatchery hygiene, growing farm procedures, transport and all associated equipment

To Be Continued.

NOVUS

Not all chelated minerals are same

Dr. Koushik De, Director-Technical Services, SCA, Novus International

Dr. Koushik De

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).

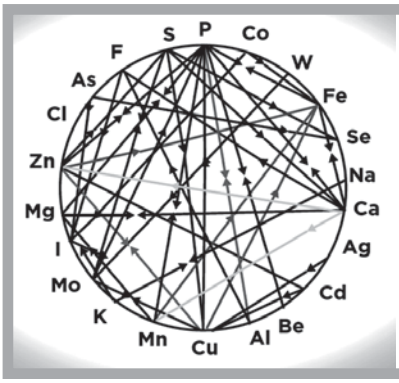
Animal Trace Mineral Requirements aren't Static:

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 havedifferent carcass characteristics andare grown to increasingly large sizes,so a healthy and stable skeletalstructure becomes even moreimportant. The increased egg outputof modern layer strains means thategg shell quality has become morecritical as hens are laying at an earlierage with corresponding reductions inboth mature body weight and dailyfeed 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 acidmediated antagonism on trace mineral bioavailability. The macro minerals calcium and phosphorus are antagonistic. Calcium suppresses zinc and manganese availability, whilephosphorous 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.

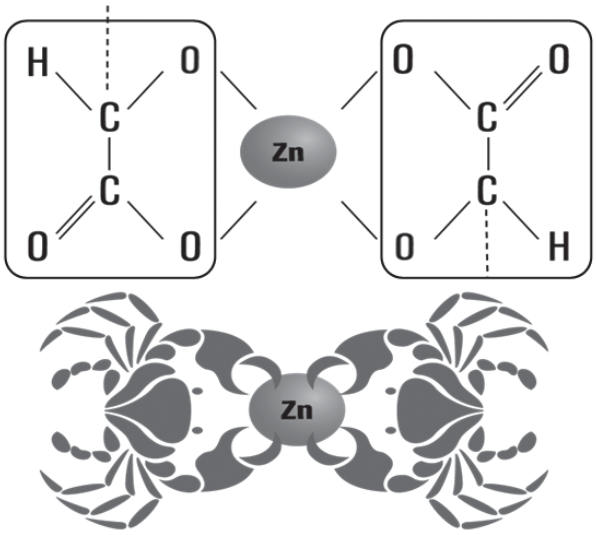
Not All Organic Trace Minerals (OTM) are same:

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-MethylThio-Butanoic 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"

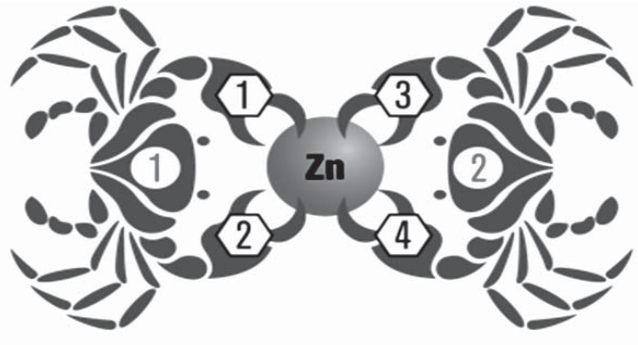


(Kratzer F.H., & Vohra P. 1986. Chelates in Nutrition. CRC Press Inc.)

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 exists. As previously mentioned, a molecule with only one ligand and a metal is a "metal complex"



Themost stable chelation rings are those formed by hydroxy acids

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

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.

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 Metallothionine (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:
MT expression in duodenal mucosa of broilers fed four zinc sources on day 23.

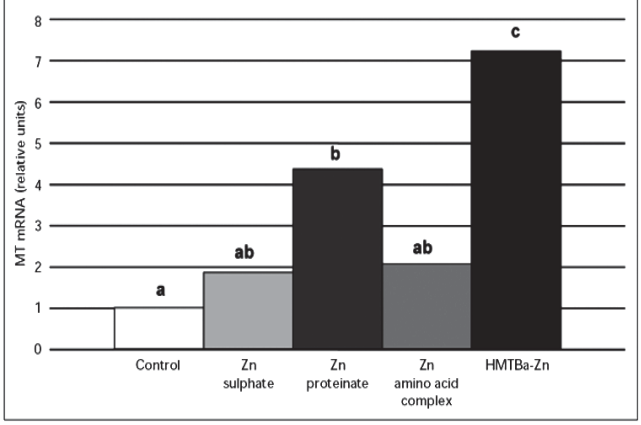
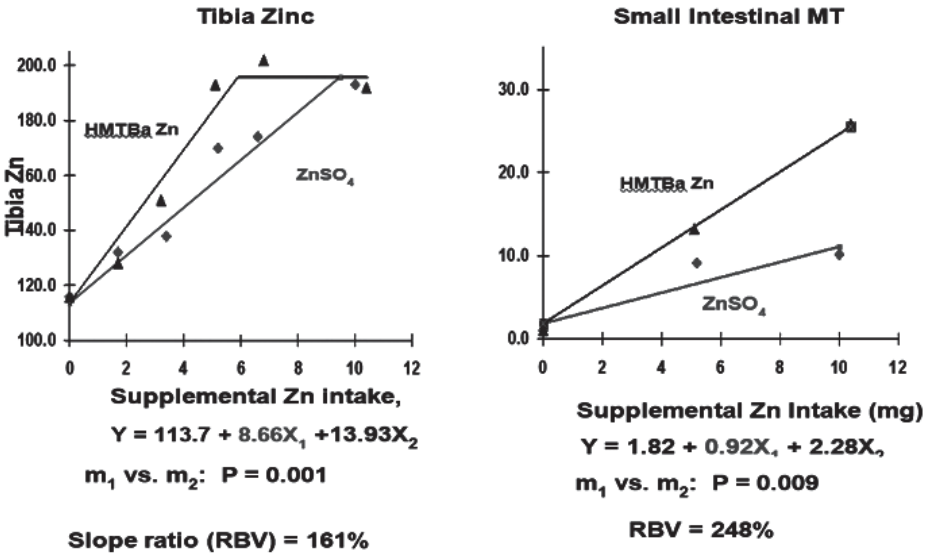


Figure 1 shows an example of using small intestinal metallothionein mRNA expression as an indicator of zinc bioavailability. In this experiment, broilers were fed control diets or diets supplemented with 40 ppm zinc fromthe indicated sources. Because zinc absorption occurs in the small intestine, differences 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 quantitativeestimate ofmineral bioavailability.

It seems likely that some OTMs trulywill not be more bioavailable thanITMs, due to their inability to

staychelated or complexed in the lowpH environment of the upper GItract. On other occasions, however,true differences in bioavailabilitycould be masked by experimentaldesign. Using tibia zinc content as themeasure of bioavailability, indicatedthat the bioavailability of zincmethionine relative to zinc sulphateranges from 117% to 206% in broilerchicks, depending on the diet matrix.

Figure 2:



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 superiorbioavailability 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 tobetter 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***

INTERFACE
PHARMACEUTICALS PVT. LTD.

RECRUITMENT

Interface Pharmaceuticals Pvt. Ltd., a 20 years experienced company in poultry and livestock sector, and an industry leader in immunomodulation, is looking for dynamic people to join under its market expansion program. The vacancies open for recruitment are as follows:

JOB PROFILE No. 1

Designation	Headquarter	Experience Required	Minimum Qualification	CTC
Regional Sales Head (South India)	Bengaluru / Hyderabad / Coimbatore (Any one of the following)	12 – 20 years (in poultry medicine and nutraceutical sales)	MBA / M Sc/ BVSc / MVSc or any equivalent degree	Better than industry standards

JOB PROFILE No. 2

Designation	Headquarter	Experience Required	Minimum Qualification	CTC
Executive (Sales) / Assistant Manager (Sales) / Zonal Manager (Sales)	Uttar Pradesh, Bihar, Maharashtra, Tamil Nadu, Karnataka, Madhya Pradesh, Telangana, Andhra Pradesh.	3 – 10 years (in poultry medicine and nutraceutical sales)	BA/ MA/ B Sc/ M Sc/ BVSc/ MVSc or any equivalent degree	Better than industry standards

Interested professionals please share your CV on

interfacepharma.recruitment@gmail.com

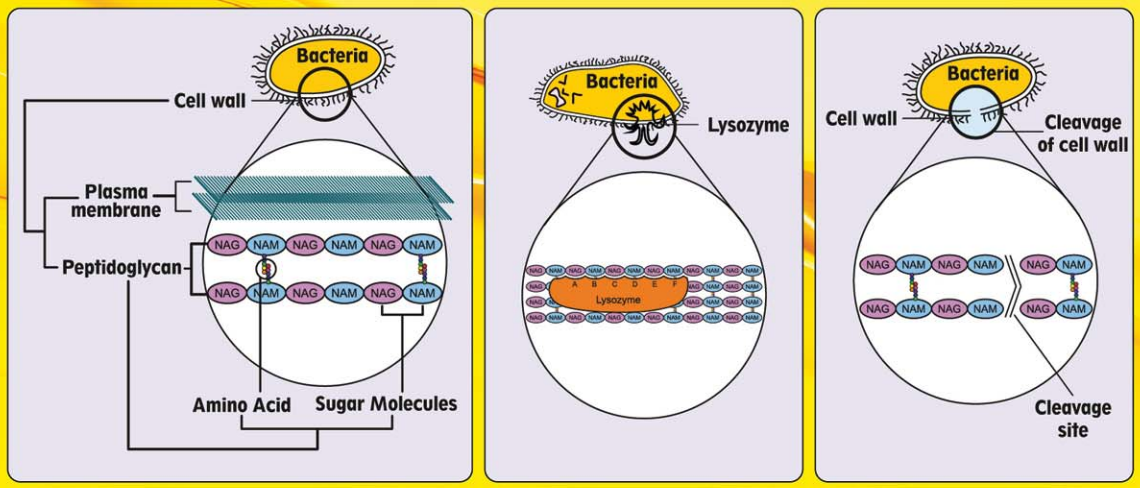
1ST TIME IN INDIA

Alembic

LYSOMBIC™
लायसोंबीक

Get rid off Antibiotic Growth Promoter

Lysozyme breaks glycosidic bond between NAM & NAG of peptidoglycan which is major component of bacterial cell wall. This results in bacterial cell wall breakage and subsequently death of the bacteria.



NAG : *N*-acetylglucosamine NAM :*N*-acetylmuramic acid

Available as

Pack : 1kg

LYSOMBIC - FS

Recommended usage:

For Broiler / Layer :
250 g / ton of feed

For Breeder :
500 g - 1kg / ton of feed

Pack : 250 gm

LYSOMBIC - SP

Recommended usage:

For prophylaxis:
1st week - 1g/L of water or 15 g/1000 chicks

2nd week onwards - 1g/3L of water

Alembic

Alembic Pharmaceutical Ltd. (Poultry Division)
Prime Corporate Park, 2nd floor, Behind ITC Grand Maratha Sheraton, Sahar Road, Andheri (E), Mumbai - 99, INDIA • Phone :+91 22 30611698, +91 22 30611682

Avian Pox Viruses: A Bane to Organized Poultry Sector

Sabarinath T[1], G.Venkatesan[2], S.K.Gupta[3], Mageswary R[4], S. Chandra Sekar[4] and Amit Kumar[2]

[1]Clinical Bacteriological Laboratory, Division of Virology, IVRI, Mukteshwar- Uttarakhand
[2]Pox Virus Laboratory, Division of Virology, IVRI, Mukteshwar- Uttarakhand
[3]PPR Laboratory, Division of Virology, IVRI, Mukteshwar- Uttarakhand
[4]Biochemistry Laboratory, Division of Virology, IVRI, Mukteshwar- Uttarakhand

Email: drsabari143ivri@gmail.com, gnanamvirol@gmail.com, schand_vet@yahoo.co.in

Synonyms: Bird pox, Avian Diptheria, Contagious Epithelioma, Molluscum Contagiosum, Gefluegelpocken (German), Viruela Aviar (Spanish), Variole Aviaire (French), Bouba (Portuguese).

Introduction:

Avian pox is a relatively slow-developing disease characterized in birds by proliferative lesions on the skin of the head, toes, legs or mucous membranes of the mouth and upper respiratory tract. Systemic infections may also occur. *Avipoxvirus* subgroup as genus of the family *poxviridae* contains a number of species and strains that vary in their pathogenicity and host speciûcity. This widespread avian disease has been found in bird families such as Phasianidae (Pheasants, Partridges, Jungle fowl, Chickens, Turkeys, Quail, and Peafowl) and Emberizidae (Buntings, Finches, Grosbeaks, Juncos and Sparrows). In most birds, avian pox infections are mild and rarely result in death. However, when lesions are on mucous membranes of the oral and respiratory cavities or on the eyelids, mortality can be high. Those avian populations that have been isolated on islands (for example, Canary Islands, Hawaiian island chain, Galapagos Islands) are more greatly impacted than are birds in continental situations where the hosts, vectors, and viruses have had a longer co-evolutionary history. As with many other diseases that are density dependent, avian pox transmission is enhanced with increasing vector and host densities. Therefore, this disease is found to have a greater signiûcance in captive situations such as zoos, bird rehabilitation centers and game farms where birds occur in much higher densities than in the wild. In the wild, the warmer and mesic regions of the world support more potential vectors, thus in these areas the prevalence of avian pox is higher, particularly in ûocking wild birds.

Historical Perspective:

Avian pox infections were among the earliest described avian diseases because of the ease in identiûcation of the obvious external lesions. Bollinger in 1873 and Borrel in 1904 were the ûrst to demonstrate a relationship between histologic lesions and structure of inclusion bodies, setting the stage for histopathologic techniques being employed to conûrm visual diagnoses. Evidence that avian poxvirus was associated with the inclusion bodies and was the etiological agent was conclusively demonstrated by Woodruff and Goodpasture in 1930. Cunningham in 1966 cultured avian pox virus on the ectodermal chorioallantoic membrane (CAM) of embryonated chicken eggs. Today, identiûcation of avian pox strains has moved into the molecular arena, with the use of Gel-electrophoresis and PCR (Polymerase chain reaction) analyses of mitochondrial DNA sequences.

Virus Characteristics:

Avian pox virus particles are large, about 150 to 250 nm by 265 to 350 nm in size and are either oval or brick-shaped and covered with irregularly spaced surface knobs. Fowl pox virus multiplies in the cytoplasm of epithelial cells with the formation of large intracytoplasmic inclusion bodies (Bollinger bodies) that contain smaller elementary bodies (Borrel bodies). The inclusions can be demonstrated in sections of cutaneous and diphtheritic lesions by the use of Haematoxylin and Eosin (H&E), Acridine Orange or Giemsa stains. Genomes of avian poxviruses are composed of a single double-stranded, 300 Kb DNA. This DNA

containing, enveloped virus develops in the cytoplasm of infected avian epithelial cells. Avian poxviruses can withstand extreme environmental conditions, particularly desiccation, sometimes surviving on perches and in dried scabs for months and years. Much of this can be attributed to the very large size of the virus. The virus is resistant to ether, with the pigeon pox virus being resistant to both chloroform and ether. Avian pox virus particles can withstand 1% phenol and 1:1,000 formalin for nine days, but that 1% potassium hydroxide or heating to 50°C for 30 minutes (or 60°C for eight minutes) inactivates the virus.

Based on host speciûcity, poxvirus strains have been identiûed and classiûed as mono-, bi-, or tri-pathogenic. A Northern Flicker (*Colaptes auratus*) virus strain is a good example of a monopathogenic strain because among 19 species of inoculated wild and domestic birds, only the Northern Flicker was found susceptible to infection. Scientists have argued that strains adapted to various avian hosts were not different enough to consider them valid poxvirus species because their basic virus characteristics appeared to be identical. However, utilizing recent increases in the sophistication of molecular research, Avian poxviruses have been listed as Fowlpox, Turkeypox, Canarypox, Pigeonpox, Quailpox, Sparrowpox, Starlingpox, Juncopox and Psittine poxviruses as valid species. To this species list, further additions include Peacockpox, Penguinpox, Mynahpox, and Albatrosspox viruses.

Epidemiology:

The geographic distribution of avian poxviruses is worldwide with a higher prevalence rate in temperate and warmer areas of the globe. The distribution of avian pox in Wild Turkeys (*Meleagris gallopavo*) over North America revealed that even within continents, avian pox distributions tend to be conûned to localized regions since the disease was found concentrated in the moister and warmer southeastern United States, even though Wild Turkeys occur in every state except Alaska. In remote islands of the globe such as Hawaii (USA), Galapagos (Ecuador) and Canary Islands (Spain), it was observed that the disease spread rapidly with much higher prevalence rate in the native avifauna compared to introduced avian species. Reports indicate avian pox infections in 278 bird species from 70 families and 20 orders. It is interesting that avian pox has never been reported from Tinamous (Tinamiformes), Loons (Gaviiformes), Nightjars (Caprimulgiformes), and Kingûshers (Coraciiformes). Avian pox has been regularly observed in waterfowl such as ducks and geese. Avian pox has been also reported in Falconiformes, Columbiformes, and Psittaciformes.

There are a number of biotic and abiotic factors that affect the distribution and prevalence of avian pox. Weather conditions, host densities and numbers of poxviruses that are present all interact in a synergistic fashion to mold the epizootiological framework of avian pox distribution among bird species and their populations. These factors also determine in a large part the character and primary causes of an avian pox outbreak. The other important factors inûuencing avian pox epizootiology are host susceptibility and numbers of vectors that occur within a certain space and time of the environment. Avian pox can occur at any time of the year in wild birds. In temperate regions, where vectors are not active during the winter period, infections occur primarily in the summer. In warmer regions of the world, avian pox is reported throughout the entire year, but most often during fall and winter months. It is at this time that host densities are highest because young-of-the year are present, complemented by the post breeding ûocking behavior of many bird species. In addition, those vectors that are speciûc to poxvirus transmission are usually most abundant during the fall and early winter period. In California, avian pox infection occurred throughout the year in a population of House Finches, but highest prevalence was during the fall and winter months. In Florida, peaks of avian pox infection in Wild Turkeys were observed in fall that occurred subsequently to peak mosquito activities. In Hawaii, peak infections were found in fall and early winter. In temperate regions of North America, during the

fall and early winter the cutaneous form of avian pox is most common, whereas late in the winter the diphtheritic form predominates.

Transmission:

Avian poxviruses can be transmitted in a number of different ways. Even though they are unable to penetrate unbroken skin, small abrasions are sufficient to permit infection. The most common method of transmission is by means of biting insects such as mosquitoes, mites, midges, and ûies. At the time of year when vectors are at the highest numbers, avian pox transmission is greatest. Many biting insects have been shown to be mechanical vectors only, transferring virus from infected to susceptible birds by contamination of their skin-piercing mouthparts. Transmission can also occur directly by contact between infected and susceptible birds or by contact with contaminated objects such as bird-feeder perches. Aerosol transmission, although rare, can occur from viruses being carried along with dust, particularly in conûned situations.

Clinical manifestations:

Avian pox occurs primarily in two different forms: (1) the skin form (most common), in which discrete, wart-like, proliferative lesions develop on the skin (**Fig. A)** and the less common diphtheritic form (**Fig. B**), in which moist, necrotic lesions develop on the mucous membranes of the mouth and upper respiratory tract. A third form, systemic infection, is rarely found in wild birds. Lesions are most common on the unfeathered parts of the body—the legs, feet, eyelids, base of the beak, and the comb and wattles of gallinaceous birds. A preponderance of lesions on the eyelids may cause mortality, as seen in granivorous birds, such as pheasants, quail, and turkeys that have become unable to see and cannot ûnd food. Moreover, when birds are blinded in the wild, emaciation follows and birds quickly succumb because of the inability to procure food or due to predation. In wild birds such as Albatross (*Diomedea immutabilis*) that have webbed feet, pox lesions appear along the ramiûcations of blood vessels in the foot webs. Focal epithelial proliferation and later necrosis and sloughing occur mainly on the plantar surfaces of the webs and toes. When fully developed, these lesions appear as circular pocks, 3 to 5 mm in diameter, with central areas of necrosis, bordered by zones of erythema. In perching wild birds, lesions start as a swelling on the toe, leg, or facial region. The swelling appears smooth, reddish, and dome shaped. Eventually the swelling cracks or bursts and lesions begin to form.

In some advanced cases, lesions are present on both mucous membranes and skin. Lesions of the mucous membranes, particularly of the mouth and upper air passages, most often result in high mortality. In chickens that had the diphtheritic form of pox, mortality rates were higher than in birds with cutaneous pox. In canaries, acute systemic infections are commonly associated with many deaths. In the wild, birds are rarely found alive with advanced avian pox infections because they usually die or are preyed upon prior to reaching this level of intensity.

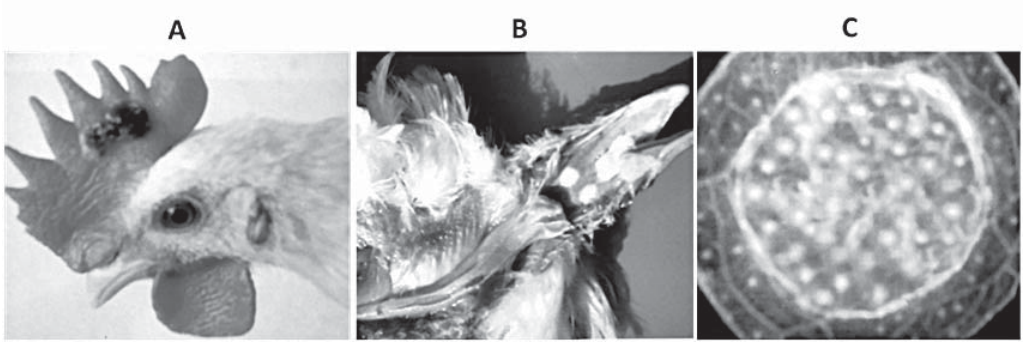


Fig A: Pock lesions in the comb of poultry due to Fowl pox Virus
Fig B: Diphtheritic lesion in upper respiratory tract of poultry due to Fowl pox Virus
Fig C: Pock lesions in Chorio-allantoic membrane of embryonated egg

Pathogenesis:

Upon successful entry of the poxvirus into avian host epithelium, within one hour the virus penetrates cell membranes and then uncoats prior to synthesis of a new virus from precursor material. In the host dermal epithelium, biosynthesis involves two distinct phases, the ûrst being host response during the ûrst 72 hours, followed by synthesis of infectious virus from 72 to 96 hours. Beginning at 36 to 48 hours, synthesis of host DNA is accompanied by epithelial hyperplasia, with host DNA declining abruptly at 60 hours. Hyperplasia ends at 72 hours with a 2.5-fold increase in cell numbers. The replication of viral DNA in the avian host begins between 12 to 24 hours, followed by an exponential rate of synthesis between 60 to 72 hours. The ratio of viral to host DNA increases up to 2:1 at 100 hours, with the maximum titer of virus attained following cell proliferation. The next phase consists of a relatively long latent period, with areas of viroplasm within the cytoplasm surrounded by incomplete membranes. The viroplasmic particles condense and acquire an additional outer membrane to become incomplete virions. These virions migrate to vacuoles of the inclusion bodies and thus acquire a membrane coat. The virus then emerges from the cells by a budding process, resulting in an additional outer membrane that is obtained from the cell membrane. This process produces the classical inclusion body (Bollinger body) that is observable via light microscopy. Bollinger body is not always a structure indispensable for the development and maturation of avian pox in birds and that infectious virus may be produced by cells in which matrix inclusion bodies only are present.

In chickens, cutaneous lesions become inûamed and hemorrhagic just prior to regression. Desiccation and scab formation then follows, with eventual sloughing and replacement by normal skin. This same pattern also occurs in wild birds, but cutaneous lesions are few and the whole process of development, regression, and healing of lesions may be much prolonged. Perhaps the fewer number of lesions in wild birds occurs because of a high natural resistance to infection, combined with minimal host response.

Diagnosis:

The visual observation of lesions on birds does not represent a deûnitive diagnosis of avian pox infection. Candidiasis, Capillariasis, and Trichomoniasis all cause lesions in the oral cavity that look similar to the diphtheritic form of avian pox.

Virus isolation in embryonated eggs & cell culture:

Isolation via the propagation of virus on chorioallantoic membranes of chicken embryos should be used as the deûnitive diagnosis showing characteristic pock lesions **(Fig. C)**. Histopathological examination of the CAM lesions will reveal eosinophilic intracytoplasmic inclusion bodies following staining with H&E. However, some strains of avian poxvirus in wild birds such as Peregrine Falcon (*Falco peregrinus*) cannot be cultured on chicken egg CAM, so they were cultured in Peregrine Falcon eggs itself. Reports suggest the use of House Finch eggs to culture the avian poxviruses from Hawaiian bird species such as Hawaii Amakihi (Hemignathus virens), Apapane (*Himatione sanguinea*), Laysan Finch (*Telespiza cantans*), and Scarlet Honeycreeper (*Vestiaria coccinea*).

Different cell cultures have been used for the propagation of FPV like Chicken Embryo Fibroblasts (CEF) (**Fig.** D), Chicken Embryo Liver (CEL) Culture, Chicken Embyo Kidney (CEK) Culture, Duck Embryo Fibroblasts (DEF) and Chicken Embryo Dermis (CED) Culture. Cell cultures derived from embryonated chicken eggs offer an economic and convenient means for pursuit of many virus investigations as well as for production of effective viral vaccines. FPV as well as eleven

Avipox virus isolates including Junco Pox and Pigeon Pox grew well in Quail Testis-35 (QT-35) cell lines but was unable to grow in mammalian cell lines. Further, Avian pox viruses can easily be propagated in continuous Duck Embryo cell lines such as DEC-99. Characteristic cytopathic effects (CPE) produced by Avipox virus isolates include an initial phase of rounding of cells followed by a second phase of degeneration, plaque formation, necrosis and sloughing of monolayer **(Fig. E).**

D

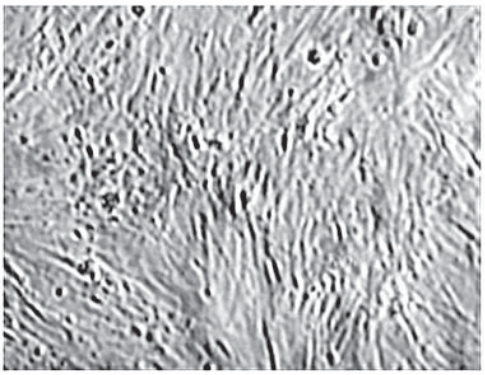


Fig D: Uninfected monolayer of Chicken Embryo Fibroblast (CEF)

E

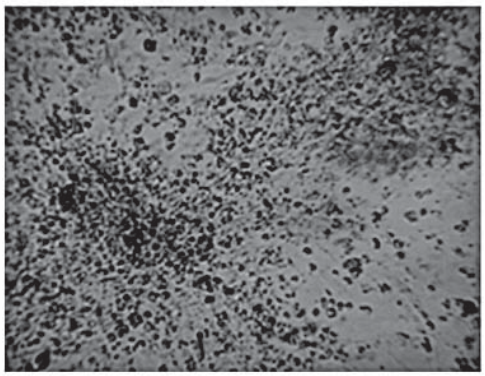


Fig E: Infected CEF cells showing rounding, necrosis, degeneration & plaque formation

Electron Microscopy:

Demonstration of typical avian poxvirus particles by electron microscopy would provide a positive conûrmation of an avian pox infection. Electron microscopy of avian pox inclusions reveals viral particles embedded in a rather homogeneous matrix, typical of poxviruses.

Serological Tests:

Serological tests such as Virus Neutralization (VN), Agar gel immunodiffusion (AGID), Passive Haemagglutination, Immunoperoxidase Test (IPT), Fluorescent Antibody Test , Immunoblotting (FAT) as well as Enzyme Linked Immunosorbent Assay (ELISA) are used routinely to measure specific humeral antibody responses against avian poxviruses. AGID is helpful but the test suffers from limitations such as cross-reactions since one cannot differentiate different species or strains of avian poxvirus. AGID is designed to detect avian poxviruses that cross-react with FPV and pigeon pox virus strains that commonly affect domestic birds. ELISA has replaced AGID as it is used in commercial flock monitoring kits. VN tests are more specific but are technically more demanding. Passive haemagglutination is more sensitive than AGID. The test will give cross-reactions among avian pox viruses. FAT along with IPT has been used by researchers to detect the presence of fowl pox viral antigens in whole chicken embryos as well as cell cultures **(Fig. F)** and it was noticed that the areas undetected in IPT for presence of virus revealed fluorescence in FAT indicating it to be more sensitive than IPT. However, IPT has the advantage that the sections can be examined with the light microscope and can be stored for an extended period without loss of colour. Antigenic variations between strains of fowlpox virus can be evaluated by means of immunoblotting or Western Blotting. However, Western Blotting is not convenient for routine diagnosis.

Molecular Methods:

Restriction fragment length polymorphism (RFLP) analysis can be used for comparison of field isolates and vaccine strains of fowl pox virus. However, this procedure is not used in routine diagnosis. Cloned genomic fragments of FPV can be used effectively

as nucleic acid probes for diagnosis of fowl pox. Viral DNA isolated from lesions can be detected by hybridization either with radioactively or non-radioactively labeled genomic probes. This method is especially useful for differentiation of fowl pox from infectious laryngotracheitis when tracheal lesions are present. Genomic DNA sequences of various sizes can be amplified by the polymerase chain reaction (PCR) using specific primers. This technique is useful when there is only an extremely small amount of viral DNA in the sample. A nested PCR has been developed targeting the 4b core protein gene of FPV in which external primers amplified 578 bp **(Fig. G)** DNA fragment while internal primer pair amplified a 419 bp fragment.

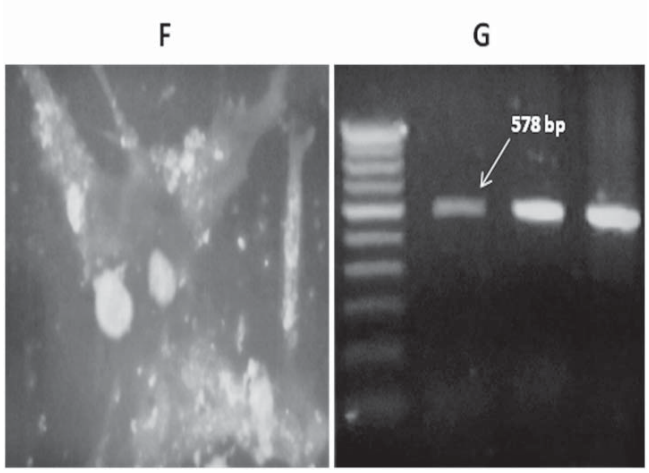


Fig F: IFAT of CEF showing presence of Fowl pox Virus (FPV)

Fig G: PCR amplicon (4b core protein gene of FPV) in scab, diphtheritic lesion & CEF

Prevention and Control:

Avian pox virus outbreaks that are being transmitted by vectors, control should be targeted at reduction of vector populations. Control can also be achieved by preventing vector access to birds. Where birds are being artiûcially concentrated, such as in aviaries, feeders and perches should be sterilized at least every two weeks using antiseptic cleaning agent such as bleach. In aviaries, diseased birds should be kept in separate, isolated, screened cages. Scientists have found that applying ûowers of sulfur directly to the lesion or giving it orally proved beneficial to birds infected with avian poxviruses. Removal of the lesions and washing in bicarbonate soda may prove useful, but caution needs to be taken not to further spread the virus. Applying silver nitrate, iodine, or 1–2% saline solution directly to the lesion has also shown some success in reducing the level of infection. Broad-spectrum antibiotics are routinely given to birds with avian pox in an attempt to reduce the chance of secondary bacterial infection.

Vaccination:

Vaccination of healthy chickens aged 8 weeks or older is recommended but at least 4 weeks prior to start of lay. When used properly, vaccine will prevent clinical signs caused by the virulent field strains of fowl pox virus. Evidence of successful immunization with vaccine can be determined by examining a flock 7-10 days after vaccination for 'takes'. A take consists of a swelling of the skin or a scab at the site where the vaccine was applied and its presence is evidence of successful immunization. Swelling and scabs will disappear at about 2 weeks following vaccination. The absence of take may indicate that the birds were immune before vaccination or that improper vaccination methods were used. Fowl pox vaccine is applied by a wing web stab method. Passively acquired immunity is a crucial factor to be taken into consideration during vaccination of progeny from flocks that has been recently vaccinated. As passive immunity (for 2–3 weeks) may interfere with vaccine virus multiplication, such progeny should be vaccinated only after the decline of passively acquired antibody.

References:

1. Singh, P., T.J. Kim, and D.N. Tripathy, 2000: Re-emerging fowlpox: evaluation of isolates from vaccinated flocks. Avian Pathol. 29, 449–455.

2. Singh, P., T.J. Kim, and D.N. Tripathy, 2003: Identification and characterisation of fowlpox virus strains using monoclonal antibodies. J. Vet. Diagn. Invest. 15, 50–54.
3. Singh, P., W.M. Schnitzlein, and D.N. Tripathy, 2003: Reticuloendotheliosis virus sequences within the genomes of field strains of fowlpox virus display variability. J. Virol. 77, 5855–5862.
4. Singh, P., and D.N. Tripathy, 2000: Characterization of monoclonal antibodies against fowl poxvirus. Avian Dis. 44, 365–371.
5. Srinivasan, V., and D.N. Tripathy, 2005: The DNA repair enzyme, CPD-photolyase restores the infectivity of UV damaged fowlpox virus isolated from infected scabs of chickens. Vet. Microbiol. 108, 215–223.
6. Tripathy, D.N., 1993: Avipoxviruses. In: Virus Infections of Vertebrates – Virus Infections of Birds, Vol. 4, McFerran J.B. & McNulty M.S., eds. Elsevier Science Publishers, Amsterdam, the Netherlands, 5–15.
7. Tripathy, D.N. and L.E. Hanson, 1976: A smear technique for staining elementary bodies of fowlpox. Avian Dis. 20, 609–610.
8. Tripathy D.N., L.E. Hanson and A.H. Killinger, 1973: Immunoperoxidase technique for detection of fowlpox antigen. Avian Dis. 17, 274–278.
9. Tripathy, D.N., L.E. Hanson and W.L. Myers, 1970: Passive hemagglutination test with fowlpox virus. Avian Dis. 14, 29–38.
10. Tripathy, D.N. and W.M. Reed, 2013: Pox. In: Diseases of Poultry, 13th edition, Swayne D.E., Glisson J.R., McDougald L.R., Nolan L.K., Suarez D.L. & Nair V. eds. Wiley-Blackwell, USA, 333–349.

NATIONAL EGG CO-ORDINATION COMMITTEE

DAILY / MONTHLY EGG PRICES DECLARED BY NECC AND PREVAILING PRICES AT VARIOUS PRODUCTION CENTRES (PC) AND CONSUMPTION CENTERS (CC) FEBRUARY 2020

Name Of Zone \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	Average
NECC Prices																														
Ahmedabad	425	400	390	390	380	375	375	378	381	384	400	415	425	425	427	430	430	405	375	360	360	360	360	360	360	360	363	365	365	387
Ajmer	330	330	330	315	300	305	321	330	340	355	375	375	375	375	377	377	362	325	325	325	325	325	313	300	315	320	317	312	300	333.58
Asansole	383	380	380	380	380	371	366	361	361	376	400	428	452	452	452	452	452	452	442	427	405	390	380	380	385	395	395	395	395	402.31
Barwala	332	332	332	332	295	295	307	323	333	345	365	373	373	373	374	362	355	351	320	301	311	313	-	-	-	-	-	-	-	336.22
Bengaluru (CC)	390	390	380	380	375	360	360	360	365	370	395	410	425	435	440	445	445	430	410	400	385	385	385	365	355	355	360	360	360	388.79
Brahmapur (OD)	377	377	362	362	352	337	337	337	337	352	372	392	407	412	417	420	420	405	390	362	362	362	362	337	337	339	344	347	349	367.79
Burdwan (CC)	400	390	390	380	368	360	360	363	368	393	418	448	468	473	473	473	473	465	435	400	400	380	360	370	380	390	390	393	393	405.31
Chennai (CC)	400	400	400	400	390	390	380	383	380	380	405	420	435	445	450	455	455	440	420	410	410	410	410	410	390	390	390	390	390	407.86
Chittoor	393	393	393	393	383	383	373	373	373	373	398	413	428	438	443	448	448	433	413	403	403	403	403	403	383	383	383	383	383	400.75
Delhi (CC)	365	365	350	342	325	325	325	333	343	355	375	383	383	383	384	384	372	361	361	340	321	331	331	331	331	335	335	335	335	349.62
E.Godavari	365	350	350	340	325	325	325	325	330	345	365	385	400	405	410	413	413	398	383	355	355	355	355	330	330	330	335	338	340	357.75
Hyderabad	355	345	345	330	315	315	315	320	325	350	365	380	390	395	401	401	385	365	340	340	340	340	320	310	310	313	316	316	316	343.37
Ludhiana	346	340	334	329	327	309	301	309	322	335	353	367	367	367	367	373	373	373	361	348	323	323	323	318	318	320	323	323	323	337.75
Midnapur (KOL)	400	390	390	380	368	360	360	363	368	393	418	448	468	473	473	473	473	465	435	400	400	380	360	370	380	390	390	393	393	405.31
Miraj	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mumbai (CC)	417	417	405	405	395	380	380	380	380	380	405	420	435	445	450	455	455	440	420	405	405	405	405	385	365	365	370	370	370	403.75
Muzaffurpur (CC)	395	390	390	381	371	357	357	348	381	395	405	419	424	424	424	424	419	409	400	386	371	371	371	371	367	371	371	371	367	387.24
Mysuru	394	394	394	384	380	368	368	368	371	376	401	416	431	441	446	450	450	435	415	405	395	395	395	375	375	375	375	375	375	397.31
Nagpur	357	353	353	345	330	323	323	332	340	370	380	380	393	395	395	393	370	355	330	315	315	310	310	305	300	305	310	315	-	342.92
Namakkal	360	360	350	350	335	335	335	340	345	370	385	400	410	415	421	421	405	385	375	375	375	375	375	345	345	348	348	348	348	368.24
Patna	390	386	386	381	367	357	357	348	386	405	414	419	424	424	414	412	409	400	395	381	357	371	367	367	357	367	367	367	357	383.86
Patna (CC)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pune	417	410	405	400	395	380	370	372	375	382	410	425	440	450	450	455	455	440	415	400	390	390	370	370	372	372	372	374	374	401.03
Ranchi (CC)	409	406	405	395	400	381	381	381	390	409	419	424	428	433	428	428	428	419	409	400	400	400	395	395	395	395	390	386	381	403.79
Vijayawada	365	350	350	340	325	325	325	325	330	345	365	385	400	405	410	413	413	398	383	355	355	355	355	330	330	330	335	338	340	357.75
Vizag	400	375	375	375	375	375	375	375	375	380	400	405	410	410	415	417	417	417	417	390	390	375	375	375	375	375	375	375	375	388.55
W.Godavari	365	350	350	340	325	325	325	325	330	345	365	385	400	405	410	413	413	398	383	355	355	355	355	330	330	330	335	338	340	357.75
Warangal	358	358	348	348	333	318	318	318	323	328	353	368	383	393	398	404	404	388	368	343	343	343	343	323	313	313	316	319	319	347.72
Prevailing Prices																														
Allahabad (CC)	385	371	371	367	362	352	362	367	367	381	405	424	419	419	414	405	405	405	405	390	381	381	362	357	352	348	348	343	343	379
Bhopal	385	365	365	365	350	345	345	345	355	355	385	405	415	415	415	395	395	395	370	345	345	345	325	325	310	315	320	330	330	360.51
Hospet	355	355	345	345	340	325	325	325	330	335	360	375	390	400	405	410	410	395	375	365	350	350	350	330	320	320	325	325	325	353.79
Indore (CC)	385	385	350	350	340	340	330	345	365	365	380	400	400	400	400	400	400	365	355	345	345	345	325	325	315	325	325	325	320	356.89
Jabalpur	383	375	360	353	345	340	340	343	360	360	385	400	407	414	414	400	400	400	370	365	352	352	337	335	337	337	342	335	325	364.34
Kanpur (CC)	371	371	371	357	348	338	338	338	338	362	395	405	405	405	405	405	395	381	381	362	352	352	352	352	338	338	343	343	343	364.96
Kolkata (CC)	370	370	370	355	348	348	348	348	367	390	412	432	447	450	455	455	455	425	390	390	370	345	345	355	365	370	375	378	378	386.41
Luknow (CC)	420	397	397	395	390	380	377	367	367	387	403	423	423	423	423	423	423	423	413	407	407	407	400	400	390	390	380	380	370	399.48
Raipur	377	377	360	360	350	350	350	353	360	360	380	400	420	435	435	440	430	415	400	360	360	360	345	345	345	348	350	352	352	374.79
Surat	435	420	410	410	395	380	380	385	387	390	415	430	440	440	442	445	445	430	390	362	385	385	375	375	375	375	378	380	380	401.34
Varanasi (CC)	407	407	400	390	380	373	373	383	400	407	423	433	433	433	427	427	427	405	395	400	390	390	383	377	370	377	380	380	370	397.93

Nobilis® IB Multi Range

For solid & durable Infectious Bronchitis protection.

A whole world of protection

The most comprehensive vaccine range for Infectious Bronchitis control

Live IB Vaccines

Massachusetts Serotype Strains

Nobilis® IB Ma5
Live freeze-dried vaccine containing Infectious Bronchitis virus, strain Ma5, serotype Massachusetts.

Nobilis® Ma5 + Clone 30
Live freeze-dried vaccine containing Infectious Bronchitis virus, strain Ma5, serotype Massachusetts and Newcastle Disease virus, strain Clone 30.

Inactivated IB Vaccines

Nobilis® IB + ND (Massachusetts / killed Clone 30)

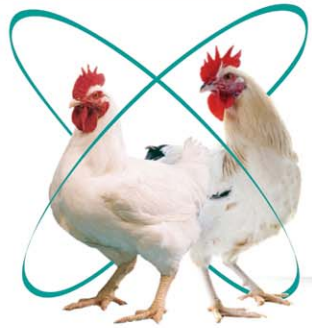
Combined inactivated oil emulsion vaccine containing Infectious Bronchitis virus, strains M41, serotype Massachusetts and Newcastle Disease virus, strain Clone 30.

Nobilis® IB multi + ND
Combined inactivated oil emulsion vaccine containing Infectious Bronchitis virus, strains M41, serotype Massachusetts & D207/D274 and Newcastle Disease virus, strain Clone 30.

Your **guarantee** for **continuous production**

Nobilis® Corvac-4

Broadest protection ever... Tetravalent vaccine



Protectotype

ONLY FROM MSD ANIMAL HEALTH

MSD Animal Health

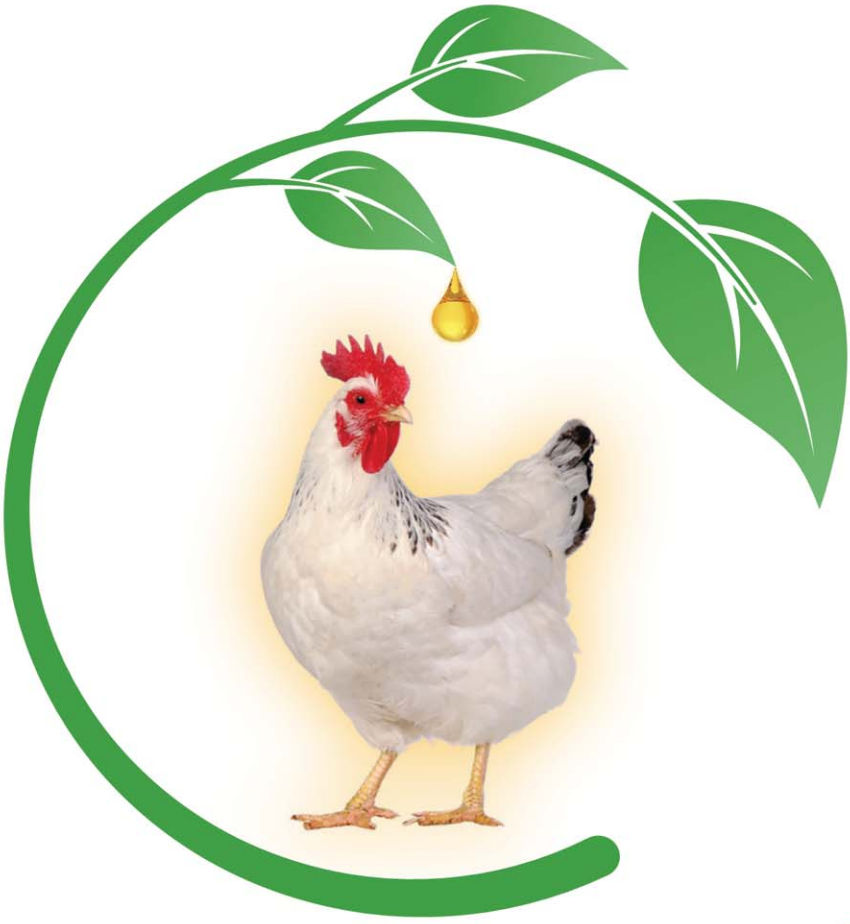
112-08-2021

Provet
Excellence through Innovation

AVINOVA™

NAGRONEX® ESF

Phytobiotic Growth Promoter



www.provet.in

provetppl provetppl provetppl

Provet Pharma Private Limited

No. 9, 1st Floor, Chakrapani Street, 2nd Lane,
Narasingapuram Extension, Maduvankarai, Guindy,
CHENNAI - 600 032. INDIA
Telefax: +91 44 2244 2124 / 27 e-mail: info@provet.in

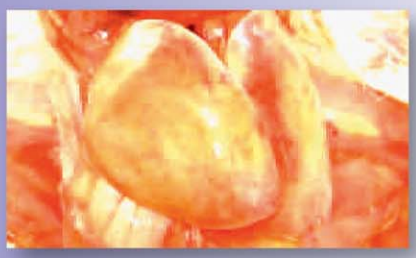
THE COMPLETE SOLUTION FOR INCLUSION BODY HEPATITIS (IBH)...

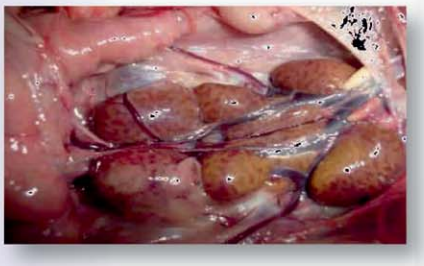
GlobiVac®

IBH

PROTECTS
LIVER AND KIDNEY
&
ENSURES
PRODUCTIVITY...

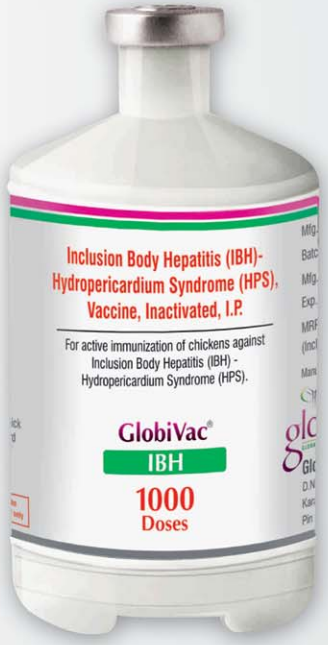
Fowl Adeno Virus Affects age groups of 3 to 6 weeks characterized by sudden onset and a mortality rate as high as 75%





Globivac IBH

Good protection against Inclusion body Hepatitis
Smooth injectability
Highly immunogenic hence provide better immunity



Globion India Pvt. Ltd.

Corporate office: 2nd Floor, Vasavi Gold Stone, Survey No. 25, Near Military Football Ground, Trimulgherry, Secunderabad-500 015, Telangana , India
Phone: +91-40-2799 0397 / 98 Fax: +91-40-2799 0399 | Email: customercare@globionindia.com | Website: www.globionindia.com

Factory: D. No.4-3, Survey No. 321, Biotech Park Phase III, Karakapatla Village, Markook Mandal, Siddipet District- 502281, Telangana, India

Bacterial Chondronecrosis with Osteomyelitis
A costly cause of lameness in poultry

Bacterial chondronecrosis with osteomyelitis (BCO) was first reported in 1972 and is now recognized as an important factor to cause lameness in poultry production. Recent research in Northern Ireland indicated that 17.3% of birds with lameness has BCO lesions. Other research in the US showed that leg problems cost the commercial broiler industry between US$80 and $120 million annually.

During the last decade the lameness condition caused by bacterial infection has been reported with various names; femoral head necrosis, tibial head necrosis, proximal femoral degeneration, long bone necrosis but nowadays BCO is widely accepted as the common term for this condition.

Antibiotic-free solutions to control BCO lameness

Watch Prof Robert Wideman of the University of Arkansas and Luis Valenzuela of BIOMIN discuss how to identify and control bacterial chondronecrosis and osteomyelitis (BCO) lameness in poultry without antibiotics.

Occurrence

BCO is a common cause of lameness in US and Europe that typically affects 1.5% of broilers grown starting at around 30 days of age. In Asia, the incidence of BCO may be lower at around 1%, as production cycles tend to be shorter, though subclinical issues and mortality do occur. Furthermore, BCO can contribute to product quality issues, e.g. consumers reject product where the white cap of articular cartilage separates from the femur head.

About 10-15% of broilers suffer from subclinical BCO, a condition that appears first in younger birds (Thorp et al., 1993). BCO increases mortality due to culling and selection, and results in lower body weight gain and higher FCR as affected birds suffer impaired mobility and are unable to move towards feeders and drinkers as frequently as they should.

BCO may be present and negatively influence flock performance and health even though it is not recognized as such. In one example, Prof Wideman cited a country he visited where multiple individuals claimed that BCO was not a problem locally. However, it turned out that 40% of the mortality in broilers domestically were being culled due to lameness caused by bacterial chondronecrosis with osteomyelitis. That means producers should be diligent: “In my opinion, wherever broilers are being grown, this [BCO] is going to be a problem—an important problem,” stated Prof Wideman.

Causes of BCO lameness

BCO lameness is caused by bacterial infection of the femoral or tibial head, which can result in femoral and tibial head necrosis. Several research results showed that Staphylococcus spp., Enterococcus spp., E. coli and Mycobacterium spp. are the most common bacteria isolated from joint

lesion in the birds with BCO lameness. As all of these bacteria above are members of the intestinal microbiota, these findings suggest the translocation of bacteria from the gut to the joints through the gut barrier.

From what we know of the pathogenesis of BCO, pathogenic bacteria (e.g. Staphylococcus spp., Enterococcus spp. and even E. coli) harbored in the gut gradually leak through the intestinal epithelium, make their way into the circulation and trigger the infections. Hence, the primary focus is to improve intestinal health and barrier function to protect against bacterial translocation responsible for BCO

Intestinal bacteria in the lumen of the intestinal tract can penetrate into the lamina propria through the weakened physical barrier, and penetrated bacteria can move to the other organs including joint via the blood stream. Once the bacteria reach to the growth plates of long bones, they are harbored in microfractures and begin to destroy the bone minerals.

Tight-junction is the structure in the intestinal tract to seal the apical boundaries of enterocyte, which consist of more than 40 proteins. Actin attachment in tight-junction enable it to close and open accordingly. It is one of the physical barriers in the innate immune system located in the intestinal tract, which prevents luminal antigens or bacteria from entering into mucosa and reaching into blood stream, resulting in bacterial translocation

Disrupted tight junction as intestinal barrier is compromised in a variety of clinical symptoms, such as lameness from chondronecrosis and spinal cord related neurological sign from osetomyelitis. Although the working mechanism of tight-junction is not clearly determined, it is obvious that the regulation of the tight-junction is closely regulated by the beneficial microbiota in the gut. The colonization of the gut with poultry probiotics can help reduce the translocation of pathogens into the bloodstream. Some studies suggested the possibility to regulate the tight-junction with methionine and cinnamaldehyde, but these nutritional approaches are still controversial.

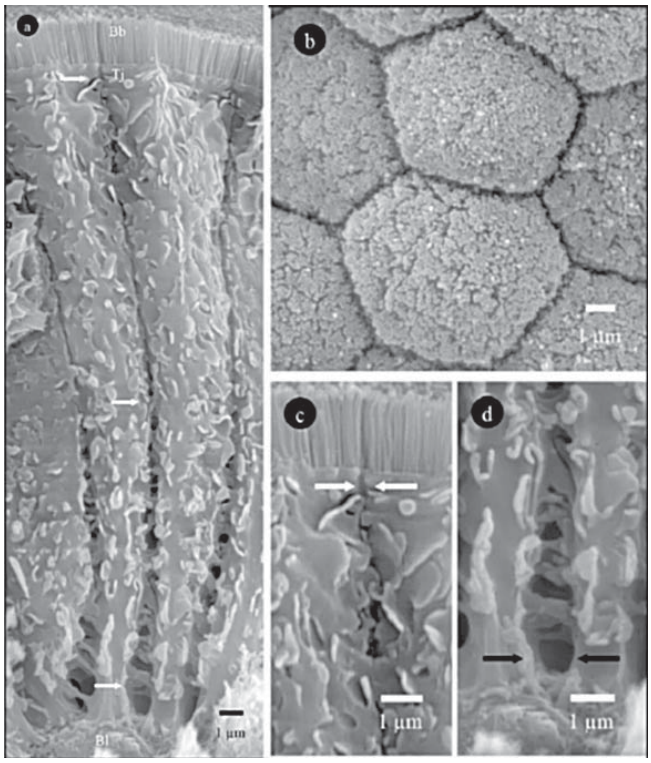


Figure 1. Villi in intestinal tract and tight-junction structure (Arrow), Picture from Bohórquez et al, 2011

Disruption of tight junctions

Regulation of tight-junction can be impaired by several factors, including dysbiosis, mycotoxin and stress. Dysbiosis is defined as a disturbed intestinal microbiota composition, which has emerged as the most common intestinal problem in poultry production. As intestinal microbiota play a critical role in maintaining intestinal homeostasis, including tight-junction, dysbiosis condition impaired the tight-junction regulation resulting in leaky gut. Several mycotoxin including Deoxynivalenol (DON), Fumonisin (FUM) and Aflatoxin B1 (AFB1) can also impair the gene expression for protein to consist of tight-junction, resulting in increased permeability of intestinal epithelium. Recent research indicated that high level of glucocorticoid from chronic stress can down regulate the expression of tight-junction related protein (claudin-1).

Solutions

Probiotics can help to minimize the BCO lameness by reduction of bacterial translocation from the gut.

In in-vivo trial conducted in Arkansas with wire-flooring model, Prof. Robert Wideman showed that broilers reared on wire flooring consistently had higher incidences of lameness than hatch-mates reared on wood-shavings litter and adding probiotics to the diet beginning at 1 day of age consistently reduced the incidence of lameness for broilers reared on wire flooring. These experiments indicate that probiotics administered prophylactically may constitute an alternative to antibiotics for reducing lameness attributable to BCO. The immunomodulation effect of the beneficial microflora with probiotic also helps the birds counteract this problem more efficiently.

"A healthy gut is the backbone of performance," according to Luis Valenzuela, Product Manager at BIOMIN. Extensive research has identified 3 types beneficial bacteria that acts as drivers of good gut health in poultry, each inhabiting various parts of the gastrointestinal tract:

1. *Enterococcus sp.* originating in the jejunum,
2. *Bifidobacterium sp.* originating in the ileum, and
3. *Lactobacillus spp.* originating in the cecum.

They act to competitively exclude harmful bacteria in the gut, prime the immune system and create a proper environment for beneficial microflora.

All three strains are found in **PoultryStar®** – a well-defined, poultry-specific, multi-species synbiotic product developed by BIOMIN that is the only one of its kind with EU authorization.

Mycotoxin deactivators or **toxin binders in poultry feed** can also reduce the bacterial translocation from tight-junction loosening caused by several mycotoxins.

References

Bacterial chondronecrosis with osteomyelitis and lameness in broilers: a review. Poult Sci. 95 (2)

Molecular Survey of Bacterial Communities Associated with Bacterial Chondronecrosis with Osteomyelitis (BCO) in Broilers. PLoS ONE 10 (4)

Bacterial chondronecrosis with osteomyelitis ('femoral head necrosis') of broiler chickens. Avian Pathology 29

Cinnamicaldehyde regulates the expression of tight junction proteins and amino acid transporters in intestinal porcine epithelial cells. Journal of Animal Science and Biotechnology 8:66

A wire-flooring model for inducing lameness in broilers: Evaluation of probiotics as a prophylactic treatment. Poultry Science 91 (4)

PRESS RELEASE

Biomin®

Science-based solution for pigs

"This EU authorization highlights the scientifically proven benefits of applying the proprietary mix of plant-based substances to piglet diets," commented Dr Antonia Tacconi, Global Product Manager Phytogenics at BIOMIN.

The zootechnical authorization reinforces the conclusion of the European Food Safety Authority (EFSA) Panel on Additives and Products or Substances used in Animal Feed (FEEDAP) favorable Scientific Opinion on the safety and efficacy of Duplex Capsule (DC-C) in weaned piglets.

"Based on the results of three efficacy studies in which positive benefits were seen, the additive has a potential to improve the growth performance of weaned piglets," stated the Opinion.

Science-based solution for pigs

Encouraging high feed intake in piglets is a key driver for producer profitability, animal fitness and overall performance. Application of phytogenic feed additives is projected to increase in the coming years.

"Phytogenic feed additives such as Digestarom® DC Xcel contain substances found in herbs and essential oils that improve swine feed digestibility, reduce inflammation and promote growth," explained Dr Tacconi.

"A growing body of scientific knowledge led by the BIOMIN Research Center and our research network has gone into making Digestarom® DC Xcel a value-adding solution for the feed and livestock industries," commented Dr Tacconi.

Unique formulation

"As a next generation phytogenic feed additive, the unique advantages of Digestarom® DC are the performance benefits, pelleting stability, ease of handling and a documented mode of action," stated Dr Tacconi.

The triple-action formulation of Digestarom® DC Xcel incorporates the innovative Biomin® Duplex Capsule technology that ensures the plant-based active compounds are delivered where they are needed to be most effective. The three modules include: 1) promoting appetizing and endogenous secretions, 2) gut microbiota modulation and 3) gut protection.

Road to EU authorization

On 5 February 2020, European Commission implementing regulation (EU) 2020/160 was published enacting the zootechnical authorization of key components of Digestarom® DC. In May 2017, BIOMIN submitted an EU dossier for the core components of Digestarom® DC Xcel as a zootechnical feed additive in piglets.

For more information

Ask your BIOMIN representative if you'd like more information about Digestarom® DC Xcel.

Don't have a BIOMIN representative? Use the contact form to get in touch today.

PRESS RELEASE

Producing Biogas from Waste and Sludge

WELTEC BIOPOWER to Present Solutions for Climate-Neutral Energy Generation at IFAT

At this year's IFAT, the world's leading trade fair for environmental technologies, which will be held in Munich, Germany, from 4 to 8 May, biogas plant manufacturer WELTEC BIOPOWER will again present its anaerobic digestion plants for industrial and municipal use. In Hall A4, at Booth 508, the internationally renowned biogas specialists will provide information on all topics concerning the use of organic waste and sludge for the production of energy.

The reference projects for the digestion of waste and the production of biomethane, which is equivalent to natural gas, include the WELTEC plant of the French potato chips manufacturer Altho, whose chips brand Bret's accounts for one third of the French market. Every year, the plant in St. Gérand, Brittany, produces about 1.75 million standard m³ of biomethane from 22,000 t of production waste in the form of potatoes and starch as well as sludge from the internal wastewater treatment plant. This amount of the climate-neutral energy source corresponds to the gas consumption of a town of 5,000 inhabitants.

Altho benefits greatly from the biomethane production, which enables it to use its leftovers in a sustainable manner and cut greenhouse emissions. The annual savings amount to approximately 3,900 t of CO2eq. This corresponds to the emissions that more than 2,000 persons would cause with a flight from Munich to New York.

For the energy plant, WELTEC has implemented process technology that is both innovative and reliable: The mix of solid and liquid substances is first pre-processed and homogenised in order to ensure efficient digestion in the stainless-steel digester. The entire process is fully automated and controlled by a PLC unit. With the help of the membrane processing, the biogas is then transformed into biomethane.

„Custom-tuned biogas technology is a must", says Jens Albartus, Director of WELTEC BIOPOWER. „Usually, anaerobic digestion plants will only encounter technical problems if the process technology does not meet the requirement profile." For this reason, plant operators and investors should opt for a provider who has experience with various substrates and climate conditions. In its projects, WELTEC custom-tailors its plants so as to ensure stable, economic operation. In more than 300 planned and implemented biogas projects in

25 countries, the specialists have gained a wealth of experience with diverse framework conditions.

Regardless of whether sludge, abattoir waste or production leftovers are used as raw material, WELTEC thus guarantees a high energy yield. This is achieved with the right blend of expertise, smart processes and custom-tailored supervision by biologists and engineers. IFAT visitors will be able to get further information on the efficient conversion of organic waste to high-energy biogas and biomethane at the booth of WELTEC BIOPOWER (Hall A4, Booth 508)

Company Portrait

WELTEC BIOPOWER GmbH is one of the world's leading enterprises in the field of stainless-steel biogas plant construction. The company has planned, developed and built anaerobic digestion plants since 2001. Today, the medium-sized company has about 80 employees at the headquarters in Vechta, Germany, and has established more than 300 energy plants in 25 countries worldwide. The global distribution and service network spans six continents. The range of customers includes businesses from the agriculture, food, waste and wastewater industries.

The strength of **WELTEC BIOPOWER** lies in custom-tailored design and technically mature solutions for projects up to 10 megawatt capacity. In this context, the high proportion of internally developed components is a key success factor. The company also owes its leading edge to the use of stainless steel. This enables the input of a diverse range of feedstocks, a fast and economic assembly and a consistently high quality standard regardless of the location.

After a biogas plant goes live, **WELTEC BIOPOWER** offers additional support through its experienced me-chanical and biological service team. 24/7 availability contribute significantly to the efficiency of the plant.

Nordmethan, a subsidiary company of **WELTEC BIOPOWER**, addresses another business area: The operation of biomethane plants and the provision of heat through energy contracting. In this way, the **WELTEC** Group covers the entire value chain of energy generation with biogas and biomethane – from the plant construction to the plant operation..

PRESS RELEASE

Memorandum submitted to Deputy Commissioner of Sonepat by PFI

Sonipat , February 24- The president of poultry Federation of India Mr Ramesh Kumar Khatri today presented a memorandum to the Deputy Commissioner of Sonepat,Dr Ansaj Singh on behalf of the Federation which was farwarded to the Prime Minister of India Mr Narender Modi to save the poultry Industry which is on the verge of destruction.

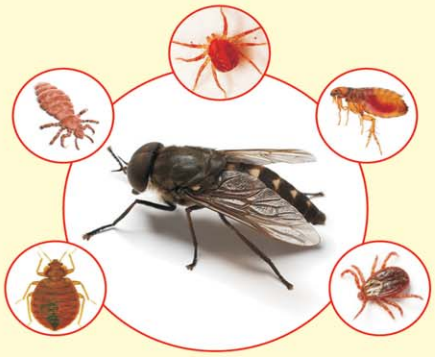
After submitting a memorandum to the Deputy Commissioner,Mr khatri expressed apprehension that Government of India is planning to reduce the imported duty on chiken leg and this decision would destroy the poultry Industry of the country .He was of the view that by reducing the duty the poultry Industry would not be able to survive for long as the poultry sector 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 leveid 100 percent at present would be reduced it would adversely affect the poultry Industry.He further maintained that if the American chicken industry would be promoted than 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 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 the lower import duty as the India was the largest consumer of the raw material.He further said that the poultry sector had great hope from the prime Minister Mr Narender Modi as he had done a lot for the farmers of 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 rumenrative prices of their produce .Under the Scheme a sum of Rs 6000 were being given to the farmers in three instalments in a year.About 12 crore farmers were getting benefit of this innovative schemes. He revealed that about 26crore eggs were being produced in india daily and about 50lakh units were working in the country and which about 4crore people were engaged in this sector through out 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 with out any political pressure to be exerted during the visit of present of America Donald Trump.



Are you using pesticides in your breeder & layer farms, for pest control ?

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

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

Say No to Pesticides on Your Breeder & Layer Farms

Your Only Truthful Solution

LitterMan™

The Complete Litter Control

Poultry Litter Management by *in situ* Composting

❊ **LitterMan** is a Pro-biotic product, natural & safe for the environment, which enables *in situ* composting of poultry manure.

❊ **LitterMan** delivers complete control over poultry manure, minimizing ammonia evolution & incidences of ;
Flies (adult & larvae) &
Ectoparasites (Ticks, Fleas, Red Mites, Lice & Bedbugs)
by breaking down the manure in to simple compounds that make manure unfavourable for their habitat & breeding.

Stop Pesticides Improve Farm Productivity

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

ANSHUMAN® INDUSTRIES

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

TERMOTECNICA® PERICOLI

Complete Solution for Poultry Industry

For over 50 years, we have been taking care of poultry farms everywhere in the world.

Now we proudly serve India as well.

PRODUCT OF ITALY

+91 914 895 8902

india.sales@pericoli-asiapacific.com

pericoli.com

PERICOLI ASIA PACIFIC Sdn. Bhd.

PRESS RELEASE

Vetphage Pharmaceuticals
a Proteon Pharmaceuticals Company

Safe anti bacterial solutions for poultry can radically reduce need of antibiotics

Between reducing the use of antibiotics and dealing with rampant bacterial infections of poultry, there is need to create safe prevention solutions, ***writes, Managing Director - Vetphage Pharmaceuticals Pvt. Ltd.***

The poultry sector in India was valued at an estimated Rs. 80,000 crores in 2015-16. Thanks to increasing income and changing food habits, the demand for poultry meat as well as eggs is expected to grow steadily. The poultry meat production in the country stood at around 3.46 million tons in 2016-17, up from 3.26 million tonnes during the previous year. Similarly, the egg production also grew by around 6% during the same period. Notably, more than 80 per cent of India's poultry output is produced by organized commercial farms, while the remaining 20% comes from the unorganized sector often referred to as the backyard industry.

The growing consumption and production of poultry on commercial scale elicits a series of health and environmental concerns. Among them are concerns over bacterial disease as well as the disposal of infected birds. Prevention of diseases and ensuring healthy growth of chicken also remain significant concerns before farmers.

Bacterial diseases cause huge losses for poultry industry

Bacterial disease causes multi-billion-dollar economic losses for the livestock industry. It is estimated that Campylobacter and Salmonella infections that are rampant in poultry together account for 9 in 10 reported cases of bacteria-related food poisonings globally. There exist more than 2,000 species of bacteria belonging to Salmonella genus, with almost all of them being potential pathogens of poultry. In fact, a study conducted on eggs in several retail outlets in India found that large amounts of salmonella were present both on the shell and inside the egg. Coliform infections or diseases resulting from Escherichia coli bacteria are another significant health concern recognized as a major cause of morbidity and mortality in chickens. Often, mass culling's are necessitated to curb such infections causing huge losses to the industry. The disposal of the culled birds which is often done through mass burials further leads to concerns of environmental degradation as water bodies and soil stands to be polluted.

To treat such diseases, poultry farmers are forced to use significant amounts of anti-microbials and other veterinary drugs and feed additives which together have negative implications on human and environmental health.

Growing threat of antibiotic resistance

Estimates suggest that 70% of all antibiotics used are used in animal farming, while only 30% are used directly in humans. In the absence of effective and safe alternatives that can prevent the disease, antibiotics are used to treat diseases and prevent disease among chicken. The entry of antibiotics in our food chain has far reaching consequences on human and environmental health.

Taking note of the global threat of antibiotic resistance, the non-therapeutic use of antibiotics in animal production has been banned in many countries. Sweden was the first country to ban the use of antimicrobials for non-therapeutic uses in the late 1980s. Denmark, the Netherlands, United Kingdom and other European Union countries have also followed suit. Recently, the Indian government has also banned the manufacture, sale and distribution of antibiotic Colistin (often considered a 'last hope' antibiotic) for poultry and animal feed supplements to preserve its efficacy in humans.

Need for safe alternatives

However, it is important to underline that banning the non-therapeutic use of antibiotics is not enough. We also need to devise solutions to help farmers grow healthy poultry and prevent bacterial infections through natural mechanisms. Interestingly, using bacteriophage-based preventive solutions is emerging as a sustainable and healthy alternative for disease prevention in poultry. Bacteriophages or simply known as 'phages' are microorganisms that are a natural element of our environment and exist everywhere around us including in the gut. Phages eliminate or devour their selected bacteria in a natural way without interacting with animal or human cells. This makes them absolutely safe for poultry and human beings.

Poland-based biotechnology company Proteon Pharmaceuticals has pioneered a revolutionary approach to use phages in a sustainable and controlled way to eliminate pathogenic bacteria without causing any harm to the microbiome or gut flora of the birds. By promoting healthy growth of birds, this significantly reduces the need for use of antibiotics. They help to reduce pathogenic bacteria without side effects, without leaving any residue and without creating antibiotic resistant strains of bacteria.

Creating and popularizing such sustainable solutions is key to the overall health of poultry and human beings. It is also important that adequate awareness is raised among farmers about following correct disease management and control practices and end reckless use of antimicrobials.

PRESS RELEASE

Vetphage Pharmaceuticals
a Proteon Pharmaceuticals Company

Dr.Bhushan Bhavsar

Managing Director of Herbal Consultants Pvt. Ltd. (www.herbal-consultants.com)
President – World Ayurveda Health Organisation (WAHO)

Dr. Bhushan Bhavsar has worked for more than a decade into the food products and supplement industry. His knowledge and expertise into the industry is well respected and proven into the ûeld of product development, regulations, research, manufacturing, packaging & designing, marketing, sales and logistics, collectively said to be providing all the services under one roof to set up your business Nationally and Internationally.

Due to his full devotion and work towards Ayurveda, Dr. Bhavsar has been chosen as President of World Ayurveda Health Organization (WAHO) working currently in 9 countries - India, Switzerland, United Kingdom, The Netherlands, Belgium, Germany, U.A.E., Brazil and Canada.

As an innovative product researcher, Dr. Bhavsar has found proven and quick solutions for many technical issues in various stages of product development. He has achieved to get two product patents in hisname.

Current Positions:

Managing Director - Herbal Consultants Private Limited (India) Director - ABC Pharma Sp. Z o.o (Poland)

Founder & CEO - Business Appetite.

Director - BrandArch Media Private Limited. Associate Director – Brandarch Technologies. Owner - Raw Resources

President - World Ayurveda Health Organization (WAHO)

Qualiûcations:

B.A.M.S. (Bachelor in Ayurvedic Medicine & Surgery)

M.D. (Ayurveda) (Part III)

M.B.A. (Healthcare and Hospital Administration) PG Diploma in Cosmetic Technology & Marketing Diploma in Digital Marketing

L.L.B. (Bachelor in Legislative Law) (Honors)

Awards & Achievements:

Best business strategic planner Young Entrepreneur's Award

Gold medal – University topper for M.B.A. Sixsigma – Black Belt-

Expertise

10 years of experience in developing new and better ways of formulating, preserving, processing, packaging, storing and delivering, in the ûeld of food, beverages, nutritional, herbal, cosmetics and dietary supplements.

Product Development:

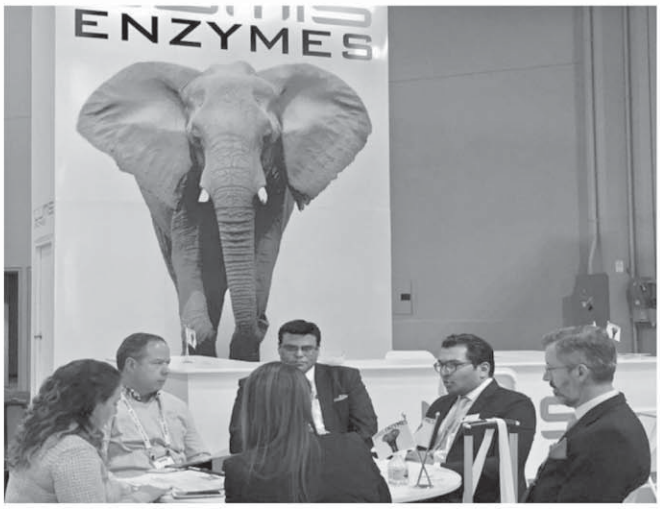
- New concept development for productinnovation.
- Excellent knowledge of baked, dairy and baby food technology (including chemistry, microbiology and labsystems).
- Expertise in Organoleptic evaluation of food andbeverages.
- Creative design of innovative products with eûcient and appealing ingredient combinations and innovativeformulations.
- Substantiation of food & nutrition, therapeutic health claims, structure/function claims.
- Conceptualization of invitro and animal studies with GLP certiûed laboratories todetermine eûcacy and safety of your product.
- Design and realization of tailor-made clinical trials to document eûcacy and to substantiate health claims for yourproducts.
- Development of Product Monographs for consumers andprofessionals.

Consultations provided (Food & Nutrition Companies):

- Campbell Food Products Ltd.,USA.
- Joint Juice Inc.,USA.
- Herbalife International India Pvt Ltd.,India
- Moringo Organics Pvt Ltd.,USA
- Patanjali Food Products (Patanjali Ayurveda Ltd.),India.
- Panda Foods,India.

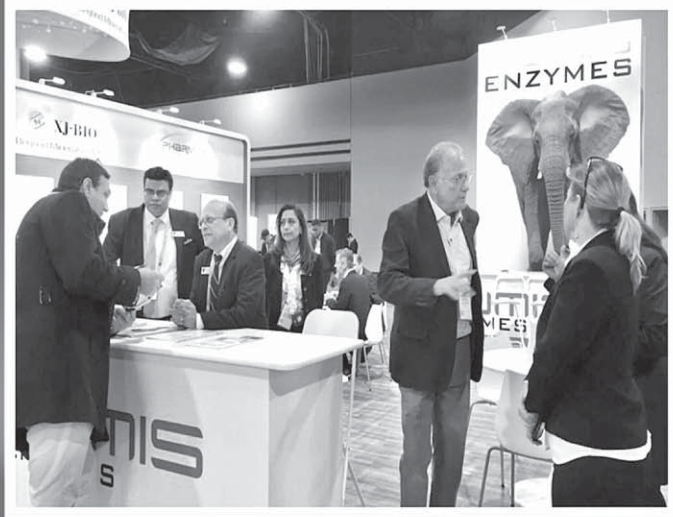
LUMIS ENZYMES

EXHIBITED AT IPPE, ATLANTA



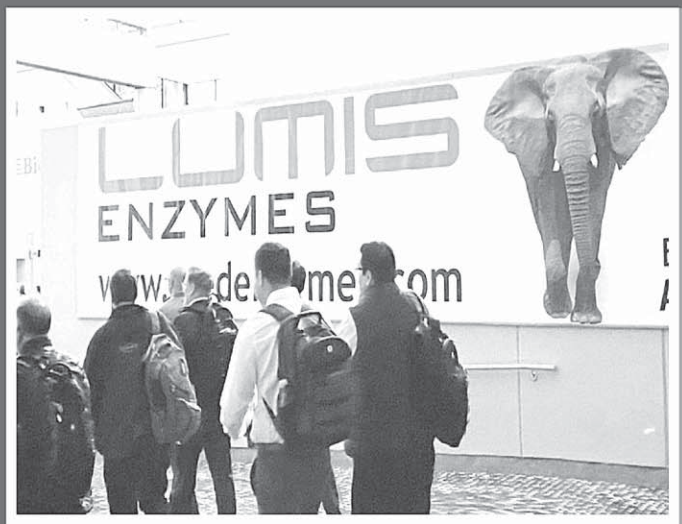
LUMIS ENZYMES

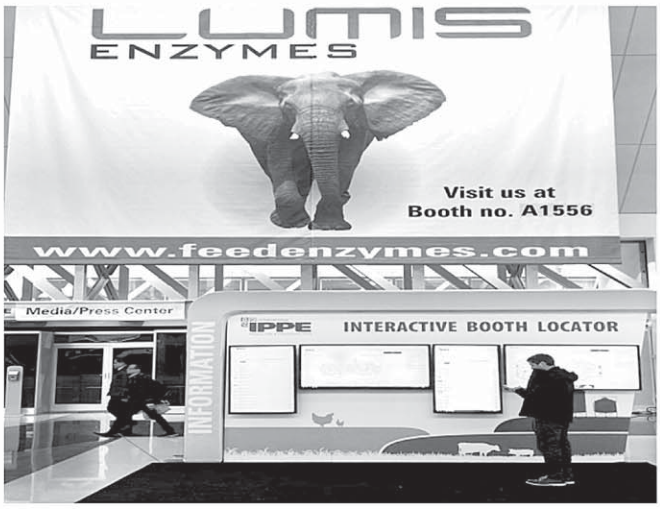
EXHIBITED AT IPPE, ATLANTA



LUMIS ENZYMES

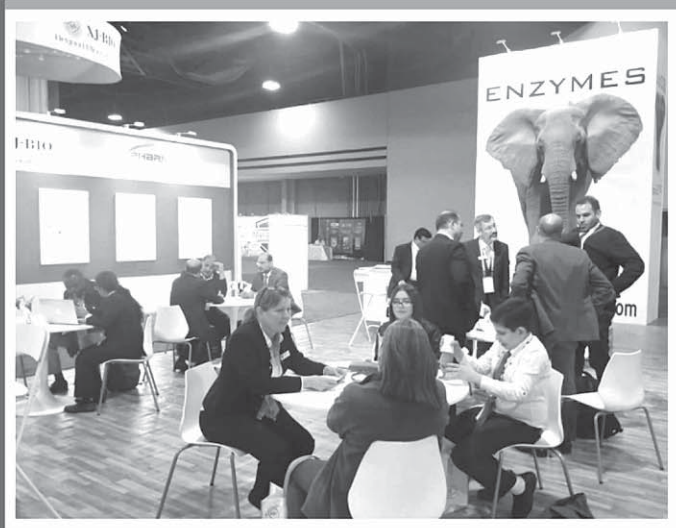
EXHIBITED AT IPPE, ATLANTA





LUMIS ENZYMES

EXHIBITED AT IPPE, ATLANTA



LUMIS ENZYMES

EXHIBITED AT IPPE, ATLANTA

LUMIS ENZYMES

EXHIBITED AT IPPE, ATLANTA

CRDX

Breathe Easy-Now

A fast acting essential oil based solution for symptomatic relief in acute dyspnoea.

- **F**ast - It is fast acting, antiinflammatory, analgesic, mucolytic, bronchodilator.
- **E**conomic - Highly concentrated. Economical with high ROI.
- **E**fficient - Very potent, works through oral as well aerosol route.

We are there when you need the most

Regenerating solutions for your changing needs...

Regen Biocorps AHI (P) Ltd.

3rd Floor, D&E 301, Ananta Trendz, Near Narayan Garden
Gotri, Vadodara – 390 021. Gujarat (India)

Website: www.regenbiocorps.com

An ISO 9001 : 2008 Certified Co.

nu start

Vitamin/Mineral Soluble Power

Profit Defender

NuStart is a concentrated water-dispersible nutritional supplement Of ***Essential Vitamins, Organic Trace Minerals*** with Built-in ***Acidifiers and Electrolytes***.

- Product from USA
- Best supportive solution for different type of ***Lameness, Stress & Immunity***
- Work as ***Nutritional Booster*** in readily available water soluble form
- Best in class ***Bioavailability***
- Helps to Improves Productivity
- Helps Chicks ***Livability and Growth***
- Work as tonic following multifactorial ***Infectious, Nutritional Deficiencies and Stress Factors***

FDA
MANUFACTURED IN A FDA - INSPECTED FACILITY

NuTech BioSciences,Inc.

Distributed by:
NuTech Bio Sciences Pvt.Ltd.
07-17/3, (3rd Floor, Beside SunCity Nursing Home),
SunCity Mail Road, Bandlaguda, Hyderabad - 500 086
M : 8124840326

Manufactured by:
NuTech BioSciences Inc.
537 Fitch Street,
Oneida NY 13421. USA
www.nutechbiosciences.com. 315.505.6500

Bhuvana NutriBio Sciences

Marketed by:
Bhuvana Nutribio Sciences
E-7, 2nd Floor,Opp. Gate No. 1, Market Yard,
Glutekadi, Pune - 411037. (India)
M : +91 9850979652, 9396686500

Better Nutrition Through Biotechnologies

FLY Problem?

FLYIN™ FLY TRAP

Very Effective

House fly Trap & Natural Bait

- Environment friendly
- Reusable & Strong trap
- Easy to use
- No pesticides
- Non Hazardous
- 100% Safe

Instructions to use : Open the sachet of attractant & pour into the container. Add one liter of water in to the container & stir well. Hang the container where the fly issue is severe. The powder starts fermenting in 0-2 days and the smell attracts the flies into the container. Remove the flies once it is completely filled & add fresh attractant and water for fresh catch. * In cold climates the fermentation will be slow and it may take 2-4 days to the flies to get attracted to the trap.

Shake the container everyday for better effectiveness.

Applications : Animal Houses, Garbage treatment plant, Food Markets, Gardens, Near Garbage, Poultry farms, Cattle sheds, etc.,

*Design Registered

Agriculture/Farm use only

Customer care : 8088886488. Email: phlox.inceptum@gmail.com

NEWS

Interface Pharmaceuticals has been awarded **SILVER AWARD** BY ASSOCHAM

NATIONAL EXCELLENCE AWARD

THE AWARD WAS AWARDED FOR INNOVATION

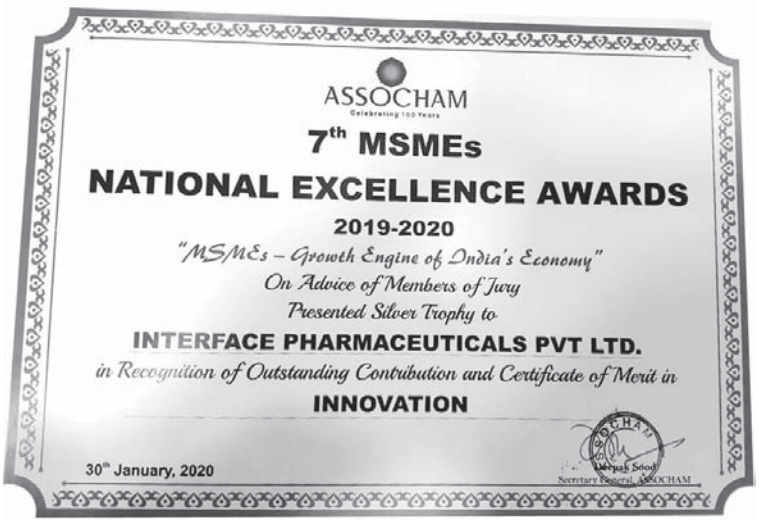
SHRI PRATAP CHANDRA SARANGI

Hon'ble Minister of State, Ministry of MSME, Govt. of India.

Handed over the Trophy and Certificate to

MR. S.K. MALHOTRA

CHAIRMAN & MANAGING DIRECTOR of INTERFACE PHARMACEUTICALS PVT. LTD.



PRESS RELEASE

Alltech launches relief effort for Australian farmers

The bushfires in Australia have destroyed an estimated 10 million hectares, claiming lives and killing wildlife and livestock. The Australia Farming Relief Fund will help provide goods and services directly to effected farmers, coordinated on the ground by Alltech family companies Alltech Lienert Australia and KEENAN Australia. Alltech is matching donations dollar-for-dollar.

Australia Farming Relief Fund will support producers impacted by bushfires

[NICHOLASVILLE, Ky.] – Even as rain begins to fall in some parts of Australia, wildfires continue to devastate large portions of the country. The fires have already destroyed an estimated 10 million hectares, claiming 25 lives and killing wildlife and livestock. Alltech, a leading animal nutrition company, is lending its support to the country's agriculture industry, launching a global fundraising effort for farmers and pledging to match donations dollar-for-dollar. The Australia Farming Relief Fund will provide goods and services directly to producers and will be coordinated on the ground by Alltech family companies Alltech Lienert Australia and KEENAN Australia.

"The Australia Farming Relief Fund represents a coordinated effort among our Alltech family, suppliers, customers and the global agriculture industry to support the producers who feed our families and are the core of our rural communities," said Mark Peebles, managing director of Alltech Lienert, which is located in Roseworthy, Australia. "The bushfires have been devastating, but Australians are resilient, and we are committed to rallying around our farmers as they recover from this crisis."

As farmers assess the damage, the loss of

livestock is expected to exceed 100,000 animals. Producers, who were already contending with a three-year drought, are struggling to secure supplies and feed.

Alltech Lienert and KEENAN Australia will use their resources to distribute supplies either donated locally or purchased using donations from the Australia Farming Relief Fund. Such supplies will include hay, finished feed, feed supplements, silage, water troughs, fencing and non-perishable items. The companies will deploy their trucks and drivers to deliver supplies to producers in Victoria, South Australia, New South Wales (NSW) and Queensland. Team members will also volunteer their time to work alongside farmers, rebuilding fences, repairing sheds and providing any on-farm support they need.

The effort will initially focus on dairies, sheep and beef farms, and apiaries. Alltech is also exploring partnerships that will offer longer-term mental health support for farmers grappling with trauma as a result of the fires.

-Ends-

Contact: Dr. Manish Chaurasia,
Marketing manager, Poultry (South Asia)
mchaurasia@alltech.com; +91 8130890989

About Alltech: Founded in 1980 by Irish entrepreneur and scientist Dr. Pearse Lyons, Alltech is a cutting-edge technology company in a traditional industry, agriculture. Our products improve the health and nutrition of plants and animals, resulting in more nutritious products for people as well as less impact on the environment.

With expertise in yeast fermentation, solid state fermentation and the sciences of nutrigenomics and metabolomics, Alltech is a leading producer of yeast additives, organic trace minerals, feed ingredients, premix and feed.

Together, with our more than 5,000 talented team members worldwide, we believe in "Working Together for a Planet of Plenty™."With the adoption of new technologies, the adaptation of better farm management practices and the ingenuity inherent in the human spirit, we believe a world of abundance could be ours.

Alltech is a private, family-owned company, which allows us to adapt quickly to our customers' needs and stay focused on advanced innovation. Headquartered just outside of Lexington, Kentucky, USA, Alltech has a strong presence in all regions of the world. For further information, visit www.alltech.com/news. Join us in conversation on Facebook, Twitter and LinkedIn.

PRESS RELEASE

Nourishing Tradition with Modern Nutrition- Alltech hosts its 2nd Poultry Nutrition Summit in Goa

Over the past 25 years, poultry nutrition has focused on production efficiency. Today, it strives to maximise biological and economic performance. In future, poultry nutrition seems to tend towards production efficiency, biosecurity and food safety, environmental stewardship, and bird's welfare.

To get a handle on modern nutrition, after its first Poultry Nutrition Summit in 2017, Alltech counts date to conduct its 2nd Nutrition summit in March27-29th,2020, location set to be Goa. The 3 dayconference explores thetop innovation and technology trends, emerging business issues and possible solutions, connecting the business and science of poultry nutrition.

Poultry Industry, undergoing a disturbed market situation due to high price and supply shortage of raw materials had resulted in absorbance of loss from last fewer months. Tackling the situation lies in choosing the right alternative! Alltech Poultry Nutrition Summit is the one platform to get assisted on maintaining the economics without hampering the performance with a right nutrition.

Poultry Industry, undergoing a challenged market situation, due to high raw material price and supply shortage had resulted in absorbance of loss from last many months. Tackling the situation lies in choosing the right alternative! Alltech Poultry Nutrition Summit is the one platform to get assisted on maintaining the economics without hampering the performance with a right nutrition.

Dr. Steve Leeson, an eminent personality of poultry industry, who published 340 papers in referred journals, over 1000 presentations at scientific and industry meetings world-wide and 8 books publication on poultry nutrition and management, will be addressing the audience as keynote speaker.

Steve Elliot, who is currently serving Alltech as a Global Director of Mineral Division who has been involved in the feed industry for more than 25 years, presents over the gathering, the health benefits of organic minerals.

Effective mycotoxin management is about seeing the whole challenge, from the farm to feed mill and from risk assessment to feed management. Dr. Nick Adams, Global Director for Alltech Mycotoxin Management marks his crucial presence to create awareness on mycotoxin management.

The summit is a platform to bring together nutrition experts and feed millers from all around South Asia to educate and build a valuable skill set about poultry industry.

"Whether your goal is to improve efficiency & profitability or to learn more about the latest nutritional & feed milling technologies to implement in your business, the Alltech South Asia Poultry Nutrition Summit is the place to be", says Dr. Aman Sayed, Managing Director- India and Regional Director- South Asia stressing the importance and benefit of attending the summit.

-Ends-

Contact: Dr. Manish Chaurasia,
Marketing manager, Poultry (South Asia)
mchaurasia@alltech.com; +91 8130890989

About Alltech: Founded in 1980 by Irish entrepreneur and scientist Dr. Pearse Lyons, Alltech is a cutting-edge technology company in a traditional industry, agriculture. Our products improve the health and nutrition of plants and animals, resulting in more nutritious products for people as well as less impact on the environment.

With expertise in yeast fermentation, solid state fermentation and the sciences of nutrigenomics and metabolomics, Alltech is a leading producer of yeast additives, organic trace minerals, feed ingredients, premix and feed.

Together, with our more than 5,000 talented team members worldwide, we believe in "Working Together for a Planet of Plenty™."With the adoption of new technologies, the adaptation of better farm management practices and the ingenuity inherent in the human spirit, we believe a world of abundance could be ours.

Alltech is a private, family-owned company, which allows us to adapt quickly to our customers' needs and stay focused on advanced innovation. Headquartered just outside of Lexington, Kentucky, USA, Alltech has a strong presence in all regions of the world. For further information, visit www.alltech.com/news. Join us in conversation on Facebook, Twitter and LinkedIn.

PRESS RELEASE

Post Budget Quote on behalf of Mr. Simon George, President, Cargill India

Budget with "Aspirational India", "Economic Development" and "Caring Society" themes is balanced in its approach and would give a necessary boost to the economy.

Government reiterated its commitment to doubling the farmer's income by 2022, and announced a 16-point action plan to boost agriculture and farmers welfare, and Cargill India is committed to contributing towards the goal. Having said so, the government allocated 15 lakh crore for farmer's credit pushing for their upliftment. Agriculture being the backbone of the nation it would be significant to see how the government would push the KrishiUdaan on not just national but international routes and enabling agri and farmers to be part of the global value chains, providing enormous value addition for farmers and the economy. In order to sustain a national cold supply chain for perishables, government announced that Indian Railways will implement Kisan Rail, which will be undertaken through the PPP model for rapid transport of perishable goods. Mapping and geo-tagging of agri-warehousing and setting up warehousing at the taluk level along with integrating warehousing receipts with the e-NAM will provide a great boost to the sector.

Agriculture amalgamated with rural development will see an allocation of Rs. 2.83 lakh crores. This budget allocation will aid in enhancing productivity, improving the income of the farmers with access to markets that would eventually help in reducing farm distress; helping the sector to achieve the aspirational growth rate. With the renewed focus on job opportunities specifically for the rural youth, the budget ensures to boost the marine fishery for creating an optimistic future with a business outlook as well. On the other hand, teaching entrepreneurial skills to the youth is required in understanding what the potential markets holds for the farm sector.

Government's initiative to encourage the states to adopt the 3 central model laws on agricultural land leasing, agricultural produce & livestock marketing and contract farming should go a long way to get these laws implemented on ground. The government's plan to boost horticulture at the district level would surely result in a focused approach and the strengthening of JaivikKheti through incorporation of digital platforms is a much awaited reform. Renewable energy is the future and now the farmers can avail the technological advancement for their livelihood through establishing of solar grids and pumps. There is a need to educate the farmers to use the required technology to show desirable results.

PRESS RELEASE

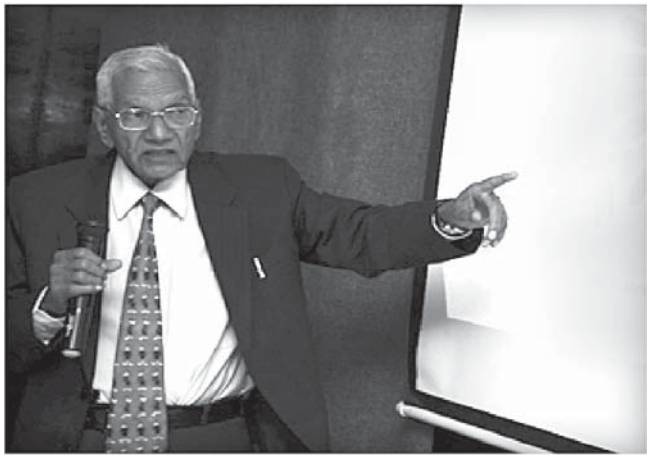
Camlin Fine Sciences organized the expert's forum at Rajahmundry

Camlin fine sciences, the leading global feed additive producer in animal nutrition arranged the veterinary health expert's forum in presence of the poultry producers in Rajahmundry. The event held at hotel Shelton on 14th of February got massive response. The local poultry producers attended the meeting in large number.

Dr Vegadwas the honorable guest speaker, a globally recognized authority on avian influenza started the discussion with thorough overview of viral disease challenges and avian influenza. He addressed about most simple but important tasks that can help overcoming the disease challenge in prevailing challenging conditions of poultry farming.

The occasion after greeting Dr Vegadtaken ahead by Dr Prasad Kulkarni, Business Head, CFS overviewing the global activities of organization and expansion of the service activities further. The unique and strong research-based product line of CFS was quickly overviewed with India and Asia expansion activities this year by the business leader. Further Dr Prakash Gosavi mediated connect of Legendry Dr. Vegad with all the expert veterinarianscame all the way spending their valuable evening dedicated for the poultry fraternity.

Dr Prasad Kulkarni, Business Head for CFS overviewing the India and Asia operations



Dr Vegad presenting his masterly and mesmerizing speech on viral diseases with focus on avian influenza and disease management.

Dr Sharath Babu, senior health expert in Tanaku greeting senior expert Dr. Vegad during the event

Dr Buchiramayya, the health expert greeting Dr Vegad during the Discussion

Dr Venkateswarlu, greeting Dr Vegad

Active participation of audience during the event

Dedication and discipline in life plays most important role to keep good health with his live example was insisted by the enthusiastic presenter Dr Vegadfurther advised to follow for the poultry flocks by means of dedicated sanitation services at the farm.

Since more realistic and burning topic took hold of the audience all the expert admitted to keepfocus on reducing the bioburden my means of cleaning and disinfection followed by good managemental practices and vaccination. Various conditions across the farms were discussed to propose solutions parted by Dr Sharath Babu, senior health expert, Dr BuchiRamaiaha, consultant and Dr SatynarayanReddy, senior health consultant along with few more veterinarians present during the meeting.

The channel partners for CFS at Anaparthy Mr.Krishna Reddy (Andhra Poultry Services) and Vijaywada based distributors Mr.Gunahskher Reddy with Mr Surendra Reddy greeted the gathering. Successfully concludingevent Mr. Ganesh Reddy, Key account manager, CFSremared crisp of discussion for the poultry producers and opened the topic for group discussion during the dinner.

CFS Team with legendry Dr Vegad including Dr Prasad Kulkarni, Dr Prakash Gosavi, Mr.Ganesh Reddy, and the channel partners Mr. Gunashakher Reedy, Mr. Surendra Reddy with organizer Mr. Krishna Reddy during the forum.

CFS Team with legendry Dr Vegad including Dr Prasad Kulkarni, Dr Prakash Gosavi, Mr.Ganesh Reddy, and the channel partners Mr. Gunashakher Reedy, Mr. Surendra Reddy with organizer Mr. Krishna Reddy during the forum.

Lamba's

New Ray in Poultry Nutrition...

Rovitex™

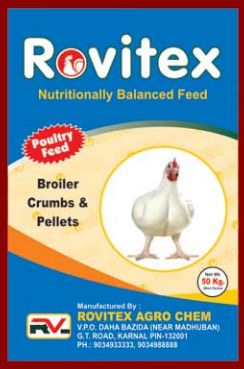
Nutritionally Balanced Feed

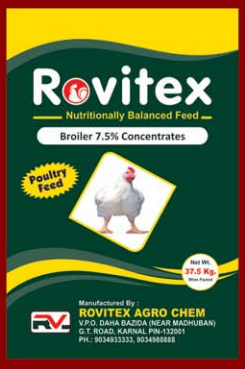
World Class 7.5% and 10% Concentrates

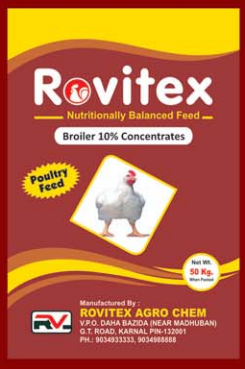
Broiler Concentrates:
- ❖ Broiler 10% Concentrates
- ❖ Broiler 7.5% Concentrates
- ❖ Broiler 5.5% Concentrates
- ❖ Broiler 3.5% Concentrates
- ❖ Broiler 2.5% Concentrates
- ❖ Broiler 1.5% Concentrates

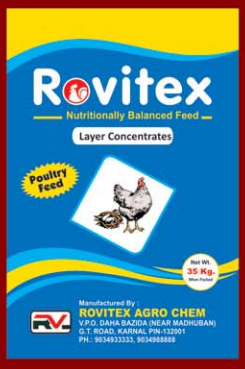
Layer Concentrates:
- ❖ Layer 5% Concentrates
- ❖ Layer 10% Concentrates
- ❖ Layer 25% Concentrates
- ❖ Layer 35% Concentrates

Broiler Crumbs/Pellets:
- ❖ Broiler Pre-Starter Crumbs
- ❖ Broiler Starter Crumbs
- ❖ Broiler Finisher Pellets









ROVITEX AGRO CHEM

H.O.: R.A-548, SADAR BAZAR, GANDHI CHOWK, KARNAL 132001 (HARYANA)
WORKS: V.P.O. DAHA BAZIDA (NEAR MADHUBAN), G.T. ROAD, KARNAL 132001 (HARYANA)
Ranjeet Singh Lamba: +91-99917-11111, 90349-33333
Samarjeet Singh Lamba: +91-90349-88888, 95410-22000
E-mail: rovitexagrochem2016@gmail.com, lamba122117@gmail.com

Dealers enquiries solicited from unrepresented areas

Increase the value of animal feed

AGal-Pro®

Kerry's AGal-Pro® enzyme solutions are based on alpha-galactosidase, a globally tested and proven enzyme solution.

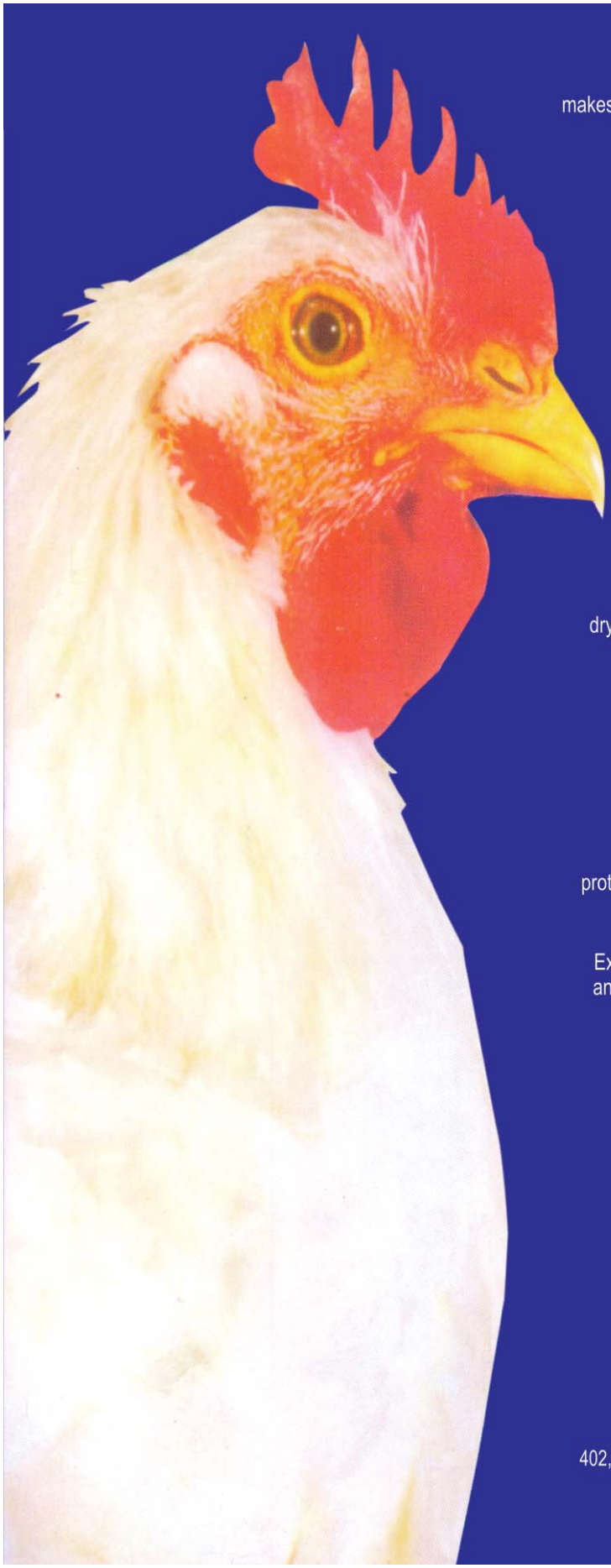
Kerry's latest product AGal-Pro® is an unique enzyme system designed specifically to counteract the limitations of using Soybean Meal and other Legume-based proteins in poultry diets by:

- Optimizing the nutritional value and energy source of feed ingredients
- Maximizing the energy density of poultry rations
- Reduce feed costs
- Increase nutrient digestibility
- Reduce waste

Learn more at **kerry.com**
+91.22.27815003 | Kerry-India.info@kerry.com

Registered Office Address: Unit No. 302, 3rd Floor, Ecospace Campus 3B, Marathalli Sarjapur Outer Ring Road, Bellandur, Bangalore- 560 103

KERRY
Leading to Better



MULTIMIX-K-PREMIX
Multi vitamin premix for poultry and live stock
makes uniform distribution of vitamins and amio acids in the poultry feed

D.C.P.
Di Calcium Phosphate feed grade
Bone Based

GROMIN-TM
Complete source of tracemineral supplement
as per requirement of commercial layers and broilers

NOVOPHOS-5000
Micro granuelated, thermo stable, double strength
phytase for poultry and live stock

BIOFUR-200
Excellent growth promoter, active anti-microbial agent
in non specific clinical infections

CHOLINE-CHLORIDE-60%
Choline-chloride-60% feed grade
dry powder vegetable base carrier, better utilization of methionine,
effective utilization of fat

BIOTOX-TCF
Unique 4 way toxin control formulae
do not binds nutrients, detoxifies feed and raw meterials

BIOLIV VET
Healthy liver - Healthy Production
Stimulates & optimizes liver functions,
protects liver from damazing effects of myco toxins, chemical toxins

ULTRA COOL PLUS
Excellent water soluble electrolyte mixture for commercial layers
and broilers and excellent concentrate for correcting dehydration
and heat stress for poultry and live stock

SODIUM BI CARBONATE
Alleviation of heat stress, prevention of poor litter quality

BIOCARE
ANIMALS HEALTHCARE

402, Ahalya Enclave, Road No. 12,Himayath Nagar, Hyderabad - 500 029
website : www.biocare.in.com
e mail : biocareanimals@gmail.com
Customer Care : +91 98491 45398

A.P. POULTRY EQUIPMENTS

Pioneers in Poultry Incubators

HI-TECH INCUBATORS & HATCHERS

Killer Cone / Halal Cutting

De - Feathering Machine:

Chicken Portioning Machine

Feed Plant (Feed Mixer & Grinder)

Solar Incubators

For Further Details Please Contact:

M. Prabhakar Reddy

Managing Partner

Mob: +91 9849212325, +91 9848123203

Office:
Villa No-45, Ramky Villas, Near HMT, Sathavahana Nagar,
Opp: KPHB, Kukatpally, Hyderabad-72. Telangana. INDIA.

Factory:
Plot No.365 & 366, Gokul Plots, Venkata Ramana Colony,
Near Vasanth Nagar, Kukatpally, Hyderabad-72. A.P. INDIA.

Email: appoultry@yahoo.com, appoultry@gmail.com, mprabakarreddy@gmail.com
Tel/Fax: +91 40 23151576 | **Website:** www.appoultry.com

SAI KRISHNA

POULTRY EQUIPMENTS

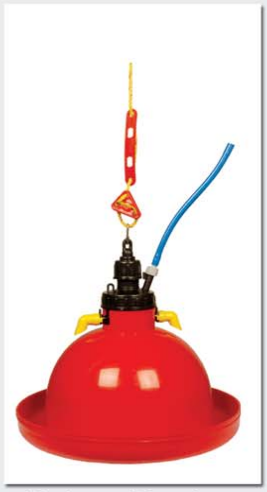
Chick Feeder

Egg Tray

Chick Feed Tray

Chick Drinker

Drinker
(Assemble Valve System)



Deluxe Drinker
(Standard & Large)

Feeder

Gas Brooder

Chain Link Mesh

Jumbo Drinker

SAI KRISHNA PLASTIC INDUSTRIES

Manufacturers of Plastic Poultry Equipments

Factory : Behind Petrol Bunk, Padmanagar, Karimnagar - 505002, Tel : 0878 - 6504508, Mobile : 98490 59508

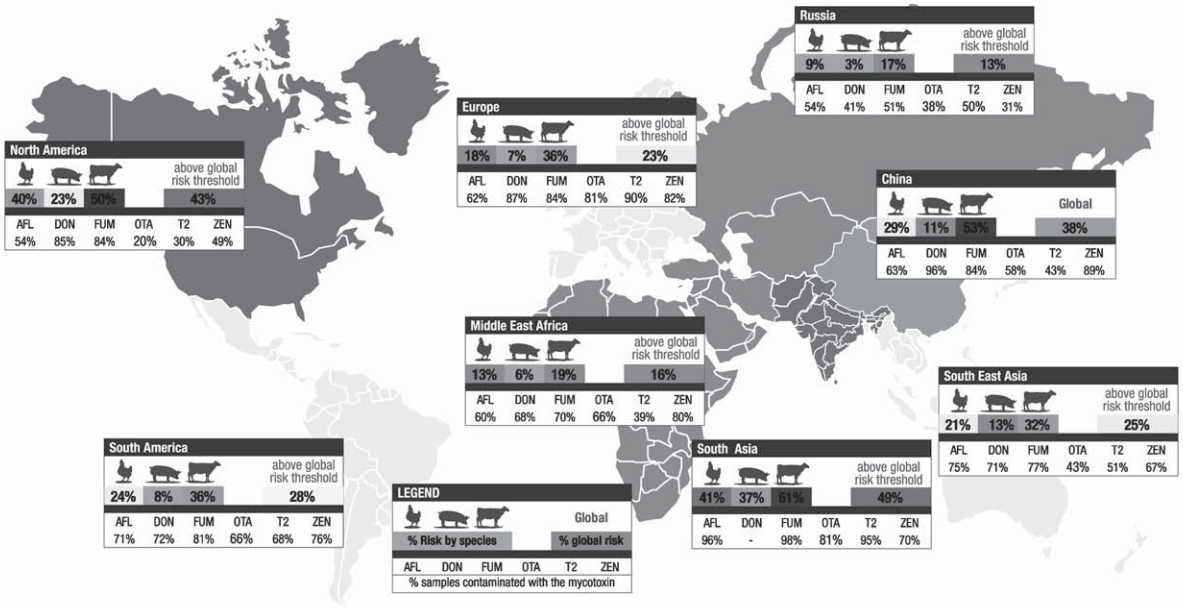
Sales Depot : Plot No : 11,Road No:2, Opp : Nimanthran Function Hall, Mamatanagar Colony, Nagole, HYDERABAD - 68. (A.P), Tel : 040 64610508, Mobile : 92466 59508, E-mail : info@saikrishnapoultry.com, Web : www.saikrishnapoultry.com

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.

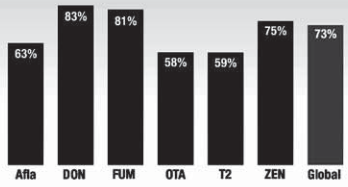
CARGILL WORLD MYCOTOXIN SURVEY Jan - Dec 2019

1

World

PERIOD : **January - December 2019**
ANALYSIS NUMBER : **282 277**

Contaminated samples by mycotoxin (%)



Risk by species

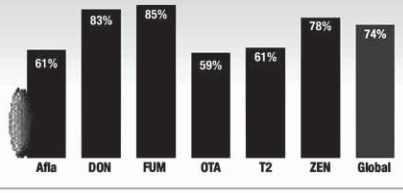
Global risk

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

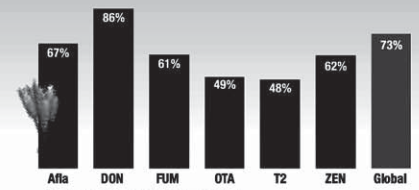
Extreme risk	50 – 100 %
Severe risk	40 – 50 %
Very high risk	30 – 40 %
High risk	20 – 30 %
Moderate risk	10 – 20 %
Low risk	00 – 10 %

ANALYSIS BY MAIN FEED MATERIAL

Corn : % contaminated samples

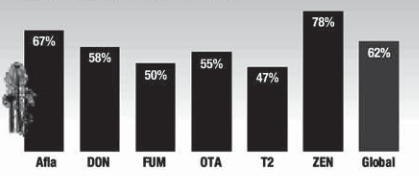


Cereals[1]: % contaminated samples



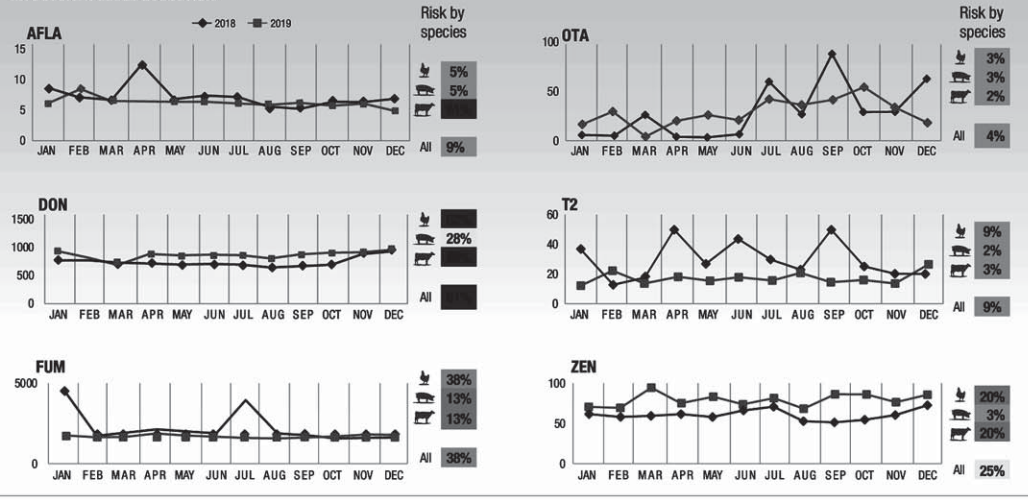
(1) wheat, barley, oat, rice sorghum, triticale...

Oleaginous[2]: % contaminated samples



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

MYCOTOXYN LEVEL EVOLUTION



CARGILL WORLD MYCOTOXIN SURVEY Jan - Dec 2019

2

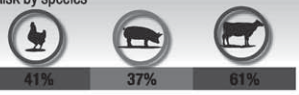
India

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



Global risk 49%

FOCUS
- High Afla (96%), FUM (98%), OTA (81%), T2 (95%) and ZEN (70%) contamination rate
- Extreme Alfa 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	Alfa	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)	Alfa	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

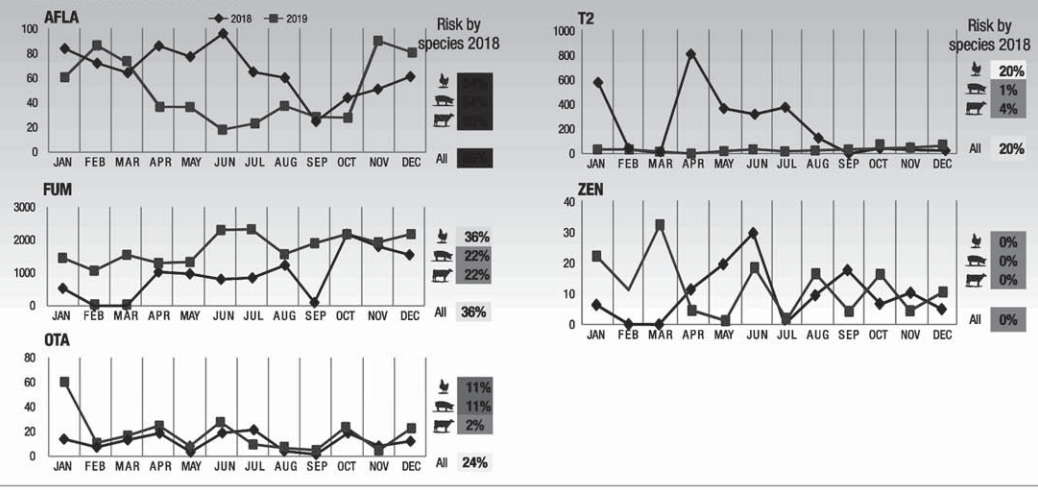
(1) wheat, barley, oat, rice sorghum, triticale...

OLEAGINOUS(2)	Alfa	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...

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

MYCOTOXYN LEVEL EVOLUTION



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

Global risk 38%

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	Alfa	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)	Alfa	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

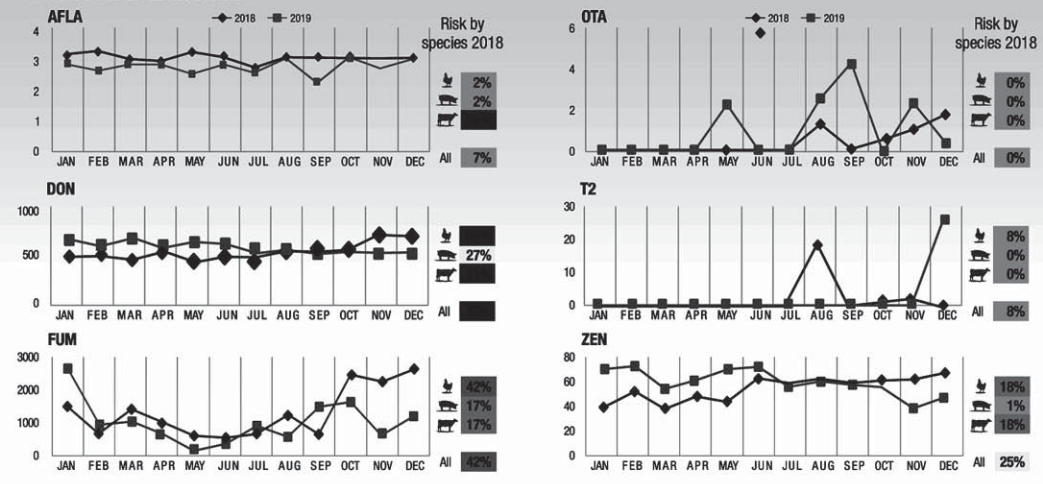
(1) wheat, barley, oat, rice sorghum, triticale...

OLEAGINOUS(2)	Alfa	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...

Extreme risk	50 – 100 %	High risk	20 – 30 %
Severe risk	40 – 50 %	Moderate risk	10 – 20 %
Very high risk	30 – 40 %	Low risk	00 – 10 %

MYCOTOXYN LEVEL EVOLUTION



CARGILL WORLD MYCOTOXIN SURVEY Jan - Dec 2019

4

Europe

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: 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

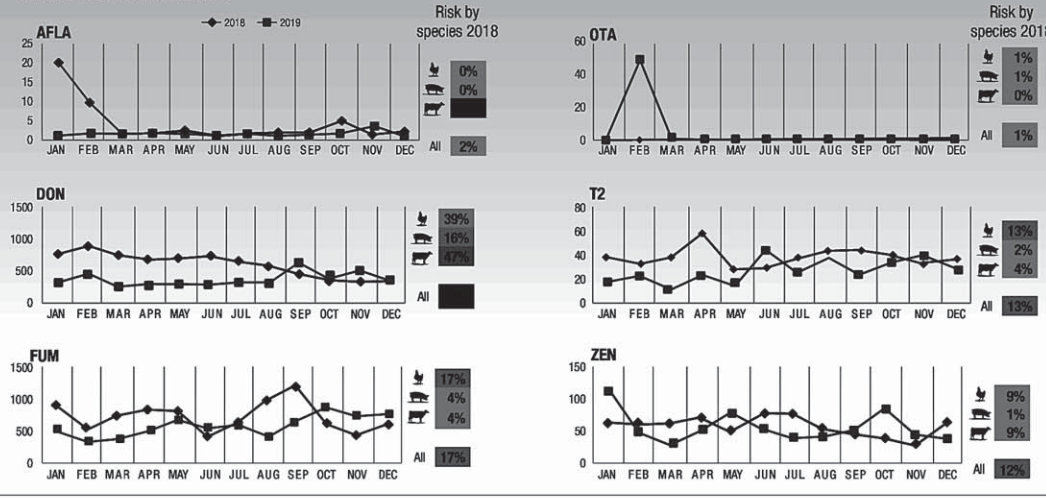
(1) wheat, barley, oat, rice sorghum, triticale...

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...

Extreme risk	50 – 100 %	High risk	20 – 30 %
Severe risk	40 – 50 %	Moderate risk	10 – 20 %
Very high risk	30 – 40 %	Low risk	00 – 10 %

MYCOTOXYN LEVEL EVOLUTION



CARGILL WORLD MYCOTOXIN SURVEY Jan - Dec 2019

5

Middle East Asia & Africa

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

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

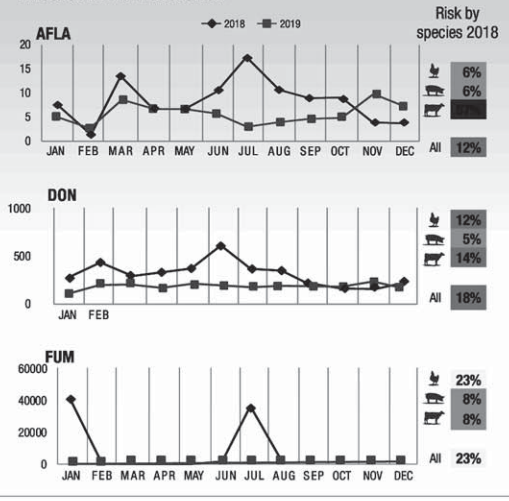
(1) wheat, barley, oat, rice sorghum, triticale...

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...

Extreme risk	50 – 100 %	High risk	20 – 30 %
Severe risk	40 – 50 %	Moderate risk	10 – 20 %
Very high risk	30 – 40 %	Low risk	00 – 10 %

MYCOTOXYN LEVEL EVOLUTION



CARGILL WORLD MYCOTOXIN SURVEY Jan - Dec 2019

6

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

40% 23%

Global risk 43%

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	Alfa	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]	Alfa	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

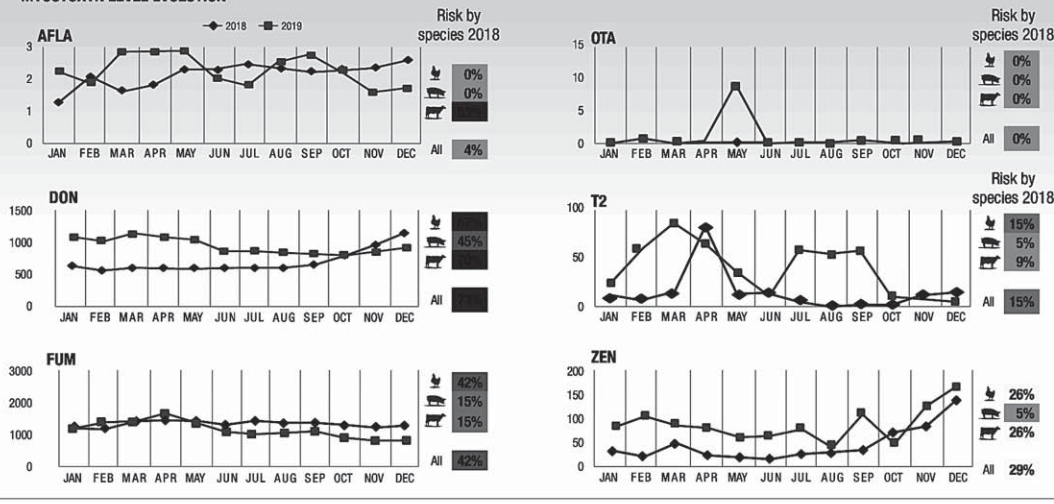
(1) wheat, barley, oat, rice sorghum, triticale...

OLEAGINOUS[2]	Alfa	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...

Extreme risk	50 – 100 %	High risk	20 – 30 %
Severe risk	40 – 50 %	Moderate risk	10 – 20 %
Very high risk	30 – 40 %	Low risk	00 – 10 %

MYCOTOXYN LEVEL EVOLUTION



CARGILL WORLD MYCOTOXIN SURVEY Jan - Dec 2019

7

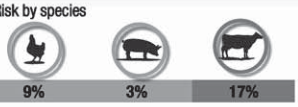
Russia

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: 13%

FOCUS

- Importment 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

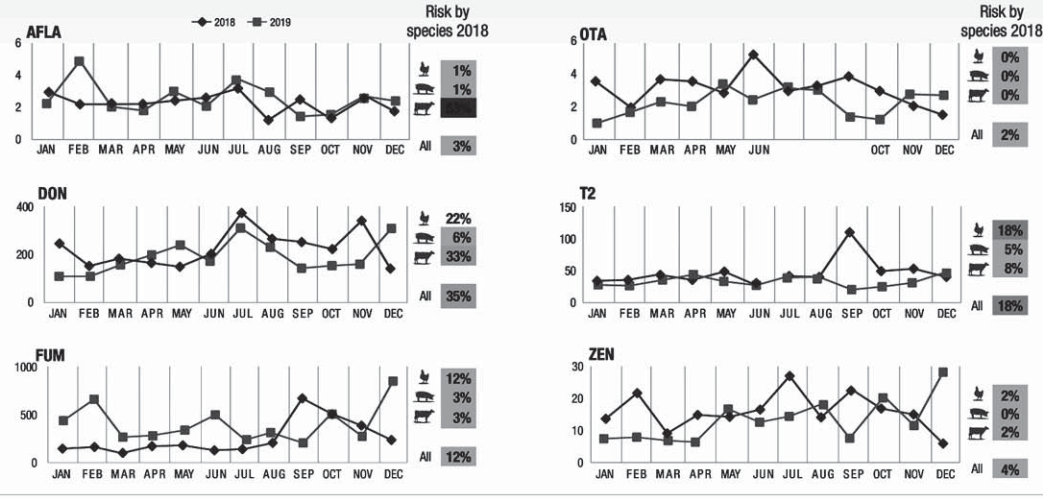
(1) wheat, barley, oat, rice sorghum, triticale...

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...

Extreme risk	50 – 100 %	High risk	20 – 30 %
Severe risk	40 – 50 %	Moderate risk	10 – 20 %
Very high risk	30 – 40 %	Low risk	00 – 10 %

MYCOTOXYN LEVEL EVOLUTION



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: 24% | 8% | 36%
Global risk: 28%

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	Alfa	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]	Alfa	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

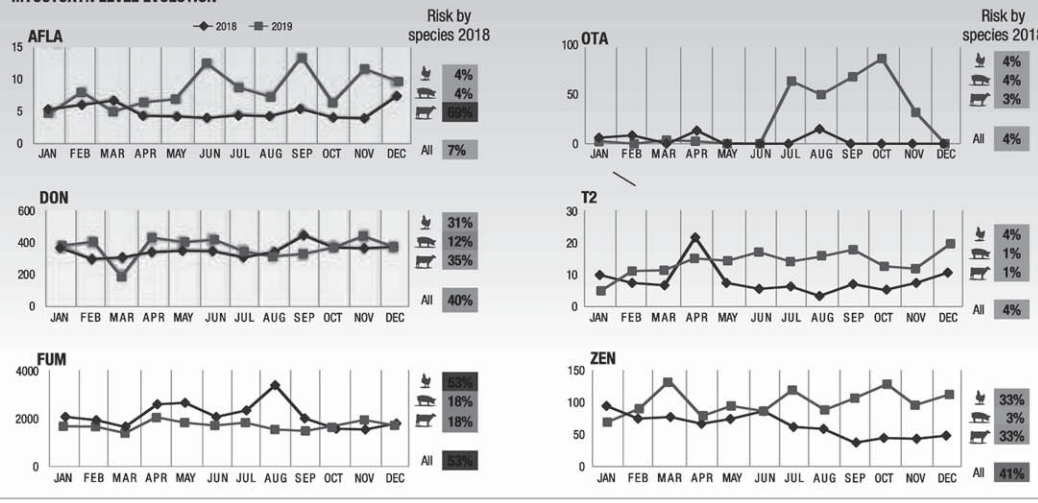
(1) wheat, barley, oat, rice sorghum, triticale...

OLEAGINOUS[2]	Alfa	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...

Extreme risk 50 – 100 % | Severe risk 40 – 50 % | Very high risk 30 – 40 %
High risk 20 – 30 % | Moderate risk 10 – 20 % | Low risk 00 – 10 %

MYCOTOXYN LEVEL EVOLUTION



CARGILL WORLD MYCOTOXIN SURVEY Jan - Dec 2019

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

21% 13% 32%

Global risk

25%

FOCUS
- High ALFA (75%), DON (71%), FUM (77%) contamination rate
- Extreme Afla 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...

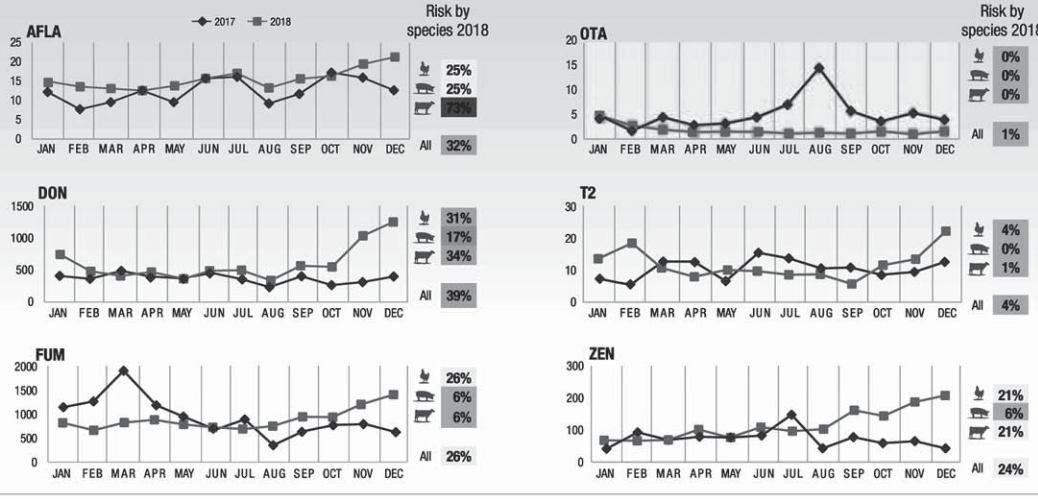
OLEAGINOUS[2]	Alfa	DON	FUM	OTA	T2	ZEN
Number contaminated samples	747	393	412	254	328	623
Number samples	1 206	944	904	736	641	1 052
% contaminated samples	62%	42%	46%	35%	51%	59%
Average of contaminated (ppb)	10	172	108	5	26	87
Maximum (ppb)	200	1 540	1 560	163	145	1 400

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

Extreme risk 50 – 100 %
Severe risk 40 – 50 %
Very high risk 30 – 40 %

High risk 20 – 30 %
Moderate risk 10 – 20 %
Low risk 00 – 10 %

MYCOTOXYN LEVEL EVOLUTION



CARGILL WORLD MYCOTOXIN SURVEY Jan - Dec 2019

सत्यमेव जयते

भारत सरकार
मत्स्यपालन, पशुपालन एवं डेयरी मंत्रालय
पशुपालन और डेयरी विभाग
कृषि भवन, नई दिल्ली–110001
Government of India
Ministry of Fisheries, Animal Husbandry & Dairying
Department of Animal Husbandry & Dairying
Krishi Bhawan, New Delhi-110001

डॉ. प्रवीण मलिक
पशु पालन आयुक्त
Dr Praveen Malik
Animal Husbandry Commissioner
Ph: 011-23384146

D.O. No. I-11/1-2020-LH **Dated 10 February 2020**

Dear Mr Sardana,

Please refer to your email dated Feb 10, 2020 seeking clarification on the issue of livestock product consumption *vis a vis* 2019-novel corona virus (2019-nCoV). In this context, this is to clarify that predominant route of transmission of 2019-nCoV appears to be human to human as per OIE, though 2019-nCoV may have had an animal source, which requires further investigation. Poultry has not been found to be involved in transmission of 2019-nCoV to human so far in any report globally. Similar viral outbreaks of corona virus in the past (SARS 2002-03, MERS 2012-13) or Corona associated common cold had no involvement of poultry or poultry products world over.

Thus, with present knowledge of affairs of 2019-nCoV, consumption of poultry and poultry products may be considered safe. General principles of hygiene, however, may be followed as per suggestions of WHO/OIE.

Yours sincerely,

10/2/2020

(Praveen Malik)

Mr Vijay Sardana
Advisor
Poultry Federation of India
714, Mayur Vihar Phase II
New Delhi - 110091

CHICKEN CONSUMPTION IS SAFE.
CONFIRMS GOVT OF INDIA.

BROILER LIFTING RATES FOR THE MONTH OF JANUARY 2020

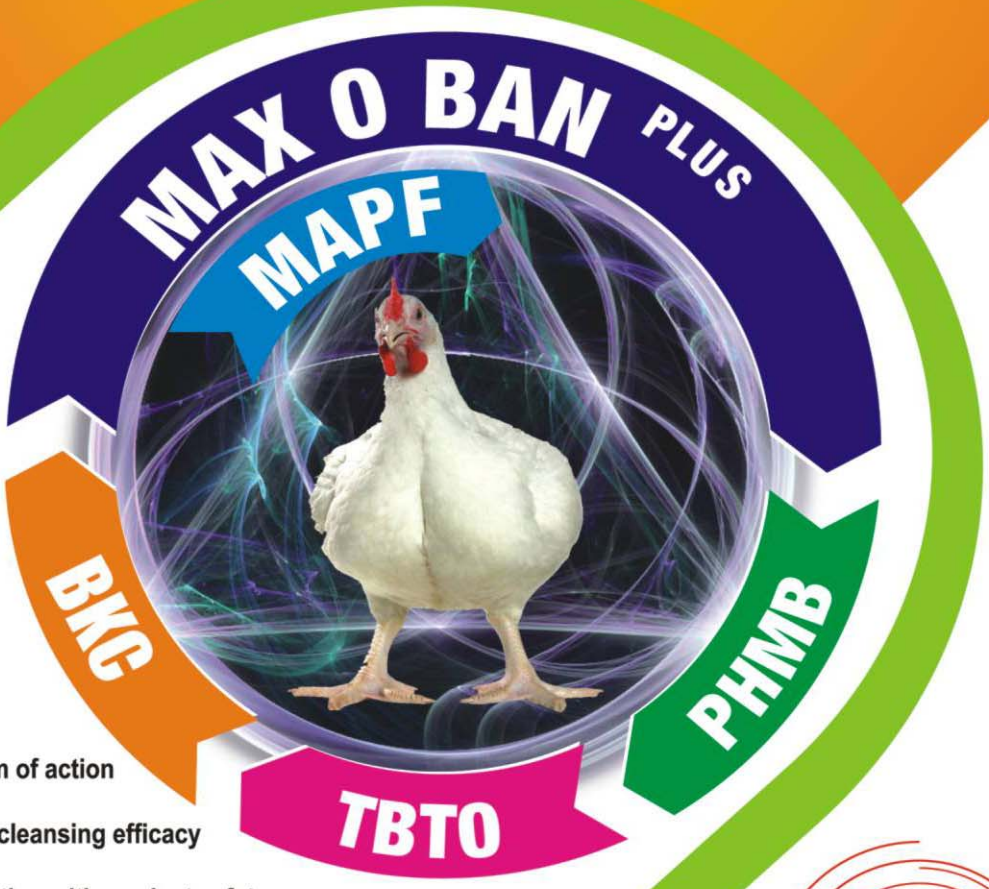
place	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Hyderabad	92	92	85	87	90	90	93	93	93	88	88	83	83	85	87	87	87	87	87	87	83	83	85	85	85	85	85	80	80	80	80
Karimnagar	92	92	85	87	90	90	93	93	93	88	88	83	83	85	87	87	87	87	87	87	83	83	85	85	85	85	85	80	80	80	80
Warangal	92	92	85	87	90	90	93	93	93	88	88	83	83	85	87	87	87	87	87	87	83	83	85	85	85	85	85	80	80	80	80
Mahaboobnagar	92	92	85	87	90	90	93	93	93	88	88	83	83	85	87	87	87	87	87	87	83	83	85	85	85	85	85	80	80	80	80
Kurnool	92	92	85	87	90	90	93	93	93	88	88	83	83	85	87	87	87	87	87	87	83	83	85	85	85	85	85	80	80	80	80
Vizag	93	93	88	90	92	92	92	92	92	88	88	83	83	83	85	85	85	85	85	85	80	80	80	80	80	80	80	75	75	75	75
Godavari	93	93	88	90	92	92	94	94	94	90	90	85	85	85	87	87	87	87	87	87	82	82	84	84	84	84	84	79	79	79	79
Vijayawada	95	95	92	94	96	96	98	98	98	94	94	94	90	90	93	93	93	93	93	93	88	88	90	90	90	90	90	85	85	85	85
Guntur	94	94	92	94	96	96	98	98	98	94																					

Beat the Bugs

ROSSARI
making you more competitive

MAX O BAN PLUS

**Don't let the microbial threats eat away your profits,
Biosecure your farm with Rossari broad spectrum biocide**



- Broad spectrum of action
- Water piepline cleansing efficacy
- Ease of application with product safety
- No microbial resistance due to complex action
- Formulation offers enhanced antifungal activity
- Innovative formulation provides excellent activity even in presence of biofilms and organic matter

Presentation
1 L & 5 L pack

ROSSARI BIOTECH LIMITED
(An ISO 9001:2015 & 14001:2015 Certified Company)
201 A-B, Ackruti Corporate Park, LBS Marg, Next to GE Gardens, Kanjurmarg (W), Mumbai - 400 078. India.
Tel. No.: +91-22-6123 3800, Fax: +91-22-2579 6982, Email: info@rossarimail.com, Website: www.rossari.com

Date of Publishing: 1
Date of Posting: 4th & 5th of every month

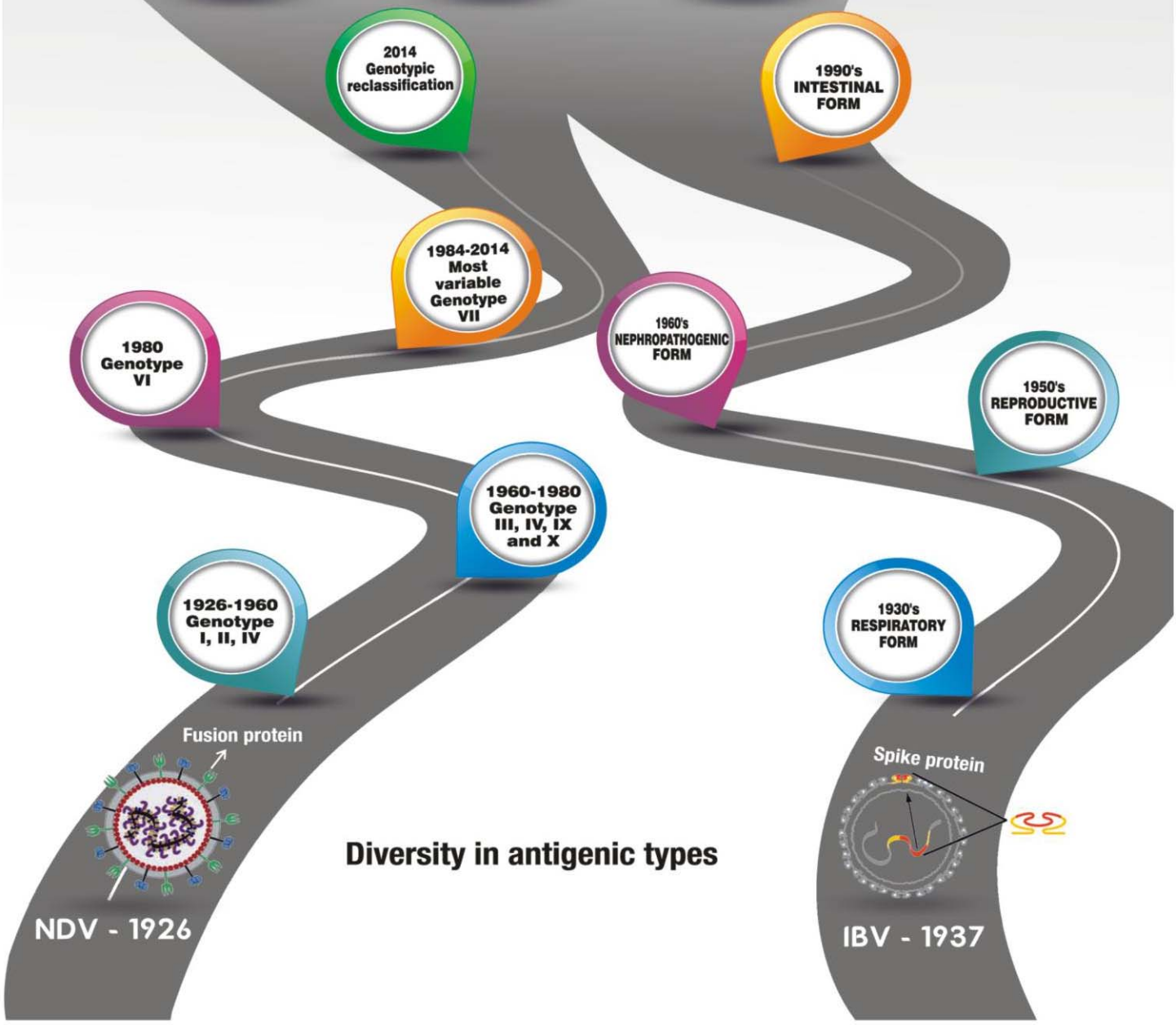
POULTRY LINE RNI APBIL/2001/3823
Postal Registration No. HSE/751/2018-2020

VH NEWBRO-MN

NEWCASTLE DISEASE AND AVIAN INFECTIOUS BRONCHITIS VACCINE INACTIVATED

Venworld™
THE BEST IN ANIMAL HEALTHCARE

Genotype XIII | **INDIA** | **Novel NPR Variants**



VENTRI BIOLOGICALS
(Vaccine Division of VHPL)

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

Email: ventri.biologicals@venkys.com

www.venkys.com