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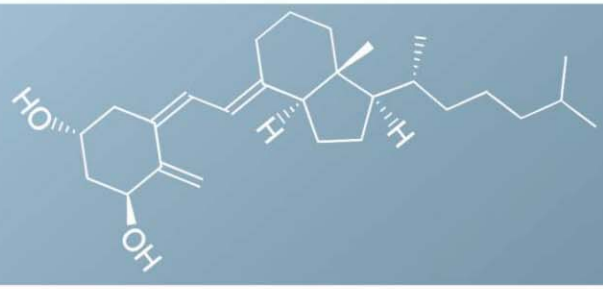

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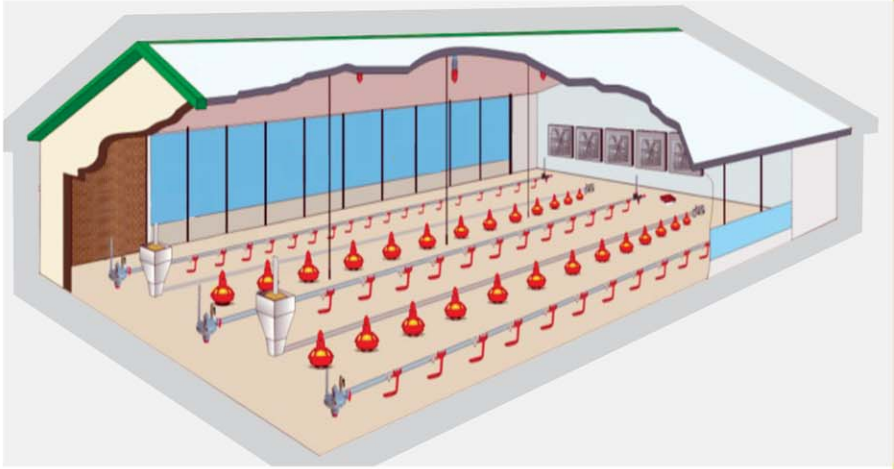

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INDEX OF ADVERTISEMENTS

Understanding aflatoxicosis in poutlry with strategies for effective management and control

Dr S. Rajalakshmi[1], Dr J. John Kirubaharan[3], Dr Ranjani Rajasekaran[2] and Dr M. Vidhya[1]

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Poultry industry is one of the fast growing sectors of Animal husbandry in Tamil Nadu. The poultry production system in the State is either backyard or commercial rearing. The increasing demand of poultry eggs and meat as valuable source of protein, has imposed a tremendous pressure on the feeding, health, rearing practices and management of poultry. The poultry feed for any production system is procured by the farmers from various outlets. Crude protein is a major component for all the finished poultry feeds, the major sources being – Corn, maize, rice bran and soyabean.

The feed outlets store these finished poultry feeds under varied environmental conditions. Contamination with microorganisms is possible to a greater extent, especially fungi and their mycotoxins which are produced under favorable conditions. Amongst the major microbial factors suppressing poultry productivity and product quality, Aflatoxicosis is an important fungal infection affecting all species of poultry. Aflatoxin is also the most toxic of all the mycotoxins in animals and poultry. The impact of feeding poultry with Aflatoxin-contaminated feed is manifold. The mycotoxin produces deleterious effects on the health and productivity levels in other domestic species too.

AFLATOXICOSIS:

Aflatoxicosis is a type of mycotoxicosis, caused by the fungi - *Aspergillus flavus* and *A. parasiticus*. A great economic impact of Aflatoxicosis is felt by the crop and poultry producers. Mycotoxins are the toxic metabolites synthesized by some naturally-occurring fungi on animal feed, feed ingredients and other crops. **Aflatoxins**, a specific group of mycotoxins are secondary metabolites produced by some species of the Genus: *Aspergillus*. Of the various forms of Aflatoxins, Aflatoxin-B1 (AFB1) is more toxic and more of a risk for human food, in both plant and animal products.

Sources of Aflatoxins and predisposing factors:

Aspergillus fungi can grow and contaminate grains and cereals (maize and corn commonly) at any time. This contamination may arise either due to heavy rains at harvest and post-harvest, or during transportation, or during processing of feed ingredients, or formulated feeds after processing, or inadequate drying of crop before storage. The fungal spores remain dormant until a moisture level of more than 12 per cent, temperature of 25-35^{o}C, humidity of 80 per cent and adequate aeration are available, which activate their growth.

Safety level of Aflatoxins:

About 20 ppb of Aflatoxin is considered as the highest safe level in the poultry feeds. The toxin contamination level in feedstuffs has been reported to be of a wide range, and usually crosses 20 ppb in the feeds of most countries. Also, the level of this major mycotoxin in the feed is often influenced by the co-occurrence of other mycotoxins at different levels, thereby worsening the disease condition.

Impact of Aflatoxicosis:

The condition affects all domestic species, but poultry are the most sensitive to Aflatoxin contamination, with the order of sensitivity being ducks > turkeys > Japanese quails > chickens. The chicks are most often affected with high mortality. Reduced feed intake, poor feed conversion ratio, decrease in quality and quantity of egg production, predisposition to secondary infections are the common clinical manifestations. Impaired hepatic protein production contributes to the toxin-induced changes in eggs. On the whole; haematological, immunological and pathological effects are the major implications in birds feeding on aflatoxin-contaminated feed, with reduced immune response against other major infections like Newcastle disease, avian influenza, etc. It also causes changes in the muscle arrangement, thereby reducing the dressed weight. The poultry products arising out of these intoxicated poultry are in turn unsafe for human consumption too.

Prevention strategies:

The preventive methods which can be followed either during harvest or storage of feedstuffs, can reduce the potential risk of Aflatoxin contamination. The feed

ingredients used for formulating the poultry ration must be safe and maintained clean at all levels to prevent contamination. Therefore it is critical to evaluate the microbiological quality of feed and potential sources of contamination during the feed production process. A practical note on the detoxification procedures are discussed below;

(A) Physical methods:

i) Exposure to sunlight or irradiation can reduce the toxin content considerably.

ii) Blowing away grain dust and other shallow particles by aspiration also clears the contaminant to some extent.

iii) Solvent extraction of toxin from feedstuffs.

(B) Chemical methods:

i) Treating Aflatoxin-contaminated feed with ammonia was commonly used earlier, but the toxicity of the reaction product classified it as 'unsafe', and hence not used.

ii) Adsorption of the toxin with potential mycotoxin binders like bentonites, during the digestive process in the gastrointestinal tract,

(C) Biological methods:

Many microorganisms or enzymes are being used to reduce the activity of the different mycotoxins, converting them into non-toxic metabolites. The *Eubacterium* strain from bovine rumen fluid, yeast strain – *Trichosporon mycotoxinivorans*; some probiotic strains of *Lactobacillus, Bifidobacterium, Propionio bacterium* have also been reported to function as mycotoxin-deactivating feed additives.

Control strategies:

The following practices may be adopted to avoid the contamination risk of Aflatoxicosis;

i) Ensuring complete drying of harvested grains

ii) Dry storage of feed ingredients.

iii) Pelleted feed must be preferred, as the production process destroys the fungal spores.

iv) Fish meal if used in the poultry feed, must not be stored more than three weeks.

v) Hygienic maintenance of feeders, waterers, feed storage bins and regular disinfection of premises with 2-3% formalin or copper sulphate.

vi) Frequent clearing of feed or water spillage and wet litter.

vii) Environmental monitoring on a periodical basis.

viii) Proper ventilation of poultry houses to avoid high relative humidity.

ix) Transport of feed composites from the feed mills to the retailers or farms are potential portals of contamination. The feed bags must not be transported in a dumped condition.

x) Nutritional balancing – increasing crude protein content, supplementation of additional levels of riboflavin, pyridoxine, folic acid and choline. Supplementation with Selenium helps to boost detoxification and immune functions of the birds.

xi) The farmers may be encouraged to follow GAP (Good Agricultural Practices) after the harvest of crops. GAPs include timely planting, providing adequate plant nutrition, control of weed growth in plantation area and crop rotation.

xii) The feed manufacturers also must have a rapid screening of Aflatoxin as a quality control check, ensuring quality supply of ingredients.

xiii) Antifungal agents like organic acids, copper sulphate, gentian violet may be used in and around storage bins.

How to sample feed for Mycotoxin analysis?

Usually mycotoxins are not evenly distributed in the animal/poultry feed. Some areas of feed sample may contain very high mycotoxin levels; other areas may contain no detectable amounts. The quality and quantity of sample provided for analysis determines the extent of detection in the feeds. The sample should reflect all of the feed available at the time of occurrence of the problem.

Following are some general considerations to be kept in mind while sampling feeds for mycotoxin analysis;

1. The sample must be collected soon after onset of animal /bird health problems.
2. A good quantity of atleast 500 grams of feed sample must be collected from different sites, so that mycotoxin contamination is not missed. Feed must be sampled from sites of ingredient storage, feed manufacture, transport, feed storage bins and feeders.
3. Sampling based upon visible presence of molds does not always provide a sample that contains mycotoxins. Detectable amounts of any known

mycotoxins may not be present in very mouldy feeds, whereas feed appearing good may have very high concentrations.

4. It is best to collect a sample during movement of the feed, like when moving it from the storage bin into a grain truck.
5. Feed samples must be preferably dry before transport to the feed testing laboratory. Wet feed sample favours the growth of moulds, especially if placed in a plastic bag. The feed may be dried in an oven for a short time, to less than 13% moisture for best preservation.
6. Send the feed sample in zip-lock bag on ice in a thermocol box, or in a clean and dry paper wrapping.

Aflatoxins are of equal concern to the human beings because of the residues left in the milk, meat, eggs and animal products. Regular screening of poultry feed both at the manufacturer's end as well as at the poultry farmer's end will help to curtail the condition, preventing huge economic loss. Appropriate use of detoxifying agents and toxin binders can help in alleviating the toxin issues without affecting the birds. In conclusion, good quality of tested poultry feed, good agricultural and management practices and proper nutritional balance can help evade the effects of Aflatoxicosis for improved productivity in poultry farms.

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Indigenous Poultry Germplasm of India

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Introduction Backyard farming has over the years contributed to a great extent to the agrarian economy of different countries. It provides livelihood security to the family in addition to securing the availability of food. Chickens are the most popular poultry worldwide irrespective of culture and region. Birds managed under backyard system contribute crucially to women livelihood and are of critical cultural importance in the lives of native communities. More than 80% of the world poultry production is in village production system contributing up to 90% of poultry products in some developing countries. Village poultry makes a substantial contribution to household food security throughout the developing world. It helps to diversify income, provides high quality food and fertilizer, and acts as a form of household savings and insurance. The importance of native breeds of poultry birds for the rural economy in developing and underdeveloped countries mostly in Asia and Africa is very high. They are part of a balanced farming system that has vital roles in the rural households as a source of high-quality animal protein and emergency cash income and play a significant role in the socio-cultural life of the rural community and woman empowerment. One of the most important positive characters of native chicken is their hardiness, which is the ability to tolerate the harsh environmental condition and poor husbandry practices without much loss in production. The native breed chickens are the reservoir of genomes and major genes for improvement of high yielding exotic germplasm for tropical adaptability and disease resistance. The low production performance of native breeds of chickens may be improved through improvement in husbandry practices, better healthcare, and supplementary feeds during lean season and also through selection and crossbreeding. Cross breeding with exotic germplasm showed the improvement quickly; however, selection in native breeds can bring the improvement permanently. In India, some of the important breeds/varieties which have been documented and many nondescript desi chicken, breeds are also reported.

Details of Indigenous Poultry Germplasm

S. No	Breed	Home tract	Description	Production Performance
1.	Ankleshwar	Gujarat	Golden yellow plumage is predominant in cocks. Black golden is more common in hens	Age at 1st egg: 5 months, Fertility rate: 91.3 %, Hatchability on total egg production: 92.4 %
2.	Aseel	Andhra Pradesh, Uttar Pradesh, Chattisgarh	Majestic stamina Pride breed of India Bred mainly for cock fighting	Age at 1st egg: 6 - 7 months, Fertility rate: 84.28%, Hatchability on total egg production: 86.11 %
3.	Bursa	Gujarat, Maharastra	Wide variation in body color	Age at 1st egg: 5 – 7 months, Hatchability on total egg production: 60-85%, Annual egg production: 40 – 66.
4.	Chittagong/ Malay	Northeastern states of India bordering Bangladesh	Game birds	Quarrelsome temperament

5.	Danki/ Dinki	Andrapradesh	Fighting purpose, Ability to fight without slashers	Age at 1st egg: 6 - 8months, Fertility rate: 70 - 85%, Annual egg production: 25 – 35.
6.	Daothgir	Assam	The bear plumage of different colors Black interspersed with white feathers Flowers of Thigir plant resembles this bird's comb	Age at the 1st egg: 5 months, Annual egg production: 45.
7.	Hansli	Orissa	Tastier than farm-bred chicken, Fighting cock	Age at the 1st egg: 6 months, Annual egg production: 50 – 60.
8.	Harringhatta black	West Bengal	Excellent breed for backyard rearing, Jet black body with white shanks	Annual egg production: 130
9.	Ghagus/ Ghegu	Karnataka, Andhra Paradesh	For egg and meat production	Age at 1st egg: 6 - 8 months, Hatchability on total egg production:60 - 85%, Annual egg production: 45 – 60.
10.	Kadaknath/kalamasi	Madhya Pradesh	Meat and blood is black in color	Age at the 1st egg: 6 months, Fertility rate: 74%, Hatchability on total egg production: 61%, Annual egg production: 85 – 90.
11.	Kalasthi	Andhra Pradesh	For meat purpose	Age at the 1st egg: 6 - 9 months, Hatchability on total egg production: 60 - 85%, Annual egg production: 30 – 42.
12.	Kashmir favorlla	Jammu &Kashmir	Meat and egg production Feathered comb & presence of the fifth toe	Age at the 1st egg: 6 months, Fertility rate: 77%, Hatchability on total egg production: 64%, Annual egg production: 60 – 67.
13.	Kaunayen	Manipur	Cock Fighting Fight for a longer duration	Age at 1st egg: 6 - 7 months, Hatchability on total egg production: 66%, Annual egg production: 35.
14.	Mewari	Rajasthan	For egg and meat purpose	Annual egg production: 37 – 62.
15.	Miri	Assam	For egg and meat purpose	Age at the 1st egg: 6.6 - 7.5 months, Fertility rate:87 - 91%, Hatchability on total egg production: 73-83%, Annual egg production: 54 – 67.
16.	Nicobari	Andaman & Nicobar islands	Short legged and compact body Adopted to hot and humid ecological zones Highest egg production among indigenous	Age at the 1st egg: 4.7 - 9.2 months, Fertility rate: 62 -98%, Hatchability on total egg production: 60-86%, Annual egg production: 112 – 237.
17.	Punjab brown	Punjab & Haryana	Meat and egg production, Male: Black stripes on their neck, wings and tail	Age at sexual maturity: 30.
18.	Tellicherry	Kerala	Mainly for meat production Black with a shining bluish tinge on the hackle Hen makes noise after laying Ayurvedic medicine for asthma treatment	Age at 1st egg: 5 - 8 months, Hatchability on total egg production: 70-80%, Annual egg production: 60-80.

19.	Uttara	Uttarakhand	Plumage is black in colour. Comb is single. These birds have feathered shank which is not present in any other indigenous breed of chicken. About 18% of birds have bunch of feathers on head (crest/ crown). Broodiness is usual. The birds are more noisy and flighty.	Annual egg production ranges from 125 to 160, Egg weight - 49.8 to 52.7g. Adult Weight: Cocks- 1.3kg and Hens- 1.1kg.

Advantages of rearing Indigenous birds

- Acceptability of the colored desi bird by the landless labourers or marginal farmers.
- Use of broodiness for hatching the chicks.
- The capability of self-defense from predators due to its alertness, light body weight longer shank length, camouflage characters, and aggressiveness.
- Have better adaptability to extreme climatic conditions prevailing in the country.
- Can thrive well under adverse environments like poor housing, poor management, and poor feeding.
- Indigenous birds are comparatively disease resistant to protozoon and ectoparasites.
- They are comparatively hardier and need less health care than exotic birds.
- The meat from native fowl has significantly higher amino acid contents (arginine and lysine) than meat from exotic birds.
- The brown-shelled eggs of native fowl are rich in threonine and valine than farm eggs, have good flavor and fetch a premium price.
- Indigenous meat is widely preferred especially because of their pigmentation, taste, leanness, and suitability for special dishes and often fetches higher prices.

The native genetic resources are the gold mines of genomes and major genes for improvement of high yielding exotic germplasm for tropical adaptability and disease resistance. Up gradation of the native breeds of chickens through different breeding technique helps to increase the productivity of the germplasm and also their conservation in their natural habitat as the rural people will be very happy to rear them for their adaptability to the harsh environment.

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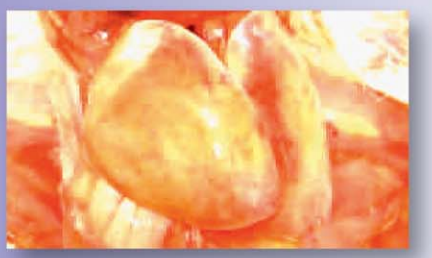

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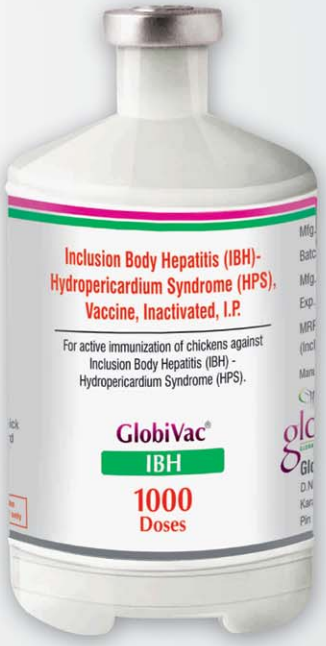

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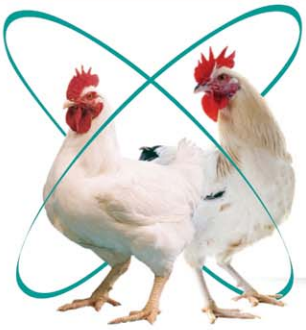

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Addressing the Superbug Concern: Phage Therapy Could Beat Drug Resistant Illnesses

Dr. Ramdas Kambale, Sr.VP, Vetphage Pharmaceuticals

Dr. Ramdas Kambale

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

One of the leading healthcare challenges of our times is the emergence of "superbugs" which are nearly impossible to treat. These 'superbugs' or drug-resistant micro-organisms are claiming an increasing number of lives every year. If the superbug threat is not dealt with, the deaths from drug-resistant infections could increase to a whopping 10 million every year by 2050 from around 700,000 currently. In fact, medical researchers have pointed out that the burden of such resistant infectionsis comparable to that of tuberculosis, HIV/ AIDS and influenzaput together.This has promptedresearchers and medical experts to look for viable alternative treatments and has elicited fresh interest in an age-old intelligence, called phage therapy.

Can Phage Therapy be the potential answer?

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

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

Phage Therapy in rearing healthy poultry

Poultry is one of the fastest growing segments of the agricultural sector in India today. While the production of agricultural crops has been rising at a rate of 1.5 to 2 percent per annum that of eggs and broilers has been rising at a rate of 8 to 10 percent per annum. As a result, India is now the

world's fifth largest egg producer and the eighteenth largest producer of broilers. Nonetheless the bigger question is whether or not they are fit for consumption.

In a recently concluded study it was established that most of the antibiotics being used in the poultry and aquaculture industry for farmed animals are increasingly losing their activity against pathogenic microorganisms. Moreover, the use of antimicrobial agents in animal husbandry has been linked to the development of resistant bacteria. If not kept in check use of antibiotics during poultry production can threaten the safety of such products through microbial residues as well as help spread microbial resistance. This has prompted many countries to withdraw antibiotics from being used in animal production as well as set up regulatory authorities for selected antibiotics as well encourage the use of bacteriophages. This is largely because phages are safe as they are only able to infect bacterial cells not human or animal cells. Without the presence of their bacterial host they become inactive within 48 hours.

Phages when consumed as part of animal feed keep the animals safe from bacterial infections. Moreover, they also do not damage the beneficial micro biome balance in animals. Phage therapy is now emerging as a useful tool in controlling bacterial infections among poultry while also encouraging growth of healthy poultry.

How we Identifyand use Phages

ProteonPharmaceuticals, one of the pioneering organizations working to introduce phage therapy in animal husbandry, has the most advanced Artificial Intelligence-supported technology to determine whether phages are lytic or not. When dealing with phages it is important that only lytic phages are used in animal health. This is because lysogenic phages are dormant and embed themselves in the bacterial cell wall to live off it without destroying it. On the other hand Lytic phages cause lysis which is destruction of the bacteria.

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

Effect of Amino Acid Balance in Poultry Feed

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Introduction:

Chicken body contains about 20% protein on wet basis and 75% on dry matter basis. Several types of proteins are present in the body of chicken. Nearly half of the dry weight of a typical animal cellis protein. The amino acids are chemical compounds which contain both an acidic carboxyl (-COOH) and a basic amino ($-NH_2$) group. All the proteins in a feed stuff are often referred collectively as "protein", although they do differ in individual composition. It is the specific sequence of amino acids and the manner in which the amino acids stands are connected to each other that determine the physical and chemical properties of each individual protein. The protein content in feed ingredients is variable.All protein contains Carbon (50%), Hydrogen (7%), Oxygen (23), Nitrogen (16) and generallySulphur (0-3%) with occasional occurrence of Phosphorus (0-3).

Classification of amino acids:

Animals like plant, synthesize proteins containing twenty two (22) amino acids. Amino acids which can not be synthesized by animals and therefore must be supplied in the diet are classified as the essential or indispensible amino acids. Of these, a few can not be synthesized at a rate fast enough for maximum growth and therefore should be supplied in the diet.

Critical amino acids for chicken are Lysine, Methionine, Tryptophan, threonine, Arginine and Isoleucine. Among the critical amino acids, lysine and methionine are the most deficient amino acids and are known as limiting amino acids and are known as limiting amino acids. Methionine and cystine are sulphur containing amino acids.

Assessing protein quality:

There are different methods for determining the relative effectiveness of dietary proteins in meeting the bird's protein and amino acid requirements.

i) Nitrogen balance:

ii) Net protein utilization:

iii) Protein Retention Efficiency:

iv) Biological value:

Table.1. Classification of Amino Acids:

Not synthesized in chicken (Essential, Indispensable)	Synthesized from limited substrate	Readily synthesized in chickens from simple substrates (Non essential, Dispensable)
Arginine	Tyrosine	Alanine
Histidine	Cystine	Aspartic acid
Isoleucine	Hydroxylysine	Asparagine
Lysine		Glutamic acid
Leucine		Glutamine
Methionine		Hydroxyproline
Phenylalanine		Glycine
Threonine		Serine
Tryptophan		Proline
Valine		

Biological value is defined as the percentage of digested and absorbed protein that is retained by the bird. The use of the biological value technique for evaluating specific proteins in chickens is difficult because of problems associated with separate collection of urine and faeces. Egg white protein is usually used as a standard and given an arbitrary value of 100. The measurement of biological value has represented attempts to determine biologically how closely the pattern of amino acids in a particular feed protein will satisfy the needs of the growing bird. Whole egg protein under these conditions has been found to have a biological value of about 100, animal protein:72-79 and cereal protein:50-65. Biological value depends to a considerable extent on the protein content of the diet. Thus, whole egg may have biological value of 100 for young chicks when fed at 12% of the diet.

Different sources of protein:

Ingredients that contain more than 18% of their total weight in crude protein are generally classified as protein feed. Protein supplements may be categorical according to source of origin as Plant proteins, Animal proteins, Non protein nitrogen and Single cell proteins.Vegetable protein sources are Soybean meal (C.P.: 47%), Canola meal (C.P.:37.5%), Corn gluten meal (C.P.:60%), Cotton seed meal (C.P.:41%), Pea nut (ground nut) meal (C.P.:47%), Seasame meal (C.P.:44%), Sunflower meal (C.P.:46.8%), Lupins(C.P.:34.5%) and Flaxseed (C.P.:22%). Animal protein sources are Meat meal (C.P.:50%), Fish meal (C.P.:60%), Poultry by-product meal (C.P.:60%)and Feather meal(C.P.:82%).

Different factors responsible for protein and amino acid requirement:

For the immature bird, growth rate, feathering and skeletal development are the major criteria; while for the laying hen the emphasis changes to egg mass production and maintenance. Many factors may influence feed consumption and protein requirements of mature laying hens. Among these are

i) Size and breed of hen
ii) Environmental temperature
iii) Daily egg mass production
iv) Houses (cage or floor pens)
v) Feeding space per hen
vi) Depth of feed in automatic feeders
vii) Whether or not the hens are properly beak trimmed
viii) Stocking density
ix) Availability and composition of drinking water
x) Disease status in the flock
xi) Energy content of the diet

Heavy breeds of poultry consume considerably more feed than light weight breeds because heavier chickens require more energy for maintenance. The heavy breed also require more protein per day for maintenance and so need a somewhat higher overall daily protein intake than do white leghorn. Assuming that a heavy breed hen consumes approximately 115 gm of feed per day, a level of 18% protein in the diet provides about 21gm of protein per hen per day. However, a modern strain of small white leghorn consume only about 95gm of feed per hen per day. The protein and amino acid level in diets for heavy vs. light weight birds can vary by as much as 10 %.

Function of Protein:

i) Components of structural tissues (skin, feathers, bone,ligaments muscle, connective tissue, beak) and cells (lipoproteins, nucleoproteins, glycoproteins).
ii) Blood proteins maintain homeostasis, regulate osmotic pressure and are involved in clotting.
iii) Carry several nutrients in the blood (calcium, iron, fat soluble vitamins, fatty metabolites)
iv) All enzymes and many hormones are proteins.
v) Involved in absorption and transportation of nutrients and metabolites.
vi) Protein, as antibodies are concerned in immunological functions.
vii) Associated with genes.

Uric acid synthesis:

Unlike mammals, birds secrete waste or excess nitrogen as uric acid rather than as urea. Uric acid is a purine synthesized by a series of reactions that also are used for synthesis of other purines such as adenine and guanine, which are components of DNA. The final step in uric acid synthesis is controlled by the enzyme xanthine oxidase, a molybdenum containing enzyme. The level of xanthine oxidase in chicks liver changes with protein level in the diet. Avian kidney tubules actively secrete Uric acid into the urine and the removal of uric acid from the blood is normally quite efficient. Blood uric acid levels rarely exceed 5-10mg per 100 ml of chicken blood, even though adults may excrete 4-5gm of uric acid per day. This is necessary in chickens since uric acid is extremely insoluble (0.4Mmol/litre) and when blood levels are elevated, uric acid may precipitates in joints, under the skin and in the kidney producing severe gout.

Similarly, kidney damage as sometimes occurs with infectious bronchitis infection may hamper uric acid excretion and cause uric acid to accumulates in the body. There have been descriptions of genetic strains of birds that have difficulty in clearing uric acid from the kidney tubules, so are prone to gout. Glycine is an integral part of the uric acid molecule. Each time a molecule of uric acid is excreted, a molecule of glycine is lost. This is the reason that chickens have a very high requirement for glycine.Although, glycine is readily synthesized by chickens, this synthesis may not be rapid enough to satisfy need for tissue growth and nitrogen excretion during periods of rapid growth. Serine is an intermediate in glycine biosynthesis and can substitute for dietary glycine under these conditions.

Energy cost of protein metabolism:

Both the synthesis and degradation of protein and amino acids are energy demanding processes and these costs are necessarily included in model predictions of energy balance. Uric acid synthesis is much energy demanding than urea synthesis, and so bird inherits an energy cost for excreting an insoluble nitrogenous product. Estimate energy cost of uric acid synthesis is about 330 kcal/mole compared to just 85kcal/mole for urea production.

Amino acid deficiency:

Amino acid deficiency is a condition in which the dietary supply of one or more of the essential amino acids is less than that required for the efficient utilization of other amino acids and other nutrients. Diet may be deficient in respect of required quantity. The amino acid which provides the lowest proportion of the theoretical requirement is referred to as the first limiting amino acid (lysine). Deficiency is therefore judged against a control diet adequate in the supply of all essential amino acids. It may causes following condition.

Table.2. Order of limitation of Amino Acids in different feed:

Ingredients	Order of limitations				
	1st	2nd	3rd	4th	5th
Soyabean	Methionine	Threonine	Valine	Lysine	Isoleucine
Meat and Bone	Tryptophan	Methionine	Isoleucine	Threonine	Histidine
Maize	Lysine	Tryptophan	Isoleucine	Threonine	Valine
Milo	Lysine	Threonine	Methionine	Isoleucine	Tryptophan
Wheat	Lysine	Isoleucine	Methionine	Valine	Arginine
Barley	Lysine	Threonine	Methionine	Isoleucine	Valine

i) Depression in growth, egg production, egg weight and feed efficiency

ii) Weight loss

iii) Immune suppression

iv) Increased susceptibility to diseases

Amino Acid Imbalance:

Imbalance is produced by the addition to a diet low in total protein of either the second limiting amino acid or more usually a group of amino acids which does not include the first limiting amino acid. The adverse effect on performance can be avoided by supplementation with the first limiting amino acids. Feed intake is depressed and in this case, a deficient protein source has been made more deficient by the addition of other amino acids (except first limiting amino acid), thus resulted growth retardation much greater than that caused by original deficient diet. In such cases, the addition of small quantities of the limiting amino acid alone can prevent growth retardation. It seems possible, that at low protein intakes in which certain of the essential amino acids may be limiting, supplementation with amino acids without the first order limiting acid could have detrimental effect.

Amino acid antagonism:

In special cases, it has been shown that one amino acid affects the requirement of another by interfering with its metabolism. An example is the Lysine-arginine antagonism, wherein dietary lysine increases the requirement of arginine. Lysine acts by competing with arginine for reabsorption in the renal tubules increasing arginine excretion and byincreasing renal arginase activity and thus splitting arginine into urea and ornithine. However, excessive intake of lysine does not affect absorption of arginine for the gut. High lysine normally suppresses feed intake and growth depression in chicks, which can be reversed by additional arginine. Antagonism differs from imbalance in that the supplemented amino acids need not be limiting amino acids. Secondly, it refers to an excessive amount of amino acid in the diet which affects only those amino acids belonging to members of the structurally similar group.

Amino Acid Toxicity: The term, amino acid toxicity is used when the adverse effect of an amino acid in excess can not be overcome by supplementation with another amino acids. Ingestion of methionine, tyrosine or tryptophan in large amount, up to 2-3 times the requirement is followed by serious apart from growth depression. A dietary excess of tyrosine causes eye lesions. The toxic action of excess methionine has been attributed to inhibition of ATP synthesis. Methionine is the most toxic under high dose.

Table 3.Requirement of Protein % in Poultry Feed:

Characteristic	Requirement for Broiler Feed			Requirement for Layer feed			
	Pre-starter	Starter	Finisher	Chick	Grower	Layer Phase I	Layer Phase II
Protein %, Min.	23.0	22.0	20.0	20.0	16.0	18.0	16.0

Conclusion:

Amino acid is the building block of protein. Each amino acid constitutes a unit of any protein. Protein is necessary for life in more fundamental way than carbohydrates or lipids; “without protein, no life is possible”.

PRESS RELEASE

Technical Seminar at Chitwan, Nepal by Venkys' (India) Pvt. Limited.

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

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

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

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

In his talk Dr. Prakash Reddy emphasized upon importance of killed vaccination in mycoplasma control, selection of proper vaccine and schedule of vaccination. He also briefed about economic importance of mycoplasma in poultry. He told about importance of control of viral disease like New castle disease & infection bronchitis in poultry along with mycoplasma control for profitable poultry farming.

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

18th week & 40th week and mycoplasma prevention program with suitable anti-mycoplasma drugs up to 12 weeks.

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

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

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

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

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

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

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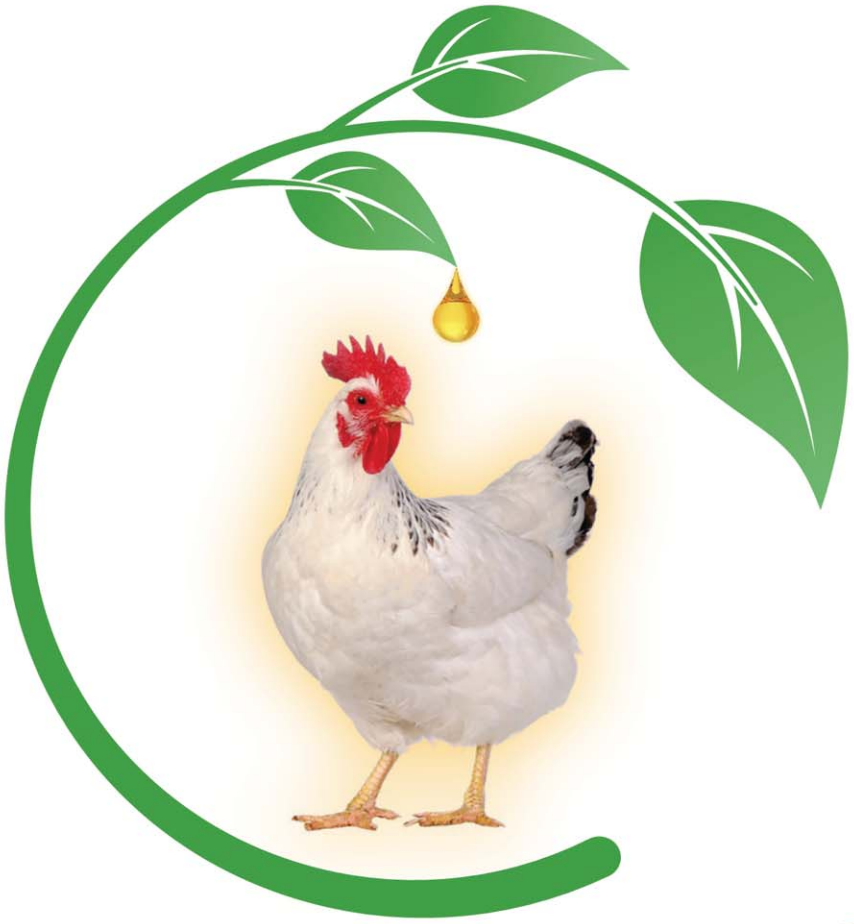

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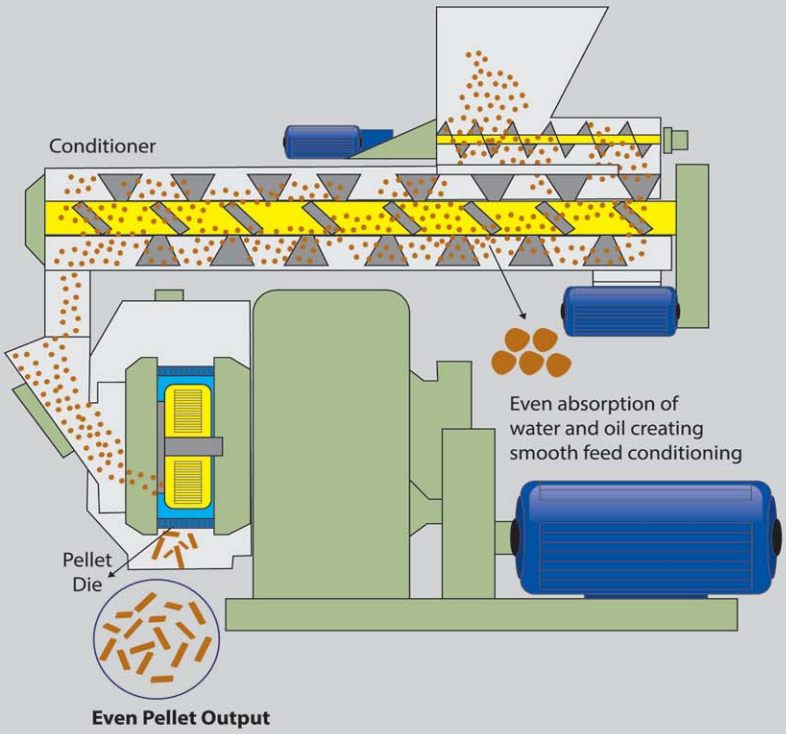

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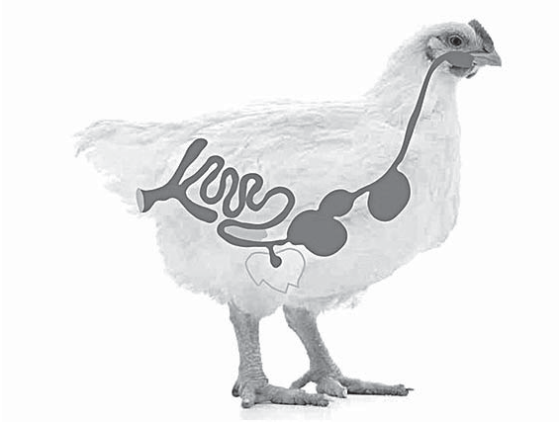
Biomin®

The Importance of Gut Health in Antibiotic-Free Production

Poultry producers face many challenges as they increase the number of flocks managed without antibiotics. Sound management practices and natural feed additives that support gut health will help producers manage the transition and protect flocks.



As consumer and regulatory opinions have evolved over the last several years, poultry producers are increasing the number of flocks raised without antibiotics. While dozens of countries have already banned the use of antibiotic growth promoters, many places where their use is not banned have seen a surge in demand for antibiotic-free products. The primary challenge that producers face in implementing antibiotic-free programs is to maintain intestinal health in order to prevent necrotic enteritis, one of the world's most common and financially crippling poultry diseases with mortality rates of up to 50%, without the use of in-feed medications

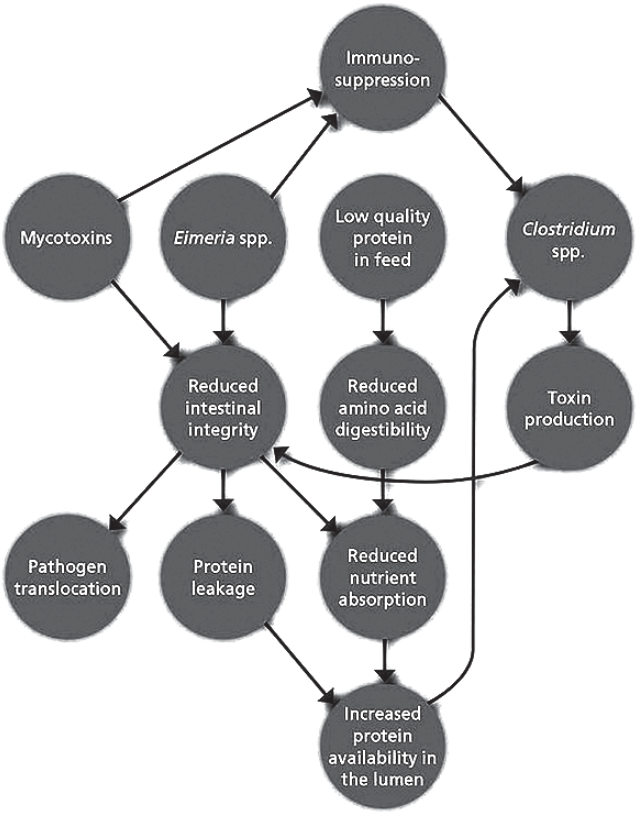
Less tools in the toolbox

Standard antibiotic-free (ABF) programs prohibit the use of several antibacterial agents, including antibiotic growth promoters, therapeutic antibiotics, and ionophores. Antibiotic growth promoters, or AGPs, are fed continuously at low (sub-therapeutic) levels to improve performance and flock uniformity, reduce bacterial infections and sub-clinical challenges, and improve flock health. Therapeutic antibiotics are used to treat bacterial diseases by impeding bacterial growth, provided they are used at recommended levels and the microorganism is not resistant. Treatment of clinical outbreaks shortens the duration of disease and reduces the spread of bacteria, resulting in reduced mortality. Lastly, ionophores are a class of antibiotics used solely for the purpose of preventing coccidiosis: a well-known predisposing factor for necrotic enteritis.

Making the shift

Eliminating these tools in ABF programs brings legitimate concerns for producers regarding performance, flock uniformity, and disease incidence –particularly necrotic enteritis and other bacterial pathogens. Furthermore, since flocks treated with an antibiotic must be removed from the program, hesitance to treat birds and compromise their antibiotic-free status could lead

Figure 1: Factors influencing the development of necrotic enteritis



to health and welfare issues and increased mortality due to disease. Several factors can have a considerable impact on the proliferation of *Clostridium perfringens* and the successful shift to antibiotic-free production, including management practices, nutritional factors, coccidiosis, and mycotoxin contamination (*Figure 1*).

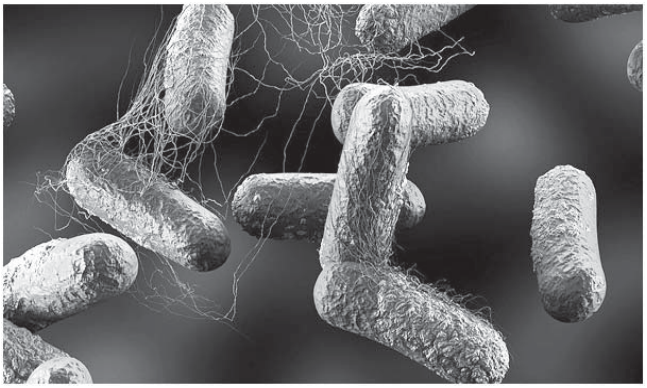
Management practices

The biggest aspect to consider is the environmental bacterial load. A number of factors are known to increase the risk of bacterial challenges, including attenuated breeder health, improper hatchery and egg sanitation, reduced house down-time, increased stocking density, poor litter management, and contamination through service personnel, visitors, and vehicle traffic.

Nutritional factors

Diet constitutes a key risk factor having a strong impact on the incidence of necrotic enteritis in broiler chickens. Indigestible dietary protein, such as that found in animal proteins like meat and bone meal or fish meal, cannot be digested and absorbed in the upper part of the intestinal tract.

Instead, protein builds up in the lower portion of the intestinal tract which can then act as a substrate for the gut microbiota. The fermentation of protein produces unfavorable by-products such as amines and ammonia, increasing intestinal pH and encouraging the proliferation of pathogenic bacteria.



Coccidial infection, resulting either from natural disease outbreak or from introduction at low levels through live coccidiosis vaccination, can damage the intestinal epithelium, allowing the leakage of plasma proteins into the intestinal lumen –a rich nutrient substrate that *C. perfringens* can exploit for proliferation and toxin production. This can reduce performance and predispose birds to necrotic enteritis.

By removing ionophores, coccidiosis management must rely on non-antibiotic coccidiostats, or live coccidiosis vaccines, or more likely, a rotation between the two. Unfortunately, many coccidiostats can build coccidial resistance and, unlike ionophores, coccidiostats do not have antibiotic properties.

Mycotoxin contamination

Mycotoxins—toxic fungal metabolites produced by common molds found in many components of poultry diets—can directly reduce gut integrity, thus leading to decreased absorption and digestion of dietary nutrients and increased intestinal barrier permeability.

Reduced nutrient uptake and leakage of plasma proteins into the lumen due to this breach results in increased protein concentration in the intestinal lumen, providing a substrate for *C. perfringens* proliferation. Mycotoxins also adversely affect immunity and have a strong correlation with enteric infections.

Gut health management solutions

Sound management practices will help limit exposing birds to conditions where *C. perfringens* can easily gain a foothold (*Table 1*). Breeder health and proper hatchery and egg sanitation needs to be monitored and sustained to prevent bacterial contamination in the hatchery. Increased down-time allows bacterial populations to diminish between flocks and prevent carryover of bacteria from flock to flock. Proper litter management and reduced stocking density will also help alleviate the risk of bacterial challenges and decrease shedding of coccidialoocysts by reducing litter moisture. Furthermore, establishing and maintaining effective biosecurity measures regarding personnel sanitation, visitors, and vehicle traffic are essential in preventing contamination from outside sources.

Factor	Corrective action	
Management	Hatchery contamination	Maintain breeder health and proper hatchery and egg sanitation
	Reduced house down-time	Increase down-time between flocks
	Increased stocking density Poor litter management	Reduce stocking density and establish an adequate litter management strategy
	Contamination form outside sources	Implement effective biosecurity plan regarding personnel sanitation, farm accesss, and traffic control
Development	Insufficient microbial gut colonization	Apply PoultryStar® at correct dosage level starting in the hatchery
Nutrition	Indigestible (animal) protein	Switch to an all-vegetable diet Apply **Digestarom®** at correct dosage level Supplement with exogenous proteolytic enzymes
Pathogens	Coccidiosis	Rotation of non-antibiotic coccidiostats and live coccidiosis vaccines Apply **PoultryStar®** and/or **Digestarom®** at correct dosage level
Mycotoxins	Mycotoxin contamination of feed	Monitor feed and apply Mycofix® at correct dosage level

The immediate post-hatch period is a critical time for the development of a chick's intestinal tract. The changes occurring during this period depend entirely upon appropriate microbial colonization. Application of probiotics in the hatchery provides an ideal opportunity for beneficial bacteria to colonize the digestive tract before chicks are exposed to potentially pathogenic bacteria and fungi in the broiler house, aiding the development of the digestive tract and helping to protect against enteric infections. One solution to reduce bacterial growth and activity is to limit their access to protein, a key nutrient source. Many producers switch to an all-vegetable diet, for example. Increasing digestibility of nutrients so they are absorbed and utilized by the bird instead of the microbiota is another option. Some phytogenic feed additives are capable of increasing endogenous digestive enzyme activity so the bird is better able to break down and absorb protein and other nutrients making them unavailable to the microbiota. Supplementation of exogenous proteolytic enzymes is another method that can help break down excess protein.

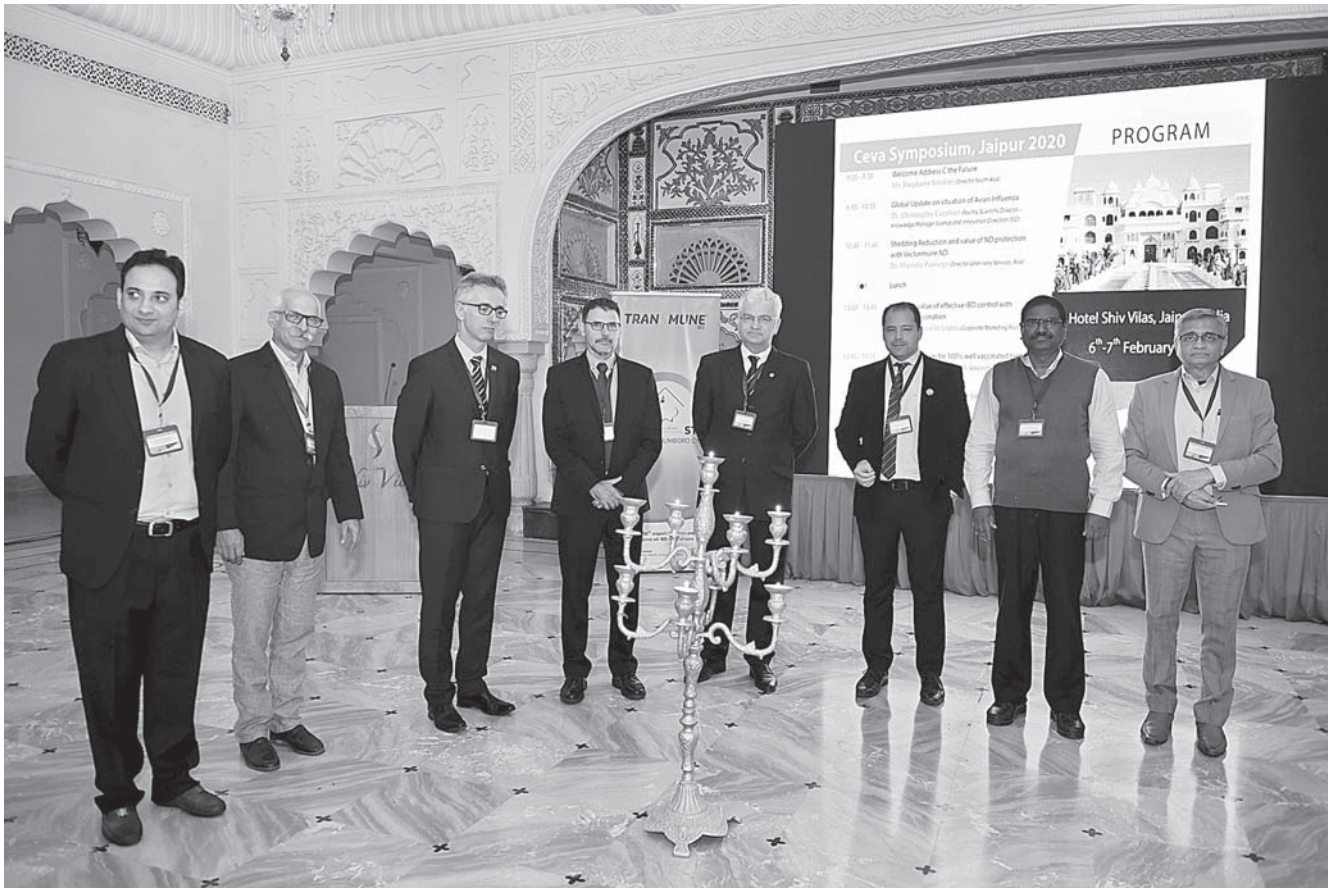
Probiotics and phytogenic feed additives, with or without the use of coccidiostats or vaccines, can help alleviate the negative effects of coccidial infection. They have been shown to reduce oocyst shedding, severity of intestinal lesions, and adverse effects on performance, demonstrating their status as a promising 'anticoccidial.' Mycotoxin contamination also poses a serious threat to livestock and poultry production globally. Given the numerous harmful effects of mycotoxins, a proper mycotoxin management program is essential to protect intestinal integrity.

Conclusion

The main challenges producers face as they transition to ABF systems hinge upon intestinal health and prevention of coccidiosis and necrotic enteritis. Switching to an ABF program requires a paradigm shift: there is no single solution that can act as a substitute for antibiotics. Numerous adjustments are necessary to succeed and a solid gut health program needs to be an essential component.

PRESS RELEASE

Ceva Innovation Summit - Jaipur India 2020



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

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

Dr. Christophe Cazaban,Poultry Scientific Director-SID presented an update on the global situation of Avian Influenza with a special reference to H9 LPAI which has become a major complicating pathogen among broilers and layers. Later, Dr. Marcelo Paniago, a most sought after Ceva's speaker by Indian vets, explained the value of ND protection with the use of Vectormune ND as a long term policy to mitigate shedding risk of vvND strains.Dr. Marco Aurelio Lopes,Corporate Marketing Poultry Manager explained as to how hatchery vaccination is a future of broiler industry and how best it can help in control ofvvIBD effectively. Dr.Chalermchai Skulphuek aka Tose introduced Ceva's internationally acclaimed C.H.I.C.K. program that ensures 100% hatchery vaccinated day old chicks.

Lastly, a very important topic was covered byMilind Limaye. He shared his experience on the unending battle with pathogens to improve hatchery hygiene standards continually as a critical factor in successful hatchery vaccination.

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

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

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

PRESS RELEASE

Grand Participation of Indian Herbs in Kolkata International Poultry Fair 2020 Held in Kolkata from 12–14 February, 2020

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

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

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

INDIAN HERBS is the originator of concept of Veterinary Ayurveda. **INDIAN HERBS** was the first company to harness the rich treasure of herbs by developing phytogenic products on modern scientific lines. It offers unique phytogenic alternatives for synthetic products with better efficacy at lower cost which are free from side effects and residual toxicity. The company is catering to wide range of animal species including poultry, ruminants, equine, swine, pets, aquatic and other animal species for more than six decades. The products of **INDIAN HERBS** are useful to produce antibiotic and residue free chicken and eggs.

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

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

Paschim Banga VIV Photo Collage

Industry, Govt. of India and was the first Herbal Company to get this recognition.

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

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

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

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

BROILER LIFTING RATES FOR THE MONTH OF FEBRUARY 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
Hyderabad	82	82	82	77	77	72	72	72	72	65	65	65	65	59	54	54	54	54	54	54	54	45	45	45	48	50	52	52	55
Karimnagar	82	82	82	77	77	73	73	73	73	67	67	67	67	60	55	55	55	55	55	55	55	45	45	45	48	50	52	52	55
Warangal	82	82	82	77	77	72	72	72	72	65	65	65	65	59	54	54	54	54	54	54	54	45	45	45	48	50	52	52	55
Mahaboobnagar	82	82	82	77	77	72	72	72	72	65	65	65	65	59	54	54	54	54	54	54	54	45	45	45	48	50	52	52	55
Kurnool	82	82	82	77	77	72	72	72	72	65	65	65	65	59	54	54	54	54	54	54	54	45	45	45	48	50	52	52	55
Vizag	75	75	75	70	70	65	65	65	65	60	60	60	60	60	60	60	60	60	60	60	60	50	50	50	50	50	50	50	54
Godavari	81	81	81	82	82	71	71	71	71	64	64	64	64	59	54	54	54	54	54	54	54	44	44	44	44	44	44	44	48
Vijayawada	87	87	87	82	82	77	77	77	77	70	70	70	70	65	60	60	60	60	60	60	60	55	55	55	55	55	55	55	59
Guntur	87	87	87	84	84	77	77	77	77	70	70	70	70	65	60	60	60	60	60	60	60	55	55	55	55	55	55	55	59

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Better Nutrition Through Biotechnologies

PRESS RELEASE

Chicken & Egg Mela organised at Hyderabad to dispel the rumours of Corona Virus

To alleviate fears amongst the common public, the Telangan Poultry Breeders Association, Telangana Poultry Federation, The National Egg Co-ordination Committe and All India Poultry Development and Services Private Limited has organised the first Chicken and Egg Mela on Friday the 28th February 2020 at Necklace Road, Hyderabad.

The Chief Guest Shri Taraka Rama Rao, Minister for Municipal Administration and Urban Development speaking on the occasion said that the Chicken and eggs contain rich proteins in value and is very safe to consume and not to believe the rumours. He said that he along with his family including Chief Minister Shri K. Chandrasekhar Rao eat chicken and eggs every day without any fear . The Minister said that the rumours created on chicken and eggs by linking it with corona virus is baseless and further said that not only chicken but mutton and fish is also safe to consume and consumption of these products are no way connected with corona virus. Particularly in India, he said that the food is cooked at high temperature and under such conditions no virus will survive. He further said that due to these rumours the consumption of poultry products has drastically fallen and to protect the industry is our responsibility and hence we are here to dispel the rumours spread on chicken.

He said that the chicken and eggs are not only rich in protein and also cheap in price and no other food gives such vitamins and proteins in alternate. The policy adopted by the State Govt to improve the poultry production in the state is very encouraging and said that he is very optimistic to see the industry comes to its normalcy very soon.

Dr Ranjit Reddy, CMD of S.R. Hatcheries, President, Telangana Poultry Breeders Association and Member of Parliament from Chevella Constituency played an anchor role and inspired the audience with his vocabulary. He said that the poultry sector has incurred huge losses near about 500 crores within a span of two months due to spread of rumours linking it to corona virus. Around 25000 farmers were affected due to these rumours and appealed the gathering not to believe the rumours and consume chicken and eggs without any fear.

Shri Etala Rajender, Minister of Health, speaking on the occasion said that the spread of rumours linking it to corona virus is totally baseless. He said that there was not even a single case of corona virus reported in the state. The industry has been badly hit and incurred huge losses around Rs.500 crores he said. He assured the gathering that no virus will survive in more than 70 degrees heat as our food normally cooked in more than 100 degree temperature and is very safe to consume

The Ministers Shri Talasani Srinivas Yadav and Shri Srinivas Goud also took part in the Mela. The cine artists who took part in the Mela attracted and inspired the audience with their dialogues linking it to poultry. The dignitaries on the dais ate chicken in front of huge gathering about 12000 who were present in the Mela in a bid to dispel the fears amongst the public. More than 6000 kg of chicken and 22000 eggs were distributed to the masses presented on the occasion.

PRESS RELEASE

Alltech

An Open Letter to Governmental Officials Worldwide

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

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

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

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

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

1. COVID-19 company policy – Our policy addresses limitations on the travel of our team, including contractors and consultants, as well as other required practices to safeguard all of our sites. This is something we are reviewing daily and continually updating to ensure best practice.
2. Visitor screening form – A visitor screening form must be completed by any guest, including internal guests and truck drivers, before they are able to enter any of our facilities. This measure is a first line of defense to safeguard against any known risks.
3. Limitation of outside visitors – While we are maintaining some business-critical meetings, we are utilizing virtual meeting platforms as an alternative or are postponing visits to a future date. We are not allowing tours or visits to our facilities that are not deemed to be business-critical at this time. Truck drivers making deliveries or pickups are asked to stay within their cabs or as close to their trucks as possible, and any entry to our facilities must be approved following completion of the visitor screening form.
4. Enhanced cleaning protocols – In addition to our regular cleaning services, we have enhanced our procedures to occur at more frequent intervals and with greater attention to the disinfection of all surfaces.
5. Team member health – We are joining governments around the world in a shared effort to slow the spread of COVID-19 by asking our team members to work from home, if their function allows. Additionally, we have required that any team member who is feeling ill is not

to return to the office until they have been free of a fever for more than 24 hours, without fever-reducing medications. Any high-risk exposure or confirmed case of COVID-19 necessitates a 14-day quarantine.

6. Operational continuity – Alltech operates nearly 100 manufacturing facilities around the world. Our global infrastructure enables us to shift production if necessary. We are working closely with all of our manufacturing teams to ensure operational continuity and service to our customers. We have implemented plans for all critical business units to work remotely, if required. As part of this, we continue to stress-test our systems and implement safeguards on the security of all data and technology.

7. Supply chain – We have been in contact with our key suppliers to review the status of all raw materials and have been reassured of continuity. While the majority of our materials and services are sourced in the Americas, we have built in contingencies globally, should the need to source from other geographies become necessary. Our global manufacturing and logistics capabilities position us favorably to continue to consistently serve our customers.

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

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

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

Sincerely,

Dr. Mark Lyons
President and CEO, Alltech

-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 delivers smarter, more sustainable solutions for agriculture. Our products improve the health and performance of plants and animals, resulting in better quality for consumers and a decreased environmental impact.

We are a global leader in the animal health industry, producing additives, premix supplements, feed and complete feed. Celebrating 40 years in 2020, we carry forward a legacy of innovation and a unique culture that views challenges through an entrepreneurial lens.

Along with our more than 5,000 talented team members worldwide, we envision a "Planet of Plenty™.We believe that through science, technology and human ingenuity, a world of abundance can be ours. It's a vision of promise, possibility and positivity for the future, but it will take all of us working together.

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

Lightning of Lamp by diligates on dias

World Veterinary Poultry Association (India) Conference 2020

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

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

The presentations from the eminent speakers were positively helpful in designing new strategies to tackle the critical issues associated with poultry production paving way for sustainable poultry production in the country. Few global and several national experts have attended this conference and deliberated. Dr Marcelo Paniago of Ceva Animal Health, Malaysia highlighted the current and future challenges of the poultry vaccine industry and solution for the near future. Prof Dr Abdul Rahman Omar from Universiti Putra of Malaysia elaborated on Immune Evasion Strategies of Poultry Viruses and its practical approach.

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

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

Dr Marcelo enlightened on selection of ideal vaccine and DIVA abled vaccines and highlighted the mechanization like in-ovo technologies which is going to play an important role in the modern poultry industry.

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

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

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

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

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

Huge Gathering during the conference

Presentation by Dr Abdul Rahman Omar from Malaysia

Presentation by Dr Marcelo Paniago from Malaysia

Poster presentation by students

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

Best Poster Presentation Award I to Mr. Rayala Reddy V Poster Title: Performance & gut integrity of broilers and detection of their residues in meat by HPLC

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

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

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

Release of WVPA (India) 2020 conference compendium

Core organizing committee of WVPA (India) Conference 2020

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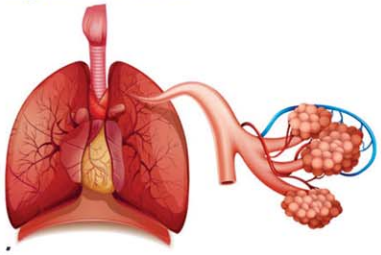

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Rest in Peace

Mr. Deepak Shah

Managing Director
Nutridian Animal Health & KCPL

4 Oct 1982 - 10 March 2020

Untimely Demise of Mr. DEEPAK SHAH M.D., Nutridian Animal Health

It is very unfortunate and shocking news about sudden and untimely demise of Mr Deepak Shah, Managing Director, Nutridian Animal Health & KCPL. He passed away at the very young age of 38 years on 10th March 2020. He left behind his wife Mrs Mona Deepak Shah and two children namely Divsha and Tanish. We the entire team of Tezasvi Publications, pray the almighty to rest the departed soul in peace and extend our full support to Mrs Mona Deepak Shah, who is going to take the reins of the company.

ABOUT THE COMPANY

Nutridian™ ANIMAL HEALTH
Leading Innovation Through Technology

Nutridian Animal Health is a sister concern of Kanad Chemical Pvt Ltd., established in 1971. Nutridian Animal Health is dealing in Poultry Feed Additive, Aqua Feed Additive and Injectable.

Nutridian is a cGMP, ISC9001:2015, ISO 22000 and Halal certified company known for its innovative products and services, bringing aesthetic and simple, environment friendly, organic health products for livestock and companion animals.

Under the dynamic leadership of Mr Deepak Shah, the company has achieved many mile stones and proved its metal in serving the Poultry, Aqua and Livestock industry in its best capacity. Though his untimely demise is irreparable loss to the company, we wish all the best to Mrs Mona Deepak Shah in her new endeavour.

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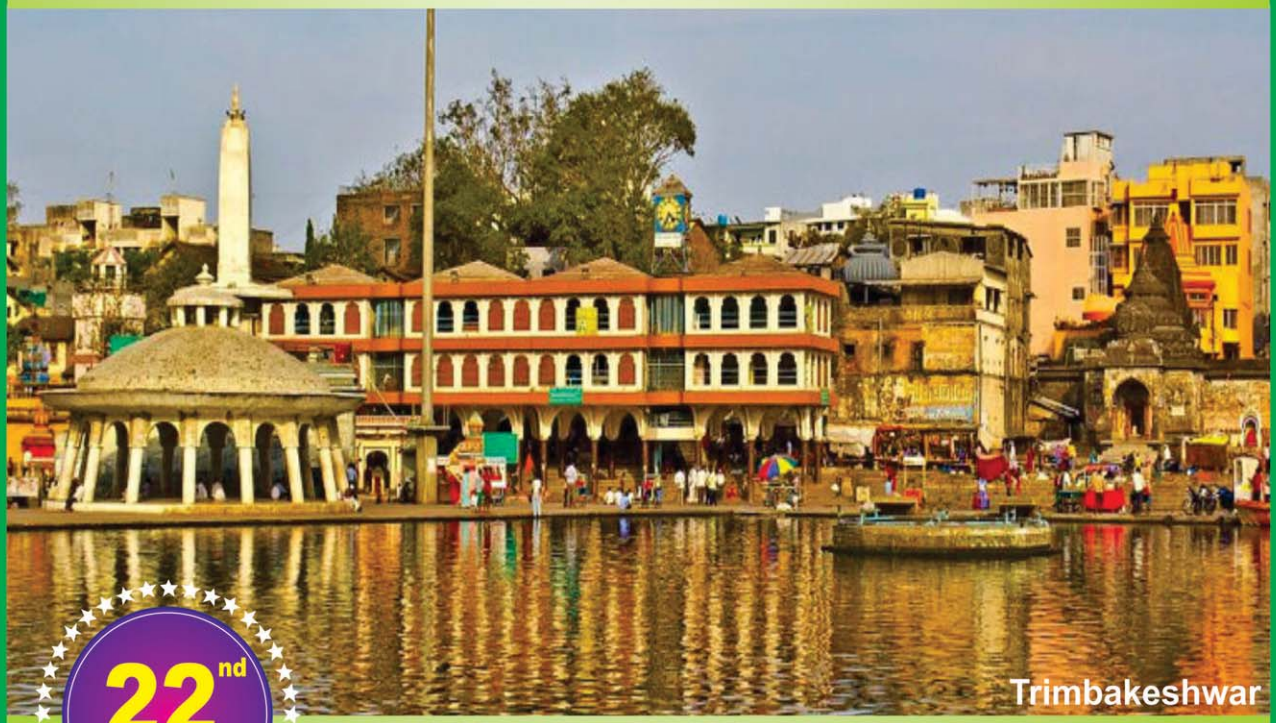

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PRESS RELEASE

Diformates: A most suitable replacement for antibiotics

Anant Deshpande* and Christian Lückstädt *ADDCON Asia Ltd. India. anant.deshpande@addcon.com

Introduction

Discovery of antibiotics is one of the greatest benefits to mankind. Millions of lives have been saved across the world ever since the use of antibiotics came into practice. Initially the use of antibiotics was restricted only to humans, until the practice of intensive farming came into existence in the 1950'S and their routine use in animals for prophylactic purposes began. In 1963, the emergence of the first resistant bacteria was described (Watanabe et al., 1963). In 1969 a committee of government experts in the UK concluded that the use of antibiotics in animals had contributed to antibiotic resistance in humans. In 1975, further UK research linked the prolonged use of antibiotics to shedding of Salmonella typhimurium and its development of resistance to: Virginiamycin, Bacitracin, Flavomycin, Nitrovin, Tylosin, Sulphaquinoxaline, Ampicillin, Chloramphenicol and many more antibiotics. These resistant bacteria proliferate in the animal and are transmitted to other animals. Transfer of the bacteria from animal to human is possible through many routes. Humans can also get infected by eating meat from animals with resistant bacteria. In 2015, antibiotic-resistant pathogens were estimated to cause over 50,000 deaths a year in Europe and the USA. The toll is projected to rise to 10 million deaths per year worldwide by 2050 (O'Neill et al., 2016). Sensing trouble, some countries have already imposed a ban on the use of prophylactic antibiotics in livestock feed and many more are in the process. However, without the use of antibiotics in animal farming, the productivity of the animal is compromised and hence there is an absolute necessity to look into suitable replacements. The following review deals with the use of effective replacements to antibiotics in the form of diformates - the double salts of formic acid; phytogenic compounds and their efficacy against bacterial pathogens. Available data show that these substitutes not only effectively control pathogenic bacteria but also improve productivity far more effectively than antibiotics.

Review

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

The antimicrobial mode of action of organic acid is explained as a two-way action; one is the bacteriostatic effect by the dissociated molecule of organic acid, which inhibits the growth of

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

Knowing that the pH in the GIT of the animal is different in different areas and that the pathogenic bacteria like E. coli and Salmonella spp. thrive and multiply in the lower GIT where the pH is favourable for their growth, the efficacy of the organic acids to control the bacteria depends on various factors such as the type and the form of organic acids used, the concentration and amount of acid reaching to the small intestine and the method of application. Though there are many organic acids available, each has a specific molecular structure and varied efficacy and a different MIC (Minimum Inhibitory Concentration) for different bacteria. Formic acid has the strongest antibacterial activity as compared to the other acids and has the lowest MIC compared to other acids (Table 1; Strauss and Hayler, 2001).

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

Similar results were observed earlier by Maribo et al. (2000) when the authors only detected 4.4% of active ingredients in the small intestine by using a

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

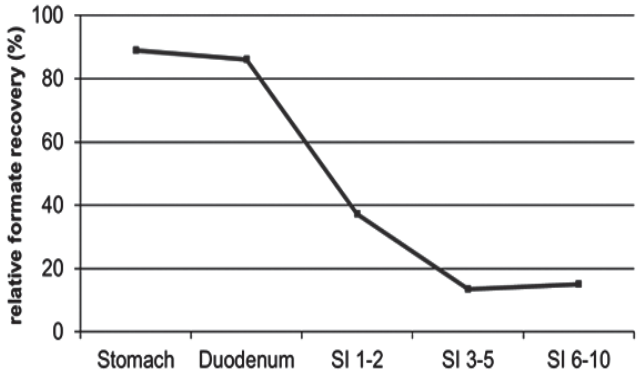
Bacteria	MIC (%)
Salmonella typhimurium	0.10
Escherichia coli	0.15
Listeria monocytogenes	0.10
Campylobacter jejune	0.10
Clostridium botulinum	0.15
Clostridium perfringens	0.10
Pseudomonas aeruginosa	0.10
Staphylococcus aureus	0.15

dosage of 0.7% liquid formic acid in the diet. Moreover, the liquid acids are corrosive so it is not practical to use these acids as such. All pure liquid organic acids are corrosive products. Even if these liquid acids are sprayed on a carrier, the product can remain corrosive.

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

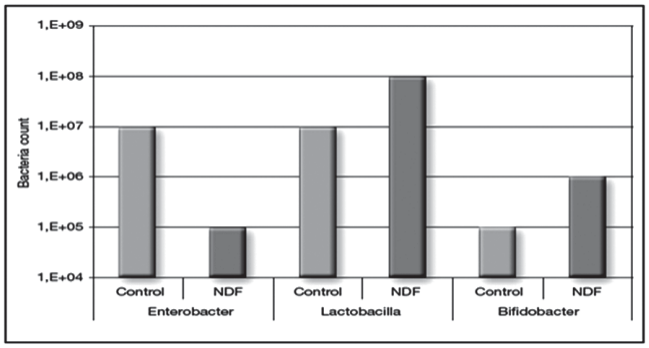
Although no much data is available on the amount of acid reaching to the small intestine when used in the form of single salts, quite encouraging data is available on the diformates- the double salt of formic acid (one molecule of mineral and two molecules of formic acid), which shows about 85% of the formic acid enters the small intestine when used in diformate form (Figure 1).

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



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

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



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

Tests against intestinal pathogens, including Salmonella, have shown that diformates have significant antimicrobial activity in broiler chickens (Table 2). Keeping bacterial pathogens under control reduced the probability of causing a disease outbreak.

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

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

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

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

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

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

index (EBI) was increased by almost 13%, thus leading to a more cost-effective production.

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

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

Though it has been well established that the diformates by the virtue of high formic acid content and with an ability to reach the small intestine in maximum concentration, exhibits excellent antibacterial and growth promoting results, the fact remains that the organic acids are more efficient in controlling the Gram-negative bacteria and show limited activity on the Gram-positive pathogenic bacteria.

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

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

From a trial done in Germany in 2015 it was seen that the combination of diformates with the plant alkaloids can, next to the regular impact of diformates on performance and digestibility, considerably reduce Streptococci spp. incidences – and have therefore also a demonstratred impact against Gram-positive bacteria. Futhermore, data are available which show a positive impact on intestinal health, in such a form that the lesion score caused by Clostridia infection is significantly improved.

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

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PRESS RELEASE

Alltech Global Feed Survey reveals first production decline in nine years

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

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

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

"2019 presented extreme challenges to the feed industry, with one of the most significant being African swine fever. The regional and global implications are reflected by the Alltech Global Feed Survey and the decline in global feed production, said Lyons. "While pig feed production is down in affected countries, we are noting increased production both in other species as producers work to supplement the protein demand, and in non-affected countries as exports ramp up. The damage caused by ASF will have long-term implications, and we expect that the top protein sources will continue to shift as our industry adapts to the shortage."

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

Regional results from the 2020 Alltech Global Feed Survey

- North America: The U.S. is the largest feed-producing country globally with an estimated

214 million metric tons (MMT), with beef (61.09 MMT), broilers (48.525 MMT) and pigs (44.86 MMT) as the leading species. North America saw steady growth of 1.6% over last year. Canada produced 21.6 MMT with pigs (8.23 MMT), broilers (3.25 MMT) and dairy (4.2 MMT) leading species feed production.

- Latin America: As a region, Latin America saw 2.2% growth to 167.9 MMT. Brazil remained the leader in feed production for the region and third overall globally, with the primary species for feed production being broilers (32.1 MMT) and pigs (17.0 MMT). Brazil, Mexico and Argentina continue to produce the majority of feed in Latin America with 76% of regional feed production.
- Europe: Europe remained relatively stagnant with a slight increase of 0.2% over last year. The top three feed-producing countries in Europe are Russia (40.5 MMT), Spain (34.8 MMT) and Germany (25.0 MMT), with pig feed production leading the way in all three countries. The ruminant sector was hit the hardest as both dairy and beef numbers are estimated to be down by 4% and 3%, respectively. This was offset primarily by strong growth in the aqua (7%) and layer (3%) industries.
- Asia-Pacific: The Asia-Pacific region saw feed production decrease by 5.5% in 2019, primarily due to African swine fever and large declines in pig feed production. China's feed production declined by almost 20 MMT of feed overall to 167.9 MMT and fell from the top feed-producing country globally to second, behind the U.S. India and Japan remained in the top nine feed-producing countries, with similar production compared to 2018 with 39.0 MMT and 25.3 MMT, respectively, while Vietnam declined by 7%.
- South Asia: The total feed production in South Asia (India, Bangladesh,aSri-Lanka and Nepal) accounts to 45.65 MMT, witnessing 2.53% growth over 2018. India ranks fifth in the top nine feed-producing countries of the world, producing 39 MMT. The Indianpoultry sector observed growth, producing 24.9MMT, and aquaculture showed a significant rise, with feed production of 2.28MMT.Dairy feed production decreased to 11.58 MMT, a dip of 2.1% over 2018, due to rising raw material prices.
- Africa: Africa continued strong growth with a 7.5% increase in overall feed production, with all the primary species seeing positive growth. The top five feed-producing countries in the region account for 75% of Africa's feed production, and they are South Africa, Egypt, Nigeria, Morocco and Algeria. The region's primary species include broiler, layer and dairy, and combined, they account for nearly half of feed production estimates in the region.

Notable species results from the 2020 Alltech Global Feed Survey

- Pig feed production was greatly impacted by African swine fever, with an 11% decrease. The primary producing region for pig feed remains Asia-Pacific, but it also experienced the largest decline of 26%, with China (-35%), Cambodia (-22%), Vietnam (-21%) and Thailand (-16%) experiencing large decreases. Europe, North

South Asiacountrywide breakdown of total feed production

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

America and Latin America remained relatively stable compared to last year, within a percentage point's worth of gain or loss. While Africa is a small region from a tonnage standpoint for pig feed, it showed a large increase of 29%.

- In the poultry sector, Asia-Pacific is the leader in both broiler (115.2 MMT) and layer (73.1 MMT) feed. In Latin America, total broiler production amounted to 60.8 MMT, with Brazil leading the region with 32.1 MMT followed by Mexico with 10.5 MMT, while Mexico's layer feed production increased by 11% to 7.05 MMT and surpassed Brazil. Russia leads Europe with 10.86 MMT of the total region's 56.3 MMT of broiler feed and 5.3 MMT of the region's total of 33.5 MMT of layer feed. In North America, the U.S. accounts for 94% of the broiler feed with 48.5 MMT, while layer feed in Canada increased by 460,000 metric tons.
- Europe leads global dairy feed production with 34% followed by North America (21.8%), Asia-Pacific (17.6%) and Latin America (15.3%). The top dairy feed- producing countries are Turkey (6.5 MMT), Germany (5.2 MMT), Russia (4.2 MMT), the U.K. (3.8 MMT), France (3.4 MMT), the Netherlands (3.3. MMT) and Spain (3.2 MMT).
- North America continues to lead global beef feed production with 62.3 MMT, followed by Europe (21.9 MMT) and Latin America (13.9 MMT). For the 2020 Alltech Global Feed Survey, the beef feed production estimation was recalculated to improve its accuracy. The new estimate takes into account the average days on feed and intake as a percentage of body weight in the feedlot. Last year's estimation was also recalculated to reflect this formula change for a proper year-on-year comparison.
- Overall, aquaculture feeds showed growth of 4% over last year. Per ton, Asia-Pacific grew the most with an additional 1.5 MMT. The primary contributors were China, Vietnam and Bangladesh. Europe's decrease is in large part due to decreased feed production in Russia, which is primarily due to an increase in imports.
- The pet food sector saw growth of 4% with the largest tonnage increases in Asia-Pacific (10%), Europe (3%) and Latin America (6%). By country, increases were seen in China, Indonesia, Portugal, Hungary, Ecuador and Argentina.

Top five fastest growing countries in poultry feed production globally

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

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

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

For more information on the survey results, visit *alltechfeedsurvey.com.*

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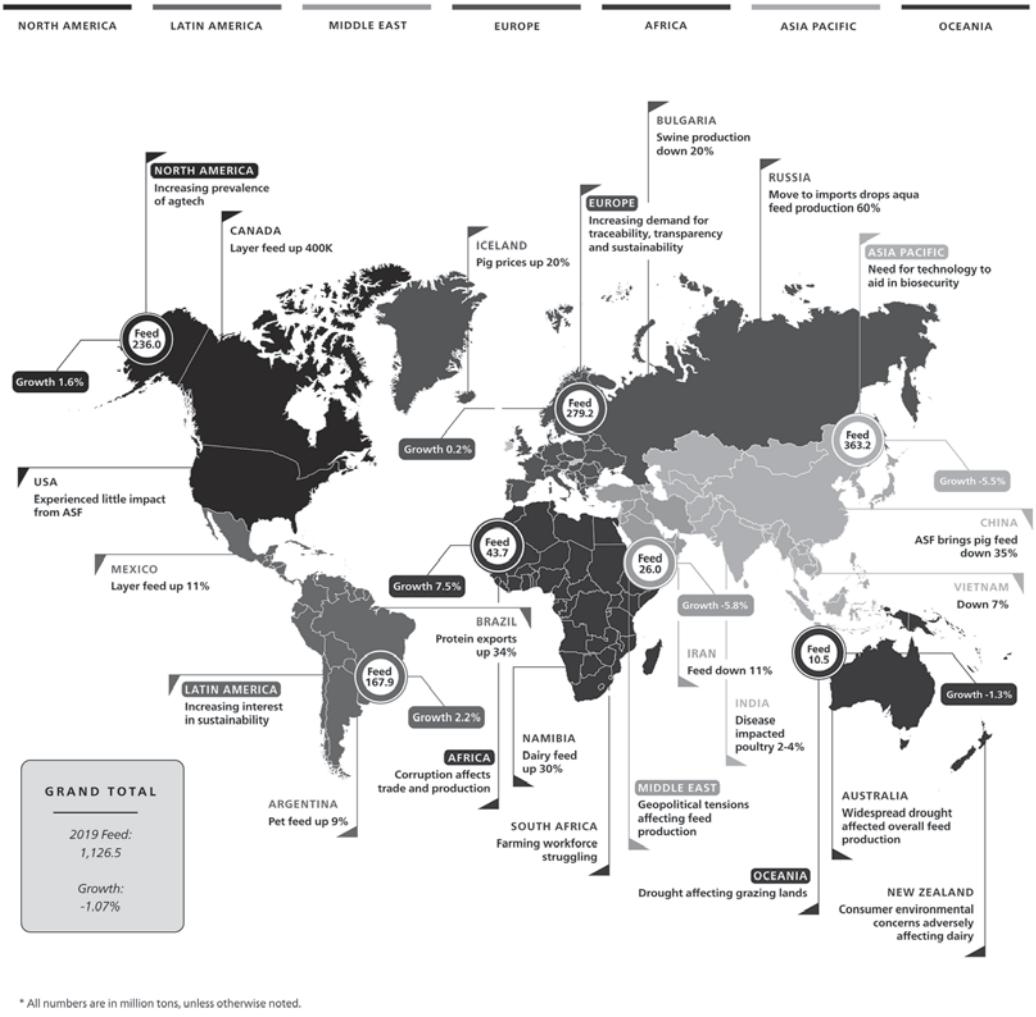

* All numbers are in million tons, unless otherwise noted.

About Alltech:

Founded in 1980 by Irish entrepreneur and scientist Dr. Pearse Lyons, Alltech delivers smarter, more sustainable solutions for agriculture. Our products improve the health and performance of plants and animals, resulting in better nutrition for consumers and a decreased environmental impact.

We are a global leader in the animal health industry, producing additives, premix, self-fed supplements and feed. Celebrating 40 years in 2020, we carry forward a legacy of innovation and a unique culture that views challenges through an entrepreneurial lens.

SCAN ME

Our more than 5,000 talented team members worldwide share our vision for a Planet of Plenty™. We believe agriculture has the greatest potential to shape the future of our planet, but it will take all of us working together, led by science, technology and a shared will to make a difference.

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

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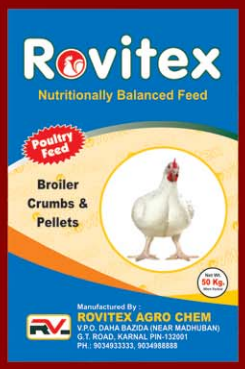

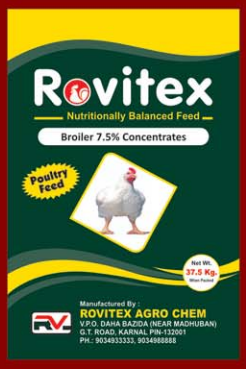

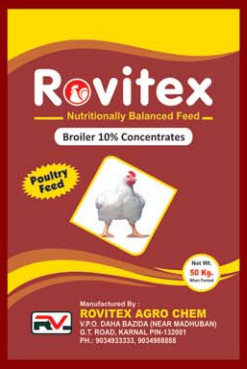

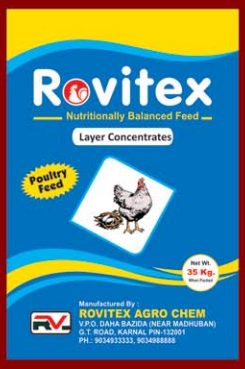

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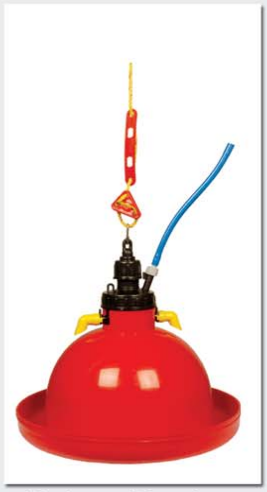

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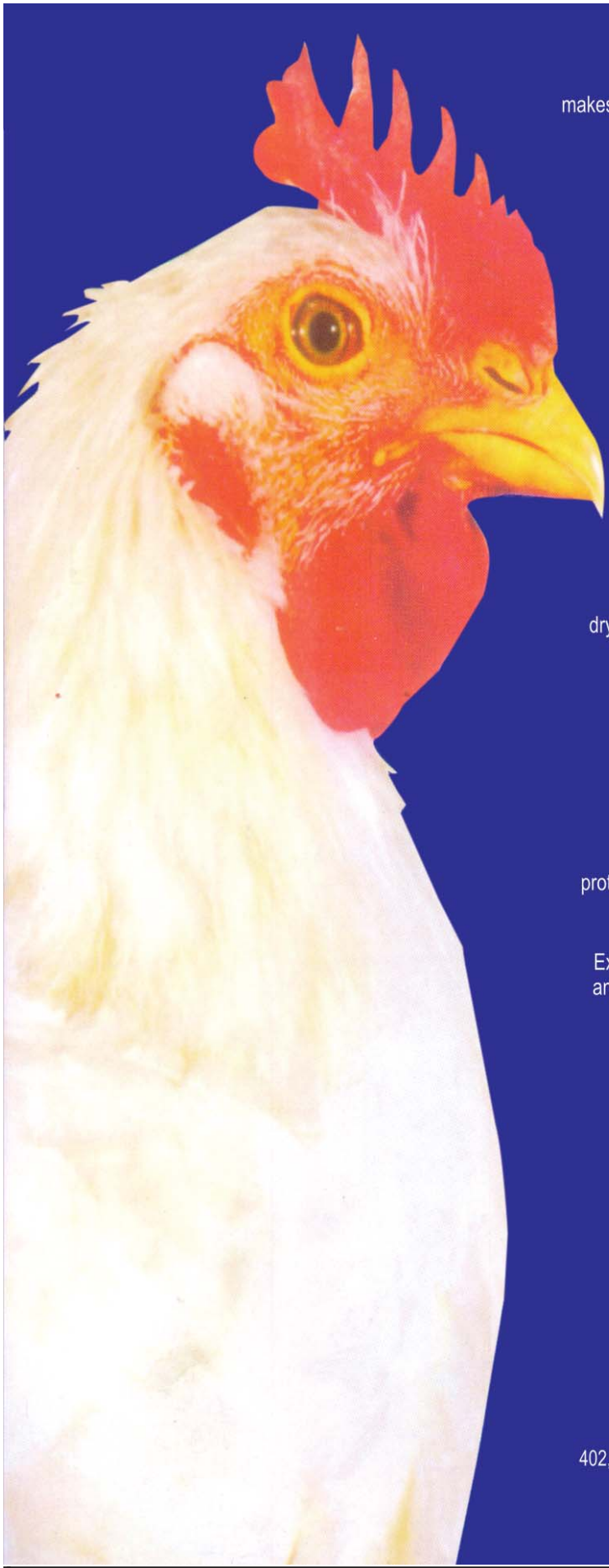

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Contributed by technical team of Rossari Biotech Limited AHN Division - ***Mr. Edward Menezes, Dr. Anish Kumar, Dr. Sachin Bhadane, Dr. Vishal Surve, Dr. C. Seenivasan, , Dr. Aashaq Hussain, Ms.Tanaya Deo***

Although there is no 'one case fits all' strategy for all farms or integrations, a basicapproach working as a partnership with a range of technical experts, stockmen and veterinarianscan develop an evolving biosecurity programme. Th is should be formalized as part of the farmveterinary health and welfare plan.This health plan should be seen as a working document that formalizes agreed actions and procedures. The plan should be a practical document that accurately reflects what is done at thefarm level, how it is done, what the aims and targets are and how these will be audited.

In setting baselines and targets for such a programme it is essential to know which disease causingorganisms are present in poultry stock at the breeder and commercial level. A programme should be in place to monitor this, so that the veterinarian and producer can be awareof what challenges are occurring but also to audit the success (or otherwise) of the biosecurity interventions. This is anexample of a practical implementation of HACCP principles.

Monitoring and setting baselines

Effective disease monitoring may be achieved by:

1. **Regular monitoring of all performance data on farm, including:**
   a. Mortality
   b. Culling rate
   c. Daily liveweight gain
   d. Evenness
   e. Food conversion ratio (FCR)
   f. European production efficiency factor (EPEF)
   g. Egg production
   h. Egg quality
   i. Fertility
   j. Hatchability
2. **Assessment of processing plant data for levels of:**
   a. Carcass damage
   b. Reject rates and criteria
   c. Downgrading
3. **Sampling and screening for disease-causing agents:**
   a. Serology
      i. Monitor response to vaccination programme
      ii. During a disease outbreak
      iii. Terminal bloods to check exposure to disease agents
      iv. Regular monitoring to confirm freedom from specific organisms
   b. Post-mortem examinations:
      i. During a disease outbreak
      ii. Specific targeted lesion scoring (e.g. for subclinical coccidial challenge monitoring)
      iii. To assess skeletal development
      iv. To screen for subclinical indications of disease, e.g. intestinal damage, presence of parasites, air sac damage
   c. Other samples
      i. Polymerase chain reaction (PCR) swabs for viral/ bacterial antigen detection
      ii. Faeces for worm egg count, coccidial challenge, Salmonella spp., Campylobacter spp.
      iii. Water – water quality testing
      iv. Tissues for virus isolation, residues of extraneous agents, carcass quality

d. Wild birds and vermin

i. Screening of reservoirs for disease threats, e.g. avian influenza, Mycoplasma spp., Salmonella spp.

4. Communication

a. Awareness of disease challenges in rearing stock

b. Early warning of disease challenges in other farms in an area

c. National and international communication on disease threats.

Once baselines are set for disease challenges and trends over time, together with good intelligenceas to what major disease risks may be introduced into a particular area, then the veterinaryhealth plan can start to lay down guidance as to what is needed as an effective biosecurityprogramme. This must be laid down in a logical manner, with aims and objectives producedthat are on the one hand effective, but are also able to be achieved under practical conditions.

Components of a Biosecurity Programme

The components of a biosecurity programme can be split into three broad areas. These are:

• **Procedural biosecurity** – this is where the concepts are outlined into an overall strategy ofwhat is trying to be achieved. Th is may be a multi-layered programme such that there is anoverarching general disease control programme, to which may be added specific HACCP typeprogrammes for specific diseases or problems. A good example of one of these specific aspects might be a Campylobacter reduction programme. Th e procedural concepts shouldoutline the strategy and the decision-making procedure and, importantly, identify who withinthe organization has responsibility for the procedures, their implementation and their audit.

• **Physical biosecurity** – this is the main foundation for the programme. It should considerthe structural requirements, farm layouts, specific cation for all equipment and facilities onfarm (e.g. barrier hygiene, showers, provision of wheel and equipment sprays, foot dips, structuralhouse design and layout, etc.).

• **Operational biosecurity** – this is where all the procedures are put into practice. The proceduralprogramme should clearly identify personnel responsible for all areas of the operationalprogramme, including production of appropriate paperwork and work recording systemssuch that it is possible to audit whether what is laid down is actually taking place in practice.Again, there is the requirement for this audit to feedback constantly into the procedural biosecurity strategy.

Procedural biosecurity

Although procedural biosecurity should be based on practical common-sense procedures, the useof HACCP principles offers the ability to review all risks and critical control points at the farmand company level and acts as a framework on which to build effective control strategies. Such asystem can be developed for small or large sites, or companies operating multiple sites. The complexityof any HACCP system will reflect the risks identified. For disease control, critical controlpoints (CCPs) are the areas or weak points where pathogens may enter the system. Once identified, then procedures can be put in place to reduce or eliminate the hazard posed by these weakpoints. Hazard analysis is the starting point and can be aimed at general pathogen reduction or atspecific threats such as avian influenza, Gumboro disease or Campylobacter. The CCPs can thenbe listed. Examples of the most significant examples for most pathogens are as follows:

• Personnel
• Other poultry
• Vehicles
• Equipment
• Feed
• Litter
• Water
• Vermin
• Insects/beetles

• Wild birds

• Residual site contamination.

Once these have been identified the next stage is to set limits to which the hazard must bereduced. For examples such as avian influenza the target might be total elimination or avoidance,whereas for organisms such as Campylobacter targets might be set for reduction in incidenceover certain time frames. In assessing whether targets for critical limits have been metthere must be effective monitoring of incidence of the organisms under scrutiny over time. Onthe basis of this monitoring the causes of any noncompliance or failure to achieve targets shouldbe identified and corrective actions put in place. Records must be kept of this HACCP programmewith ongoing verification and feedback of success or failure, such that targeted progresscan be made. Th e further aspect of physical biosecurity is aimed at reducing the existence orimpact of CCPs, while operational biosecurity procedures should outline the practical and operationalsteps taken to address known CCPs.

Physical biosecurity

1. Location. Although this may be on a wish list that is not actually achievable, the aimshould be to locate farms as well dispersed as possible. A minimum acceptable distancebetween poultry farms should be 500 m, and preferably 1 km. Consideration should alsobe given to prevailing wind direction when planning units in relatively close proximity,order to minimize the risk of airborne infection. When siting breeder or grandparent farms,this distance should be extended to 8–10 km wherever possible. Th is should be adequateto limit likely movement of viral diseases spread by aerosol or dust vectors. Increasingly,poultry are sited in densely populated poultry areas, either for historical or logistical reasons.Some degree of compromise is always necessary and this indicates why in some geographicallocations there may be added dependence on other aspects of the biosecurity programme. These considerations should extend to the likelihood of poultry litter beingspread on agricultural land in the area. It may not always be possible to have control overtypes of stock or biosecurity measures of third-party producers in a region. As a result, it hasto be accepted that airborne respiratory viral challenges will be a feature of the disease loadin many areas. In some countries there has been government consideration and restrictionof stocking of poultry farms in a particular region in an attempt to break the cycle of infectionwith highly contagious diseases such as avian influenza.

2. Avoid building sites near waterways, ponds or lakes used by migratory water fowl. Th ishas relevance for a number of diseases but most notably for avian influenza and Newcastledisease, where migrating waterfowl or seabirds may act as potent vectors to introducedisease into a novel area, while themselves showing no clinical signs or illness. If thereis local surface water, this should not be used as the source of drinking water forcommercial poultry, again because of likely contamination from wild birds with viralpathogens.

3. Avoid putting birds on range, as they will be susceptible to contamination from wild birdsand will attract vermin. Th ere is a balance here, with increased interest in the perceived welfare advantages of more extensive production systems, against the risks posed to suchflocks, either on their own account or as a focus and source of infection for housed flocksin a given geographical area. Again, flocks which must be kept under such systems requiremore rigorous actions in other areas of the biosecurity programme to compensate.

4. Locate houses away from major roads that handle high volumes of poultry vehicles (feedlorries, live haul vehicles, etc.).

5. There should be effective waste disposal and removal of used litter as far away from thesite as possible. Factories able to burn poultry litter as a source of energy are a valuablemethod of reducing the infectious agent load in a particular geographical area.

6. The areas around and between houses should be constructed of materials and surfaces thatcan be cleansed and disinfected to reduce the transmission of all organic material on vehicle, tyres, boots, etc., from the area outside the house into the house. Areas around houses shouldbe kept clear of vegetation to avoid harbouring vermin. Kerbed aprons will help preventwashing of contaminated debris on to surrounding land.

7. Locate poultry sites in well-drained areas to avoid standing water.

8. Use potable drinking water with a low total viable count.

9. House design and site layout should help with the implementation of the biosecurityrequirements.

Th ere should be a secure perimeter fence such that there is a controlledentry point for all visitors. An amenity block should contain protective clothing and bootsas a minimum, but include shower facilities wherever possible for all visitors who mustenter the site.

10. Plan the layout of the site to enable feed to be blown into silos/bins on site from outsidethe perimeter fence, ensuring that feed vehicles can be excluded from the site.

11. Where vehicles must enter a site, consider provision of wheel immersion baths and pressurewashing facilities.

To Be Continued…

PRESS RELEASE

Interface Pharmaceuticals Pvt Ltd participated Poultry Expo held at Bharatpur, Nepal

Mr. S.K. Malhotra recieving Trophy for participation from Mr. Guna Chandra Bisht popularly known as Swami Ji Chairman of Avinash Group and Chairman Nepal Poultry Federation

Doctors from Venkateshwara Hatchery in discussion with Mr. S.K. Malhotra

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

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

This is a known fact that when researchers are working for more productivity out of birds then the birds have to be protected throughout life. People already using our immunotherapy program informed us that they are getting a higher productivity than the standards. They will be using our products continuously and forever.

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

Mr. Pushp Raj Dahal former Prime Minister of Nepal along with Mr. Guna Chandra Bisht (Swami Ji) at Interface Stall

Dr. Doughlus greaves from Hyline U.S. with Mr. Manan Malhotra

Dr. I.P. Dhakal former Vice Chancellor Agriculture University with Interface Managements

Mr. Guna Chandra Bisht (Swami Ji) at Interface Stall

Swami Ji in friendly conversation with Mr. Manan Malhotra Chief Operation Officer Interface

Swami Ji and Mr. Manan Malhotra in informal discussion

Mr. Rishee Baral distributor for Nepal in discussion with Interface Management

Mr. Dhrub Manadhar & Mr. Deepak Khanal at Interface Stall

Dr. Subir Singh and other doctors of Avinash Group at Interface Stall

Mr. Shobha Ram Oli in discussion with Mr. S.K. Malhotra

Mr. S.K. Malhotra in discussion with eminent farmers of Nepal

Farmers of Nepal in Discussion

Interface Stall at Nepal Poultry Show

Full view of Interface Stall

NATIONAL EGG CO-ORDINATION COMMITTEE

DAILY / MONTHLY EGG PRICES DECLARED BY NECC AND PREVAILING PRICES AT VARIOUS PRODUCTION CENTRES (PC) AND CONSUMPTION CENTERS (CC) MARCH 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	30	31	Average
NECC Prices																																
Ahmedabad	365	365	365	340	340	340	340	342	345	348	348	348	348	348	310	310	280	280	250	250	250	250	250	320	340	345	345	345	345	345	345	323.93
Ajmer	300	300	290	280	280	280	280	294	299	299	285	275	265	265	245	229	221	216	200	170	170	170	210	250	250	250	250	250	250	245	245	252.03
Asansole	395	395	395	380	375	365	365	365	365	370	370	370	370	370	350	347	332	324	310	285	275	275	275	385	430	450	450	450	430	430	405	369.45
Barwala	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	216	216	216	-	-	-	250	255	255	255	255	255	225	250	-	240.72
Bengaluru (CC)	360	360	360	340	340	320	320	325	330	335	335	335	335	335	315	315	290	290	250	235	235	235	235	285	335	345	345	345	345	345	345	316.77
Brahmapur (OD)	347	347	347	315	315	315	318	323	329	332	332	332	332	322	285	260	260	200	200	200	200	200	275	345	350	355	365	375	375	375	375	309.7
Burdwan (CC)	393	393	393	363	363	363	363	378	378	378	380	380	380	350	350	340	330	320	300	275	275	380	380	420	430	430	450	450	435	435	415	376.45
Chennai (CC)	375	375	375	350	350	330	330	330	330	330	330	330	330	330	300	300	270	270	230	230	230	230	230	260	335	360	360	360	360	360	360	317.41
Chittoor	368	368	368	343	343	323	323	323	323	323	323	323	323	323	293	293	263	263	223	223	223	223	223	253	328	353	353	353	353	353	353	310.41
Delhi (CC)	325	315	310	310	310	295	295	300	305	305	305	305	305	305	290	275	260	245	235	235	235	235	235	270	270	270	270	270	270	250	255	279.35
E.Godavari	340	340	340	310	310	310	313	316	321	324	324	324	324	324	290	290	290	290	225	225	225	225	290	330	340	345	345	345	345	345	345	310
Hyderabad	316	316	295	295	275	275	280	285	290	295	295	295	295	275	275	250	250	210	210	210	210	210	275	325	335	335	335	335	335	335	335	285.54
Ludhiana	313	308	303	303	293	288	288	288	295	295	295	295	295	285	278	278	253	243	226	216	216	206	-	256	-	-	-	-	-	-	-	274.6
Midnapur (KOL)	393	393	393	363	363	363	363	378	378	378	380	380	380	350	350	340	330	320	300	275	275	280	380	420	430	430	450	450	435	435	415	373.22
Miraj	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mumbai (CC)	370	370	370	350	350	330	330	335	340	345	350	350	350	350	330	330	305	305	285	265	265	265	265	330	380	395	395	395	395	395	395	341.45
Muzaffurpur (CC)	362	362	357	352	352	348	343	343	348	348	348	346	338	338	319	309	300	286	286	267	267	267	267	-	-	-	-	-	-	-	-	324.04
Mysuru	375	375	375	345	345	325	325	330	335	340	341	341	341	341	320	320	295	295	250	235	235	235	235	290	335	345	345	345	345	345	345	320.93
Nagpur	300	295	285	280	275	275	275	275	275	275	280	270	260	250	228	215	180	-	-	-	100	180	275	-	-	-	-	-	-	-	-	252.4
Namakkal	348	348	328	328	308	308	308	313	318	323	323	323	323	290	265	265	265	195	195	195	195	195	225	275	325	335	335	335	335	335	335	293.35
Patna	357	352	343	343	343	339	339	339	343	343	343	333	328	328	324	295	286	262	257	257	257	257	257	-	-	-	-	-	-	-	-	314.13
Pune	374	374	374	350	350	340	330	330	335	340	345	345	345	335	325	315	305	300	280	250	250	225	265	330	380	400	400	410	410	410	410	339.74
Ranchi (CC)	376	376	371	371	367	367	367	367	367	367	367	357	357	357	338	328	328	314	290	286	286	286	286	-	-	-	-	-	-	-	-	342.43
Vijayawada	340	340	340	310	310	310	313	316	321	324	324	324	324	324	290	290	290	290	225	225	225	225	290	330	340	345	345	345	345	345	345	310
Vizag	350	350	350	350	350	350	350	350	355	355	355	355	355	355	355	300	300	300	300	275	260	245	245	345	345	345	345	345	345	345	345	331.29
W.Godavari	340	340	340	310	310	310	313	316	321	324	324	324	324	324	290	290	290	290	225	225	225	225	290	330	340	345	345	345	345	345	345	310
Warangal	319	319	319	298	298	278	278	283	288	393	298	298	298	298	278	278	253	253	213	213	213	213	213	278	328	338	338	338	338	338	335	291.06
Prevailing Prices																																
Allahabad (CC)	338	333	333	328	324	314	312	312	312	312	312	319	314	314	300	295	276	257	248	228	228	228	228	-	-	-	-	-	-	-	-	294.13
Bhopal	310	310	310	310	300	290	300	300	305	310	310	305	290	280	260	260	240	235	220	200	200	200	200	200	200	200	305	305	305	305	305	270
Hospet	325	325	325	305	305	285	285	290	295	300	300	300	300	300	280	280	255	255	215	200	200	200	200	250	300	310	310	310	310	310	310	281.77
Indore (CC)	310	310	310	305	295	295	295	295	295	300	310	305	295	285	270	270	250	240	230	230	200	200	180	180	180	180	270	270	220	220	220	258.54
Jabalpur	320	320	320	307	307	302	302	305	310	305	310	310	302	295	265	265	250	235	210	185	185	185	195	240	240	240	240	240	250	260	260	266.45
Kanpur (CC)	333	333	333	324	324	315	315	315	315	315	324	324	309	309	290	276	276	276	252	252	252	252	252	-	-	323	323	323	323	-	276	301.21
Kolkata (CC)	378	378	350	350	350	350	355	362	365	365	365	365	347	347	345	325	320	300	270	270	275	275	380	400	400	400	417	415	417	410	410	356.64
Luknow (CC)	370	370	370	370	360	350	350	350	350	350	350	333	328	328	323	323	323	323	323	310	310	310	310	-	-	286	286	286	-	-	333	332.4
Raipur	352	352	352	332	332	320	320	320	320	320	320	322	322	302	280	280	280	250	210	210	210	210	210	210	210	210	350	359	359	330	350	293.67
Surat	380	380	380	355	355	355	355	355	360	363	363	363	363	363	320	320	290	290	260	260	260	260	260	330	350	360	360	400	400	400	400	342.25
Varanasi (CC)	360	360	350	350	350	350	350	350	350	350	350	350	340	333	333	333	317	310	300	283	283	283	283	-	-	380	381	381	-	-	310	335.92

A HUMBLE TRIBUTE TO

Dr. SUSHIEL AGRAWAL

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

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

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

IH

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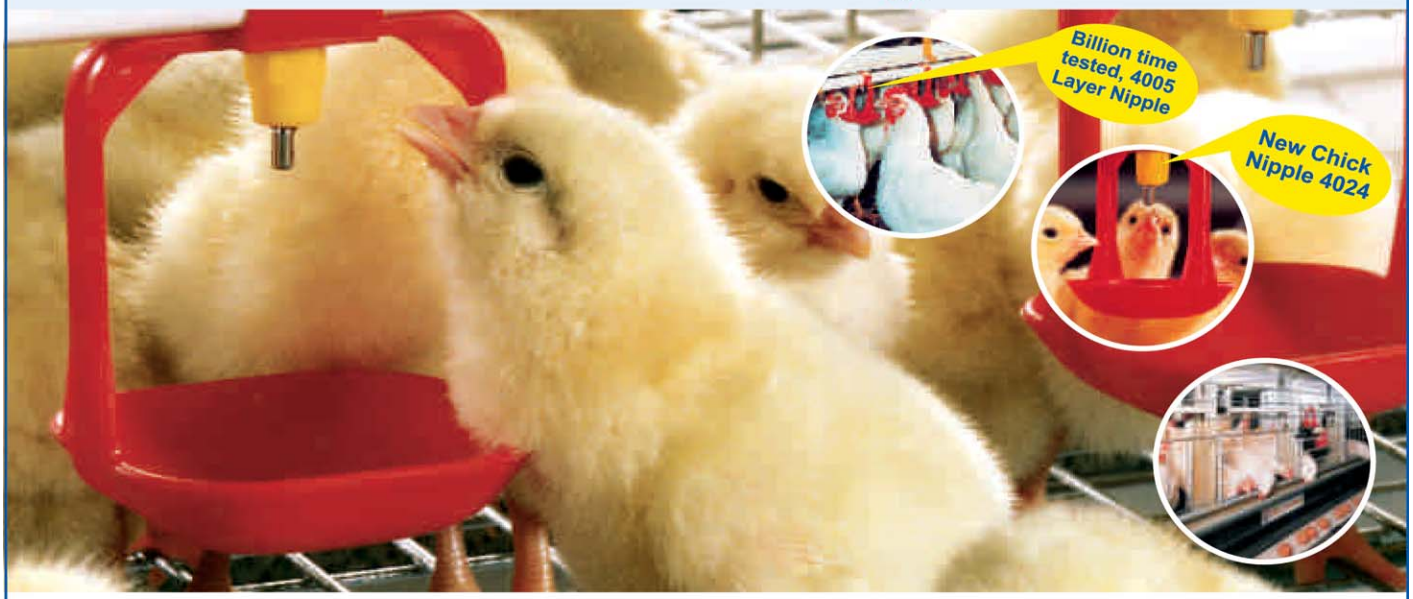

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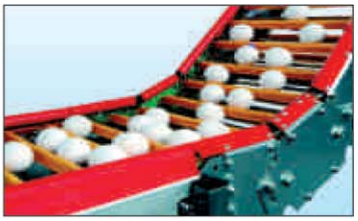

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