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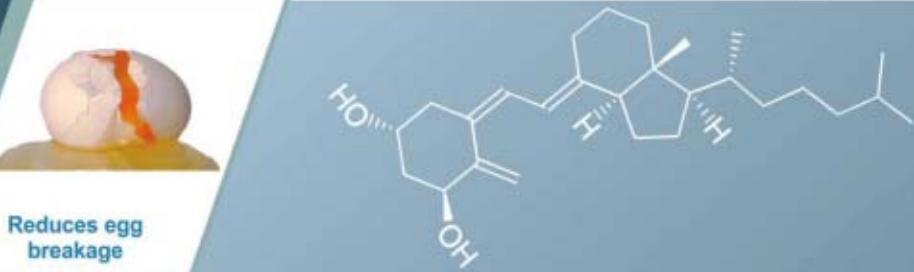
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Mr. Basantlal Agrawal, Chairman, MOEL was felicitated by Mr. Shiv Shankar. Mr. Sandeep Agrawal, Mr. Manoj Agrawal are with Chairman. Mr. Sunil Agrawal (left) and Alkesh Agrawal (right) along with Mr. Satish Sangamner, Dr. Sahebrao Rathod and Dr. Swami.

In order to recognise their support, we the team of India Poultry Expo have personally travelled to Dhule, Maharashtra and took pride in facilitating the management. Below are the pictures of the felicitation.



Mr. Manoj Basantlal Agrawal, Director, Maharashtra Oil Extractions Pvt Ltd being felicitated by Dr. Saheb Rao Rathod.

From left: Mr. Sandeep Agrawal, Mr. Basantlal Agrawal, Mr. Satish Sangamner, Mr. B. Shiv Shankar and Dr. Swami



Mr. Sandeep Agrawal honoured by Dr. Swami.
From left: Mr. Satish Sangamner, Dr. Sahebrao Rathod, Mr. Basantlal Agrawal, Mr. B. Shiv Shankar & Mr. Manoj Agrawal.



Mr. Alkesh Agrawal is being felicitated by Mr. Satish Sangamner.

From Left: Mr. Sandeep Agrawal, Dr. Sahebrao Rathod, Dr. Basantlal Agrawal, Dr. Swami & Mr. Manoj Agrawal

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Cultured Chicken Meat Production

K.Premavalli, S.Prakash and S.T.Selvan,

Post Graduate Research Institute in Animal Sciences, Kattupakkam,
Tamil Nadu Veterinary and Animal Sciences University

Cultured meat, also called lab-grown clean meat, in vitro meat, imitation meat, synthetic meat, artificial meat or bio-manufactured meat is meat which includes muscle cells, fat cells, connective tissue, blood, and other components, produced by in vitro cultivation of animal cells, without actual slaughtering of animals/birds. Cultured meat can also be produced from cells taken from the feather of chicken. It is produced by using tissue engineering techniques. White meat is an ideal material for meat culture due to its anaerobic activity, low fat content, and plasticity. Cultured meat can be “an alternative protein source to feed the world”. There are limited dedicated research activities going on throughout the world and cultured meat has not yet been commercialized.

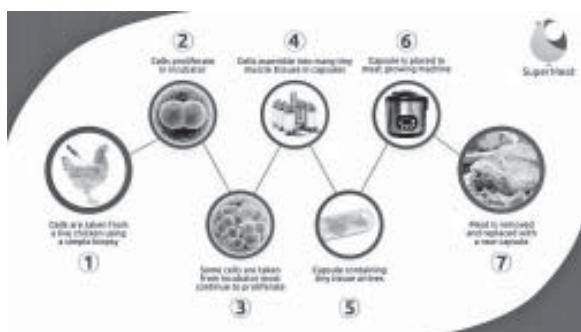
Methods

It starts with cells extracted from an animal and cultured to develop into strands of muscle tissue fit for human consumption after cooking. Collection of cells can be made through a biopsy; cells from chicken feather.

Maintaining a Primary Culture

1. Extract myosatellite cells from primary tissue

Use of “primary cells” from a living or recently slaughtered animal, or using a population of “immortalised” cells, that will keep on dividing is essential. The most viable cells are to be chosen.

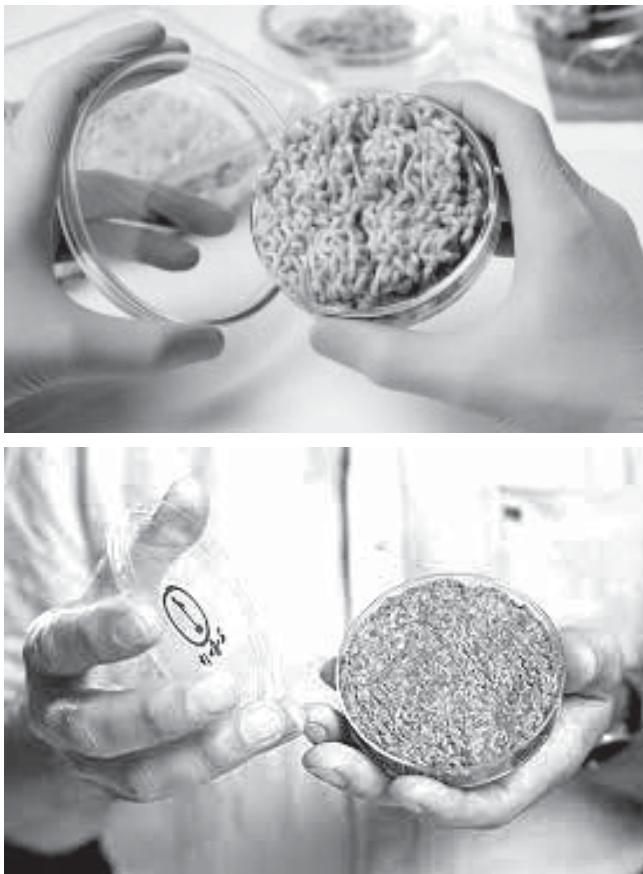


2. Plate cells in gelatinized flasks
3. Initiate serum starvation
4. Administer growth media every 48 hours

Plant-based nutrients are added to grow cells in a bioreactor. 20ml of fresh Growth Media are added to the flasks every 48 hours to promote proliferation without differentiation, until cells are ready to be frozen down. A combination of DMEM, sodium bicarbonate, horse serum, and penicillin promote cell attachment when plated. A combination of McCoy's Solution, sodium bicarbonate, chicken serum, and penicillin promote cell proliferation without differentiation.

5. Ensure optimum environmental conditions during incubation

Normally, optimum proliferation with minimal differentiation was maintained when cells were kept in T75 flasks for incubation at 37.5° C and exposed to a constant flow of 5% Co₂.



6. Passage cells to new flasks once desired confluence has been reached

Cells may reach appropriate confluence for passaging 96 hours after plating. Flasks with a confluence between 80% and 90% will be produced at 5×10^6 to 2×10^7 cells per flask with minimal amounts of cell differentiation. Many factors such as contamination and changes to their environment or feeding schedules can lead to cell death. Maintenance and prevention of death of cells is a difficult process. Once cultivated for primary culture, cells must be maintained for 40 to 60 cell divisions in order to determine their immortality. To retain immortality, myosatellite cells must be kept at optimum conditions throughout the culturing and storage process.

7. Production of clean meat

The resulting product is 100 percent real meat, is often called "clean meat" because the product is cleaner, but without the antibiotics, *E. coli*, *salmonella*, or waste contamination – all of

which come standard in conventional meat production. The pure muscle tissue – basically, lean mince, rather than something with the taste and texture of a chop or steak, which means adding fat cells and connective cells to give it "a bit more taste". The production of clean meat is significantly more environmentally friendly, much like clean energy.

8. Freeze and store cells in Nitrogen tank for ATCC deposit

A large robot and data scientists are involved in collecting data from all of the machines in the lab to identify the best ingredients.

Why Cultured meat?

It is because most food scientists believe that current methods of food production are unsustainable. Some estimate that food production will have to double within the next 50 years to meet the requirements of a growing population. During this period, climate change, water shortages and greater urbanisation will make it more difficult to produce food. Lab grown meat will help stop the slaughter of animals and protect the environment; industrial farming contributes to greenhouse gas emissions such as methane through agricultural waste and nitrous oxide via fertilizer use. The lab grown meat can be produced in a bioreactor in only two days, but it is not yet commercially available for mass consumption.

Advantages

1. Avoids sacrificing of animals/birds
2. Take fewer resources to produce than rearing livestock/ birds.
3. Require less energy, take up less land, and release less methane and other greenhouse gases than conventional meat production.
4. Eliminate much of the cruel, unethical treatment of animals that are raised for food.
5. Reduce the considerable environmental costs of meat production; resources would be needed only to generate and sustain cultured cells, not an entire organism from birth.

6. Reduce the environmental footprint of meat by up to 60%.
7. Reduce land pressures
8. Fight anti-microbial resistance and food contamination.
9. Predicted to be three times as efficient as chicken, which is the most efficient conventionally produced meat.
10. Does not require the use of antibiotics.

Disadvantages

1. Very costly
2. Overly dry (from too little fat).
3. In the beginning it will taste bland

Questions to be answered

1. "Does cultured meat spoil at the same rate as conventional meat?
2. Does it allow the same growth of potentially harmful microbes?
3. Is its shelf life the same?
4. Does it have the same nutritional qualities?"

Future research areas

In the process

- Design of bioreactors,
- To determine how to suspend large quantities of muscle cells in a bioreactor
- To explore plant based alternatives for the culturing process.
- Making sure of the cells to differentiate and form into myotubes.
- Estimation of actual time taken and labour needed to turn millions of tiny cells into meat
- Cells need to be grown on a very large scale in a commercial facility for its wide availability.
- Shortening the step involved in the bioprocess around the bioreactors, to grow muscle cells on a large scale that is economical and safe and high quality,
- Fast production of lab grown meat
- Establishment of accessible avian muscle cell line for the production of cultured meat is must.

- Establishment of an immortal chicken myosatellite cell line

After the process

- Nutritional qualities -Proximate, aminoacid, fattyacid composition analysis of cultured chicken meat
- Sensory analysis of cultured chicken meat

Major concerns

Three major concerns are to do with price, taste, and naturalness and the related issue of safety. Consumer preference will decide the success or failure of lab-grown meat. Careful attention to texture and judicious supplementing with other ingredients could address taste concerns.

Clean meat production companies

1. Mosa Meat,
2. Memphis Meats- Cultured chicken and duck meat
3. Super Meat - Chicken
4. Finless Foods.
5. Tyson Foods,(United States,)
6. **New Harvest**- Chicken and turkey meat
7. Future Meat Technologies,
8. Impossible Foods
9. Beyond Meat,

10. Good Food Institute, a Washington, D.C

The clean meat must be produced from high-quality cells from animals and cultivating them into meat

- Should be nutritious, tasty
- Should taste like actual original traditional chicken meat.
- Should have highest level of quality
- We must keep the benefits of conventional meat while making several lab grown chicken meat products healthier, more nutritious and safer.
- Process should produce less waste and dramatically fewer greenhouse gas emissions.
- Must produce cultured meat on par or even lower than the traditional / conventional meat.

If the clean meat companies can succeed in creating authentic-tasting products that are also affordable, clean meat could make our daily eating habits more ethical and environmentally sustainable.

Regulatory bodies

To receive market approval, clean meat will have to be proved safe to eat. USDA and FDA announced that the two agencies would jointly oversee the production of cultured meat products. In the new plan, the FDA will oversee “cell collection, cell banks, and cell growth and differentiation,” and then the USDA will “oversee the production and labeling of food products derived from the cells of livestock and poultry.”

Common problems

Cultured meat research has already begun but is faced with many obstacles.

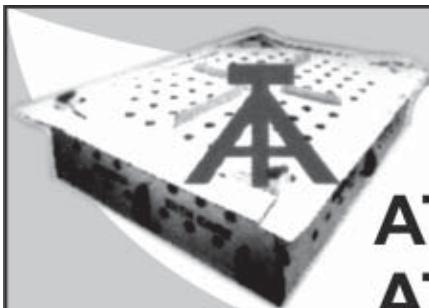
- Availability of cell lines,
- Efficient production of cells at a large scale, and cell growth using plant based media and scaffolds.
- Generating muscle cell lines that can be scaled up in a bioreactor and exploring plant based materials that can be used to grow these cells.
- Derive cell lines either from existing clonal or mass cultures or from primary culture.
- Subsequently, the cell lines will be adapted to suspension culture, while retaining their ability

to differentiate into myotubes on a solid, plant based substrate.

- Validating animal serum for the growth medium, the nutrient bath, the cells need in order to survive and grow.
- Establishment of master cell bank for deposits
- A shift from animal agriculture to lab-based products can potentially reverse global warming, decrease foodborne illnesses and environmental pollution, and spare billions of animals.
- Establishment of an efficient method of culturing avian myoblast cells on a large scale, leading to further research in the field of cellular agriculture.

Conclusions

In vitro meat culture offers a solution to unsustainable meat production while still providing animal products to our growing population. Use of cheaper ingredients to feed the meat cells can be followed to lower the production cost of cultured meat. It should mimic the appearance, colour, flavour, texture, juiciness, tenderness and over all acceptability of the original conventional chicken meat. We must produce USDA and FDA approved cultured meat in a better way, so that it is nutritious, affordable, safe healthier and sustainable.



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Management of fracture in avian species

Deepti Sharma, Beenish Qureshi

FRACTURES in both companion birds (parrots, falconry birds and backyard poultry) and wildlife casualties occur because of trauma (with or without nutritional deficiencies). Clinically, many a times have seen that avian bones seem to heal faster than mammalian bones. The main goal in these avian fracture repair goals are identical to those in mammals, these are :

- To achieve accurate alingment of the fracture fragments.
- To cause minimal trauma, thus preserving fracture site vascularity mainly
- To apply rigidity, satisfying the mechanical needs of the fracture
- To restore limb function so that we can reduce incidence of fracture disease
- To minimise pain
- And lastly to do it as quickly and cost effectively as possible.

METHODS OF REPAIR

Some fractures in birds heal adequately with no form of applied fixation at all. Fractures of the pelvic and shoulder (coracoids, clavicle and scapula) girdles can, in many cases, heal without external/internal support.

External coaptation is most appropriate if the bone is too small for internal fixation. Application is generally quick, requiring a short anaesthetic only, if at all, with many performed in the conscious patient following analgesia. "Mouldable splints", fashioned from padded aluminium finger splints, pipe cleaners or dressing materials and "wing wraps" or "figure of eight dressings", can be used to manage a variety of fractures.

Types of Splints

FIGURE-OF-EIGHT WING BANDAGES: This method is best used for fractures of the elbow or carpal joint, or in small or very young chicks. It is important not to apply this bandage too tight.

SCHROEDER-THOMAS SPLINT: This method is best used for fractures involving the tarsometatarsus

(shank) and hock joint. It is developed from a wire or rod material, used to produce two right-angle bends next to the ring at the top of the splint, so that it runs parallel to the long axis of the leg.

ROBERT JONES BANDAGE: This method is best used for simple fractures involving the hock joint. It required heavily padded leg bandages that can be used with or without additional splinting material. Materials used for an external coaptation device various, however to be effective, it must be firm enough to provide support, and can include human orthopedic molds (orthoplast, hexelite), wood applicator sticks, tongue depressors, aluminum rods, or similar such material.

Internal Fixation Internal fixation may be used for fracture management in both medium and large birds in much the same manner as mammals. The major problem involves the lack of appropriate sizes of pins, screws and plates. Most of these were developed for human or small animal use. Consequently, their size and weight are prohibitive, except for the larger raptors. Other problems associated with internal fixation include providing exposure, minimal sepsis and articulation insult.

Isolate the bird from the flock and place in a safe, comfortable, warm location (your own chicken "intensive care unit") with easy access to water and food. Limit stress. Call your veterinarian. Surgeries for the fractures are performed only by a veterinarian, and are recommended in most fracture cases in birds. To minimize the pain, painkillers should b given for reducing the stress.

REFERENCE

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A Bennett, A Kuzma Fracture Management in Birds. Journal of Zoo and Wildlife Medicine (1992)

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Total Immunity – A Sustainable Future

by: **Regen Biocorps AHI (P) Ltd**

Experts from Regen Biocorps AHI Pvt Ltd, hosted a technical seminar on 9th August, 2019 at Hotel Prem Plaza, Karnal which was attended by poultry veterinarians and consultants, to deliberate on current trends in the industry. The topic of discussion, "Total Immunity – A Sustainable Future," was apt in the current context of challenges that the egg and meat industry in India is facing. Mr. Rakesh Vats, Regional Head – North Region, welcomed the distinguished guests to this event and set the context of the discussion and handed over the dias to next speaker, Mr. Pawan Kumar Mudgil, CEO and Founder. Mr. Mudgil has given a brief introduction about current challenges faced by Poultry industry after the Govt. Of India's colistin ban recently with global perspective and how the company is equipped with products which are solution based.

The poultry industry was going through a bad phase due to skyrocketing raw material prices in general and Maize in particular which has been trading at the highest price ever for pretty long period from beginning of 2019. More recently, poor quality and availability is making the matter even worse. This is challenging the overall profitability of producers and also leading to excess overhead cost. Higher production cost together with lower selling price is challenging the viability of producers. Managing known and unknown diseases is becoming more challenging and is a big concern because of uncertainty of disease pattern and huge financial impact. To compound the problem further, recent ban by Government of India on Colistin has put the Industry in quandary. This decision is going to reshape future course of our industry in short span of time.

This seminar was aimed at highlighting the appropriate solutions, to aid efficiency in production by focussing on "Total Immunity" which is sustainable.

Dr. Uttam Pal, Head - Technical, who has extensive experience on Poultry for more than 15 years, highlighted the novel ways to enhance Innate immunity. Dr. Pal emphasized that first couple of weeks are very important for Primary Lymphoid organs development. Supplementation of soluble specialised nutrient in this critical stage of life is vital. He envisaged that innate immunity can be improved with Immon®, a specialized product based on immune nutrients.

Birds do have a strong Immune system comprises of Innate and Adaptive Immunity. Genetically selecting the birds for higher productivity negatively impacts on Immunity. Hence, commercial birds are genetically immune-incompetent and needs extra care on this ground.

Dr. Pal, also presented a detailed R & D trial report of Immon® on Layer stress management by reducing the Corticosteroid activity in blood resulting into improved egg production and feed efficiency. These parameters were significantly higher than control groups². He opined that Immon® itself can effectively replace the need of probiotics, multivitamins and immune-stimulants used during brooding period in Broiler Integration. It can be a major boost to Broiler Integrators wishing to raise antibiotic free chicken (AFC)!!

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"We thank our honourable guests congregated by sparing their valuable time for active participation in this event", said Mr. Mudgil. "We are committed to serve the local industry and providing solutions for its challenges through collaborative projects. By understanding and anticipating proactively on the changing needs of our valuable partners, we bring about solutions with global knowledge and expertise. We will bring more advanced knowledge and technology which will pave way for more efficient customer service", he added.



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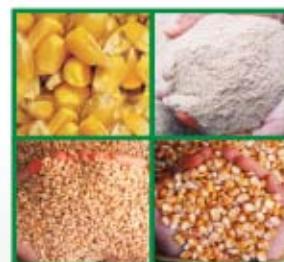


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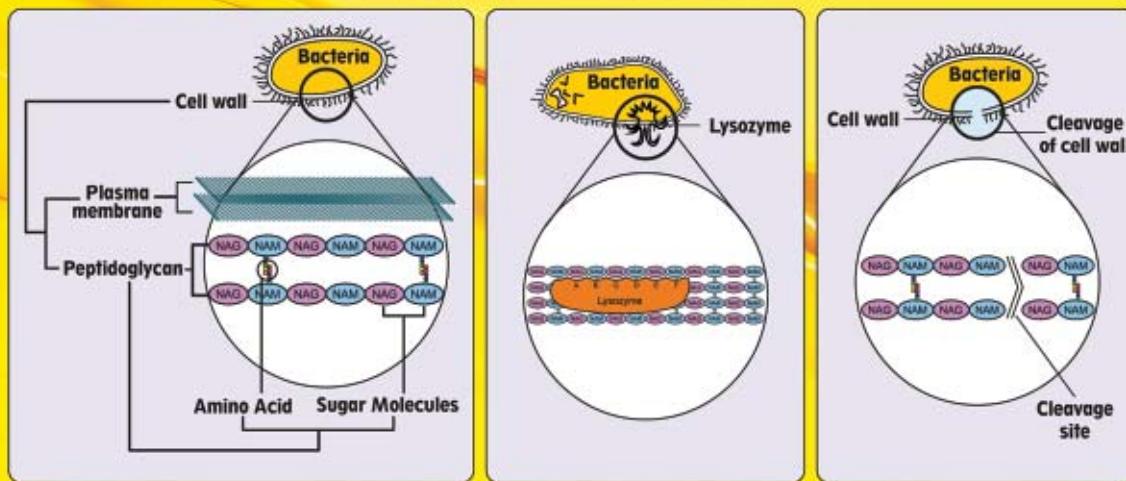
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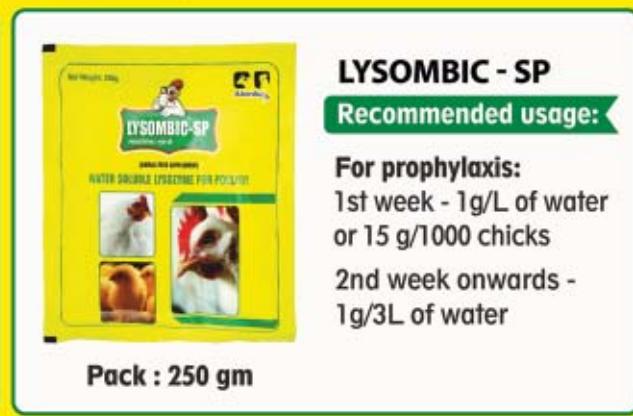
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Managemental control of Infectious stunting syndrome in broilers

K.Iniyah, C.Lavanya, S.Jayachitra and K.Balasundaram

Veterinary College and Research Institute, Namakkal,
Tamil Nadu Veterinary and Animal Sciences University (TANUVAS)

- Major economic problem throughout the world
- Causes diarrhoea in broilers during first week of life and leads to cessation of growth
- The financial losses are caused by increased number of culled birds, poor feed conversion, reduced body weight and lower uniformity at slaughter

Species affected:Chicken and turkey, mainly broilers

Synonym

- Pale bird syndrome
- Malabsorption syndrome
- Runting and Stunting syndrome
- Helicopter disease
- Poult enteritis

Etiology

- Reo virus, entero virus, parvo virus, toga virus, rota virus and calci virus.These viruses could be detected in affected birds but the condition is not caused by single etiology
- The condition is associated with several enteric viruses and appears to be multifactorial although the true etiology remains to be identified.
- Camphylobacter and spirochaetes also involved in cause

Predisposing factors

- Cold temperature during brooding
- Poor hygiene and managemental problems
- Over stocking of day old chicks
- Mycotoxin affected feed
- Dietary vitamin deficiency

Transmission

- Vertical transmission, horizontal transmission through faecal contamination
- Incubation period : 7 to 14 days
- Morbidity upto 50-90% in the first week of age
- Mortality based on severity of the disease at first week of life. Surviving birds enter the chronic phase.

Clinical signs

Acute phase

- Uneven growth
- Temporary stunting and permanent runting
- Poor feed conversion ratio
- Lack of pigmentation in skin, feet or beak
- Pale comb and wattle
- Osteodystrophy
- Broken or twisted feet and lameness
- Abnormal and fluffed out feathers
- Undigested feed in the droppings
- Mucoid diarrhoea
- Pasting of faeces around the cloaca
- **Coprophagy**, birds seen with droppings smeared in the beak
- Tremors and incoordination
- Reluctant to move
- Death

Chronic phase

- Stunted birds with down feathers have increased appetite for both faeces and dry ration
- Swaying gait with pendulous abdomen
- Birds appear stunted and never attain target weight for age

Gross lesions

- Affected birds are relatively small for their age and pale
- Distension of intestinal rumen with poorly digested contents and caecum swelling with foul yellowish contents
- Hard atropic and very pale pancreas
- Thickened proventricular walls and ulcers in the mucosa
- Osteodystrophy

Histopathological lesions

- Cystic lesions in the small intestine particularly duodenum with varying amounts of cell debris in the lumen and large accumulation of mononuclear cells
- Inflammation and blockage of pancreatic ducts
- Reduction in the zymogen granules and shrinkage of apical region in the exocrine cells of pancreas

Diagnosis

- Clinical signs and post-mortem lesions
- Since multiple etiological agents are involved and presence of enteric virus in normal birds, laboratory investigation may not be possible to diagnose the condition.

- Poor managemental conditions and presence of more than 5% stunted birds in the flock
- Stunted birds with prominent clinical signs may be sacrificed for histopathological examination of pancreas

Treatment

- No effective treatment for severely affected birds
- Use of Antibiotics may be effective in less severe cases

Prevention and control

- No vaccination to control this condition
- Good farm hygiene to reduce the burden of multiple infectious organisms
- Good flock nutrition, antibiotics and vitamin supplements may be helpful
- Following all-in-all-out system of rearing with adequate down time between flocks
- Use of clean litter material without contamination
- Avoiding use of faeces contaminated eggs for hatching
- Maintenance of proper brooding temperature
- Proper cleaning and disinfection of hatchery, brood chamber and poultry house
- Removal and proper disposal of dead birds immediately

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Bacteriophages as therapeutic agents in Poultry Diseases

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Introduction:

Increasing concerns about antimicrobial resistance in animal and human pathogens and epidemiology of transmission of antibiotic resistance have driven the recent search for novel alternatives to antimicrobial drugs in humans and animals. Although bacteriophage (phage) therapy is one such alternative, it is not novel. Soon after their discovery by Twort (1915) and d'Herelle (1917) phages were used to control avian typhoid caused by *Salmonella gallinarum*. Human applications soon followed, and by 1930–1940 phages were commonly used therapeutics, particularly in Georgia, Russia and Poland, and also in the USA (Summers, 2005). Interest in phage therapy declined soon following the introduction of antibiotics, but has increased dramatically particularly with recent research serious infections caused by antibiotic resistant pathogens such as vancomycin-resistant Enterococci (Biswas et al., 2002) and methicillin-resistant *Staphylococcus aureus* (MRSA) (Matsuzaki et al., 2003).

Pertinent aspects of phage biology & Mode of action of phages:

Phages are highly plentiful in nature and share a common ecology with their bacterial hosts (Bryant and Kutter, 2005). Because of their ubiquitous presence they are found in the alimentary tracts of animals and humans, and in foods, soil, water, sewage and associated environmental niches. Bacteriophages can be grouped into Lytic and Temperate phages. **Lytic phages** exhibits a self-replicating virulent infectious cycles that results in rapid degradation of host cell DNA, replication of phages and lysis with release of hundreds of progeny phages (Guttman et al., 2005). In contrast **Temperate phages** do not lyse the host cell, incorporates phage genome into host cell

genome & replicates along with host DNA as prophage. Hence there is no cell destruction, it is clear that pro-phages do not offer any therapeutic effect.

At an ideal ratio of phages to susceptible host bacterial cells, phages amplify themselves by repeated cycles of replication until the host cell is eliminated or killed. This ratio is referred as Multiplicity of infection (MOI). At very high MOIs, the host may be killed by 'lysis from without', in which attachment of many phages to a single bacterial cell results in lysis without phage replication. At low MOI, where the numbers of target bacteria are insufficient or falls below the 'phage proliferation threshold' level extensive lysis of host cells takes place. In other situations, phages and susceptible bacteria may co-exist in equilibrium of a predator-prey relationship. Co-existence with relatively stable numbers of hosts and phages may reflect the emergence of phage resistant sub-populations.

Another important characteristic that influences the therapeutic potential of phages is their specificity, which determines their host ranges among targeted and non-targeted bacteria. Most phages offer greater specificity than antimicrobial drugs, targeting only specific subtypes within a species, serovar or serogroup. Phage specificity is determined largely by the interaction between binding sites on their tail fibers and one or more receptors on the cell surface of the host bacterium, which may include lipopolysaccharides, proteins, capsular polysaccharides, flagella and pili. The ideal therapeutic phage will infect multiple pathogens carrying common surface receptors, such as the *Salmonella* phage, Felix O1, which infects most *Salmonella* serovars (Kallings, 1967).

Phage therapy in chickens:

In general, colibacillosis is a serious problem in poultry production, infections starts in the respiratory system, quickly becomes systemic and

causes considerable mortality. *Salmonella* and *campylo bacter* infections are the most common food-borne bacterial enteritis in developed countries

S. No.	Phage used	Organism studied	Author
1	'R' phage	<ul style="list-style-type: none"> - Intramuscular (i/m) inoculation of 10^6 R phage PFU fully protected 3 week old chickens against i/m inoculation of 10^6 cfu of <i>E.coli</i> O18:K7:H7 strain H247. - reduced mortality by 70% in treated flocks. 	Smith & Huggins, 1982.
2	Phage virulent for <i>E.coli</i> O2:NM strain	<ul style="list-style-type: none"> - Birds were challenged with 10^4 CFU of an <i>E. coli</i> O2:NM strain into one thoracic airsac. - The mortality was 85% in control birds, whereas mortality was reduced to 35% in birds inoculated with 10^4 PFU and 10^8 PFU completely protected the birds. 	Huff et al. 2002
3	Anti-SE Bacteriophage	<ul style="list-style-type: none"> - Anti <i>Salmonella enteritidis</i> phage quantified to 10^9 PFU / g of agar. - Broilers diets were supplemented @ 0, 0.05, 0.1 and 0.2 per cent of diet & Birds are challenged with pathogenic <i>Salmonella enteritidis</i>. - Body weight gain, Feed intake and Feed efficiency were comparable to control and did not affect the performance of broilers. - Mortality rates for Control, 0.05%, 0.1% and 0.2% groups were 30%, 17.5%, 12.5% and 10% respectively. 	Kim K.H et al. 2013
4	Bacteriophages of <i>Salmonellatyphimurium</i> & <i>Salmonella enteritidis</i>	1.18×10^{11} PFU phages/chick reduced mortality in broilers challenged with 10^5 CFUs <i>Salmonellatyphimurium</i> & <i>Salmonella enteritidis</i> and reduced <i>Salmonella</i> counts in cecum.	N. M. Nabil et al. 2018
5	<i>Clostridium perfringens</i> CP-6 strain 10^8 CFU/ml at 1.0 ml/bird by oral gavage.	<ul style="list-style-type: none"> - Significantly reduced mortality of <i>C. perfringens</i>-challenged birds by 92%. - Weight gain and feed conversion ratios were significantly better in <i>C. perfringens</i> challenged chickens treated with the bacteriophage cocktail. 	Miller et al. 2010

**PFU Phage forming units

Limitations:

1. High variation in the protective dose, in some cases it was 10^4 PFU and some cases 10^{11} .
2. Only strong lytic phages are suitable.
3. Preventive treatment in phage therapy did not prevent colonization.
4. Some lytic phages are known to release endotoxins that cause fever, and sometimes toxic shock.
5. Use of phages with uncharacterized genomes seems to be dangerous. Only full characterization and screening of phages can eliminate those that encode toxic proteins.
6. All phages contain foreign proteins which could induce an immune response potentially reducing the effectiveness of therapy.

Conclusion:

The increasing resistance of pathogenic bacterial strains to the most used antibiotics in broiler farms is considered an important problem leading to high economic losses to the poultry industry. Antibiotic

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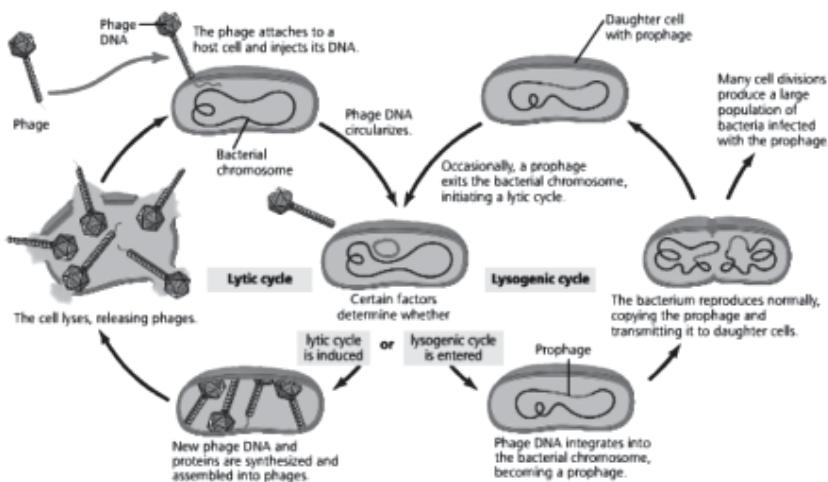


Figure.1 Steps in Lytic and lysogenic cycle of bacteriophages.

treatments does not only kill pathogenic bacteria but also affect the normal micro flora, potentially leading to secondary infections. Phage therapy has reduced side effects compared to traditional antibiotic treatments due to the specificity of phages. The development of adequate phage preparations may in the future prove to be one of the most effective methods for fighting bacteria that are pathogenic for humans and animals, and will also make it possible to obtain products that are safe and free of antibiotics.

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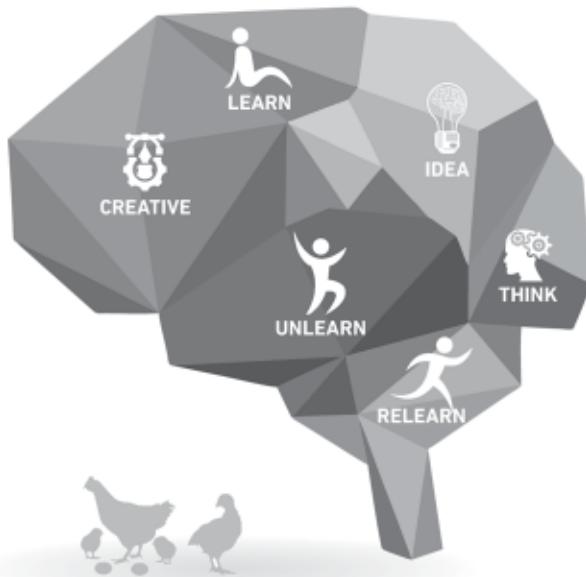


Institution of Veterinarians of Poultry Industry

ANNUAL SCIENTIFIC PROGRAM 2019

INDIAN POULTRY 2.0

LEARN UNLEARN RELEARN



Institution of Veterinarians of Poultry Industry (IVPI) conducted its Annual Scientific Program 2019 (ASP) on 14th August at Conrad Hotel, Bengaluru. The theme of this year's ASP was "Indian Poultry 2.0: Learn, Unlearn and Relearn" focusing on the Challenges of Poultry Industry and The Way Forward in alignment with BioSecurity, Health, Welfare, Environment & Consumer Needs.



The President of IVPI, Prof G Devegowda welcomed all the Veterinarians, Speakers & Poultry Entrepreneurs and introduced the Theme of the Technical Program to the audience. Mr. Chinnaraj, Poultry Farmer, Businessman & Member of Parliament from Namakkal was felicitated on this occasion.



First Speaker, Mr. Suresh Chitturi, MD & Vice Chairman, Srinivasa Farms spoke about the Importance of Poultry Industry in the Indian Economy. He highlighted the Potential of Poultry in reducing malnutrition among young children, providing employment generation, developing Solar energy, harvesting water and Biogas production at the farm level etc.



Second Speaker, Mr. Abhay Hanjura, CEO of LICIOUS, discussed in detail about the Innovative & Technology driven marketing and sales model for chicken, meat and sea food. He highlighted the potential of huge opportunity for the other Poultry Entrepreneurs to focus in the e-commerce segment for chicken retailing.





IVPI's Lifetime Achievement Award for the year 2019 was awarded to Dr. Puttanniah, a renowned Pathologist and one of the founder member of IVPI.

Third Speaker, Dr. Benoit Pele from Hendrix Genetics spoke about the status of Egg Industry in Asia and the opportunities in the future. He highlighted the enormous health benefits from Egg consumption & insisted to include eggs in the school meal programs across India.



Dr. Ravikiran compered the entire program and Dr. Prakash Satihal gave Vote of Thanks followed by chanting National Anthem. The IVPI-ASP 2019 ended on a high note followed by networking dinner.



Inclusion Body Hepatitis In Chicken

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Introduction

Inclusion body hepatitis (IBH) associated with fowl adenovirus (FAdV) infection has occurred worldwide and resulting in considerable economic losses to the poultry farmers. It is an acute disease of chicken caused by the virus of the genus *Aviadenovirus* and referred to as fowl aviadenovirus (FAdV). There are 12 FAdV types (FAdV1 to FAdV8a and FAdV8b to FAdV11), classified into five species based on their genotype (designated FAdV A to FAdV E). All most all serotypes are involved in causation of IBH. It normally occurs in meat-type chickens at 3 to 7 weeks of age, but it has been reported in birds as young as 2 day-old and as old as 20 weeks. High mortality occurs when the affected birds are less than three weeks of age. Depending on the pathogenicity of the virus, immune status of the chicks and concurrent secondary infections, mortality may reach up to 80 per cent.

Transmission

Horizontal and vertical transmission plays an important role in IBH. The virus transmits vertically through embryonated eggs. Horizontal transmission of fowl adenovirus occurs by the oral – faecal route and further spread takes place by mechanical means and by contamination with infected faeces.

Clinical signs

Sudden mortality is found in birds of 4 days old up to 6 weeks. Mortality generally ranges from 40-60%. In many cases the IBH can be a primary disease in broiler chicken without any immunosuppression and it causes low morbidity and mortality ranges between 10 to 30% and it can reach up to 80% in the presence of other immunosuppressive factors. Affected birds showed reduced feed and water intake, lethargic, huddling with ruffled feather, yellow droppings and in some flocks showed leg weakness.

Postmortem lesions

On necropsy examination affected birds showed ascites, enlarged pale, friable and mottled liver. The kidneys are pale, swollen and mottled appearance. Haemorrhage into the renal cortex may be found in some of the birds.

Histopathological examination

Classical IBH is characterized by focal hepatic necrosis and presence of intranuclear inclusion bodies in

hepatocytes.. Congestion and focal hemorrhage are observed in kidneys. In many of the hepatic cells, the nuclei disappear entirely, leaving a ghost cell consisting of one or more large vacuoles. Varying degrees of pyknosis, karyorrhexis and karyolysis are observed in the majority of the hepatic cells.

Diagnosis

- Diagnosis of IBH is based on both conventional and molecular techniques. Conventionally IBH can be diagnosed based on the clinical signs, gross pathology, histopathology and serological techniques.
- Histological investigations and detection of intranuclear inclusion bodies in hepatocytes.
- Isolation of fowl adenovirus using chicken embryo liver culture and identification by PCR and real time PCR.
- Serotyping of fowl adenovirus using PCR combined with RFLP, sequencing and High Resolution Melting curve analysis of hexon gene

Prevention and control

- The immunosuppressive viruses like infectious bursal disease virus and chicken infectious anaemia viruses potentiate these diseases. So, the major step should be to eliminate these two agents.
- Feed should be free of mycotoxin
- Implementation of proper winter management programme
- Appropriate biosecurity measures should be maintained.
- Infected and non-infected breeding flocks should be separated.
- Vaccination of breeder flock with serotype specific fowl adenovirus vaccine.

Conclusion

Inclusion body hepatitis is a recently reemerged fowl adenoviral disease of meat type chicken. The control of disease is difficult due to involvement of many fowl adenovirus serotypes causing disease. It should be eliminated from the poultry flock by strict implementation of biosecurity measures, routine screening of flocks for other immunosuppressive diseases and proper vaccination programme.

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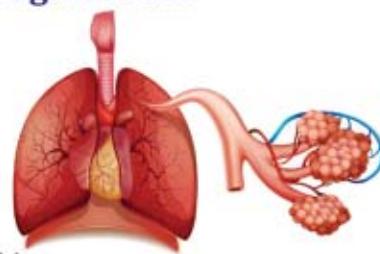
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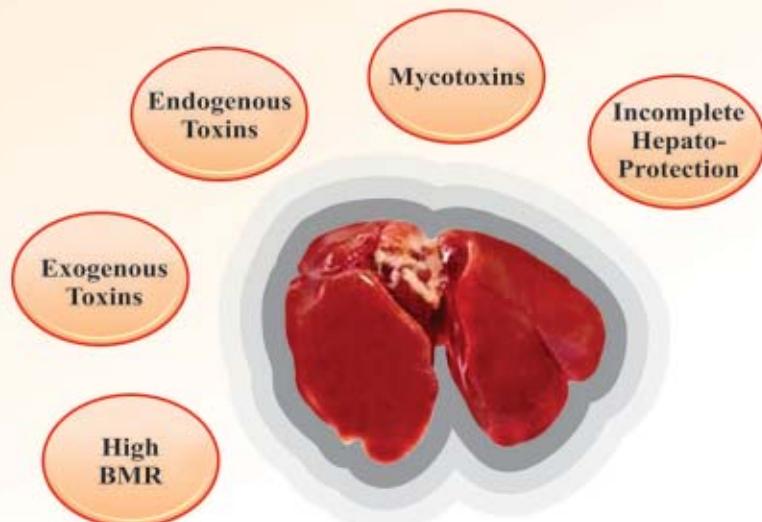


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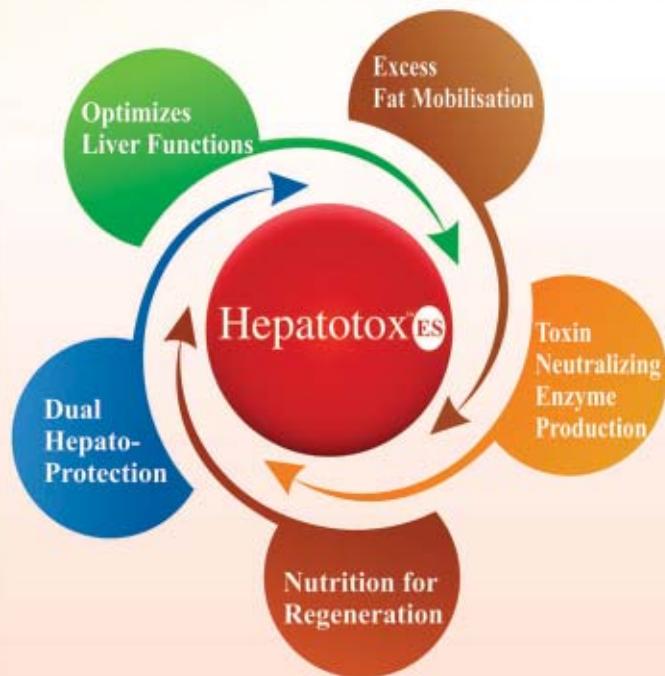
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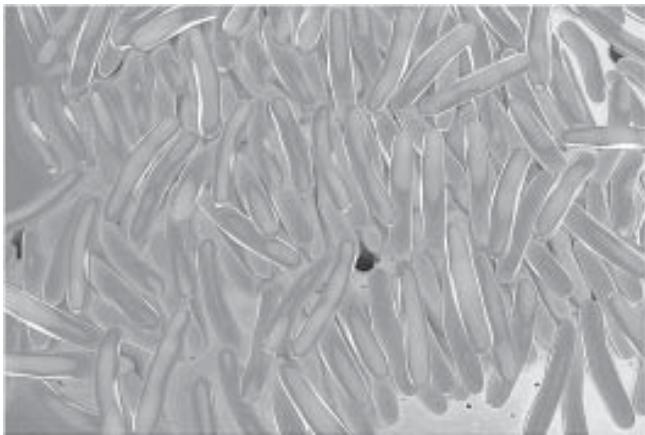
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PRESS RELEASE

Boosting Vaccines' Effectiveness using Synbiotics

Recent evidence demonstrates that supporting poultry gut health with a combined prebiotic and lactic acid bacteria-based probiotic can improve an animal's immune response



Birds are highly susceptible to many infections and diseases which are caused by a variety of microorganisms such as bacteria, viruses, fungi and parasites. The birds' vulnerability to these infections is particularly high in intensive commercial poultry rearing systems worldwide. Without their effective immune systems birds would hardly be able to survive in such a hostile environment.

The avian immune system

Avian species' immune system is quite unique as they don't possess lymph nodes but instead they have lymphoid aggregations along the gastrointestinal tract (GIT) and other mucosal surfaces. The GIT-associated lymphoid tissue (GALT) has about 65-70% of the birds' immune system. This means that in addition to the digestive and absorptive functions, the gastrointestinal tract is also considered the major immune organ in birds.

Natural immune system development

Under natural conditions, chicks hatch in close proximity to the mother hen, allowing them to eat and drink as soon as they are hatched. Microflora from the mother hen also colonizes the gastrointestinal tract of young chicks. Early feeding

and microflora colonization have very positive effects on birds' performance and on the maturation of the birds' immune systems.

Modern, slower colonization

Poultry production under modern husbandry practice does not allow newly hatched chicks to come into contact with mother hens, slowing the development of gut microflora and the immune system by 3 weeks or more. The lack of the gut microflora establishment opens the door to enteric colonization by pathogens, making the chicks susceptible to infections and diseases.

Probiotics' positive effects on immunity

Lactic acid bacteria-based probiotics support a bird's immune system in several ways. They play an important role in the development and establishment of gut microflora and encourage rapid maturation of the immune system. This helps the birds to respond better to vaccines and also defend themselves against infections. Probiotics also have an important role in combating diseases and infections.

Commensals and probiotics are always sensed by immune cells, where antigen presenting cells such as macrophages, dendritic cells and B-cells sample these beneficial bacteria and induce specific local immune modulation with the activation of B-cells to produce secretory IgA against these beneficial bacteria which can be considered harmless and non-inflammatory in the mucosal and the systemic environment (oral tolerance). Probiotics help the host's immune cells to better recognize and eliminate harmful pathogens. Improved tolerance coincides with less energy expended on inflammation, leaving more energy directed towards growth.

Probiotics and vaccine interaction

More in-depth work has been done in humans looking at the effect of probiotics on vaccine response. For instance, a large increase in vaccine-specific serum IgA and IgG antibodies titres was observed in individuals that received *Lactobacillus*- and *Bifidobacterium*-based probiotics with *Salmonella typhi* and Cholera vaccines compared to those who received the vaccine alone (Paineau *et al.*, 2008, Maidens *et al.*, 2012).

Similarly, but to a lesser extent, some work has been done in birds. For example, Methner and others (2000) found out that the administration of the live *Salmonella* vaccine before or at the same time as probiotics offered the best protection against experimental *Salmonella* challenge as a result of the development of a stronger immune response.

Synbiotics build on the success of probiotics

The benefits of probiotics, or beneficial bacteria, in supporting gut microflora are well documented. Prebiotics are non-digestible food ingredients that beneficially affect the host by selectively stimulating the growth or activity of one or several beneficial bacteria in the gut. Synbiotics combine prebiotics and probiotics in order to deliver further benefit to animals.

IBD vaccine trial

A study performed at Kasetsart University, Thailand, evaluated the effect of PoultryStar® — the first poultry-specific, multi-species synbiotic product to be authorized by the EU — against flavomycin — an antibiotic — and negative control on broilers' performance and immune status following infectious bursal disease (IBD) vaccination on day 14. Compared to the other trial's groups, PoultryStar® increased performance in addition to increasing IBD antibody titres, indicating an up-regulation of the birds' immune status (Table 1).

Table 1. Performance parameters after 45 days and immune status after IBD vaccination program.

Performance parameters	Negative Control	Positive Control	PoultryStar®
Number of birds	600	600	600
Duration of trial (days)	45	45	45
Live weight (g)	1894	1979	1947
Feed intake (g)	3352	3449	3358
Mortality (%)	1.12	0.59	0.53
FCR	1.77	1.75	1.73
IBD titres	1281	2304	3385
PI*	235	250	249

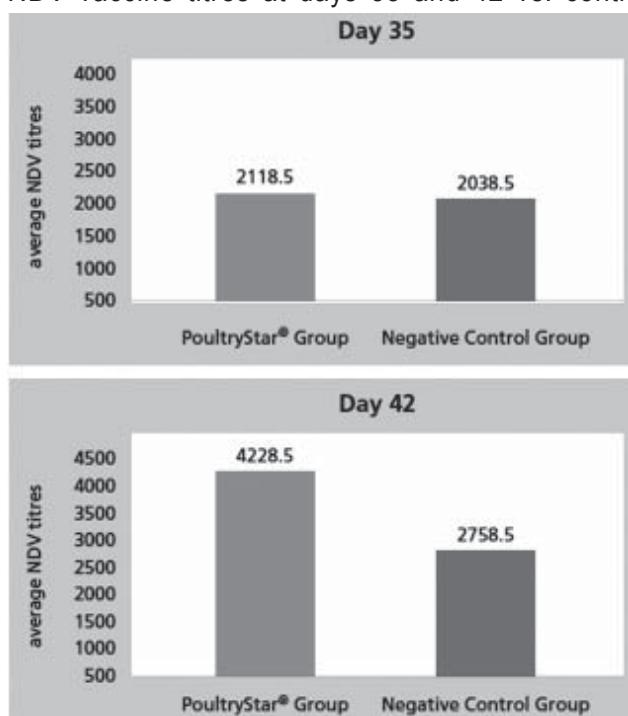
*PI (Broiler Productivity Index) = (Livability [%] x Live weight [kg]/age [d]/FCR) x 100

Source: BIOMIN trials, Kasetsart University, Thailand, 2005

IBV and NDV trial

A similar effect on vaccine response was noticed in a recent field study where birds were divided over two houses, each house was divided into two groups; a PoultryStar® group and a control group. On the first day, all the groups received Newcastle disease virus (NDV) and infectious bronchitis virus (IBV) vaccines in the hatchery followed by NDV vaccine on day 15. On days 35 and 42 NDV vaccine titres were found to be higher in the synbiotics treated groups (Figure 1).

Figure 1. Effects of PoultryStar® administration on NDV vaccine titres at days 35 and 42 vs. control



Source: BIOMIN trials, Poulpharm, Belgium, 2014

More to discover

How synbiotics enhance vaccines response is not fully understood. The positive effects of synbiotics might be due to the fact that probiotics work as adjuvants for vaccines (directing immune response) and as facilitators of a return to tissue homeostasis following pathogen challenge. Moreover, the diversity and composition of the gut microflora also may influence the efficacy of oral vaccines. The failure to develop protective immunity to vaccines in particular geographical areas could be due to intestinal microflora composition among other reasons (Valdez *et al.*, 2014). Combining

probiotics with vaccines has a positive effect or sometimes no effect on the vaccine response as the response is dependent on the probiotic strains used (Maidens *et al.*, 2012).

Conclusion

With the increasing interest in the use of probiotics in animal production, it is important to understand the role they play in modulating the bird's immune system. Although the immuno-modulatory activities of probiotics are not yet fully understood, they can increase birds' immune response following vaccination.

Free Lance Poultry Consultant

DR.MANOJ SHUKLA, a renowned poultry Veterinarian, with 20 years of enriched field experience, now started Free Lance Poultry Consultancy. In the past 20 years have contributed to the development of the hatcheries in various capacities of leading companies across India - Maharashtra, Gujarat, Madhya Pradesh, Chhattisgarh, Orissa, Bihar, West Bengal, Jharkhand, North-East, Uttar Pradesh and neighbouring country of Nepal.



His areas of expertise include:

- Commercial Layer Management.
- Commercial Broiler Management
- Nutrition (Feed Formulations).
- Breeder Management.
- Sales & Marketing of Day-Old commercial Layer chicks, Broiler chicks & Poultry Feed.
- Sales & Marketing of Broiler Breeder.
- Integration.
- Training to Field staff.
- Field Trail of Drugs & Feed additives.
- Speaker in Technical Seminars.

He can be Contacted at:- **Dr. Manoj Shukla**

A-1, Gaytri Nagar, Phase-II, P.O. Shankar Nagar, Raipur, Chhattisgarh-492007

Mob.No : 09644233397, 07746013700, Res. 0771-4270230

Email : drmanu69@gmail.com

As a strategic partner, Poultry Line wishes Dr. Shukla every success in his new assignment



VIP's EggChi Walkathon



"VIP's EggChi Walkathon" 28th July 2019, Sunday is a fruitful day for Poultry Industry! Together Team VIP & Team Poultry completed the perfectly executed event organised by Vets In Poultry (VIP)! Reaching the common people for explaining science behind the egg and chicken products in a methodic way. A remarkable example of well-organized-executed industry-cum-public rally. We VIPian's are overwhelmed by the kind of dedicated participation from each segment of industry and society.

Just a year-old VIP has successfully completed the event of "EggChi Walkathon". The event with support from all bodies and members of industry cannot be better to have such blockbuster opening to our association. It's a success of mega-event was involvement of participants from Industry & Society actively participated including their family, young children in a shower drizzling road show. This event

will be trigger point to Indian Poultry and we expect many such events to happen. VIP will stand alongside to any such promotional activities.

28th July is super Sunday and created many historic landmarks:

- 1- First of its kind in the history of poultry industry
- 2- Active participation from families and children are our valuable participants
- 3- More than 500+ participants enjoyed EggChi walkathon
- 4- Walkathon started in spite of rainfall and continued as per decided agenda
- 5- The effective tool of public interview by our team to reach common public overcoming their routine doubts about the egg & chicken food product. More than 70 interviews within 2 and half hours what an interactive event it was!





6- Distribution of frozen chickens & scientific pamphlets (Egg & Chicken) to walking civilians

7- Voluntarily and actively participations, support and endorsement from each segment of industry across India

8- Distribution of boiled eggs and chicken nuggets

9- Displayed banners, placards and slogans to break myths for mass awareness

10- The event is appreciated & supported by almost all Associations of India in one go

-PF&BA-MH, CLAFMA, NECC, TPFBA-TA, KPFBS-KA, IVPI-KA, BCC-TN, PVF-TN, BFCC-GJ, WBPF-WB, IPJA, IPEMA and all others associations and bodies.

In spite of many minor and major challenges, all industry mates coming together with different schools of thoughts for a noble cause of overcoming malnutrition through the VIP's EggChi Walkathon has been a grand success.

The "EggChi Walkathon" started from Balgandharva Rangamandir travelling Jm Road - FC Road to end up at Sambhaji Udyan with the distribution of egg & chicken products. The group marched from start & keep discussing with bus drivers, shopkeepers, auto rickshaw drivers, on the way to local residents of JM road and FC road Toddlers, youngsters and female participants were enjoying the drizzling

showers during the rally with all due arrangements of safety.

The request letter for Promotion, Eggs inclusion in mid day meal and Overcoming social Misconceptions was handed over to former agriculture minister Mr. Sharachandra Pawar and acting member of parliament Mr. Girish Bapat, BJP, Pune.

"The rally was impressive at public interaction conducting interviews of pedestrians who came for morning walk on JM & FC road and for breakfast as well" said the president of VIP Dr Ajay Deshpande.

We a technocrat face of industry, conveyed the fare message about the production system, its rigorous controls for addressing nutritional requirement of the society especially when we as a country are topmost in production of eggs and least consumer unfortunately. This was also a good platform to clarify the myths and misleading of media, society towards consuming egg & chicken added by Dr Pedgoankar, GM, Venkateshwara Hatcheries.

Dr. Ajit Ranade, Dean at Mumbai Veterinary College, addressed the requirement of protein in our diet and relative importance of eggs and Chicken. He has also appealed the general health conscious morning walkers to focus protein rich diet along with exercise.





Dr V R Kulkarni while talking to media also addressed the importance of current protein requirement of Indian population and way outs of meeting the same through poultry farming products. He has also converted the attributes of poultry products from health & beauty point of view.

The public interacting was addressing questions from public about the nutritional composition, its safety, table eggs been non fertile & high in nutritive value, importance of chicken & why Indian local produced chicken is safe to consume

The managing committee of VIP, explained moto behind this initiative is to:

- 1) Address Protein Malnutrition and way-outs to overcome through Egg & Chicken (EggChi)
- 2) Spreading awareness of poultry products (Chicken, Egg & It's byproducts) in society
- 3) Explaining scientific background to break the false propaganda and fear against the egg and chicken consumption in the society along with improving connect of technocrats in the poultry industry.

We as Team VIP, are grateful to all the 8 teams to execute flawless show. Each team putting their efforts as an individual and as a team was above



the expectations was the real reason behind the success.

1. - Promotional Tool Management Team-
Dr Prasad, Dr Rahul Sawarkar, Dr Pankaj, Dr Satbhai, Dr Nitesh Kadam, Dr Vijay Gadge, Dr Vinayak, Pramod Joshi
2. - Statutory Authority Management-
Dr Santosh Ire, Rulesh Kherde, Rahul Pedgoankar, Shailesh Rasinkar, Manish Pingale
3. - Participation drive management with all communications-
Dr Ajay Sir, Dr CB Pathak Sir, Dr VRK Sir
4. - Public interaction team-
Dr Jeevan, Dr CB Pathak Sir, Dr Ajay Sir, Dr VRK Sir, Dr Sujet Kulkarni, Dr Ajit Ranade Sir, Dr Pankaj Tuptewar, Dr Vinayak Surve, Dr Satyjit Jagtap, Vinay Kulkarni, Rahil Somjee, Ganesh Bhosale, Girish Bodhe, Pradeep Gadekar, Charuhas, Varun, Jagdish Patil&Vasantkumar Sir.
5. - Trafic & Rally management team-
Dr Atul Rajput, Dr Sachin Patil, Dr Sachin Badane, Dr Vaibhav Akkewar, Dr Pradeep





Doiphode, Pradeep Gadekar, Alok Upadhyा, Yogesh Autade, Manish Pingale, Milind Padwal, Pardeshi & all volunteers

6. - Untoward incidence handling team.
Dr Sunil Bhinge Sir, Dr Baswaraj Sir, Rahil Somjee, Alok Upadhyा, Rahul Pedgaonkar, Dr Satbhai
7. - Refreshment Team
Rahil Somjee, Rulesh Kherde, Anant Patil, Shailesh Rashinkar, Pramod Joshi, Parshuram
8. - Media Team
Dr Ranade Sir, Dr Ajay Sir, Dr Pedgaonkar Sir, Dr VRK Sir, Dr Sujit Sir

Hearty Thanks to each one who involve directly and indirectly. This event would not have been completed without proactive support of industry corporate houses to distribute chicken and eggs. Godrej and Baramati Agro distributed frozen chicken, Venky's express helped for Fried Chicken Nuggets, Yojana Poultry & Om Layer (Chicks) helped to distribute boiled eggs after the event as an refreshment. Great response from all Mumbikar industry mates to attend even despite of red alert due to rain was remarkable. Poultry fraternity peoples from Hyderabad, Kolhapur, Sangli, Nasik and adjoining states to add value to event. We are thankful to all media friends from regional newspaper, channels, FM and national media for giving desired coverage. Tons of thanks to all Indian Poultry associations and bodies for their unconditional support and value added inputs. Thanks to Major participants from big houses: Japfa,

VH, Godrej, Baramati Agro, Premium, Siddhivinayak, KuKooChaKu, Khadkeshwara, Urja, Kiran Breeding, Om Chick India, Jumbo Rooster, Bhairavnath Breeder, Yojana, Bhairavnath Layer, PDRC, CP & Pharma Distributors & Companies and all farmers and groups. Thanks to the man who initiated the idea and he's Dr G Gopal Reddy.

Grateful to every contributor in direct or indirect way to deliver our objectives effectively and especially well aligned with each segment of poultry industry. Thanks once again.

Regards,

Dr. Ajay Deshpande, President

Dr. Santosh Ire, Secretary

VIP Committee:

- Prof Dr Ajit Ranade (Tech Advisors)
- Dr VR Kulkarni (Vice President)
- Dr Prasad Kulkarni (Treasures)
- Dr CB Pathak (EC Member)
- Dr Sujit Kulkarni (EC Member)
- Dr Jeevan Sonwane (EC Member)
- Dr Pankaj Tuptewar (EC Member)
- Dr Sachin Patil (EC Member)
- Dr G Gopal Reddy (EC Member)
- Dr Sahebrao Rathod (EC Member- Nasik)
- Dr Rais (EC Member- Anand)
- Dr Badal (EC Member- Chandigarh)
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And all VIP Working Committee



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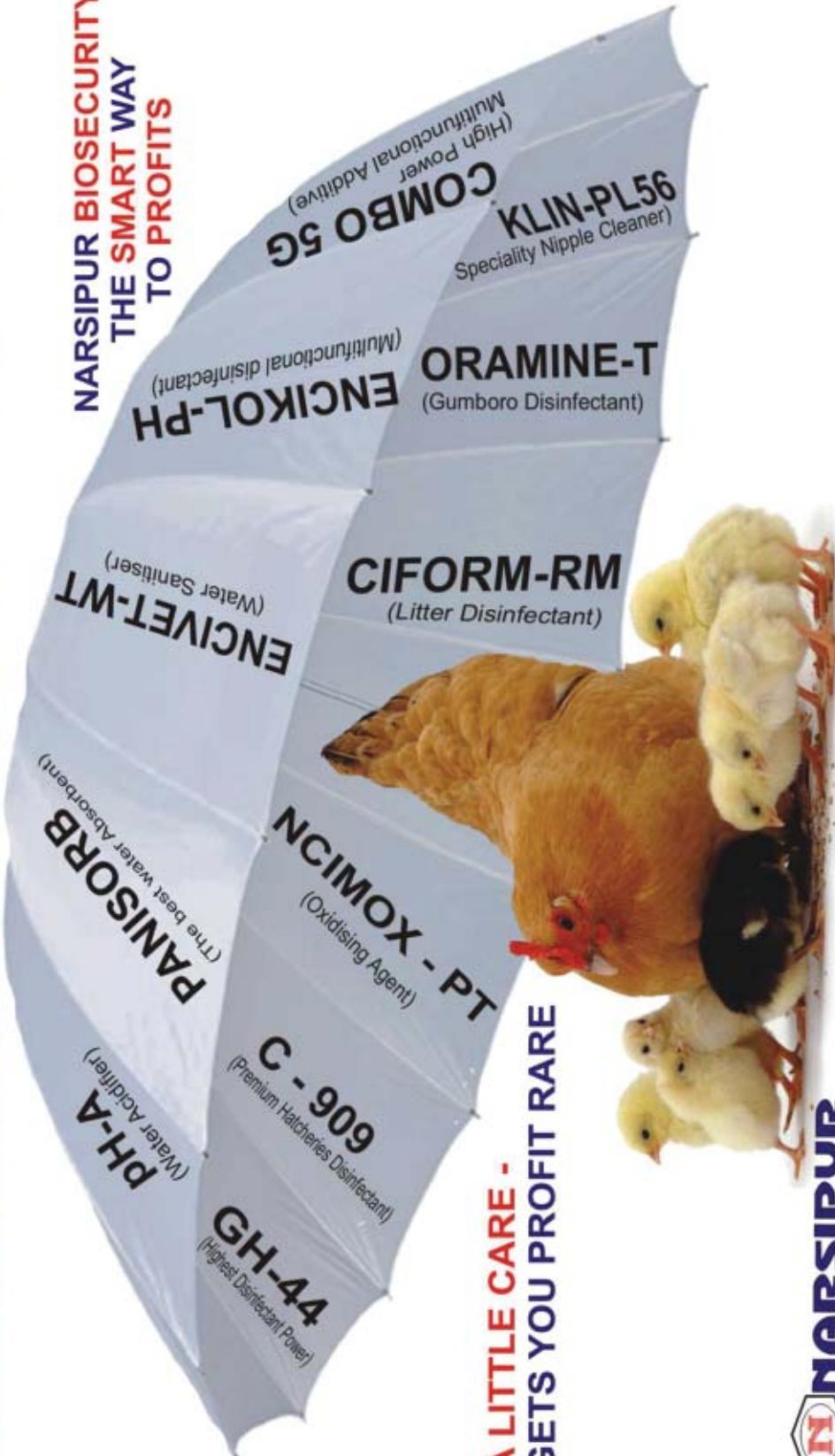


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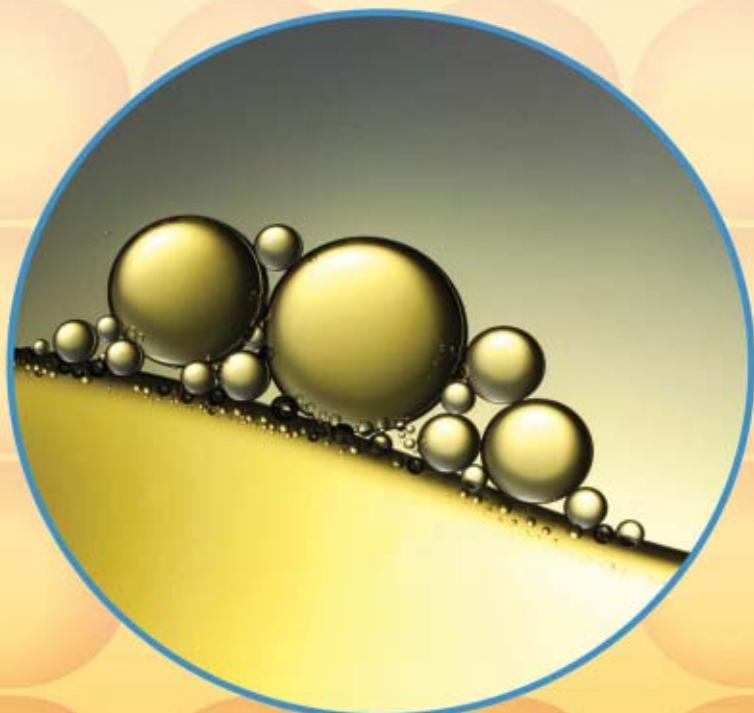
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Poultry sector clarifies 'myths' around consumption of broiler chicken

'Antibiotics are administered only after prescription by registered veterinarians'



Already reeling under the impact of severe shortage of maize to feed broilers, the poultry sector is now combating what it terms a "misleading" campaign against consumption of chicken on social media platforms.

The arguments put forward by the Karnataka Poultry Farmers and Breeders Association (KPFBA) to bust the "myths" of poultry consumption have found support from poultry science experts.

Reacting to the campaign through videos on social media that caution people against broilers, holding the consumption of "antibiotic" and "hormone" injected birds responsible for a variety of side-effects including obesity, early puberty, and development of anti-microbial resistance, KPFBA president K.S. Akhilesh Babu said that antibiotics are not administered indiscriminately in the poultry sector.

Antibiotics are administered only for therapeutic purposes and only after prescription by registered veterinarians, he said while dismissing reports of "hormone" injection as "patently false".

"The cost of hormones is costlier than the bird itself. Already, the cost of production is so high, why will anybody increase the cost by adding hormones?" he asked.

The growth of broiler to its full size in 40 days has been attributed to scientific rearing methodologies

with the assistance of feed formulations and efficient management practices. "Today, the birds are growing faster than their ancestors on account of advanced technology in poultry rearing," Mr. Babu said.

Endorsing the contentions made by KPFBA, retired professor and Head, Department of Poultry Science, University of Agricultural Sciences, Bengaluru, G. Deve Gowda told The Hindu that there is no reason to fear that consumption of broilers will lead to obesity. "For, there is practically no carbohydrate in the chicken meat. It contains purely protein, vitamins and minerals. It is a rich package of all nutrients," he said.

Poultry sector in India in 2019	
Turnover Rs. 1.2 lakh crore	Average size of broiler farm 4,000 birds
Annual growth 6% to 8%	Daily production of broilers 1.1 crore
Direct employment 40 lakh	
Indirect employment 2.5 crore	Data sourced from Karnataka Poultry Farmers and Breeders' Association
Broiler farmers 1.9 lakh	

There could be reasons to fear about early puberty and obesity only if hormones are used, Prof. Gowda said.

However, the poultry industry, which has already voiced its protest against the recent notification issued by the Government of India's Department of Animal Husbandry and Dairying on the size of the cages or enclosures for breeding of birds in the poultry sector, does not foresee any threat to consumption of broiler chicken.

NATIONAL EGG CO-ORDINATION COMMITTEE

DAILY / MONTHLY EGG PRICES DECLARED BY NECC AND PREVAILING PRICES AT VARIOUS PRODUCTION CENTRES (PC) AND CONSUMPTION CENTERS (CC) AUGUST / 2019

CITY (COMPANY)	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	Avg.	
AHMEDABAD (Necc)	370	372	374	374	374	374	374	374	374	374	374	374	374	374	374	374	374	374	374	374	374	374	374	382	386	385	360	355	355	372.64			
AJMER (Necc)	315	315	305	295	290	290	291	300	302	311	320	320	321	322	324	325	325	325	325	325	325	325	325	316	310	311	325	326	326	312.96			
BANGALORE (Necc)	350	355	355	360	360	360	360	360	360	360	340	340	340	340	340	345	345	345	345	345	345	345	350	350	355	355	335	335	325	325	348		
BARWALA (Necc)	315	315	315	305	300	296	296	296	305	312	314	314	317	321	323	324	326	326	326	326	326	326	326	316	312	314	320	320	320	313.71			
BHOPAL (Necc)	350	350	350	350	335	330	330	330	330	330	330	330	330	330	335	340	345	345	347	345	345	345	345	350	350	350	340	330	330	330	330	338.88	
CHENNAI (Necc)	365	375	375	375	375	375	375	375	375	375	375	375	375	375	355	355	355	355	355	355	355	355	360	360	365	365	365	365	345	345	364.2		
CHITTOOR (Necc)	358	368	368	368	368	368	368	368	368	368	368	368	368	368	348	348	348	348	348	348	348	348	348	348	348	348	348	348	348	361.57			
DELHI (Necc)	330	330	325	315	315	315	315	315	315	315	325	330	330	330	335	335	338	338	340	342	342	342	342	342	342	342	337	337	337	340	331		
GODAVARI (Necc)	323	327	330	332	333	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	343	343	343	330	330	330	332	333.76		
HOSPET (Necc)	315	320	320	325	325	325	325	325	325	325	325	325	325	325	305	305	305	305	305	305	305	305	305	310	315	315	320	320	300	300	290	313	
HYDERABAD (Necc)	320	323	326	328	328	328	328	328	328	328	328	328	328	328	328	328	328	328	328	328	328	328	331	334	337	339	341	320	310	310	313	326.52	
INDORE (Necc)	345	340	325	320	310	310	310	310	310	310	325	330	340	350	350	350	350	350	350	350	350	350	350	345	345	345	345	335	335	340	335.6		
JABALPUR (Necc)	341	342	343	343	338	328	325	325	327	327	332	332	332	332	335	335	338	339	341	343	346	346	350	350	350	350	342	335	335	335	338.6		
KOLKATA (Necc)	365	369	373	375	377	377	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	380	370	364	360	360	362	374.16		
MUMBAI (Necc)	372	375	378	381	381	381	381	381	381	381	381	381	381	381	381	381	381	381	381	381	381	381	381	386	390	390	395	395	365	365	365	380.16	
MYSSORE (Necc)	362	362	367	367	367	367	367	367	367	367	367	367	367	367	347	347	347	347	347	347	347	347	347	352	357	357	362	365	345	345	332	356.28	
NAGPUR (Necc)	325	325	325	320	320	310	310	310	310	310	315	315	315	322	320	325	330	333	335	335	335	335	335	340	345	345	345	345	310	310	310	315	319.8
NAMAKKAL (Necc)	365	365	370	370	370	370	370	370	370	370	370	370	370	370	350	350	350	355	355	360	360	365	365	368	368	358	340	340	340	340	359.16		
PUNE (Necc)	360	362	364	365	365	365	365	365	365	365	365	365	365	365	350	350	350	350	350	350	350	350	350	350	350	350	350	350	340	340	340	354.6	
PUNJAB (Trading)	331	331	331	331	320	315	315	325	325	329	329	329	329	329	332	332	332	338	338	340	340	340	340	340	340	340	340	340	340	340	340	340	318.92
RAJPUR (Necc)	342	342	342	342	342	332	332	332	332	332	337	340	344	344	344	347	347	350	350	355	357	360	360	360	360	360	360	360	360	360	344.48		
SURAT (Necc)	385	385	385	385	385	385	385	385	385	385	385	385	385	385	385	385	385	385	385	385	385	385	385	389	393	395	375	375	370	370	384.08		
VIJAYWADA (Necc)	323	327	330	332	333	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	334	343	343	343	330	330	330	330	333.76		
VIZAG (Necc)	350	352	352	352	352	352	352	352	352	352	352	352	352	352	352	352	352	352	352	355	357	359	361	361	361	361	361	361	361	354.68			
WARANGAL (Necc)	320	323	326	329	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	331	330.33	

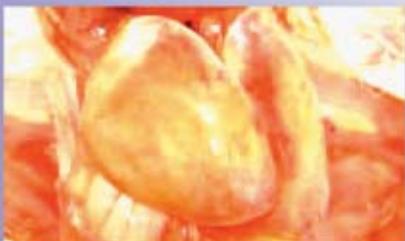
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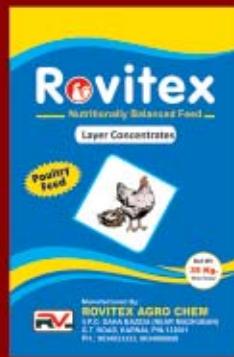
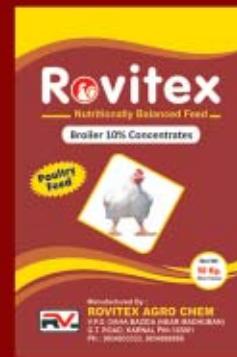
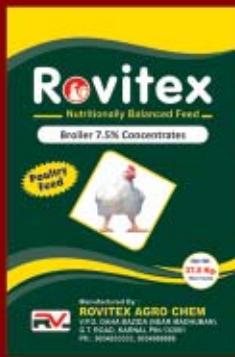
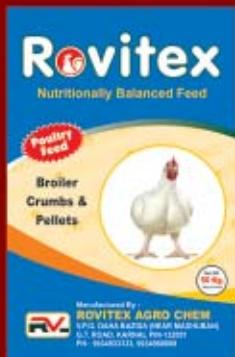
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- ❖ Broiler 2.5% Concentrates
- ❖ Broiler 1.5% Concentrates

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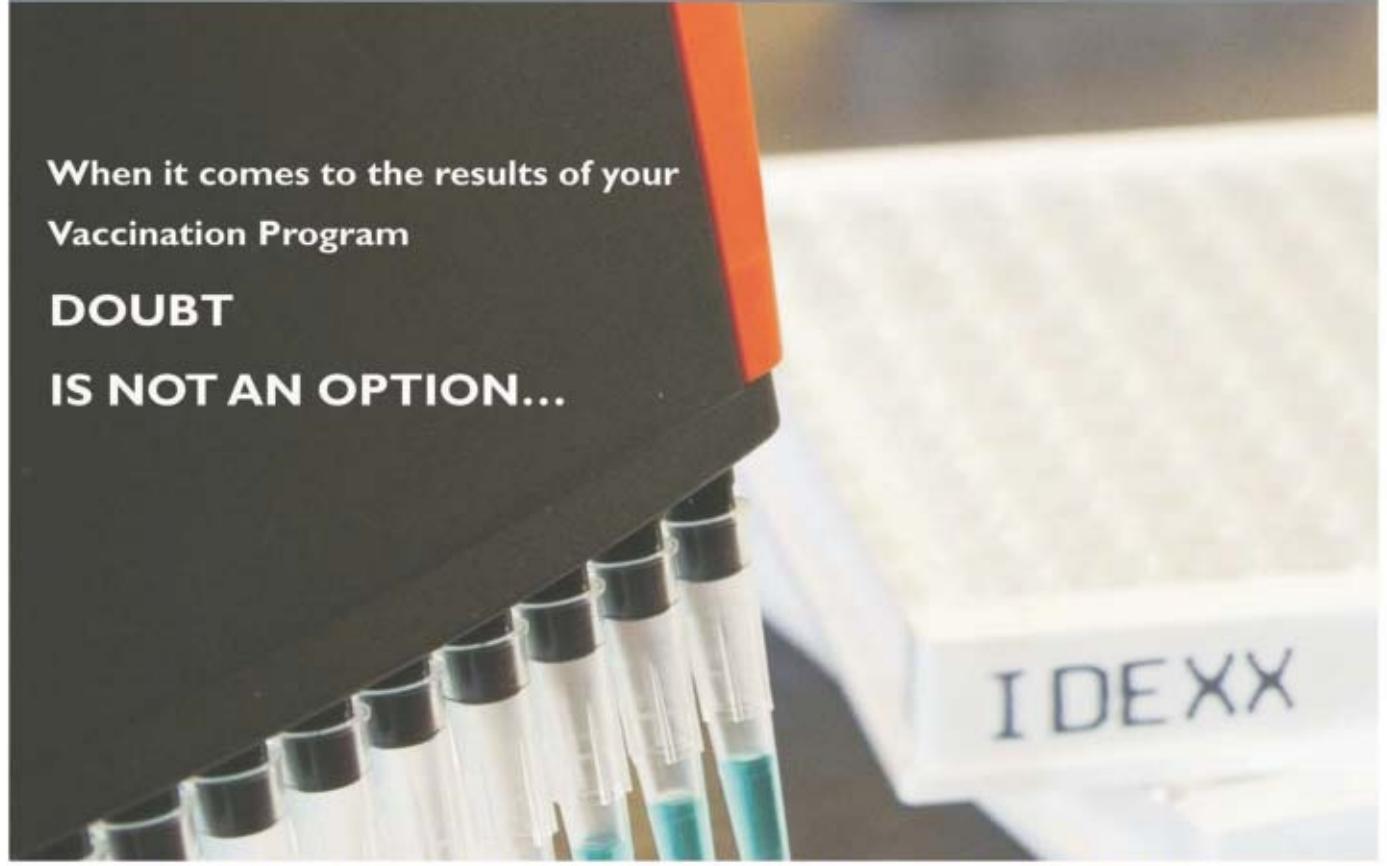
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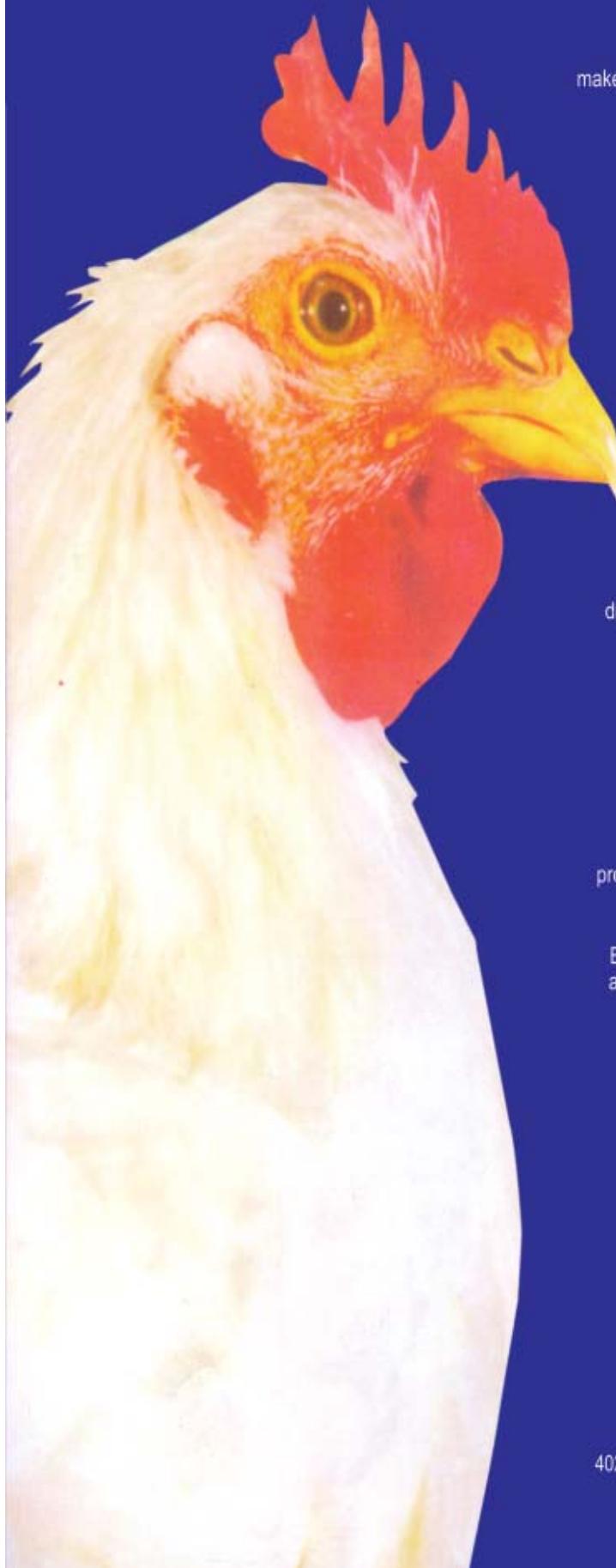
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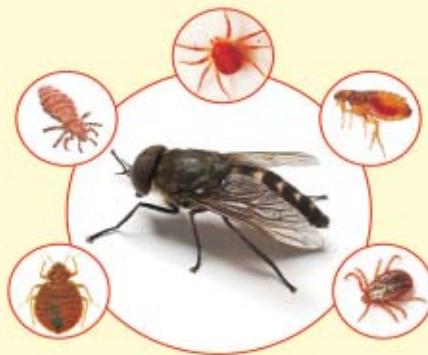


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* D. Michael Fry - Department of Avian Sciences, University of California, Davis, California - Environ Health Perspect 103(Suppl 7):165-171 (1995)



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PFI filed an RTI against Law commission of India

Poultry Federation of India filed an RTI against Law commission of India to review the documents used in drafting of report no. 269. Upon reviewing the documents, the PFI concluded that there is an urgent need to file a case in Hon'ble High Court against Law Commission of India as its report is manipulated. The text is published as under for the information of our readers.



POULTRY FEDERATION OF INDIA

49, Omaxe Plaza, Omaxe City, G.T. Karnal Road, Sonepat - 131001
Phone : 0124-4085090 E-mail : poultryfederation@gmail.com
Website : www.pfindia.org

RTI exposes Foreign-Funded NGOs manipulated Law Commission Report No. 269 as part of the dangerous hidden agenda

Request:

Concerned Ministries, Departments and Courts should reject the Law Commission of India Report 269 in the Present Form and investigate the people involved in Drafting unscientific and manipulated Report

Details Inside

Evidence under RTI exposed the dirty picture of Foreign-Funded NGOs of Union Minister

The Inside Story:

How Conspiracy by Foreign-Funded NGOs led by Union Minister by manipulating Law Commission of India was planned to create farmers unrest in the country before elections by forcing courts to adopt manipulated Law Commission Report to destabilise Doubling farmers Income Agenda of Prime Minister of India?

Foreign-Funded NGOs are repeatedly making a public noise that Indian Courts and Government of India endorse Law Commission Report No. 269, which was drafted by 21st Law Commission.

Background: Considering the technically incorrect recommendations made by the Law Commission vital technical on the various aspect of the subject like Housing and transportation in the report 269 it was important for us to understand who is behind this mischievous act and which are forced keen to destroy India's food security, willing to create farmers unrest before elections of 2019 and creating obstructions in doubling farmers agenda of Prime Minister Modi.

Poultry Federation of India is the leading organisation working for the welfare of the small poultry farmers. Small poultry farmers of India work under the technical guidance of Indian poultry scientists and experts to ensure performance under hot climatic conditions like India. Under all odd conditions today, Indian farmers have achieved some of the best performance parameters in poultry production and ensuring their livelihood and ensuring good quality protein for 70% Indian population.

There is a serious attempt to hurt the Indian poultry industry so that India is forced to open its market for imported poultry products from the countries which are giving donations to these foreign-funded NGOs.

How Law Commission of India was manipulated by foreign-Funded NGOs?

After reading the whole report No. 269 with full of technical and scientific errors, we were keen to know the complete process adopted by Law Commission of India adopted in the finalization of the report from start to finish, including who all were involved in drafting the technical report, which all evidence were used by law commission, who provided the expertise and experience on such technical matters and other related matters. We want to state that the content of the law Commission Report indicates there are many serious gaps in the recommendations and them area clear indication that who all were involved were ignorant about poultry science and the ground reality of India and farmers of India.

As a concerned organisation, on behalf of poultry farmers of India, we filed list of questions with various departments under RTI Act and also demanded an opportunity to inspect all the documents, records, transcripts, video recordings, voice recordings and any form of documents and supporting information on the following questions.

Our specific questions under RTI application related to Report No. 269 were as follows and with our observations:

S. No.	Questions under RTI	Observations during Inspection and Response under RTI	PFI request to Authorities
1.	Please share the information and allow inspection who initiated the consultation process on the subject? Please share the documents or letter which	PFI could inspect the records. According to File No. A-60011(4)/1/2017-Admin.III (LA) dated 02.03.2017.	Can a minister of the union government in his/her official capacity write to the Law Commission on a subject, which is not in her domain without any
	initiated the process on this subject for this report.	There was a letter dated 03.02.2017 from Mrs Maneka Sanjay Gandhi in her capacity of Hon'ble Minister of Women and Child Development via Department of Legal Affairs to make reference to the Law Commission to conduct a detailed study of domestic law and international trends which may government housekeeping and transportation of poultry Birds.	consultation with the domain union ministry in the same government and the concerned Minister? The fact is this is a violation of the Collective Responsibility of the Government and undermining the existing of domain ministry and Minister within the Government. Why she had not asked the concerned ministry to address her concerns, before asking for detailed investigation by Law Commission. She has not even marked the copy to the concerned Ministry or to Cabinet Secretariat or PM office. It is well known that Mrs Maneka Sanjay Gandhi runs an NGOs and she receives foreign funding

			<p>for the NGOs. As policy maker herself, seeking foreign funding for her NGOs itself is a violation of FCRA Laws and Rules. Recently the government acted against some prominent people violating FCRA rules, why there is leniency against this person.</p> <p>Why show cause notice should not be issued to the minister for undermining the functioning of the relevant ministry by the minister in the same government and disciplinary action should be initiated.</p>
2.	<p>Please share the information and allow inspection of all the meetings notice issued and the mailing list to whom letters were forwarded.</p>	<p>According to the law commission records which were provided to us, there was no invitation sent to any subject expert or poultry company or poultry farmers to explain the factual position.</p>	<p>Why Law Commission of India, headed by retired Judge of Supreme Court, ignored this basic requirement in an investigative study.</p> <p>What was the motive behind</p>
		<p>This is against the natural justice and against the spirit of democratic principles and the process laid out by Honourable Supreme Court of India.</p> <p>Important: The only mode of communication which was adopted by the Law Commission was its own website and that too in English.</p> <p>Do we expect poultry farmers to visit the Law Commission website during a particular duration when there is no information was given to anyone including to the concerned Ministry, Universities, state governments and industry bodies?</p>	<p>these hidden agenda moved by foreign Funded NGO?</p> <p>Why Chairman law commission never asked the Commission staff to ask response from the concerned ministry before initiating the process of investigation?</p> <p>Request: This issue must be investigated by CBI because this shows that foreign-funded NGOs are able to dictate the functioning of the Law Commission of India and its Chairman. This is a grave threat to the sovereignty of India and its constitutional bodies. There may be many such incidences in the country where foreign-funded NGOs must be dictating their will on many policymakers of the country.</p>

	<p>3. Please share the information and allow inspection List of expert committees who advised the law commission on this subject and their qualifications and areas of expertise on the subject.</p>	<p>According to RTI, there are no records of any sort on this regard.</p> <p>No experts were called and no letters were issued to any expert for meetings.</p>	<p>Under RTI, we came to investigate this aspect as well. We cross-checked with leading poultry research bodies of Government of India about the same under the RTI Act. According to them, they are not aware of any such development, they were never invited or no information was ever asked from them.</p> <p>The government must investigate why Indian government research bodies were kept in dark and why they were not invited for discussion when Law Commission is planning to work on policy recommendations on a highly technical matter where there is no expertise exist with Law Commission?</p>
	<p>4. Please share the information and allow inspection of the List of newspapers and other communication options used with the date and content of advertisements called for the consultations for the report.</p>	<p>No advertisements were issued and no information was shared with the public regarding this investigation.</p>	<p>What was the motive behind keeping such vital activity secret, where millions of farmers and their livelihood is at stake?</p> <p>CBI must investigate why foreign-funded NGOs with the support of Union Minister planning to destroy food security and livelihood of millions of farmers of India.</p> <p>Who is behind this game and why the union minister is working against the Prime Ministers's agenda of doubling of farmers income in India.</p>
	<p>5. Please share the information and allow inspection, who made the payment for the advertisements.</p>	<p>According to RTI, No records exist.</p>	<p>This basic activity was not undertaken.</p>
	<p>6. Please share the information and allow inspection details of the</p>	<p>According to RTI, No records</p>	<p>During our informal interaction with the junior staff in Law</p>

	meeting organised by Law Commission, venue details, timings, expenditures incurred, payment details, attendance sheet and name of the participants and their organisation details and contact details like email and contact numbers.	exist.	Commission, we were told that this whole report came from outside the commission, no work was done in the Law Commission of India. This report was just released by the Law Commission. This is the serious and grave matter with serious consequence. Government of India must ask all the office bearers of 21 st Commission to explain the source of information and how the report was drafted and who all were involved with evidence. Hon'ble President of India, Prime Minister of India, Chief Justice of India, the collegium of Supreme Court must investigate the conduct of the former judge and seek an explanation.
7.	Please share the information and allow inspection, Were there foreign-funded NGOs part of the consultation process for the above-mentioned document?	Yes. Official records very clearly indicate that only NGOs which was interacting with Law Commission of India is actually a Foreign-Funded NGO named "People for Animal".	According to our information, their foreign funding has gone up when they filed the case. This can be investigated with the Home Ministry of Govt. of India.
8.	Please share the information and allow inspection, was there any attempt made by Law Commission to identify the agencies funded by foreign entities?	No attempt was made by the Law Commission to know the credibility of NGOs sending letters to them.	.
9.	Please share the information and allow inspection, of the copies of the representation, sent by all agencies including NGOs and their evidence during the consultation process.	The number of letters which came to Law Commission under different letterheads was from the same address, posted from the same post office, posted on the same date and time and in fact the font and text of the letters were also same. Few MPs and government officers and business people	I request CBI and Government of India to investigate the source of funding for these NGOs. Why so many NGOs are operating from the same address in Mumbai. Who are these people and why service they are offering to society? It seems there is a deeper conspiracy in the game. Who are the people willing to

		<p>forwarded the letters. The fact is the language of all the letters were the same.</p> <p>It is shocking that the Law Commission never asked any agency to check the credentials of these NGOs.</p> <p>There was no letter from an expert or person who is aware of the poultry system in India.</p>	destabilise the countries food security. Why foreign-funded NGOs are so keen on managing these letters and Law Commission Report?
10.	Please share the information and allow inspection, Who drafted the Law Commission Report and where? Please indicate the name of the experts involved in the drafting of the report, venue and dates for the finalisations of the meeting.	No records exist who drafted the report, who all were part of the consultation process, not even draft report exist in computers.	CBI must investigate the whole case and try to identify the people involved in this planted report which is trying to destabilize the farmers and food security of the country.
11.	Please share the information and allow inspection of the information and allow inspection, of the names of the experts involved during the consultation process and in the drafting of the report.	No such records exist in Law Commission of India.	CBI must investigate who drafted the report because there are no experts in the Commission on the subject.
12.	Please share the information and allow inspection of all the evidence and documents used by the Law commission during the process of the consultation process and finalisation of the report.	No such records exist in Law Commission of India.	CBI must investigate who drafted the report because there are no experts in the Commission on the subject.
13.	Please share the information and allow inspection the list of research documents used which are from Indian research institutes?	No such records exist in Law Commission of India.	CBI must investigate who drafted the report because there are no experts in the Commission on the subject.
14.	Please share the information and allow inspection, whether the draft and final report of the Law Commission circulated to all the	No such records exist in Law Commission of India.	CBI must investigate who drafted the report because there are no experts in the Commission on the subject.

	relevant administrative ministries and departments in central government, state governments, development agencies and poultry association? If yes, please arrange the details and copy of the letters sent to them.		
15.	Please share the information and allow inspection, was there any feedback from the various departments of Union and state government, research institutes and development agencies and poultry association of the report of the Law Commission, if yes, please share the details and reply from the various departments on this report.	No such records exist in Law Commission of India.	CBI must investigate who drafted the report because there are no experts in the Commission on the subject.
16.	Please share the information and allow inspection, whether the Law Commission amended the report based on feedback from the administrative ministries, if yes, please provide the details thereof.	No such records exist in Law Commission of India.	CBI must investigate who drafted the report because there are no experts in the Commission on the subject.

We request all the concerned Ministries and department to investigate how such an important institution i.e Law Commission of India can be manipulated and how to fix this problem to protect the national interest.

CC:

1. Hon'ble President of India
2. Hon'ble Prime Minister of India
3. Hon'ble Chief Justice of India
4. Hon'ble Minister for Law and Justice
5. Hon'ble Minister for Animal Husbandry, Ministry of Agriculture, GOI
6. Secretary, Dept. of Animal Husbandry, Ministry of Agriculture, GOI
7. Secretary, Ministry of Law and Justice, GOI
8. Chairman, Animal Welfare Board of India
9. Director, Central Bureau of Investigation.

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Hyderabad	112	112	105	98	93	93	93	85	80	80	80	80	80	80	75	70	70	72	72	76	76	76	79	79	81	85	85	85	85		
Karimnagar	112	112	107	100	95	95	95	85	80	80	80	80	80	80	75	70	70	73	73	77	77	77	79	79	81	85	85	85	85		
Warangal	112	112	105	98	93	93	93	85	80	80	80	80	80	80	75	70	70	72	72	76	76	76	79	79	81	85	85	85	85		
Mahaboobnagar	112	112	105	98	93	93	93	85	80	80	80	80	80	80	75	70	70	72	72	76	76	76	79	79	81	85	85	85	85		
Kurnool	112	112	105	98	93	93	93	85	80	80	80	80	80	80	75	70	70	72	72	76	76	76	79	79	81	85	85	85	85		
Vizag	107	107	105	100	100	100	95	90	90	90	90	90	90	90	85	80	80	75	75	77	77	77	77	77	77	72	72	75	75		
Godavari	108	108	103	98	93	93	93	88	88	83	83	83	83	83	78	73	73	75	75	77	77	77	80	80	82	82	82	82	82		
Vijayawada	110	110	105	100	95	95	95	90	90	85	85	85	85	85	80	75	75	77	77	79	79	79	82	83	84	84	84	84	84		
Guntur	112	110	105	100	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95	95		

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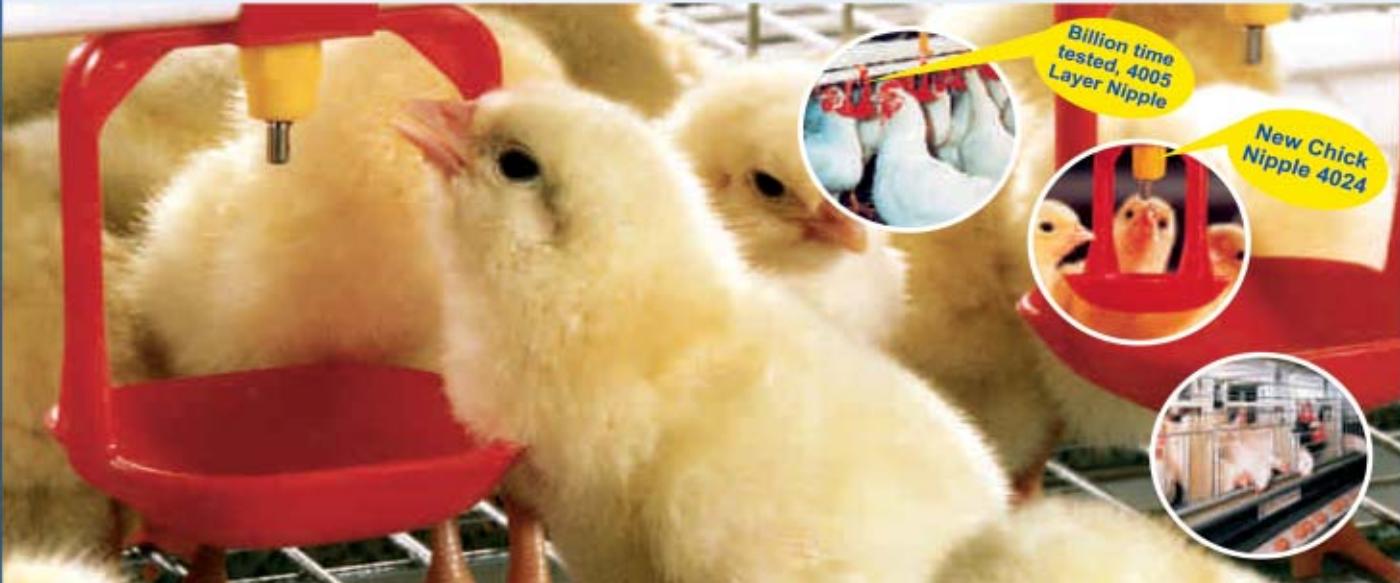
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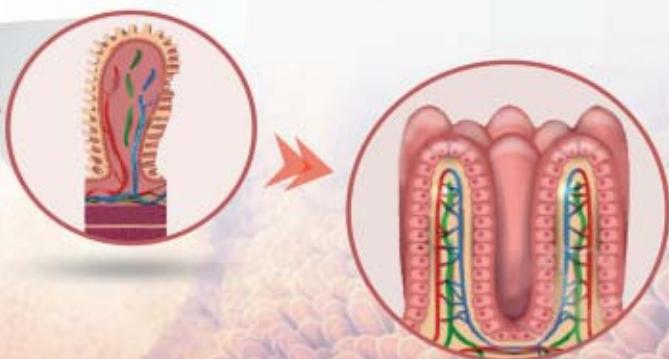
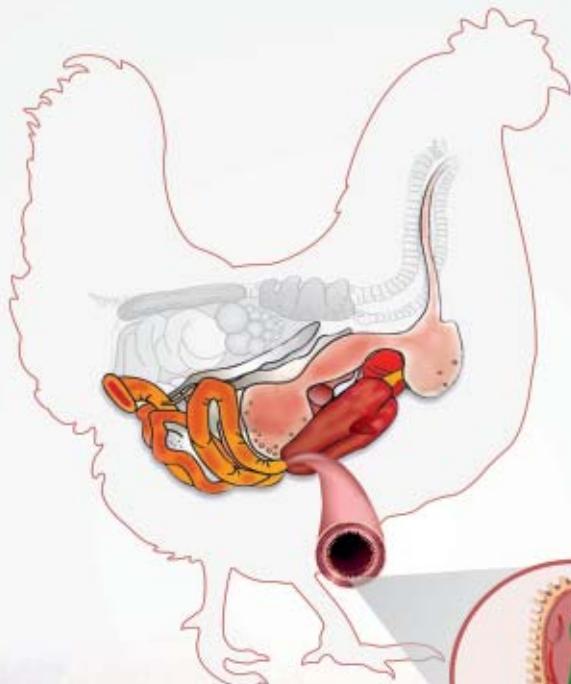
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Boost to Srinivasa's expansion plans with IFC's Partnership



Hyderabad, India | August 8, 2019 - As part of strategic investment to support India's agribusiness sector, International Finance Corporation (IFC), a member of the World Bank Group, has committed to invest INR 1,300 million (or USD 18.75 million equivalent) in Srinivasa Farms Pvt. Ltd. ("SFPL" or "Srinivasa" or the "Company") to partner with the Company in its pursuit to expand pan India with capacity enhancement and product diversification. The first tranche of INR 650 million (or USD 9.37 million equivalent) has already been invested.

Srinivasa Group had its moorings way back in 1965 when Mr. Jagapati Rao Chitturi (Chairman) forayed into poultry business in Hyderabad. The Company is a leader in the integrated layer and broiler business which has diversified interests in soya, feed, contract farming, chicken processing and retail.

Hy-Line International, the world leader in Chicken layer (egg laying) genetics, has tied up exclusively with Srinivasa Farms in India, which is a testimony to the Company's legacy and sound fundamentals in poultry.

One among its many achievements that the Company has embarked on was setting up of the state-of-the-art chicken processing plant near Hyderabad, India, to produce a variety of value-

added chicken products for hotels and restaurants and fast food segment. The Group is also putting up a Mega Food Park as part of its diversification plans to provide food processing infrastructure to small and medium enterprises in Andhra Pradesh in a plug and play mode.

The poultry sector generates economic benefits along the value chain by integrating small farmers into production processes. In India, it is one of the most organized sectors in agriculture with a market value of \$16.8 billion. Even though India's per capita consumption of eggs and chicken has grown in the last five years, it is expected to grow further at 7-10 percent per annum. India already ranks 3rd in egg production and 4th in broiler production, globally.

"Strengthening the agribusiness sector is at the heart of India's development agenda. It is a sector of strategic focus for IFC. Investment in the poultry sector can lead to job creation for low-skilled workers who are entering formal labor force for the first time," said Mr. Jun Zhang, IFC Country Head in India. "Srinivasa's successful expansion will create jobs, improve rural logistics, and help create a market linkage for small farmers."

Apart from funds infusion, IFC will contribute to the partnership by bringing to the table its global expertise in the poultry sector, technical advisory on best operating practices and climate-smart agricultural practices, corporate governance, and food safety standards. IFC's investment will help roll out the Company's network to new areas and expand farmer reach.

KPMG was the exclusive financial advisor to the company for the transaction.

Mr. Suresh Chitturi, Vice Chairman and Managing Director of Srinivasa Farms (and also the Vice Chairman of International Egg Commission, UK & Vice President of All India Poultry Breeder Association) said – "over the next 2-3 years we will

invest over INR 3000 MN in doubling our capacities. The plan is to pursue a collaborative growth model to expand allied businesses such as retail, processed foods and agri-businesses, besides value added products. Our project expansion will create many more jobs with best practices in work force management and sustainable development keeping environment in focus."

About Srinivasa Group

Founded by a pioneer of the poultry industry by establishing his *rst poultry farm in 1965*. Today, Srinivasa is fully backward integrated in the poultry value chain, with presence in soya & feed, layer and broiler breeding and broiler integration (contract farming) with a vision to move up the poultry value chain, the Company recently set up a chicken processing unit and opened company owned retail outlets. It further plans to venture into egg processing and chicken value added products. Srinivasa is a leader in the poultry industry with long standing relationship with poultry farmers. Srinivasa entered into exclusive pan-India distribution

agreement with Hy-Line International for layer chicks. The Company is headquartered in Hyderabad with over 2,500 employees and serves over 1,000 customers / farmers across 30+ cities in the region. Currently, Srinivasa is present in 16 states across India.

For more, log on to www.srinivasa.co

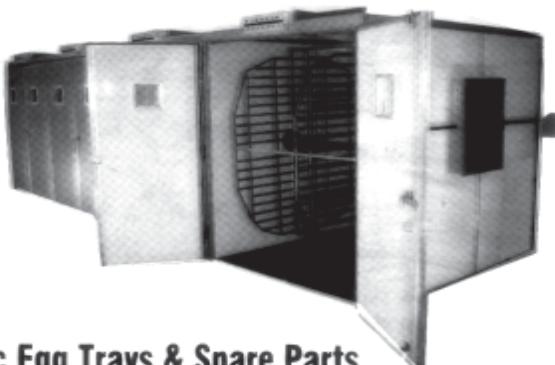
About IFC (International Finance Corporation)

IFC - a sister organization of the World Bank and member of the World Bank Group - is the largest global development institution focused on the private sector in emerging markets. We work with more than 2,000 businesses worldwide, using our capital, expertise, and inuence to create markets and opportunities in the toughest areas of the world. In *scal year 2018, we delivered more than \$23 billion in long-term *ncing for developing countries, leveraging the power of the private sector to end extreme poverty and boost shared prosperity. For more information. For more, log on to www.ifc.org**



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***E. coli* infections in poultry and their successful management with Bacteriophages**



Dr. Ajay Chalikwar
Zonal Technical Manager,
Provet Pharma Pvt. Ltd.

Introduction:

Poultry faces tremendous pressure in terms of weight gain, efficient feed conversion, stress, disease challenge and resistance to anti-microbials. Major challenges are bacterial, viral, metabolic, mycotoxins, etc.

E. coli has emerged as a major infection in broilers, layers and breeders and is commonly encountered in almost all the poultry operations including hatcheries, meat processing plants, etc. irrespective of a good water sanitation programme.

Focus now is on *E. coli* infections in poultry and there effective control through the use of non-conventional therapies like Bacteriophages.

Brief about *E. coli*

E. coli is a Gram-negative, facultatively anaerobic, rod-shaped, non-spore forming, coliform bacterium belonging to Enterobacteriaceae. *E. coli* strains pathogenic to poultry are mostly extra-intestinal and grouped under APEC (Avian Pathogenic *E. Coli*).

Diseases caused by *E. coli* are mostly systemic in poultry unlike mammals,

where it causes gut related diseases. Most APEC strains are motile having peritrichous flagella, survive freezing and persist for extended periods at cold temperatures. Reproduction of most strains is inhibited by a pH of less than 4.5 or greater than 9, but the organism is not killed. It is commonly seen as a secondary infection to other bacterial / viral infections and rarely as a primary infectious agent, but recent trends show that they have the ability to cause disease on their own.

It is a typically localized or systemic infection when host defences have been impaired. *E. coli* is the most frequent cause of mortality and can be isolated even from dead birds. Normally poultry house dust contains 10^5 to 10^8 CFU/g of *E. coli* inside the houses and outside up to 40 feet area under dry conditions, but wetting reduces the count by 84-97%.

E. coli causes various infections in poultry like Omphalitis, Salpingitis, Egg Yolk Peritonitis, Colisepticemia, Colibacillosis, Cystic degeneration of ovarian follicles, Cellulitis, Coligranuloma, Arthritis, Sternal bursitis, etc.

Economic impact of APEC is mainly due to

- Mortality
- Morbidity
- Slower growth rates
- Poor FCR
- Decrease in egg production
- Downgrading of carcass
- Spread of antimicrobial resistance to other bacteria

Antigenic structures and toxins of *E. coli*

Antigens are classified according to Kauffmann scheme. It contains 3 major antigens like O (somatic), H (flagellar) and K (capsular). Currently there are approximately 180-O, 60-H and 80-K antigens. The O antigen determines the serogroup & addition of the H antigen and sometimes K antigen determines serotype.

APEC doesn't produce enterotoxins unlike mammalian species. Immune response in poultry is directed against O antigen. Common serotypes found are O, O2, O18, O35, O36, O78 and O111.

Virulence factors involved

Adhesins - Fimbrial or non-fimbrial F1 fimbriae may be expressed during initial colonization whereas P fimbriae are expressed later when the organism is in the lower respiratory tract or body tissues. Bacteria are killed rapidly following expression of F1 fimbriae by macrophages.

Iron acquisition methods - Ability of APEC to obtain iron is well documented.

Protectins - Resistance of APEC to complement is related to K1 capsule, smooth LPS layer, and Outer membrane protein. Increased serum survival gene (ISS) in APEC has its role in complement resistance with a ColV plasmid which increases virulence in day old chicks by 100 times.

Conditions in APEC infection

Factors that increase host susceptibility to *E. coli* infection

Virus

Adenovirus, Avian Influenza), New Castle Disease, Infectious Bronchitis, Avian Metapneumovirus, Infectious Bursal Disease, Marek's Disease and Chicken Infectious Anaemia.

Bacteria

Mycoplasma gallisepticum, *Pasteurella multocida*, *Staphylococcus sp.*, *Streptococcus sp.*

Others

Invasion of skin barrier, excess ammonia in sheds, mycotoxins like ochratoxin and fumonisin, young age group, stress of various origin, sex (males are more prone), contaminated water and feed, dry dusty condition, feed / water restriction, parasitic infection, intestinal and caecal coccidiosis, inadequate ventilation, dysbacteriosis, relatively high ammonia overcrowding, poor litter condition, temperature extremes and high temperature and high humidity.

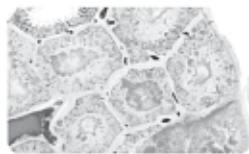
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Adult house flies act as mechanical vectors and harbour organisms in their body and cause horizontal transfer of antibiotic resistance and virulence genes. Low incubation period - 5-7 days.



Salpingitis in laying hens.

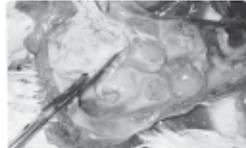


Microscopic appearance of *E. coli* in pleuro-pneumonia



Cellulitis in broilers at slaughter

Egg Yolk Peritonitis



Cystic degeneration of ovarian follicles

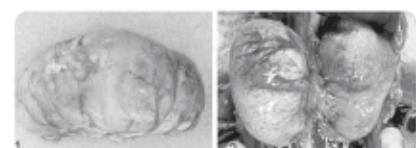
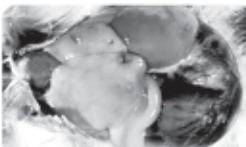


Colibacillosis in chicks & adults

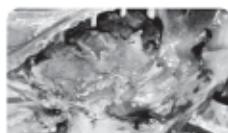


Swollen head syndrome

Yolk sac infection in chicks



Orchitis in males



Pleuro-pneumonia & Airsacculitis in broilers



Omphalitis in 3 day old chicks

Images courtesy: *The Poultrysite*

Resistance of APEC to heavy metals, disinfectants & antibiotics

APEC has the ability to acquire resistance to Chlorhexidine, Formaldehyde, Hydrogen Peroxide, and Quaternary Ammonium

Compounds (QACs) through acquiring resistance often encoded by large R plasmids. APEC Inc H12 & PAPEC-01-R plasmids confer resistance to silver, copper sulphate, Benzalkonium chloride following transfer to recipient strain by conjugation. APEC Inc F IIA plasmid confers resistance to Aminoglycosides, QACs, Phenolics, β lactams & Silver.

APEC Inc A/C plasmid confers resistance to phenolics, QACs, aminoglycosides, sulpha drugs, tetracyclines and mercury.

It has inherent ability to form biofilms on abiotic surfaces like plastic/metal waterlines and protect itself from getting killed by the sanitizers.

Certain plasmids may also contribute to APEC's acid and bile tolerance, affecting survival of APEC in the bird or elsewhere. Regional variations exist as far as resistance is concerned, as some strains are still susceptible.

***E. coli* control through the use of Bacteriophages**

Bacteriophage is a non-pathogenic virus with a vast majority (about 96%) of known phages belonging to Myoviridae, Podoviridae and Siphoviridae. They are known as bacterial parasites because they lack the cell structure and enzyme systems necessary for food uptake, protein synthesis or construction of new particles, and as incomplete organisms can only replicate in a live cell.

Positive results of the use of bacteriophages in fighting bacterial infections have contributed to the research on the potential use of viruses that destroy bacteria in treatment of diseases in both human and animals. Their specificity and range of activity are determined by the presence of receptors located on the surface of bacterial cells, among which we can distinguish LPS fragments, fimbriae and other surface proteins.

No mortality was observed in chickens treated with 10^8 PFU of an *E. coli* bacteriophage mixture. Due to the specificity of bacteriophages for a particular bacteria, manifested as the ability to infect only one species, serotype or strain, this mechanism of action does not cause destruction of the commensal intestinal microflora. A cocktail of more than one phage (at least 3 - 4) in sufficient concentration is synergistic.

Bacteriophage has 2 life cycles

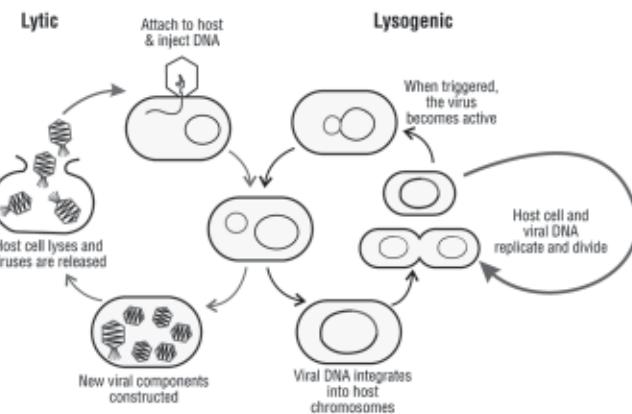
Lytic

Phage acts like a typical virus, it hijacks its host cell and uses cell's resources to make lots of new phages thereby causing lysis of the cell and death subsequently. Phages attach, enter the cell, copy DNA and synthesize protein, assemble new phages and cause lysis of the host cell with release of daughter phages capable of infecting other cells.

Lysogenic

Phage reproduces without killing its host. Some phages use the lytic life cycle and some switch between the 2 cycles. Here, there will be attachment of phage to host cell, injection of DNA into host cell, integration with bacterial chromosome and becoming prophage and finally cell division along with host cell.

Life cycle of Bacteriophage



Under the right conditions, the prophage becomes active and comes back out of bacterial chromosome, triggering lytic life cycle and killing the host cell.

Advantages of phage cocktail

Lead phage has very virulent activity and neutralizes a bacterial population within few hours of inoculation against a wide spectrum of *E. coli*.

Associate phage has lower virulence than lead phage but has very wide spectrum of activity and is very stable. This phage covers the bacterial population which evades the action of lead phage.

Guard phage is similar to associate phage in spectrum but can attach to a different kind of receptor with different mode of action and is mainly added to ensure protection against resistant *E. coli*. Synergistic action of these 3 phages will ensure complete bactericidal action.

CONCLUSION

Bacteriophage therapy is a very good solution as preventive measure in chicks in the first week and as a therapeutic thereafter as per the infection pressure.

Some authors suggest effects similar to antibiotics in preventing colibacillosis in chicks.

There is evidence that bacteriophages have the ability to penetrate the blood-brain barrier and confirm that bacteriophages have a prophylactic effect in addition to therapeutic effect.

Bacteriophages can be given orally, by aerosol spray or parenterally or along with antibiotics in case of severe *E. coli* challenge and can be given along with all live and inactivated vaccines (except live *E. coli* vaccine).

Bacteriophages enter blood circulation upon oral administration and control *E. coli* systemically.

(References available on request)

Alltech India pledges 1,000 trees to the Isha Foundation for Make a Difference Day



[BENGALURU, India]—Alltech India celebrated the life and legacy of its founder, Dr. Pearse Lyons on his 75th birthday by visiting the Isha Foundation for Make a Difference Day.

The Isha Foundation is a leading and renowned NGO, working on various social causes. Alltech, in keeping with aPlanet of Plenty™ and its commitment to the UN Sustainable Development Goals, decided to help the foundation by pledging 1,000 tree saplings to their Cauvery Calling campaign.

Cauvery Calling is a first-of-its-kind campaign in India, setting the standard for how the country's rivers can be revitalised. The initiative does this by planting trees, helping with water retention and reviving river ecology and climatic conditions.

The current water crisis is a growing concern across India. The Cauvery river is one of the key sources of water to Bengaluru city and millions of farmers in the Karnataka and Tamil Nadu states

where it flows. It brings wellbeing and prosperity and is the very source of life for these lands. However, over the last few years, the river has been dry apart from monsoon season, not reaching the sea. A forest-fed perennial river is fast becoming a seasonal stream. This is due to losing 87% of its tree cover in the last 50 years. As the trees disappear, the soil erodes, the Cauvery dries up and the farmers suffer. Cauvery Calling is trying to reverse this effect by planting more trees.

The Alltech India team also took part in an Upa Yoga session, which helped to rejuvenate the employees' bodies, minds, and souls.

Elsewhere, the Alltech Pune Facility team visited Zilla Parishad School in Savardari village and spent quality time with them, as children are the future of any nation. The team hosted an interactive session with the school's 175 students and donated essential notebooks and stationery materials.



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About Alltech:

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

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



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

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



Preventive measures are only option for combatting key parasites in turkeys

Robert Beckstead speaks with Poultry Health Today about best practice for turkey producers and how to protect their flocks.

Beckstead cited *Histomonas meleagridis* — the cause of blackhead disease — *cochlosoma* and *tetratrichomonas* as problem parasites in turkeys, mostly because there are no vaccines or treatments for them.

“The failure to have efficacious drugs or the [inability] to use them is a concern for most poultry producers,” he said. That coupled with the push from consumers to stop using certain medications in poultry feed makes control of the parasites difficult for producers.

H. meleagridis is spread to birds by the roundworm *Heterakis gallinarum*, ultimately leading to blackhead disease (*histomoniasis*). Chicken flocks are known reservoirs for both *H. meleagridis* and *H. gallinarum*, so turkey flocks that are close to chickens positive for these parasites have a greater chance of developing blackhead disease, said Beckstead, an associate professor at the university’s Prestage Department of Poultry Science.

More questions than answers

Not a lot is known about how turkeys contract *cochlosoma*, which impairs weight gain. However, the parasite is found in wild birds, which could be the source of infection for turkeys.

Histomoniasis and *cochlosoma* tend to appear sporadically in turkey flocks, compared to *tetratrichomonas*, which is found in about 70 percent of birds in the field. All three parasites can occur at any age, he said.

The virulence of *tetratrichomonas* as well as signs of the disease are other unknowns, but levels of the parasite appear to increase in birds with enteric distress. Turkey flocks near a flock positive for *tetratrichomonas* are going to have an increased risk for contracting the parasite, Beckstead continued.

He estimated that blackhead disease and *cochlosoma* have a similar negative economic impact on the turkey industry. *Histomoniasis* is

scarier because you can lose an entire flock, which tends to cause more angst than the weight loss that occurs with *cochlosoma*. But economically, the losses due to both parasites are probably similar. Less is known about the economic impact of *tetratrichomonas*.

Control options

Biosecurity is the best way to help prevent these parasites in turkeys, Beckstead emphasised. It’s especially important to make sure workers on the turkey farm don’t interact with chickens. In addition, maintaining single-aged flocks versus multi-aged flocks will reduce the chances of having any of these parasitic problems.

Research in Beckstead’s lab indicates healthy birds are less likely to transmit parasites. He predicted that gut health is going to be an important focus regarding control of the parasites.

For example, turkeys that are flushing are more likely to transmit blackhead disease. “If you have large [coccidiosis] outbreaks, which cause birds to flush and huddle together, you’re going to get more transmission of blackhead disease,” he said.

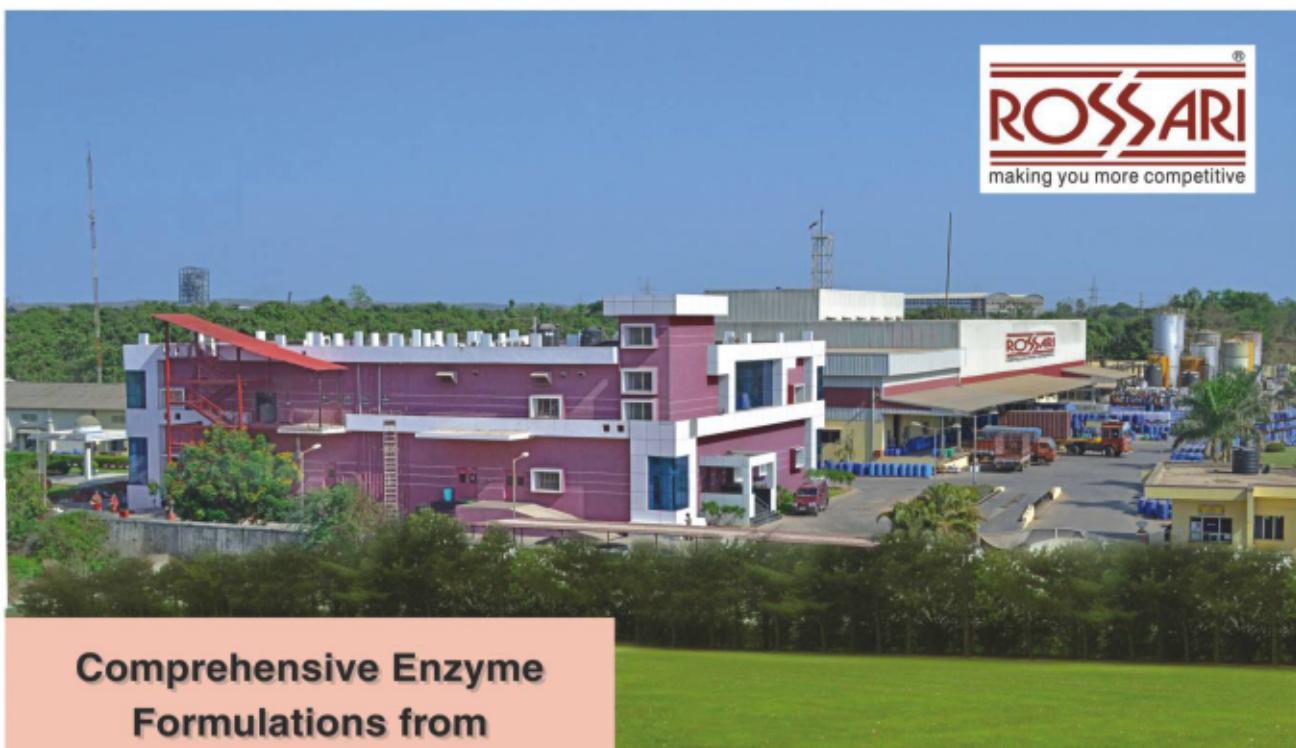
Nutrition may also play a role. Anything in the diet that could lead to flushing, such as added salt, could contribute to transmission of parasites, Beckstead said.

Another potential control method may be genetic selection. About 5 percent of turkeys appear to have genetic resistance to blackhead disease. Currently, his lab is working with breeder companies and using new technology to identify genetic markers that indicate which birds are resistant.

Although there’s been some success with natural products tested in the lab, the results don’t always translate to success in the field, he indicated.

Beckstead expressed appreciation to the National Turkey Federation, which has donated funds that will enable research to continue.

Courtesy: thepoultrysite.com



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