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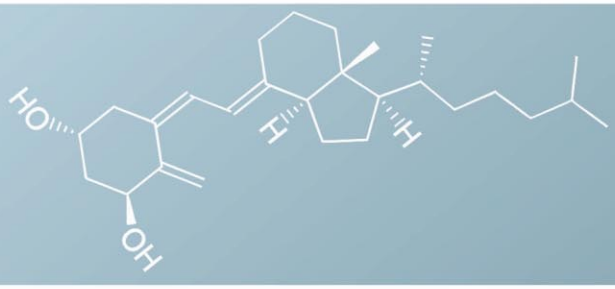

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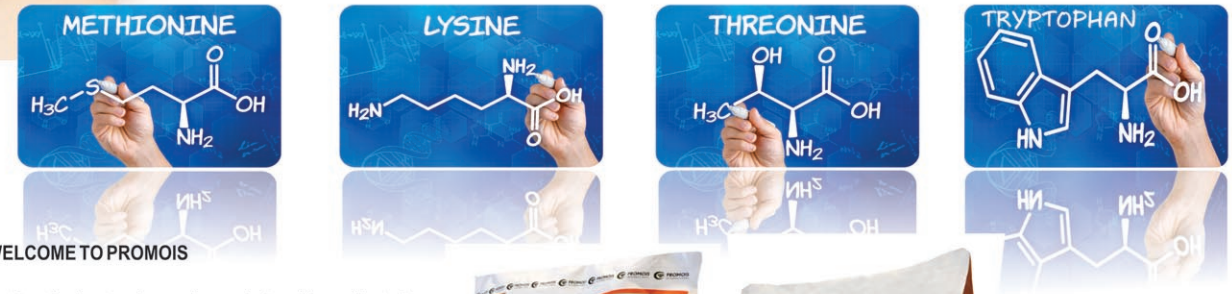

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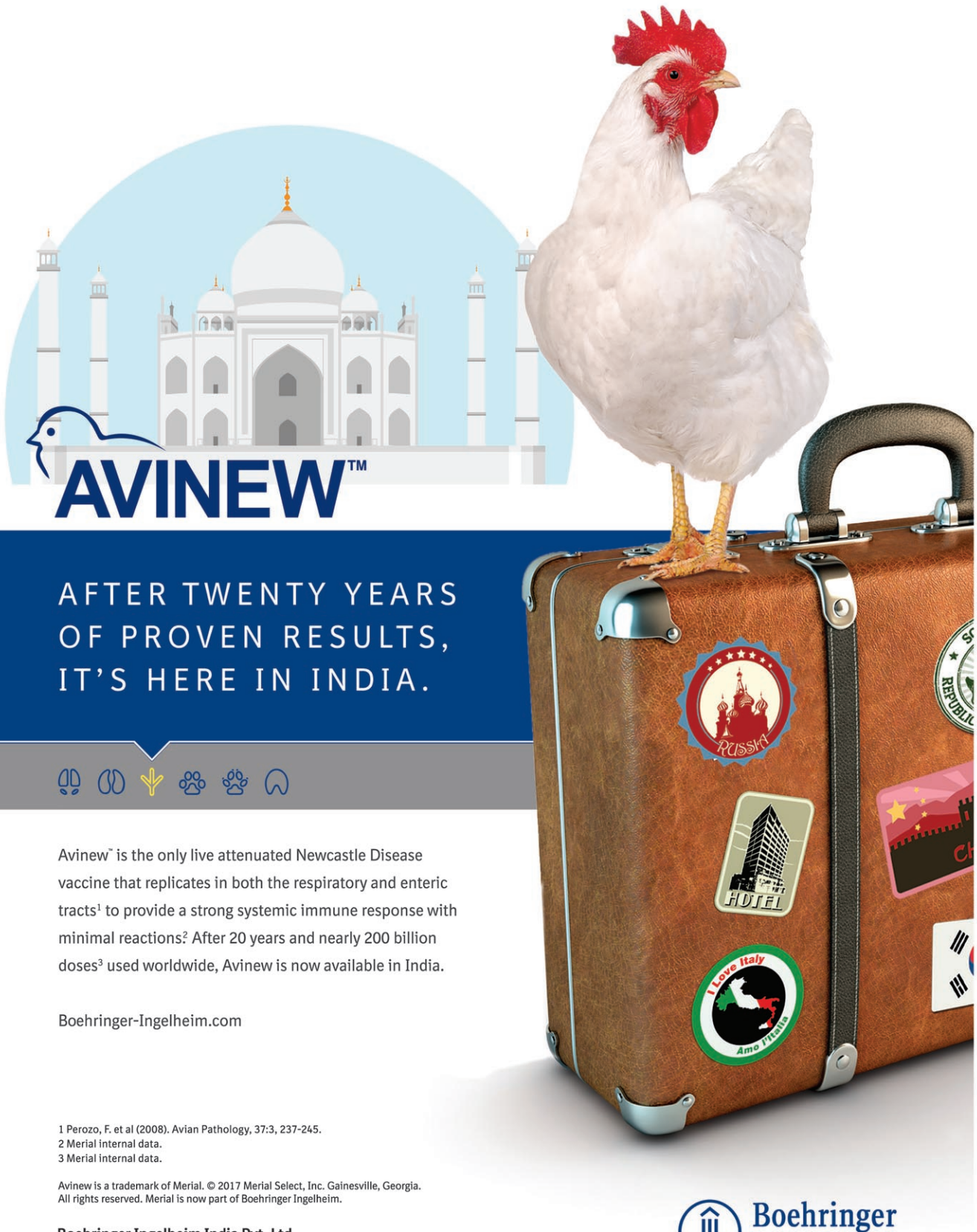
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INDEX OF ADVERTISEMENTS

A study on the effects of dietary supplementation of butyrate/Intest Plus Quattro on broiler performance

Dr. Onkar Pawaskar*, Dr. Mangesh Sagar**

Amongst the organic acids, short chain fatty acids (SCFA) are considered as potential alternative to antibiotic growth promoter. Butyric acid is one such SCFA, which has higher bactericidal activity when the acid is in undissociated form. Bacterial cell take up undissociated fatty acids and once these acids dissociate, there is change in the intracellular pH leading to death of bacterial cells. Butyrate also appears to play a role in development of the intestinal epithelium. However, the levels of SCFA are quite low in the intestine and caeca of young chicks and so the young chicken may be the best candidate for butyrate supplementation.

Volschendorf has stomach stable, target release, **matrix coated**, odorless butyrate **Intest-Plus Quattro™**. The product is an energy source of rapid proliferation of intestinal mucosa epithelial cells, activatory lymphocytes which ensure the rapid repair of injured intestinal mucosa and accelerate proliferation and maturation. **Intest-Plus Quattro™** promote the growth of beneficial bacteria Lactobacillus, bifidobacterium and inhibit the growth of harmful bacteria such as E. coli, Salmonella in the gastrointestinal tract with effect to reduce the diarrhea, promote healthy growth of bird and increase disease resistance power.

As a part of continuous R&D and upgradation of the product Volschendorf has conducted a very big trial of **Intest-Plus Quattro™** on broiler performance in India with one of the most renowned field facility.

Objective of the study:

The objectives of the trial were to evaluate the effects of dietary supplementation of Intest Plus Quattro on the following parameters:

1. Performance of commercial importance viz., body weight, feed intake, feed conversion ratio and overall productivity of the flock.
2. Histo-morphology of the small intestine (jejunum) and enumeration of selected bacterial species.
3. Overall economics of production considering feed cost as the main criteria.

Materials and Methods

In a trial of **35** d duration a flock of 400 broiler chickens were distributed into 4 treatment groups according to the experimental design. Distribution of the chicks between the groups and within the groups between the pens was done following a completely randomized block design. Each treatment group consisted of 10replicate pens and there were 10 chicks in each pen. The birds were vaccinated against Newcastle disease (5d and 20d) and infectious bursal disease (12d). The lighting schedule involved 24h light during the first week and 20 h of light up to the 6th week. The test facility, pens and birds were observed twice daily for general flock condition, lighting, water, feed, ventilation and unanticipated events and records were maintained from the beginning whenever any bird was found dead, culled or sacrificed due to any reason. All the mortalities were subjected to necropsy to determine the probable cause of death.Diets and drinking water were offered *ad libitum.* The birds were fed with a starter (1-14 d), a grower (15-28 d) and finisher (29-35 d) feed, all prepared fresh at the beginning of each feeding period with raw materials of the same lot. Body weight was measured pen wise at weekly intervals and average daily body weight gain (ADG) during 1-14d, 15-28 d, 1-28 d, 29-35 d, 15-35d and 1-35 d was calculated. Feed conversion ratio (FCR) was calculated. Mortality was recorded as it happened.

Histology of the small intestine

The histological study of the small intestine (SI) was performed to evaluate the effects of the trial diets on the histo morphology and integrity of gut.

Table 1: *Experimental design*

	Acronym	
T1	Negative Control (NC)	Regular conventional corn soy diet formulated to meet the prevailing industrial practices. This diet was devoid of any in-feed antibiotic growth promoter though coccidiostats were used.
T2	Positive Control (PC)	The NC diet was supplemented with bacitracin methylene Disalicylate at the rate of 500 mg/kg diet.
T3	NC + IPQ	The NC diet was supplemented with Intest Plus Quattro at the rate of 1g/kg in the starter and 500 mg/kg in the grower and finisher diets.
T4	PC + IPQ	The PC diet was supplemented with Intest Plus Quattro at the rate of 1g/kg in the starter and 500 mg/kg in the grower and finisher diets.

Conclusions

It was concluded from the present study that

1. Supplementation of Intest Plus Quattro improved body weight and feed conversion ratio in the experimental birds.
2. Liveability and production efficiency also improved when Intest Plus Quattro was supplemented along with BMD in the diet.
3. *Clostridium* and *Salmonella* counts decreased by supplementation of Intest Plus. Intest Plus supplementation caused a higher number of *Lactobacillus* as compared to BMD.
4. Dietary supplementation of Intest Plus Quattro had definite positive effects on small intestinal histology and resulted in longer villi and deeper crypt which might explain the comparatively superior body weight and feed conversion ratio in this study.

Body weight (g) and average daily gain in body weight (g) at different periods of measurements

Dietary groups	Body weight g					Average daily gain in body weight g					
	7-d	14-d	21-d	28-d	35-d	1-14 d	15-28 d	1-28 d	29-35 d	15-35 d	1-35 d
Negative Control (NC)	20 4.5	54 4.9	106 2.3	170 8.6	2246 .2	35. 61	83.1 2	59. 36	76.7 9	121. 52	62. 85
Positive control (NC+BMD)	20 5.4	54 3.3	107 3.5	171 2.2	2265 .3	35. 49	83.4 9	59. 49	79.0 2	123. 01	63. 39
NC+Intest Plus	20 5.4	54 8.8	108 2.9	172 5.4	2296 .7	35. 88	84.0 5	59. 97	81.6 1	124. 85	64. 29
PC+Intest Plus	20 6.2	54 8.1	108 5.0	174 1.5	2301 .3	35. 84	85.2 4	60. 54	79.9 6	125. 23	64. 43
SEM	0.6 63	1.9 83	4.96 5	7.57 9	11.6 57	0.1 42	0.45 2	0.2 71	1.22 6	0.77 3	0.3 33
Pr> F	0.8 56	0.7 41	0.36 0	0.41 8	0.29 1	0.7 41	0.38 0	0.4 18	0.58 7	0.30 2	0.2 91

Fig 1: Body weight (g) at 35 d and ADG(g) during 1-25 d

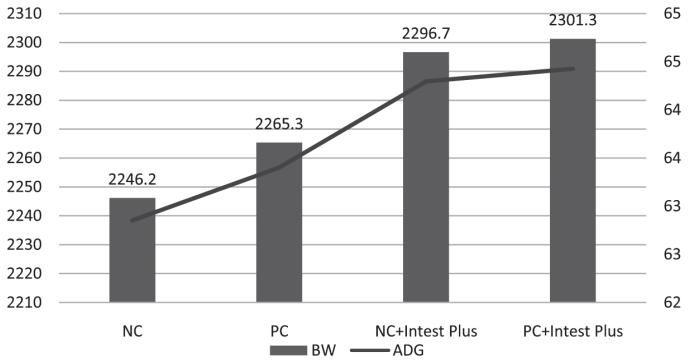
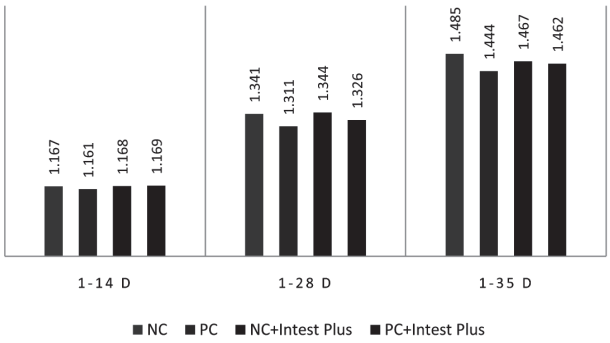
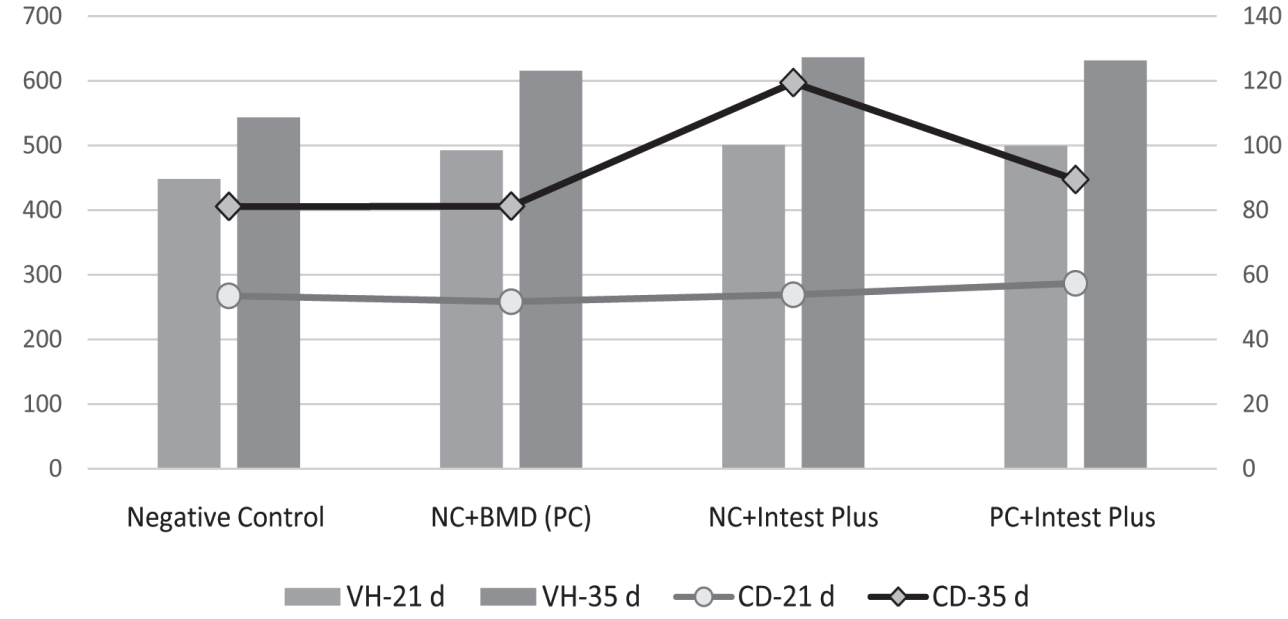


Fig 5: Feed conversion ratio at different periods



Height of villus and depth of crypt at the jejunum of the experimental birds at 21 and 35 d of age (all values in µm).



Histology of the jejunum in the experimental groups at 21 d of age (4X magnification)

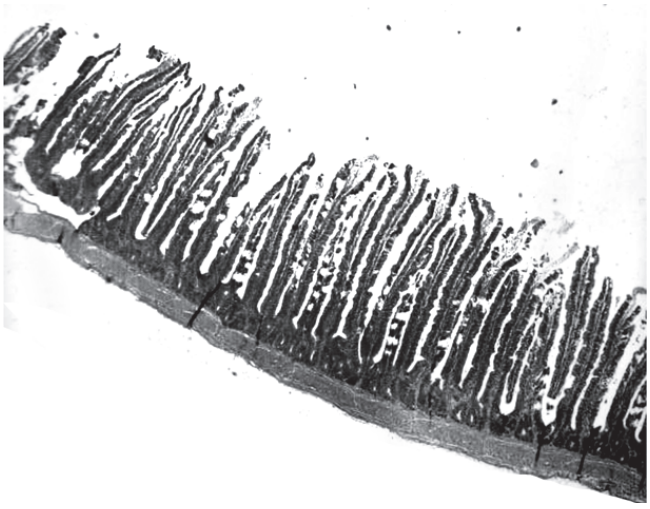


Fig 9 (a): Jejunum of Negative Control group

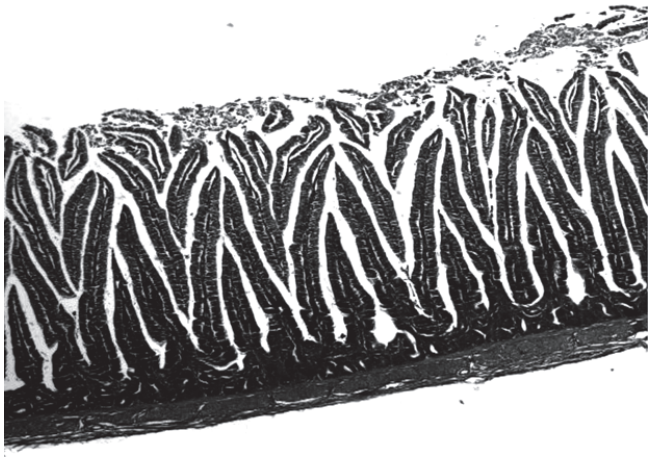


Fig 9 (b): Jejunum of PC group
Villi were more compact in their arrangement

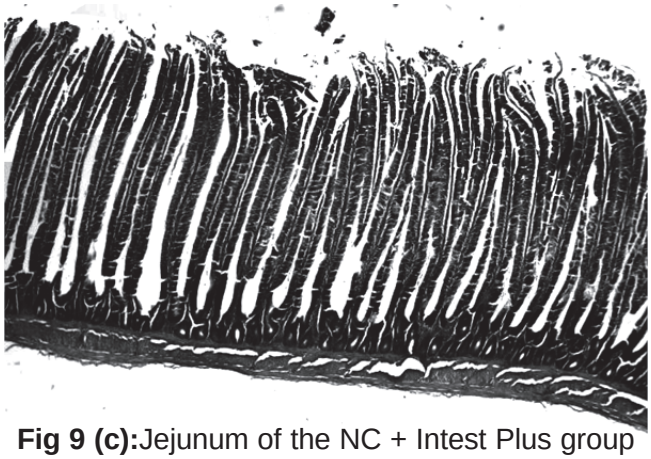
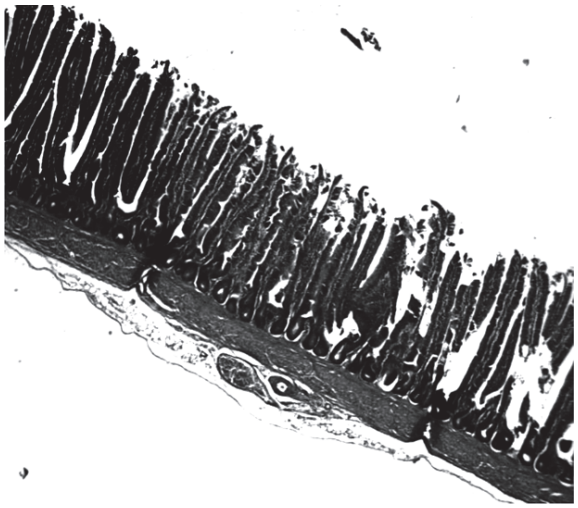


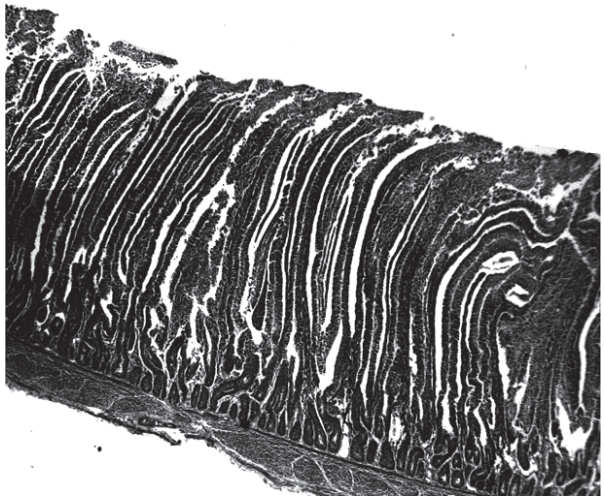
Fig 9 (c): Jejunum of the NC + Intest Plus group
Villi were more elongated

Fig 9 (d): Jejunum of the PC + Intest Plus group
The fragmented areas were artefacts

Histology of the jejunum in the experimental groups at 42 d of age (4X magnification)



Jejunum of Negative Control group



Jejunum of Positive Control group
Villi were longer as compared with the NC

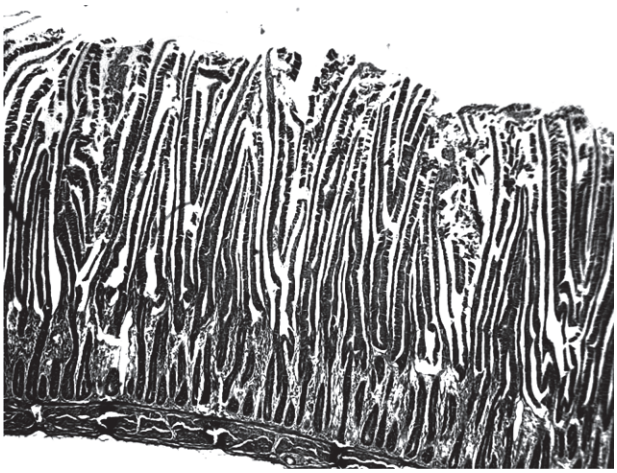


Fig 9 (c): Jejunum of the NC + Intest Plus group
Villi were more elongated

Fig 9 (d): Jejunum of the PC + Intest Plus group

Microbiological report of the supplied caecal content

Sample No	Escherichia coli (cfu/g)	Salmonella (cfu/g)	Lactobacillus (cfu/g)	Clostridium perfringens (cfu/g)
T1-1	0.002 X 10^7	BD L	8.4 X 10^7	0.4 X 10^7
T1-2	18.0 X 10^7	BD L	0.4 X 10^7	18.4 X 10^7
T1-3	4.8 X 10^7	BD L	3.4 X 10^7	0.8 X 10^7
T1-4	8.8 X 10^7	BD L	5.1 X 10^7	6.8 X 10^7
T1-5	7.8 X 10^7	BD L	4.2 X 10^7	5.8 X 10^7
Mean	7.88 X 10^7	BD L	4.3 X 10^7	6.44 X 10^7
T2-1	11.6 X 10^7	BD L	4.8 X 10^7	8.4 X 10^7
T2-2	7.0 X 10^7	BD L	0.1 X 10^7	8.7 X 10^7
T2-3	11.6 X 10^7	BD L	0.01 X 10^7	17.6 X 10^7
T2-4	11.4 X 10^7	BD L	0.4 X 10^7	12.1 X 10^7
T2-5	9.8 X 10^7	BD L	0.2 X 10^7	10.9 X 10^7
Mean	10.28 X 10^7	BD L	1.1 X 10^7	11.54 X 10^7
T3-1	1.0 X 10^7	0.4 X 10^7	4.0 X 10^7	1.6 X 10^7
T3-2	0.4 X 10^7	0.1 X 10^7	1.0 X 10^7	3.0 X 10^7
T3-3	0.8 X 10^7	0.05 X 10^7	2.8 X 10^7	4.4 X 10^7
T3-4	0.2 X 10^7	0.5 X 10^7	3.2 X 10^7	2.8 X 10^7
T3-5	0.5 X 10^7	0.3 X 10^7	1.8 X 10^7	3.9 X 10^7
Mean	0.58 X 10^7	0.27 X 10^7	2.56 X 10^7	3.14 X 10^7
T4-1	10.0 X 10^7	2.4 X 10^7	2.4 X 10^7	10.4 X 10^7
T4-2	3.4 X 10^7	2.1 X 10^7	2.6 X 10^7	2.2 X 10^7
T4-3	0.06 X 10^7	3.3 X 10^7	0.4 X 10^7	1.0 X 10^7
T4-4	4.8 X 10^7	2.0 X 10^7	2.1 X 10^7	4.4 X 10^7
T4-5	5.1 X 10^7	1.4 X 10^7	1.4 X 10^7	5.4 X 10^7
Mean	4.67 X 10^7	2.24 X 10^7	1.78 X 10^7	4.68 X 10^7

BDL = Below detection limit

Interpretations:

1. T2 increased the pathogen (*E. coli and Clostridium*) content significantly and it reduced beneficial *Lactobacillus* load significantly (in comparison to T1)
2. T3 is the best treatment because the pathogen load is significantly reduced and reduction of *Lactobacillus* load is low (in comparison to T1)
3. T4 also reduced pathogen load as well as *Lactobacillus* load significantly (in comparison to T1)

Inference: T3 is the best treatment because the pathogen load is significantly reduced and reduction of *Lactobacillus* load is low

* Director, Volschendorf Enterprise Pvt. Ltd

** Director- Sales and Marketing, Volschendorf Enterprise Pvt. Ltd

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Reference:- The Gazette of India , Page No.-21, No.-155, Date:- 13-04-2018

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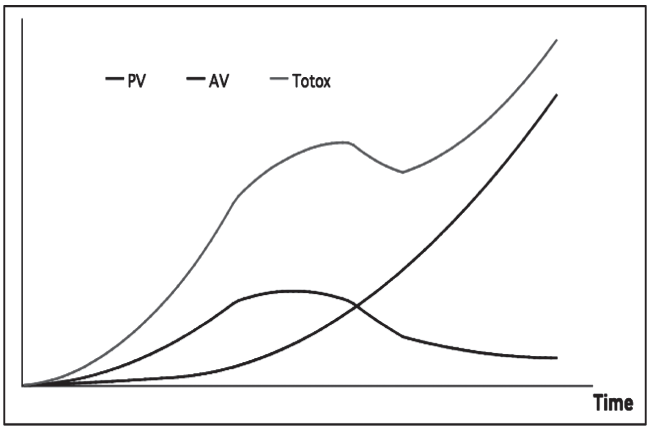
Lipid Evaluation Discloses Volatile Energy of Fats and Oils

Chandrasekar S, Rengarajan S, Rahul Mathew and Snehal Tawde

Introduction: Fats and oils are the most concentrated and expensive source of energy for poultry diets. Apart from this they also serve in aspects of feed quality, milling efficiency, palatability, reducing dustiness etc. Being expensive source of energy, it is highly important to assess the quality of fats for ideal procurement and appropriate ration formulation.

Assessment of fats and oils could be done through two primary aspects like oxidative quality and nutritional quality apart from the physical evaluation.



Oxidative Quality: Measuring the oxidative quality of fats and oils through Peroxide Value (PV) is a most common phenomenon. However, sometimes PV can mislead with low values when oxidation is nearing the end. Under such circumstances, Anisidine Value (AV) and / or Totox value (TV) could help to understand the oxidation process in a better way.

The other useful tools for understanding oxidation status are acid value (free fatty acids - FFA), thiobarbituric acid (TBA) and iodine value (IV).

Nutritional Quality: To animal feed applications, it is of high importance to assess the nutritional quality of fats. Beyond oxidation, the components like U:S ratio and NEM will have greater impact on the nutritional value.

Factors on Nutritional Quality

- Free Fatty Acids
- U : S (Unsaturated and Saturated Fatty Acids) Ratio
- NEM (Non Elutable Matter)
  - MIU (Moisture, Impurities and Unsaponifiables)
  - Oxidised and Polymerised Fats
  - Glycerol

Predicting the energy values is of high importance for superior economic realization and appropriate ration formulation.

Wiseman Equation

The study by Wiseman J, established the relationship between the degree of saturation, the level of free fatty acids and MIU on the energy value of the lipids in correlation with bird age.

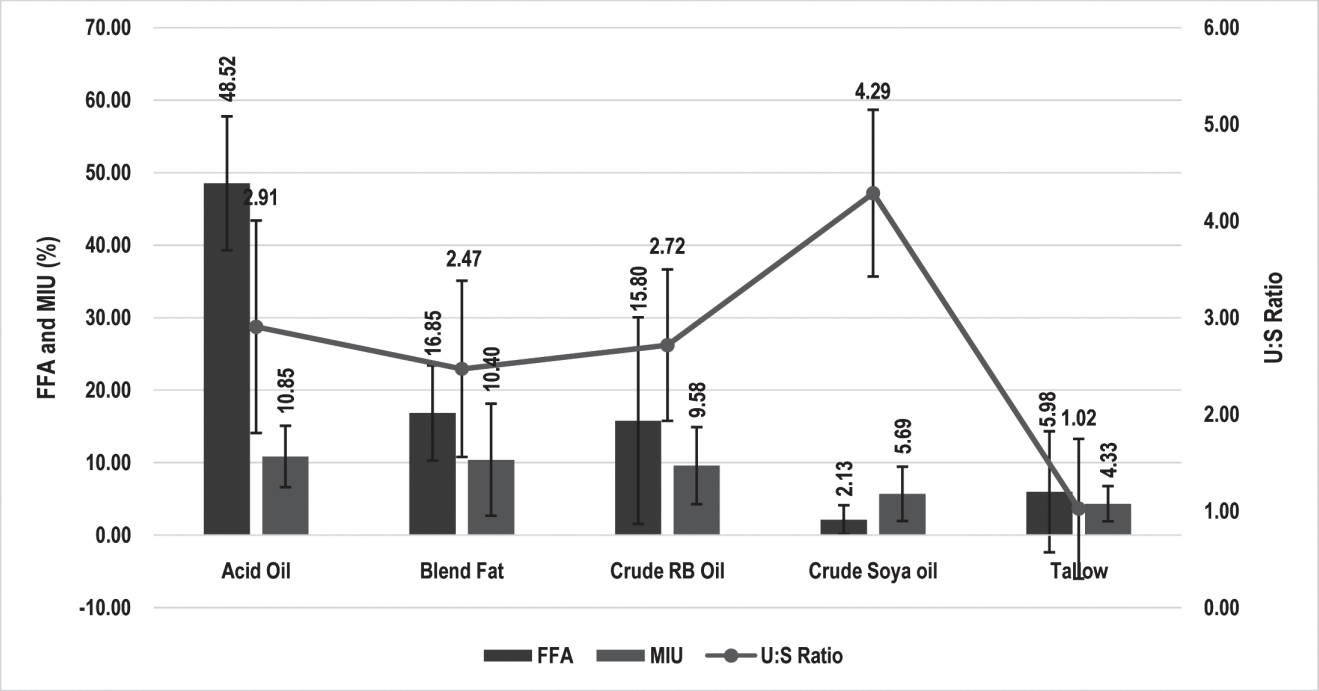
$$E = \left[A + B.\boldsymbol{FFA} + C.e^{D\left(\frac{U}{S}\right)}\right].\left(1 - \frac{MIU}{100}\right)$$

Lipid Evaluation Test (LET)

LET assesses the fatty acid profile, oxidative quality, free fatty acids and MIU which are the critical information required to assess the metabolizable energy value of lipids.

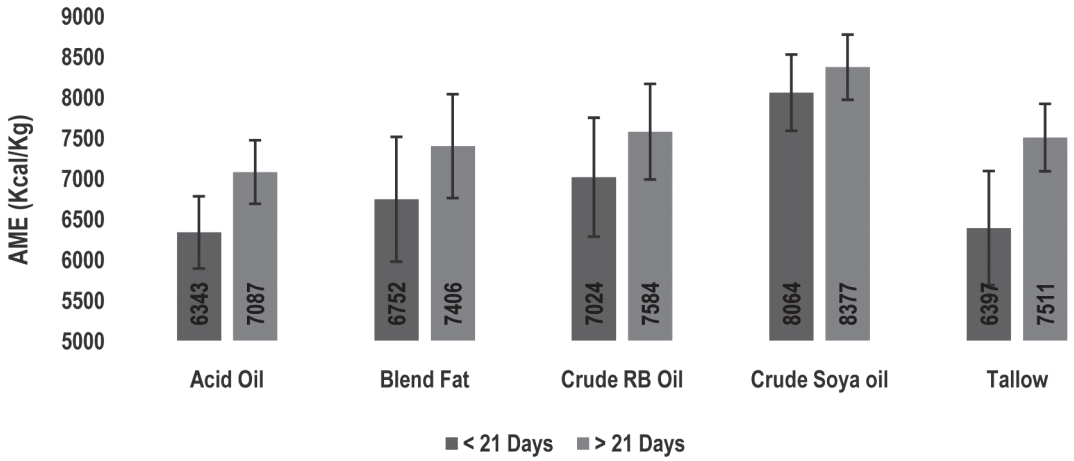
Findings of LET

Kemin assessed close to 250 samples of fats and oils commonly used in poultry diets and following are the representation on FFA, MIU and U:S ratio of them.



The free fatty acids levels of commonly used oils like crude rice bran oil and blended vegetable oils were relatively higher than the assumed levels for purchasing criteria. MIU really needs attention from the point of purchasing to ration formulation and this directly reduces the energy in relation to their level of the lipid. Lesser the U:S ratio makes the digestibility challenging for the bird, especially emulsification and hydrolysis and so delivers relatively lesser energy, However, a final U/S ratio of 2.25 -2.50 in the complete feed for young birds and 2.0-2.25 for older birds could be ideal.

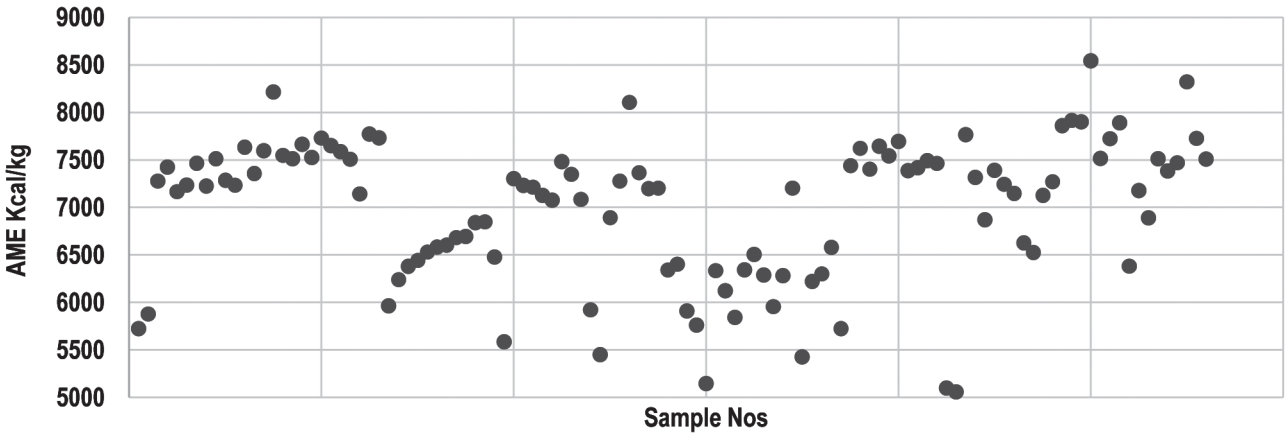
AME of Fats and Oils



Average energy values of different fats have been calculated in which the variation among the samples ranged from 15-26%, whereas the difference between the best and lowest values had above 35% variation.

Variation in Crude RB Oil

Being a commonly used source, the ME values of crude rice bran oil is depicted here. It demonstrates the variation in energy and demands a strict quality procedure for predicting ideal values for ration formulation.



The data shows the clear variation among different types of oil which is obvious. **Whereas the variation within the same type of oil is a concern for the feed formulator on applying a specific reference energy value for ration formulation.** It could be ideal to use age specific ME values for feed formulation or use of superior nutritional emulsifier which can narrow the energy gap arise in the final ration.

Early IBD Intermediate followed by Plus Vaccination proves effective in Improving overall Broiler productivity in high disease challenge areas of WB: A case study

Dr B C Dutta, Poultry Consultant

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- B V Sc & A H from BCKV in 1983-84
- Associated with Poultry Industry since 1984.
- Involved in Broiler Production, Management, Disease Control, SOP development, Manpower development, Business planning for last 13 years in most part of India.
- As Freelance Poultry Consultant, presently working with several Broiler Integrators of WB, Consultancy Organization, Indian& MNC Poultry Pharmaceuticals in India, Nepal & Bangladesh.
- Expertise in trouble shooting of broiler farms under any situation.

Introduction

Vaccination is the most practical method of protecting birds against viral diseases. The word Biosecurity is not complete without scientific Vaccination program. No poultry producer would consider a disease prevention programme to be complete without a comprehensive vaccination program, and the Vaccination program would be inefficient without a practical idea of the disease history of the specific area and data thereof.

Vaccination occupies a pivotal position owing to the widespread prevalence of dreaded poultry diseases. Amongst the diseases Infectious Bursal Disease (IBD) is most unnoticed & neglected because of absence of classical clinical outbreak. But suspected early subclinical IBD infections leading to Immunosuppression making the way for entry of other diseases leading to severe losses in poultry. Therefore, a minimum compromise or inefficiency in vaccination program may prove to be detrimental in terms of disease outbreaks and loss of production efficiency.

Therefore, the aim of vaccination is not only to control the specific disease outbreak & minimise mortality but also to prevent immunosuppression to protect the birds from other disease outbreaks leading to high mortality and from all infections & diseases with minimal mortality.

Description and background of the study

The objective of any vaccination program is to produce sufficient antibody in the body of chicken so that the birds can prevent future entry of same infectious organism. Live Vaccines against prevalent diseases is most common vaccination program in broiler considering:

1. History of outbreak of the disease in the given area
2. Age of birds mostly affected
3. Mortality pattern
4. Strain of Virus available in the specific area
5. Vaccine strains available
6. MAB (Maternal Antibody) level of concerned chicks
7. General health of the birds in question.

With Live vaccines the onset of Immunity is very rapid but usually short-lived. The live vaccines may stimulate the production of local or mucosal immunity as well as general immunity. This is the reason why short-lived broilers are being managed mostly with live vaccines.

The broiler poultry in the district of South 24 Parganas are suffering from various diseases every year during January to May. Mortality during this season is always double digit. There are IBD, IBH, ND, LPAI, CCRD, E Coli, Necrotic Enteritis, etc. No one is honestly trying to identify the actual reason of such huge loss due to high mortality every year. Rather, people want shortcut by using some medicines or disinfectants and are failing repeatedly. Biosecurity practise is very poor with country breed chicken & ducks are roaming everywhere because of socio-economic conditions of the area. In most cases slow mortality starts from 7 – 8 days of age and continue either in same rate or in the form of heavy outbreak. This history speaks about early immunosuppression of chicks and subclinical IBD may one factor.

To understand the effects of IBD virus induced early immunosuppression on Broiler productivity a field study was conducted in the 24 Parganas (South) district of West Bengal, India where human population pressure is very high, the farm density also very high, drinking water quality is poor and highest annual mortality in poultry happens every year due to several suspected viral diseases owning to excessive population pressure carrying out optimum bio-security practices is not always possible.

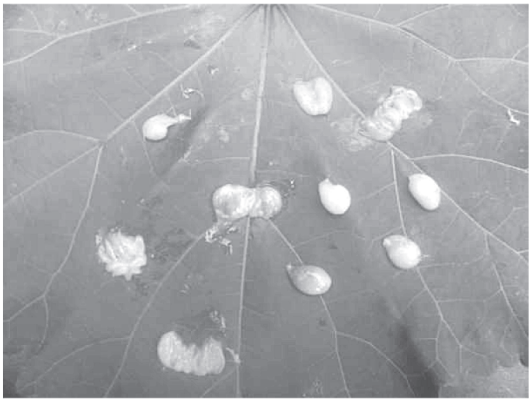
The study was taken up during a period when the area under study was reeling with heavy mortality due to viral outbreaks. The average mortality across the farms was calculated to be 30% and in some cases mortality as high as 100% was not uncommon. Organ and blood samples from dead & live birds were collected and sent to different laboratories for investigation. However, results were inconclusive because laboratories differ in finding the causative microorganisms and as a result of this no specific Vaccination program could be drawn to help the farmers to get rid of this problem.

Materials and methods

In WB presently, IBD Intermediate Plus strain Live Vaccines are being used as routine at 12 – 14 days. WB is producing only 15% of Broiler Hatching Eggs and rest are outsourcing from other parts of India. The constraint here is that WB broiler producers don't know the breeder vaccination program. In most cases DOC titre of outsourcing eggs has very high CV and a major percentage of chicks are below protective level.

Since last few years WB is suffering from Early Immunosuppression in broiler in the region with slow

Pic 1: Bursa of 8 days age Chicks



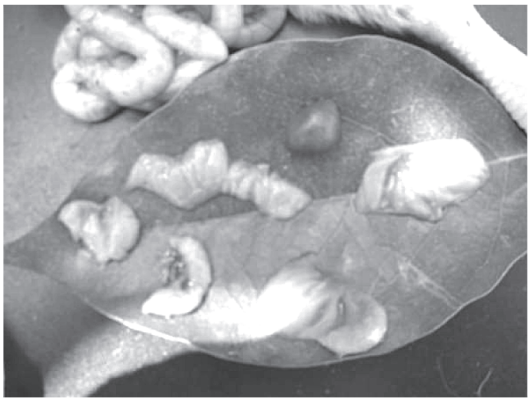
Pic 2: Bursa of 9 days Chicks

mortality from 7th or 8th day. Post mortem examination reveals damage of Immune organs. Bursa size varies from very small to double of normal size with pus, sometime haemorrhages. Occasionally, cheesy flakes are

noticed. Spleen usually enlarged & congested. Thymus enlarged & congested. Sometime tiny haemorrhagic spots are available in caecal tonsils. There are high incidents of IBH, Hydropericardium, VVND, E coli, Necrotic Enteritis, CRD in the area in almost all farms either in clinical form or subclinical. My experience of working for 10 years in the said area and the current disease scenario was speaking about early immunosuppression. Post mortem examination neither could ignore IBD, nor establish IBD in absence of

Pic 3: Bursa & Spleen of 19 days Chicks

Pic 4: Thymus of 19 days age Chicks



Pic 5: Bursa & Spleen of 11 days age Chicks

Pic 6: Bursa of 19 days age Chicks

timely laboratory test. But after seeing the DOC IBD titre (Max 7206, Min 924, Mean 3642 and CV 45.4%) of chicks going to house in that area, I started thinking of doing a field trial with 2 IBD Vaccination.

The effects of 4th Day IBD Intermediate (**IBD Suprim** of Globion India Pvt Ltd) followed by 14th day **IBD Plus** Vaccination were tested in farms of Bonobithi Farms Pvt Ltd (Midnapur Hatchery Group), a broiler Integrator, at their Baruipur branch of South 24 Parganas, WB. In total 29 farmers were selected randomly in the area where chicks are being housed from 12 hatches during 21st March to 14th April 2018. Total 19 farms (Treatment) were administered two IBD Vaccination & 10 farms remain as control with only one IBD Plus Vaccination and their farm data of the harvested flock was collected.

The methodology of application of IBD Intermediate & IBD Plus are described below:

1. All birds in the 19 Treatment farms are administered with IBD Suprim (Intermediate Strain) on 4th day and IBD Plus (Intermediate Plus) on 14th day. The birds of 10 control farms are administered with IBD Plus vaccination on 12th day. All vaccines are used through Eye drop route.
2. Other Vaccinations (6th day ND Master Clone & 20th day ND VH) and Medications are same for all 29 farms.

The details of the farm wise performances are presented in Table 1

Table 1: *IBD Suprim field trial with at Baruipur, 24 Parganas (s), West Bengal*

Farm	Vaccine Schedule	Hatch date	CHICKS	Mort %	Body Wt	F C R	M Age	Day Gain	EEF	CFCR
Farm 1	IBD Plus	21-Mar-18	1,436	15.53	1.923	1.801	38.00	50.60	237	1.820
Farm 2	IBD Plus	21-Mar-18	2,255	11.18	1.959	1.723	40.03	48.94	252	1.733
Farm 3	IBD Plus	21-Mar-18	1,480	12.91	2.018	1.764	41.00	49.23	243	1.760
Farm 4	IBD Plus	23-Mar-18	1,990	11.31	1.907	1.895	41.08	46.43	217	1.918
Farm 5	IBD Suprim + IBD Plus	26-Mar-18	1,390	13.60	1.947	1.797	40.00	48.66	234	1.810
Farm 6	IBD Suprim + IBD Plus	26-Mar-18	1,298	10.55	1.912	1.879	39.30	48.65	232	1.901
Farm 7	IBD Suprim + IBD Plus	26-Mar-18	2,489	10.49	1.837	1.713	40.20	45.70	239	1.754
Farm 8	IBD Suprim + IBD Plus	31-Mar-18	900	14.22	1.592	1.741	38.00	41.90	206	1.843
Farm 9	IBD Suprim + IBD Plus	31-Mar-18	1,970	12.94	1.962	1.807	42.20	46.49	224	1.816
Farm 10	IBD Suprim + IBD Plus	31-Mar-18	948	13.19	2.043	1.733	41.00	49.84	250	1.723
Farm 11	IBD Suprim + IBD Plus	31-Mar-18	1,289	9.08	1.885	1.901	42.13	44.74	214	1.930
Farm 12	IBD Plus	02-Apr-18	1,538	13.78	2.087	1.713	40.01	52.17	263	1.691
Farm 13	IBD Suprim + IBD Plus	02-Apr-18	1,839	21.70	2.005	1.924	42.13	47.59	194	1.923
Farm 14	IBD Suprim + IBD Plus	04-Apr-18	2,355	19.58	2.004	1.952	43.36	46.23	190	1.951
Farm 15	IBD Suprim + IBD Plus	04-Apr-18	2,374	16.64	1.898	1.757	39.18	48.45	230	1.782
Farm 16	IBD Plus	04-Apr-18	895	10.50	1.925	1.757	41.49	46.41	236	1.776
Farm 17	IBD Plus	07-Apr-18	4,156	20.45	1.948	1.857	41.55	46.88	201	1.870
Farm 18	IBD Suprim + IBD Plus	09-Apr-18	2587	8.08	2.462	1.742	44.33	55.53	293	1.627
Farm 19	IBD Suprim + IBD Plus	09-Apr-18	2,169	6.64	2.076	1.646	40.28	51.53	292	1.628
Farm 20	IBD Plus	11-Apr-18	1,390	7.41	2.192	1.797	42.00	52.20	269	1.749
Farm 21	IBD Suprim + IBD Plus	11-Apr-18	1,192	8.72	2.152	1.871	42.22	50.97	249	1.833
Farm 22	IBD Suprim + IBD Plus	11-Apr-18	1,990	4.92	2.149	1.815	42.32	50.78	266	1.778
Farm 23	IBD Suprim + IBD Plus	11-Apr-18	1,287	10.26	2.304	1.841	45.58	50.55	246	1.765
Farm 24	IBD Suprim + IBD Plus	12-Apr-18	1,383	12.58	1.978	1.832	38.89	50.86	243	1.837
Farm 25	IBD Suprim + IBD Plus	12-Apr-18	1192	18.12	2.162	1.934	43.76	49.40	209	1.893
Farm 26	IBD Plus	13-Apr-18	1783	10.94	2.361	1.905	46.87	50.37	236	1.815
Farm 27	IBD Suprim + IBD Plus	13-Apr-18	1,798	11.40	2.188	2.049	45.55	48.03	208	2.002
Farm 28	IBD Plus	13-Apr-18	1,596	9.52	2.419	1.872	47.74	50.67	245	1.768
Farm 29	IBD Suprim + IBD Plus	14-Apr-18	2,790	6.95	2.309	1.699	43.08	53.59	294	1.621

It may be noted that this is not a formal trial maintaining protocol with same chicks, same feed under similar management practise and in same climate. Here only feed is common and chicks are from same breeding farm & same hatchery but of different hatch date. Husbandry practise & infrastructure are different in all 29 farms but under same climate & disease challenge situation. Every individual farms have its own limitations and farm group performance has been given better weightage rather than any individual farm. That's why to minimize error, average results of Control & Treatment are compared while analysing final results of the study.

Table 2: *Comparative performance of treated vis-a-vis un-treated farms*

Treatment	No of Farms	Chicks	Mortality %	Body Wt (Kg)	F C R	Mean Age	Day Gain	EEF	C FCR	Production Cost (Rs)
+ IBD Suprim	19	33,240	11.86	2.071	1.810	41.92	49.41	241	1.792	69.48
- IBD Suprim	10	18,519	13.48	2.062	1.819	41.99	49.11	233	1.804	70.13

The above data suggests that Early IBD Intermediate followed by Intermediate Plus Vaccinations improved the productivity of the broilers. Despite presence of poor drinking water and disease threats, mortality decreased in the treated farm group to a great extent and this resulted in slide improvement in body weight, productivity index and feed conversion ratio at the time of harvest. This may be because early IBD Vaccination prevents the treated birds to get infected early from field IBD virus and thus immunosuppressive effects were lower compares to the birds not received early IBD vaccines, which in turns prevents entry of other infections at later stage of life resulting lower mortality with higher productivity. Immunocompetence of treated group birds seems to be better than those of un-treated birds.

The difference in mortality between the IBD Suprim administered farms and the un-treated farms under similar bio-security situation is fascinating and averaged to be 1.62%. The difference in C FCR (FCR at 2 kg body Wt) between the two groups was 12 points which means a saving of 12 gm of feed per kg broiler.

The economics of the treatment with IBD Suprim is presented in Table 3 where it has been shown that IBD Suprim treatment yielded Extra profit of Rs 0.39/ per Kg broiler which was possible due to substantial reduction in production cost by achieving a better liveability and better FCR.

Table 3: *Economics of IBD Suprim treatment*

Parameters	Treatment	Control
Chicks	33,240	18,519
Weight Sold (Kg)	60,681	33,036
Feed Consumed (Kg)	1,09,840	60,090
Med Cost (Actual)	62,491	34,816
Chick Cost (as per Standard)/Kg Broiler	14.24	14.57
Feed Cost (as per Standard)/Kg Broiler	51.97	52.29
Med Cost/Kg Broiler	1.03	1.05
Broiler Growing Cost/Kg Broiler to Farmer	5.06	4.74
Overhead Cost/Kg Broiler	1.64	1.68
Total Cost of production Rs/kg	**73.94**	**74.33**
Net profit Rs/kg	**0.39**	

It is concluded from the field trial that two IBD Vaccination; ***4th day Intermediate followed by 14th day Intermediate Plus, broiler productivity can be substantially improved yielding greater profit to the farmers.***

Acknowledgement:

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2. Bonobithi Farms Pvt Ltd, Baruipur Team
3. Globion India Pvt Ltd, Hyderabad

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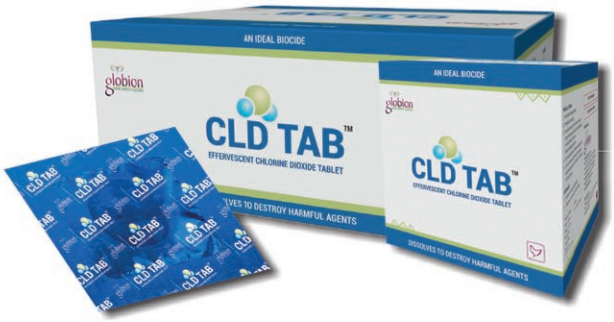

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12 Biosecurity Tips to Achieve Peak Efficiency and use Antibiotics Responsibly

In Brief

- Biosecurity, when done correctly, can reduce the incidence of disease.
- Biosecurity is a key part of a holistic approach to the reduction or removal of antibiotics from the diet.
- Biosecurity is not someone else's responsibility: we must all take responsibility for implementing the necessary change.

Antibiotic resistance on the agenda

Widespread concern on antibiotic resistance is relatively new. The first paper showing the transfer of antibiotic resistance between humans and animals was written in November 2016. The United Nations has declared antibiotic resistance a global priority.

The United Nations predicts that, unless we act now, antibiotic resistance could claim up to 10 million victims per year by 2050. So, we have to act now.

But how do we act and implement a new business or industry model where the priority is a prudent use of antibiotics? The key to antibiotic-free production is good gut health and an efficient immune system.

Biosecurity is one logical solution

Biosecurity is recognized as one possible and logical solution for reducing the use of antibiotics. However, it may not be possible to replace antibiotics with only one strategy. Instead, a holistic approach should be considered.

Biosecurity can help directly by reducing environmental disease challenges, and some parts of biosecurity, for example water sanitation, are essential for animal production. But biosecurity also has an indirect impact on the control of antibiotic resistance by building awareness throughout the industry. Biosecurity, when thought of as a management system rather than a disease control tool, spurs the education of consumers, delivering big benefits throughout the food chain.

In order to realize these benefits, we have to broaden the traditional view of biosecurity. The new vision promotes biosecurity into a global priority to which everyone is committed. Biosecurity is our responsibility—not somone else's. We all have the tools. Motivating people to behave according to certain rules is key to ensure success.

What climate change means for farm animals

Experts predict that, if nothing is done, the average temperature of the planet will rise of approximately three degrees during this century. Higher bacterial load and water challenges are two examples how climate change will impact farm animals.

1. Higher bacterial load

Climate change will have a devastating impact on disease challenge. We will have new forms of disease. The risk of Salmonella contamination increases by 10-15% for every one-degree increase in temperature. That could mean that, at the end of this century, we will have a 50% greater Salmonella problem.

2. Water challenges

Water is an essential part of the diet of any animal. Animals drink at least three times the amount they eat. As temperatures increase, water requirements will also increase. Also as a result of increasing temperatures, there will be more soil erosion causing more and different types of pollutants getting into the aquifer, as well as new parasites and new diseases.

Territorial biosecurity

The Po Valley in Northern Italy illustrates the importance of biosecurity [8:49]. Within one square mile, there are nine individual farms all with different animals of different ages, using different production schemes, different movement of people, and different movement of vehicles. That is why we should think more in terms of territorial biosecurity and micro zoning rather than compartmentalization, which is what is happening now, especially to control the big emergencies like avian flu in poultry or foot-and-mouth.

Lombardy is considered as the leading pork-producing region in Italy and accounts for nearly

50% of Italian pig production. The density of pigs in this region is shown in a photograph [9:55]. From the photograph, you can see the proximity of the farms. In some cases, they are less than 300 yards away from each other. Biosecurity compromises are made to keep good neighborly relations. These are situations that need to be addressed when considering territorial biosecurity because disease is on the agenda every day. Officials are saying that disease can wipe up to 20% off gross production value, which is a lot of money. Only in a country like Italy, it would mean a loss of approximately 500 million lira, which if divided by the number of pigs raised or the number of cows present on farms, could escalate into a really problematic scenario.

Antibiotic use requires education and a shift in mindset

Italy cannot afford to be considered as one of the leading countries in terms of antibiotic use: a new model must be found. The Italian ministry of health decided that the use of antibiotics on farms should be curbed by at least 30% by 2020. But the problem is one of education.

We can find the answer by educating people and introducing them to new business models. There are no new antibiotics in the pipeline at the moment, and even if there were, a new active ingredient would only solve a small part of a very big problem. The answer lies in innovation. And in conjunction with this is mindset. If you do not change your mind, nothing is going to change in any aspect of your life.

Sustainable development goals

Focus should be placed on the relationship between human health, animal health, and environmental health. People and animals interact in a common area: the environment. Whether healthy animals are sustainable or sustainable animals are healthy, we know that one is the true path. However, it is certainly true to say that **healthy animals do not need antibiotics**.

The broader picture should not be forgotten. It is very easy to associate biosecurity protocols to the livestock parameter outcomes, forgetting that performance is also related to animal welfare. The environment will be dramatically changed by a 'clean and disinfect' protocol, with less dust, less endotoxins circulating, and the concept of one health comes into play. In a barn, you have the animals that are being raised, but also the people working very intensively.

Many approaches to biosecurity

Several common sets of beliefs about biosecurity still have blindspots.

1. Some people are of the mentality that biosecurity only requires a hose and some water to clean the whole farm. These people are not aware of biofilm and the implications of biofilms in creating antibiotic resistance.
2. Other people are of the mentality that they are doing all they can to control disease, perhaps even using more than the recommended dosages of antibiotics, but with little or no success. These people have forgotten the role of fomites, the non-living vectors of disease, which also need to be controlled.
3. Another set of people who will do as instructed by their veterinarian or advisor, but without really believing in the solution. In this case, economic expense will be minimized and mistakes will be made. For example, using a cheap disinfectant might not be applicable to the target application.
4. People who react dramatically to big emergencies such as Avian flu or foot-and-mouth disease. But once the threat is over, disinfection is withdrawn and there are no biosecurity measures in place at all.

With quality assurance, veterinarians realize that to control food-borne pathogens such as Salmonella, Campylobacter and Listeria, you cannot not rely on antibiotics alone: you also need to control the environment by cleaning and disinfecting in a rational way.

Biosecurity is the supporting concept around the world. Some may call it a fight against antibiotic resistance, but the underlying concept is the same. Biocompliance is the key concept and key approach used on farms that are ruled by precise disciplines. This is true for food safety, for animal

welfare (biocide regulations for disinfectants and cleaners) and for environmental efficiency.

Dramatic change in the hygiene market

In recent years, the hygiene market has changed a lot. Up to the end of the last century, the approach was farm to food with a focus on putting food on supermarket shelves. Then, with the introduction of quality control and quality assurance, the concept of biosecurity in a very formal way emerged because it was a matter of customer responsiveness.

You could not sell products to supermarkets if you could not prove that you had e.g. a HACCP (hazard analysis and critical control point) program in place. There are now many similarities with the IT industry. Now that many consumers have smartphones, we can have all the intelligence we need at the right time. The same is true of biosecurity; we must be proactive.

As different intangible values arise, the scenario is developing into 'farm to foodture'. Foodture is half food, and half future.

The 'Foodture'

The more layers you build around food, the more value you create for the market, the producer, and for the whole industry. From food, we will produce i-food or intelligent food. Intelligent food will be produced in a sustainable and economic way. E-food stands for environmental food, making sure our livestock production leaves a green footprint. And finally, we have to be ready for the digital revolution even in our conservative market. We will get to a point where we have smart and connected food, with the producers and consumers sharing data directly to improve quality and production patterns.

Achieving biosecurity excellence

The important factors for biosecurity are compliance and execution: these dynamics cannot be escaped. There must be a strong focus on each step to make sure that you are putting the best biosecurity program possible in place, and this is down to the people.

For the strategy to work, you need the people involved to be properly engaged. To help with this, identify someone on the staff who embraces the biosecurity strategy and use them to emulate to the rest of the team.

Do staff really use foot dips?

The biosecurity chair of Montreal University set up some trials to monitor the use of foot dips. There were many problems to overcome in terms of measuring compliance with the foot dips on their site.

In the control group, they put a hidden camera near the foot dips and monitored use. In another group, signposts were put up to notify people of the presence of the cameras. In the third group, the people were told that they were going to be filmed using the foot dips and the camera used for the filming was not hidden.

When people knew they were being filmed, there was a much greater rate of compliance compared to those who knew nothing about the cameras [29:44]. However, after six months, the difference across the three groups was negligible which highlights the importance of reinforcing biosecurity measures regularly.

Is biosecurity worth the investment?

The big question is whether biosecurity is really worth investing in. When disinfection products were introduced to the market, they were seen as very expensive.

To prove their worth, a number of field trials were run. The data from those trials was shared, the main conclusion being that good biosecurity can decrease the risk of disease if coupled with good management practices such as 'all-in-all-out' as introduced in 1996. There were big savings made on the cost of medication.

More recently, 20 years after the original trials, scientific trials have been run by the University of Ghent who came to the same conclusions.

12 take-home messages

1. Know the farm: Just as the Chinese General Sun Tzu said 'If you want to win the war, get to know your enemy but don't forget to know your army', you have to know your farm as completely as possible. Carry out regular audits, know all the critical control points that you have to set up. Plan ahead, measure and simulate the impact of your

actions. Invest time gathering information about your farm.

2. Use detergents regularly and consistently.

Detergents offer savings on labor costs, and 80% of the costs of a biosecurity program is not product or equipment, but labor. The people on the ground have to be very clear about why their job is so important. Using detergents can also lead to savings of up to 50% in water usage, and in some cases, the effective use of detergents can allow you to afford the cost of at least one-man unit.

3. Use licensed product: This is the only way to combine safety, security and efficacy.

4. Pay attention to your water system.

Water systems will have a growing importance in the future, and the advice is to follow the 'KISS' rule – keep it simple, stupid. The biosecurity principle is essentially the same.

First, you clean, and then you disinfect. It might be worth staying away from generic chlorine and investigating new active ingredients such as triclosan, which can be five times more effective in the phase of addition whereby a biofilm develops and bacteria acquire antibiotic resistance.

5. Sanitize the air in continuous flow.

6. Disinfection is the first line of defense on the farm: Take care when vehicles are entering the farm site, but also when they are leaving so as not to spread disease from one farm to another.

7. Use foot dips: These should be strategically located around the farm. The disinfecting solution should be changed when you can see dirt accumulating.

8. Mycotoxin management: There is no point in spending a lot of money on a sophisticated diet if you do not manage the problem of mycotoxins.

9. Don't make silly mistakes

For example, do not move dirty sows into a farrowing unit which you have spent hours cleaning as they will re-infect it.

10. Remember animal welfare: Endorphins are important for humans, but also for animals. We perform better or more efficiently when we feel better.

11. Structural biosecurity is important.

Avoid overcrowding and competition at the feeding trough or nipple.

12. Behavioral biosecurity is also important.

Hand sanitizer should be used every time you get close to a pig, not only to protect yourself, but also to ensure that you are not conveying any disease to the animal through touch.

Conclusion: Biosecurity has a role in a holistic approach in order to guide the market to a prudent use of antibiotics. It will allow us to efficiently produce as much as was previously possible with antibiotic inclusion. The only compromise we have to make is with ourselves. We have to not only be ready for change, but be the change itself.

Decreased Egg Production: With Focus on Backyard Poultry

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Over 72% of India's population lives in rural areas and of that, 58 per cent depend on agriculture and associated activities for their livelihoods. Backyard poultry (BYP) rearing is a proven gender friendly production practice.

Poultry rearing has significant advantages over other livestock activities to rural women especially, because:

• It is easy to manage and can be taken up under diversified agro-climatic conditions.

• It's requirement of land, capital and other external inputs are low for small scale units.

• It can provide quick returns and continuous income throughout the year, as it enjoys good market demand and prices.

• BYP is the most efficient converter of household and farm waste into food of high value.

• BYP enhances women's social status and decision-making power in the house hold by increasing women's income and can be used as a tool to reduce poverty in rural areas, help the family in times of need and have cash for emergencies.

• It helps them to obtain an income to provide for the needs of their children and the household

• It supplements the family's protein intake.

Collecting eggs from the nest boxes is one of the great joys of backyard chicken keeping and when the yield from the nest boxes isn't what we expect, it can be disappointing, and at times, cause for concern. A drop in egg production can be one of the first signs of a problem in poultry flocks and just as we pay attention to chickens' droppings to monitor their health, so one should pay attention to the hens' daily egg count for signs of trouble too. Fluctuations in egg production can be caused by a number of physical, behavioural, environmental and emotional triggers, some requiring remedial actions and others, no cause for alarm. The following are the most common causes of drop in egg production in backyard flocks with solutions where possible.

Decreased lighting conditions

Light triggers a hen's pituitary gland to produce eggs. Regular egg-laying requires 14 to 16 hours of light and decreased daylight hours in autumn and winter can cause a drop in or stop to egg production.

Supplemental light can be added to the coop to encourage egg-laying with no detrimental effects to the hen despite myths to the contrary.

Stress and Change

Hens are extremely sensitive to stress and typically respond to it by putting the brakes on egg-laying. They particularly dislike change, which is a major cause of stress and decline in egg-laying. Any one of the following can adversely affect egg production:

• Changes in feed

• Changes in coop layout

• Moving to a different farm or coop

• Adding or losing flock members

• Annoyance from a well-intentioned child

• A fright from a predator

• Irritation from internal or external parasites, violent weather

• Barking dogs, cats, other animals and

• Too High and too low temperature.

Broodiness: A broody hen in the coop can affect a flock's egg production. Not only does she stop laying eggs; the mere sight of her sitting on a nest can inspire a chain reaction of hens to brood, resulting in fewer eggs overall.

Broodies should be broken properly or permitted to hatch eggs in a location away from the nest boxes to ensure a prompt return to egg-laying and to preserve their health.

Disease-Illness-Parasites

Hens that are ill or have parasites such as worms, coccidia, mites or lice, do not perform optimally. Taken in conjunction with flock history and any other symptoms, a drop in egg production can indicate that hens are sick or suffering from a parasite infestation. For example: if a drop in egg production follows the addition of new chickens to the flock and no other physical symptoms are noted, a communicable disease or parasite should be suspected and investigated further.

Newcastle disease (NCD): NCD is a viral infection that can result in a mortality rate of 100 % in chickens. It also leads to a drop in egg production and quality.

Infectious bronchitis (IB): This is a rapidly-spreading viral infection of chicken characterised by respiratory signs. It also causes drop in egg production (up to 50 %) and egg quality. Egg shells are deformed. There is a vaccine for this disease.

Epidemic tremor: This is a viral infection that results in a drop in egg production. Layers are vaccinated on the thirteenth week of age. The vaccine is given in the drinking water.

Egg drop syndrome: This is a viral infection that affects the reproductive organs of chickens. The signs are a drop in egg production, thin shells, soft shells and shell-less eggs. There is a vaccine available to prevent the disease. Layers are vaccinated on the sixteenth week of age. The vaccine is given in the muscle.

Other diseases causing a drop in egg production are salmonellosis, mycoplasmosis, infectious laryngotracheitis and internal parasites.

Fowl Pox: Fowl pox is a viral disease of chickens characterized by scab-like lesions on the skin of the unfeathered body parts and/or on diphtheritic (wet) membranes lining the mouth or air passages. Infection with the fowl pox virus will cause the chickens to have poor growth, poor feed conversion and a precipitous fall in egg production. Fowl pox may affect any age bird. It is transmitted by direct contact with an infected chicken or by mosquitoes.

Coccidiosis: Coccidiosis is a protozoan disease characterized by enteritis and diarrhoea in poultry. Unlike the organisms which cause many other poultry diseases, coccidia are almost universally found wherever chickens are raised. Coccidiosis outbreaks vary from very mild to severe infections. Individual strains of cocci attack birds differently, resulting in diverse symptoms. The overall symptoms may be one or more of the following:

Bloody droppings, high mortality, general droopiness, emaciation, marked drop in feed consumption, diarrhoea and drop in egg production in layers.

It is common to add a coccidiostat in the feed of broilers. In addition, live vaccines are currently available.

Avian influenza: Avian influenza is a viral disease affecting the respiratory, digestive and/or nervous systems of many species of birds. Avian influenza viruses are classified based on severity of disease, ranging from apathogenic to highly pathogenic. The mildly pathogenic form produces listlessness, respiratory signs (sneezing, coughing), and diarrhoea. The level of mortality is usually low. The highly pathogenic form of avian influenza produces facial swelling, cyanosis, and dehydration with respiratory distress. Dark red/white spots (cyanosis/ischemia) develop on the legs and combs of chicks. Mortality can range from low to near 100%. The decrease in egg production is related to the severity of the disease and can be severe.

There is no specific treatment for avian influenza. Recovery is rather spontaneous. Birds slaughtered 7 days after infection often have no significant increase in condemnations.

Mycoplasma gallisepticum infection

Mycoplasma gallisepticum infection (chronic respiratory disease, PPLO infection, airsacculitis, MG) is characterized by respiratory distress (coughing, sneezing, snicks, rales, discharge from eyes and nose). Feed consumption and egg production decline in laying hens. Mortality is

usually low but there may be many unthrifty birds. The organism may be present in a flock and cause no disease until triggered by stress, e.g. changes in housing, management, nutrition, or weather.

Tylosine and tetracyclines have been used extensively for treatment. Injectable antibiotics may be more effective if the disease is advanced and if the flock is small enough to be treated individually. Live and inactivated vaccines also are commonly used to reduce the adverse effects of the disease.

Fowl cholera: Fowl cholera is an infectious bacterial disease of poultry. With an acute outbreak, sudden unexpected deaths occur in the flock. Laying hens may be found dead on the nest. Sick birds show anorexia, depression, cyanosis, rales, discharge from eyes and nose, white watery or green mucoid diarrhea, and egg production is decreased.

As fowl cholera becomes chronic, chickens develop abscessed wattles and swelling of joints and foot pads. Cheesy pus may accumulate in the sinuses under the eyes.

Antibiotics can be used, but require higher levels and longer medication to stop the outbreak. Where fowl cholera is endemic, live and/or inactivated vaccines are recommended. Do not start vaccinating for fowl cholera until it becomes a problem on the farm and a diagnosis is confirmed.

Infectious coryza: Coryza is a respiratory disease of chickens. Common clinical signs include swelling and puffiness around the face and wattles, a thick sticky discharge with a characteristic offensive odor from the nostrils, labored breathing, and rales. There is a drop in feed and water consumption as well as egg production.

Sulfadimethoxine is the preferred treatment for infectious coryza. Sulfamethazine, sulfamerazine, or erythromycin (Gallimycin) can also be used as alternative treatments. The sulfa drugs are not FDA approved for pullets older than 14 weeks or for commercial laying hens.

A vaccine for infectious coryza is available. It is given subcutaneously (under the skin) on the back of the neck. Chicks are usually vaccinated four times, starting at 5 weeks ofage (i.e., at 5, 9, 15, and 19 weeks with at least 4 weeks between injections). Vaccinate again at 10 months of age and twice yearly thereafter.

Egg Hiding: Free-range or pasture-raised hens may fall into the unwelcome habit of laying eggs outside the coop in secluded locations. Hens have been known to disappear for weeks, secretly brood eggs and return to the flock with baby chicks in tow.

Coop training ordinarily eliminates the problem of egg-hiding.

Egg-eating chickens: Everyone loves fresh eggs, and chickens are no exception. Hens often start eating eggs when they discover a broken egg in a nest box. Once a chicken gets the taste of this high-protein, nutritious snack, it becomes difficult to deter intentional egg breaking and eating.

Age: After two years, a hen's production naturally declines. An aging flock will naturally produce fewer eggs after its first two years. Nothing can reverse this process.

Predator Theft: Various predators can be responsible for egg theft including: raccoons, rats, snakes, opossums and skunks. Coops should be secured with hardware cloth to ensure that nocturnal predators cannot gain access to the birds at night when they are most vulnerable.

Nutrition Imbalance: The wrong feed, too many snacks/treats, overcrowding, mixing commercial layer feed with scratch/cracked corn/oats, etc. & being physically prevented from getting to the feeders by another flock member can all lead to nutritional deficiencies, which can result in a drop in egg production.

Water deprivation: Access to clean, fresh, cool water at all times is imperative to the formation of eggs.

Egg production will suffer if a hen's access is limited physically (frozen or too far away) restricted (prevented from reaching it by another chicken) or unpalatable (dirty/medicated/warm).

Molting: Molting is the natural process of feather shedding and re-growth. Hens divert protein and energy away from egg production to concentrate on feather growth. Supplementing a hen's diet with extra protein during a molt can aid in feather growth and egg production.

The major problem that plagues BYP is the high mortality rate among the birds. This is the direct result of the utter disregard to the vaccination of the birds. The various constraints identified through investigations and surveys for low returns from BYP are:

1. Heavy mortality in birds due to outbreak of diseases.

2. Low production potential (meat and eggs) of birds due to malnutrition and unhealthy birds.

3. Lack and difficult access to veterinary services (vaccines and quality chicks) due to distance from villages and inadequate transport facilities.

4. Lack of awareness and knowledge about improved practices.

5. Limited access to knowledge, technology and extension services such as market information, credit etc.

To make backyard poultry rearing a better and profitable business to poor farmers especially farmers following measures may be adopted:

- Vaccination programme may followed
- Short training to the lady farmers may be given
- Better strains of birds may be adopted for backyard poultry farming.

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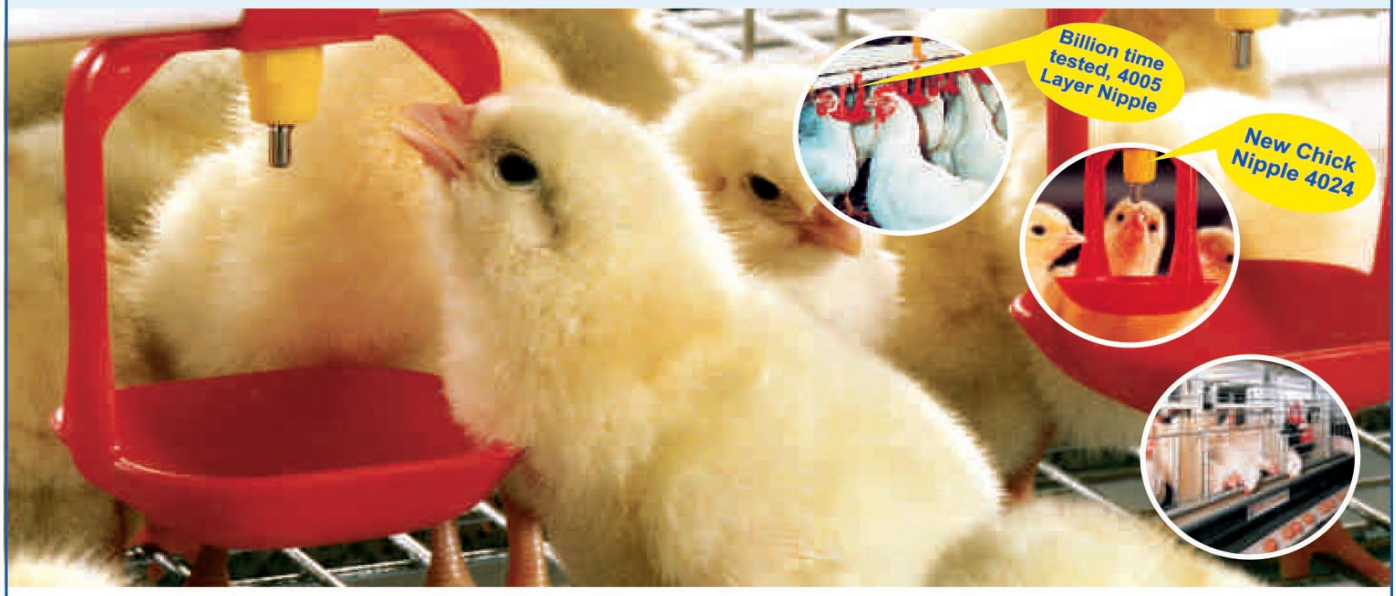

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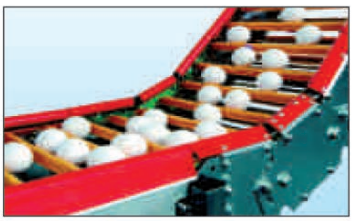

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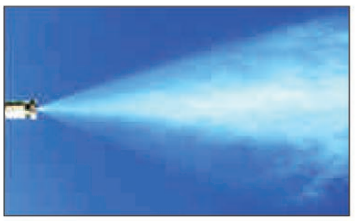

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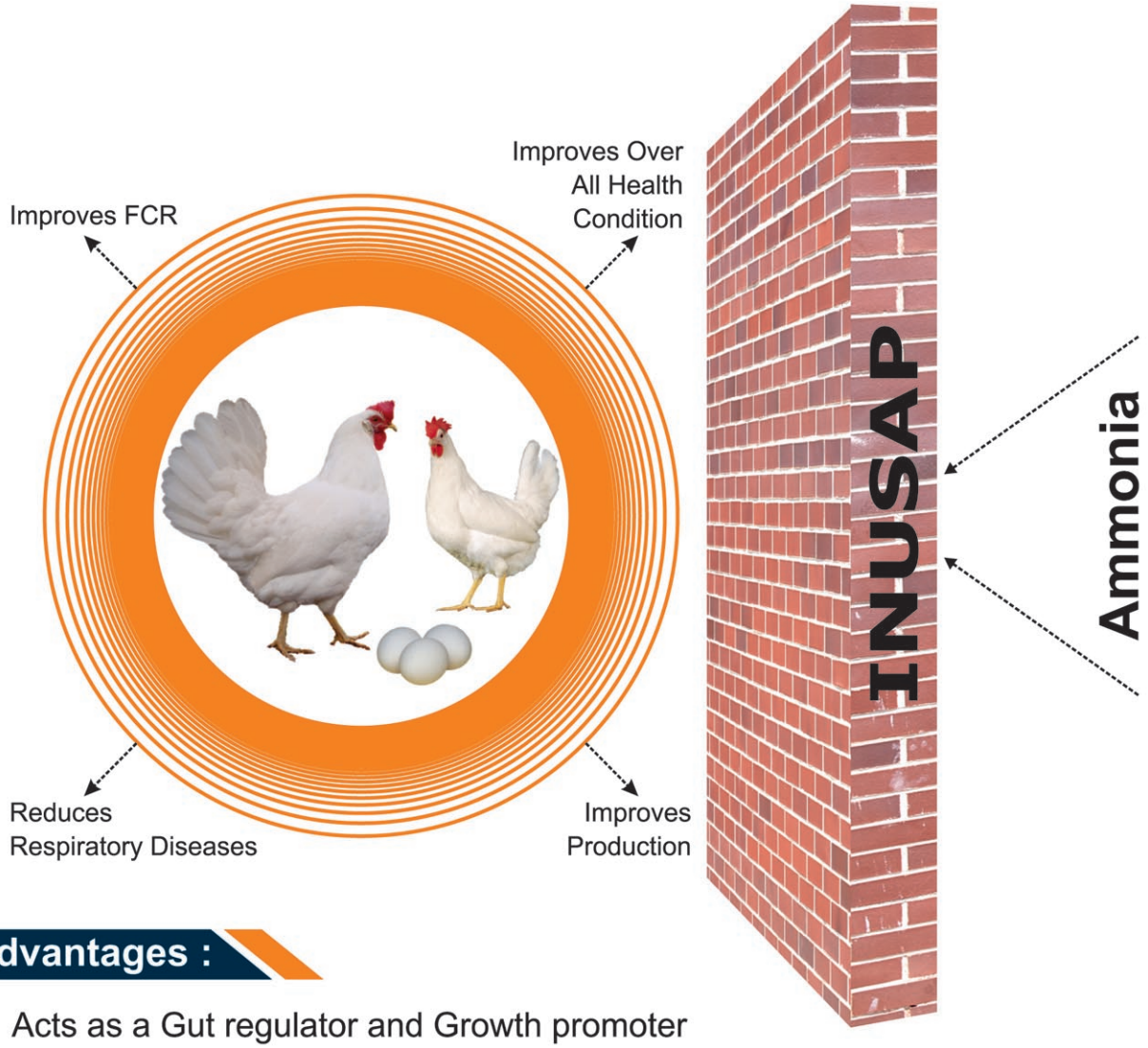

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DRY LITTER-AN IMPORTANT FACTOR in BIO-SECURITY

Prevention and control of Coccidiosis in Poultry Production

Venkat M Shelke, Kemin Industries South Asia Pvt Ltd

INTRODUCTION: Coccidiosis, caused by various *Eimeria* species, is one of the most economically devastating infectious diseases of poultry raised in deep litter system.It occurs mainly in caecal and intestinal systems, and results in high morbidity and mortality.The coccidia consists of a wide variety of single-celledparasitic animals in the sub-kingdom Protozoa. As a group, thecoccidia of the genus *Eimeria* are predominatelyhost-specific, i.e., each species occurs in a single host. Worldwide, the poultry industry spends significant amount of money in prevention and treatment of coccidiosis, which causes substantial economic losses due to malabsorption, bad feed conversion rate, reduced weight gain and increased mortality.

ETIOLOGY: Parasites causing coccidiosis are commonly found in places where chickens are raised. Coccidia can multiply rapidly inside the cell lining of intestine or caeca. Many species of *Eimeria* genus can infect poultry with no cross-immunity between them. *Eimeria* have a self-limiting life cycle and are characterized by high tissue and host specificity. They show a wide variation in their pathogenicityas shown in **Table-1**.

Table-1: Characteristics of important *Eimeria* spp. infecting chickens

Host	*Eimeria*	Location	Pathogenicity*
Chickens	*E. acervuline*	Duodenum, Jejunum	++
	E. brunetti	Ileum, Rectum	+++
	E. maxima	Duodenum, Jejunum, Ileum	++
	E. mitis	Duodenum, Jejunum	+
	E. necatrix	Jejunum, Caeca	+++
	E. praecox	Duodenum, Jejunum	+
	E. tenella	Caeca	+++
* – non-pathogenic; + low pathogenic; ++ moderately pathogenic; +++ highly pathogenic			

TRANSMISSION

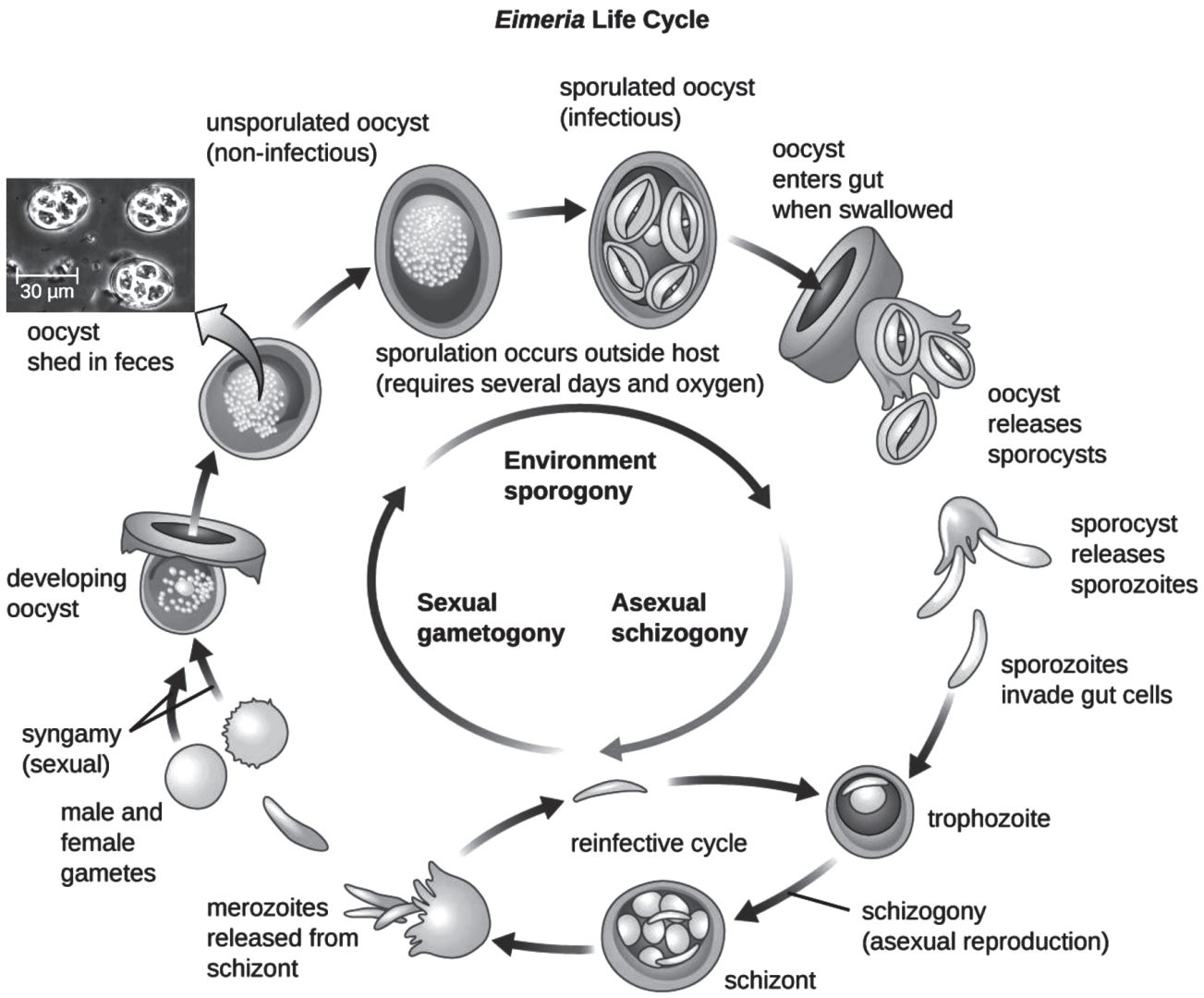
Wild birds, insects or rodents spread sporulated oocysts mechanically via contaminated boots, clothing, equipment or dust.The natural route of infection is by direct oral transmission. Following the ingestion of sporulated oocysts, the microenvironment of host digestive tract stimulates excystation of oocyst in gizzard resulting in the release of sporozoites that invade and destroy cells in intestinal mucosa and begin the reproductive cell cycle as seen in **Fig-1**.

DIAGNOSIS

CLINICAL SIGNS : Young birds are more susceptible to *Eimeria* species involved to cause coccidiosis than older, as the *Eimeria* lifecycle varies from 4-7 days. The severity of an infection depends on the age of birds, number of sporulated oocysts ingested, immune status of flock and environmental management. Infected birds frequently display a typical 'sick bird' attitude with depression, prostration, tend to huddle together, have ruffled feathers, consume less feed and water, soiled vents, and the droppings are watery to whitish or bloody.

LESIONS: *E. acervulina* lesions have a unique appearance, consisting of white patches or transverse white lines inside the gut that may be observed from outside. The lesions of *E. maxima* results in multiple petechial haemorrhages, noted segmental ballooning or enlargement of mid-gut area with the presence of orange-tainted mucous. Gross lesions of *E. tenella* are confined to caeca with the presence of haemorrhages around the wall of caeca;freeblood or chocolate-coloured fluid

Fig-1: Reproductive cycle of the sporulated oocyst.



content inside caeca, thickening of caecal wall, and large core of cellular debris and blood. *E.praecox* and *E. mitis* are considered nonpathogenic or low pathogenic and experimental infections with these species may produce pathogenesis resulting in enteritis, diarrhea and reduced feed efficiencies.

LABORATORY TECHNIQUE: Coccidiosis is often diagnosed by counting coccidia per gram of faeces and by microscopic examination of oocyst. The rRNA and rDNA probes were used for identifying individual species through characteristic restriction fragment patterns, randomly amplifying polymorphic DNA assay to differentiate *E. acervulina, E. tenella* and their strains.

PREVENTION

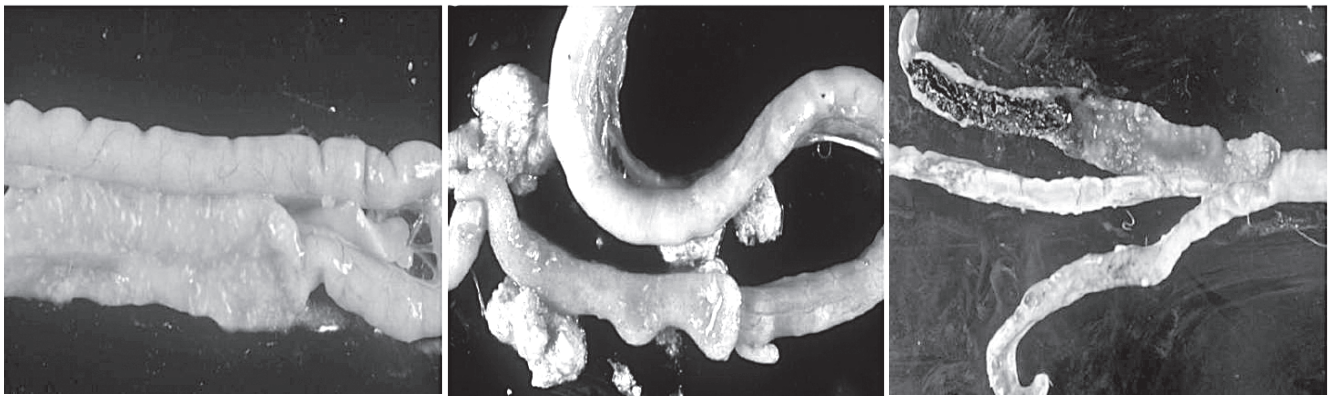
• POULTRY HOUSE MANAGEMENT

In USA, removal of caked litter and aeration of poultry houses at an interval of 2–3 weeks is practiced and top dressing with fresh litter before placing a new flock is a rule. On the other hand, a thorough cleanout between flocks is a common practice in most European countries and Canada. Strict biocontrol measures adopted by caretakers of poultry houses can play a great role in restricting the spread of infective oocysts.

• PROPHYLACTIC APPLICATION OF ANTICOCCIDIALS

Now a day's prevention and control of coccidiosis is dependent upon the proper usage of anticoccidial

Fig-2: Gross lesions of *Eimeria* species.



***E. acervulina* lesions** ***E. maxima* lesions** ***E. tenella* lesions**

drugs or vaccines with proper cleaning and disinfection of farms along with better farm management practices. Eradication of coccidiosis by litter cleaning and disinfections is not feasiblein poultry farms because of the resistant capacity of coccidial oocysts to environmental conditions and some disinfectants.Hence, usage of various anticoccidials like ionophores or chemicals is necessary to avoid the losses due to coccidiosis outbreaks. Addition of starter and grower feed is referred as a **straight program**. The concentration of ionophore may be increased in grower feed for maximum protection at time of peak coccidian oocyst shedding (3-4 weeks) during straight program, which is referred as **step-up program**.Whereas, the decreased anticoccidial concentration in grower or finisher feed is referred as **step-down program.** The addition of chemical and ionophore anticoccidial in starter and grower feed respectively is referred as **shuttle program**. These practices minimize the risk of anticoccidial molecule resistance because time of exposure to same drug is limited. These rotation of anticoccidials involves the changing of the product every 4-6 month by giving proper rest to each category of anticoccidial molecules.

- **VACCINES**

Live vaccines are commonly used in summer season because live vaccines containlive non-attenuated coccidian which induce some lesions, stimulate active immunity and predispose birds to necrotic enteritis. Broiler breeders are vaccinated twice intramuscularly during brooding growing phase which will help to pass maternal antibodies to their offspring and immunity to infection that has been demonstrated with *E. acervulina*, *E. maxima*, *E. mitis* and *E. tenella*.Developed countries like United States and Canada use vaccines like recombinant vaccines or live vaccines likelivacox (consisting of precocious and egg-passaged lines), coccivac and immucox which contains several virulent coccidia species.

- **NATURAL ALTERNATIVES TO PREVENT COCCIDIOSIS**

Recently use of natural products like fungal extracts, plant extracts and probiotics to reduce problems caused by coccidiosis has improved.Varying effects of some diet supplements include immune stimulation, anti-inflammatory effect, antioxidant activity and cytoplasmic damage.

- **FATS**

Sources of fat containing docosahexaenoic acid, eicosapentaenoic acid and linolenic acid (known as n-3 fatty acids) in high concentrations from fish oils or flax seeds was observed to reduce the severity of *Eimeria tenella* infection in young broiler chicks. Diets supplemented with 2.5 to 10% fish oil, 10% flax seed oil, or 10% linseed oil significantly decreased cecal lesions, reduced parasitic invasion rate and development.

ANTIOXIDANTS

Antioxidant molecules plays an important role to control and reduce oxidative stress caused by increased levels of reactive oxygen species and free radicals. This can initiate chain reactions in the cell, resulting in the death or serious damage to cell. Usage of antioxidants from natural sources can restore balance of oxidants/antioxidants which helps to recover the coccidiosis affected birds. Curcumin extracted from *Curcuma longa*, may be useful to reduce the lesions caused by *E. acervulina* and *E. maxima* in upper and middle part of small intestine.*An extract from Artemisia annua*, *Artemisinin,*is useful in reducing oocyst shedding of *E. acervulina* and *E. tenella*than *E. maxima* infections.

ESSENTIAL OILS

Addition of essential oils in the formulations or diets of poultry to control coccidiosis has been practiced recently. It was reported that *in vitro* destruction of *Eimeria* oocysts after a three-hour contact period was observed with addition of essential oils from artemisia, thyme and tea tree.*Eimeria* oocystsare destroyed by essential oils extracted from artemisia, thyme, tea tree and clove.

HERBAL EXTRACTS AND MEDICINAL PLANTS

Some plant extract has anticoccidial effects.The effect of 15 different herbs were assessed and found that*Ulmus macrocarpa, Pulsatilla koreana, Torilis japonica, Artemisia asiatica* and *Sophora flavescens* have shown higher survival rates in day old infected broilers with *E. tenella*,than those of the infected control.

IMMUNE RESPONSE MODULATORS

Diet with lyophilized powder of plums extract in chickens reported an increased body weight gain, reduced fecal oocyst shedding rate and an increased mRNA's for IFN-ã and IL-15, greater spleen cell proliferation and enhanced immune responses.Recently, trend of probiotics and prebiotics usage as an alternative for antibiotics has increased. Use of these products had shown to control the establishment of pathogens in intestinal tract of chicken, which not only helped to improve the body weight gain and reduced feed conversion ratio but also livability and immunomodulation of chicken. A study showed that the commercial probiotics contacting *Pediococcus acidilactici* and *Saccharomyces boulardii acts as prophylactic drug alternative for controlling coccidiosis*. Diet containing *Lactobacilli*showed immunomodulatory effect by stimulating gut associated bacteria in neonatal chicks, which protect chickens from disease without any effect on growth performance, and can also be used as a possible replacement for antibiotics.

TREATMENTAND SUGGESTIONS

- Drugs which are effective to control the coccidiosis outbreaks are preferred.
- Sulfa trimethoprim, tolrazuril or sodium sulfachloropyrazinemonohydrate, amproliun with vitamin K,sulfadimethoxine or sulfamethazine (sulfadimidine) are generally used to control the coccidiosis outbreaks.
- Proper water lines flushing to be done to ensure that it does not contains residues of drugs and supplements given through water (vitamins, electrolytes, etc.,).
- Sulphonamides are more stable and effective at neutral to alkaline water pH.
- The required withdrawal periods vary between sulphonamides, which must be taken care during treatment.
- Be awareof label directions and withdrawal periods to ensure efficacy and avoid tissue residues.
- Choosing proper anticoccidial molecules through feed by following golden rules of anticoccidial rotation must be implemented by giving sufficient rest to each molecule, which will minimize coccidiosis outbreaks throughout year.

Bioavailability of Minerals in Poultry Feed Stuffs

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1. INTRODUCTION

The word bioavailable means how usable a particular mineral or substance is. Usable means that it must be digested, absorbed, and find its way into the correct body cells. Within the cells, it must be further altered or converted into other chemicals, usually, to be useful in some way for the body. Then, when its function is over, it must be able to be easily eliminated from the body so that it does not accumulate as a toxin and clog up the body.

Bioavailability is often for a specific purpose, at a specific time and with specific conditions of the body. In other words, a specific form, valence or spin of a mineral can be well-suited or bioavailable for one location or enzyme system in the body, but not suitable in another location or enzyme binding site.

The bioavailability of a mineral or trace element is defined as the fraction of the ingested nutrient that is absorbed and subsequently utilized for normal physiological functions. For some of the elements this is the incorporation into various metalloproteins, such as Fe in haemoglobin. In addition, some elements, such as Ca and Mg, have a structural role in bones and teeth. Most elements are an integral part of a wide range of enzyme systems, for example Se in glutathione peroxidase. Physiological requirements for different inorganic nutrients vary widely, depending upon age, sex, stage of growth, pregnancy, and lactation. Dietary requirements are calculated from physiological requirements and efficiency of absorption from the diet, which ranges from less than 1 to almost 100%. The variation depends on dietary and host-related factors, including the amount of the element consumed. Dietary components greatly influence the absorption of most of the nutritionally important trace elements and minerals, with the exception perhaps of Se and I. The utilization of I by the thyroid, however, can be impeded by goitrogenic substances such as thiocyanate. Minor plant constituents, such as phytic acid and phenolics, can have a strongly inhibitory effect on absorption, peptide digestion products from dietary proteins can enhance or inhibit absorption depending on their nature, and there are several mineral-mineral interactions. Dietary components appear to have the great effect on bioavailability.

2. COMPONENTS OF BIOAVAILABILITY

- Digestion
- Absorption
- Liver surveillance
- Transport
- Trans membrane movement
- Intracellular movement
- Absorptive Phase
- Assimilation Phase
- Target binding

3. DIETARY FACTORS INFLUENCING BIOAVAILABILITY

A. OXALATES

Oxalates, tannins and phytate possess anti-nutritional properties, specifically in the binding of minerals, thereby impairing mineral absorption into the body. high-oxalate (primarily spinach) diet was fed, mean apparent balances of Ca, Mg and zinc were negative, indicating that this type of diet impaired mineral absorption. The mechanism could be a binding of both oxalic acid and dietary fibre to minerals in a dietary fibre-mineral-oxalate complex.

B. TANNINS

Tannins are also organic compounds that can inhibit mineral absorption. Tannins, also known as polyphenols, are responsible for the astringent quality found in certain grains such as sorghum. Most tannin research relates to impaired haem-iron bioavailabilityforming insoluble iron tannates within the gastrointestinal tract.

C. PHYTATE

Phytate, like oxalates and tannins, is an organic compound (myo-inositol hexaphosphate) which occurs in all plants and serves as the storage form of **P** in the living plant. Phytate is a potent chelator of minerals and, thus, its presence in a food will strongly dictate the outcome of minerals associated with this molecule. Phytase is the enzyme which hydrolyses phytate, thereby releasing the bound mineral or minerals.

Phytic acid (myoinositol hexaphosphate) is found in cereal grains and legume seeds and is a major determinant of the low Fe,Ca and P bioavailability in these feeds. It is thought to form an insoluble complex with Fe, other minerals and peptide degradation products in the intestinal lumen, from which the Fe cannot be absorbed . The degradation of phytic acid in wheat bran almost completely removes the inhibitory effect of wheat bran on Fe absorption and adding phytic acid to wheat rolls inhibits iron absorption dose dependently. Phytic acid is a major inhibitory factor in isolated soya protein. Fe absorption increased significantly when phytic acid free soya protein isolates were fed.

Some traditional food processes such as fermentation, germination or soaking can activate native phytases in cereal grains which then degrade phytic acid and improve Fe absorption. The results from human studies with pure fibre fractions, such as cellulose and pectin, indicate that fibre *per se* does not influence Fe absorption . The inhibitory effect of bran can be attributed almost entirely to its high phytate level .

D. GOITROGENS

The most studied factors relating to I bioavailability are the goitrogens, but these only have a significant impact on I daily intake when the usual dietary intake of I is low. Goitrogens can reduce the levels of I uptake by the thyroid, or impair its metabolism. Thioglucosides are the most common goitrogens, as found in brassica vegetables, e.g. cabbage, cauliflower, broccoli, mustard and turnip. On hydrolysis thioglucosides yield thiocyanates and isothiocyanates which inhibit the selective concentration of I by the thyroid. Thiocyanates are also formed by hydrolysis in feeds such as nuts, cassava, maize and sweet potatoes.

E. POLYPHENOLS

The phenolic compounds present in plant include tannic acids, phenolic acids, flavonoids and polymerization products. They are particularly high in beverages such as tea, coffee, herb teas, cocoa, sal seed and sorghum. Hydrolysable tannins of have been shown to be a most potent inhibitor of iron absorption. Chlorogenic acid, the phenolic compound in certain feed, is also inhibitory and coffee also reduces Fe absorption . The monomeric and polymeric flavonoids also inhibit Fe absorption. Phenolics in vegetables can also strongly inhibit Fe absorption and there is a strong inverse relationship between their polyphenol content and Fe .

4. BIOMARKERS

Another method for estimating bioavailability is to measure mineral responsive biomarkers, such as changesin gene expression, or the activity of a mineral-dependent enzyme. Biomarkers are particularly informative when measured in the small intestine. Metallothionein is one such biomarker, because its expression is regulated by zinc status; the magnitude of metallothionein messenger RNA (mRNA) and protein expression depends on the amount of zinc absorbed. Therefore, metallothionein mRNA or protein expression is often used as an indicator of the zinc status of humans and animals and to evaluate the bioavailability of different zinc sources.

5. **PRINCIPLES OF MINERAL BIOAVAILABILITY**

The bioavailability of a mineral or other chemical element often depends upon such things as the valence, spin, mass, atomic number, isotopes, and other physical and chemical properties of the mineral.

1. **Atomic and sub-atomic factors.** These are the structure, size, weight and other properties of an atom or mineral.

A. Atomic of molecular spin. Spin is a primary physics property of all matter. The spin of any substance has a *direction*, a *velocity* and other qualities such as *wobble*. For example, in stoichemistry or stochiometry, the *direction of spin* an atom or a molecule is labeled as the D-form or the L-form of the molecule. D stands for *dexto-rotary*, which means spinning to the right. L stands for *laevo-rotary* or spinning to the left.

B. Valence. A second important factor in the bioavailability of a mineral and some other chemical substances is called its ***valence***. Valence is the number of electrons in the outer shell of the atoms of the substance. For example, copper, iron and manganese usually have a valence of +2 or +3. If the valence is not correct, it will affect the availability of the mineral. For example, iron found in meat has a different valence, at times, than iron found in vegetables. Biologically active calcium usually has a +2 valence, as does magnesium. On occasion, however, it could change, or calcium could be bound to something that shifts this property and for this

reason changes the biological value of the calcium or magnesium.

C. Atomic mass or weight of a mineral. Another physics property of a mineral is its *atomic weight, mass or density*. This depends mainly upon the number of *neutrons* and *protons* in its nucleus, according to atomic theory. For example, hydrogen and helium are the lightest elements because they have only one or two protons and electrons respectively. This is why blimps and balloons filled with helium or hydrogen are lighter than air and float up in the sky. Hydrogen and helium are also smaller atoms than all the others.

In contrast, *heavy metals* such as cadmium and lead are literally more dense and heavy. Most are very poisonous for all life forms. They are not only heavier, but they are larger than the light elements.

The correct minerals for health are in the middle between the lightest and heaviest elements. The body must have the right weight of minerals or it will not function properly.

For example, the heavy metals are literally too big and do not "fit" as well into certain enzymes and other structures in our bodies. This is one of the main reasons they poison us. They are like nuts and bolts that are too big to fit where they are supposed to go. This is why so much attention in nutritional balancing is focused on getting rid of the heavy metals.

2. Isotopes and the bioavailability of minerals Besides having a general size, and weight or mass, each mineral also comes in slightly different sizes and weights that are called ***isotopes***. These are lighter or heavier versions or forms of the same atom. The heaviness or lightness of an isotope depends upon the number of *neutrons* in the nucleus of the atom, according to atomic theory.

A. Molecular factors. These are the structure, shape, size or other properties of combinations of atoms, which are called in physics *molecules* or *chemical compounds*.

The way that atoms are combined with, or bound to other atoms is a critical aspect of bioavailability. At times, the pure mineral is more effective and available. This is often called an *ionized* state of matter. In other cases, minerals form various types of compounds. These include *colloids*, which is a suspension of fine particles with an electrical charge. For example, in nutritional balancing science colloidal silver is used to kill germs very effectively and with much less toxicity than most antibiotics.

B. Chelated minerals- In other cases, a mineral is bound to a proteinaceous substance such as an amino acid. This is called a *mineral chelate* or a *chelated mineral*. This is a far more bioavailable form of a mineral than many others.

C. In other cases, a mineral is bound to oxygen, and called an oxide, and so forth. Hundreds of combinations are possible, especially in feed and water. This is tricky, because a mineral in one form may be very bioavailable in the liver, for example, but a different mineral compound may be needed in the brain.

D. The ability to transmute. This is a rather esoteric aspect of bioavailability, but an important one to know about. Biological transmutation of the chemical elements means their transformation into other elements and compounds that occurs at low temperature and pressures in living organisms.

3. Interactions These are other factors or forces in our bodies such as its acidity, electrical balance, temperature and many others. **Interactions with many factors and forces within the body. There are many such factors, but here are a few of the most important ones.**

A. Intestinal absorption. This is the most important factor in the bioavailability of all minerals, vitamins, proteins and other nutrients. Impaired digestion results poor absorption of nutrients, so the nutrients just pass through the digestive tract and move out of the body in the faces. A lot of energy has been wasted chewing and attempting to digest the food, only to have it wasted.

Reasons for impaired digestion. These include not chewing feed enough, eating too fast, eating when upset or anxious, low levels of salivary digestive enzymes, low levels of stomach acid or other digestive substances in the stomach such as intrinsic factor, low levels of bile salts, bile acids, or pancreatic enzyme deficiency, intestinal infections of many kinds, improper intestinal flora , toxic chemicals or toxic metals in the feed that irritates the intestines, eating too much at one meal, leaky gut syndrome for many reasons, an irritated intestine that moves the feed along too fast, parasitic infections in the intestines or colon that irritate the tissues, genetic malformations of the intestines or colon, and a few other rarer

reasons such as tumors or blockages of several kinds.

B. Binding, transport and releasing factors. Minerals and other substances must usually be "unwrapped" and "rewrapped" or "repackaged" many times as they are absorbed and transported through the body. It is like moving cartons of merchandise around the world that must be carried in planes, trains, ships and other cargo containers. Some of the cargo (the minerals) is delicate, and some is hazardous or toxic, so the body has found ways to bind it and transport it safely when the body functions correctly. At the sites where the minerals and compounds are needed, they must be released properly as well, or they will not do their jobs correctly.

Another common example is that to release some calcium and many other compounds requires a very low or acidic pH of the stomach. This causes calcium to be released so it can be made into usable chemicals in our bodies. Otherwise, calcium in the diet may be wasted. Keeping the stomach very acidic is critical for good digestion. Acid-blocking drugs make the stomach less acidic, which relieves heartburn but impairs calcium utilization and bioavailability

Important transport or carrier molecules in the body include *ferritin* for iron, and *metallothioneine* and *ceruloplasmin* for copper and some other minerals. If these transporters are deficient for some reason – usually poor nutrition – then the minerals cannot be utilized well and become bio unavailable.

C.Conversion in the liver. An important factor in this regard is how well the substance can be broken down in the liver. All of our feed goes to the liver after eating. The liver converts it to other substances in many cases, or stores it away, and throws away that which cannot be used.

Some substances just do not fare well in the liver, and instead build up there or can even damage the liver. These include alcohol, most medical drugs, and hundreds of toxic chemicals such as pesticides. Even some vitamins such as high-dose niacin, and spirulina, chlorella and other green and blue-green algae are not able to be processed well by the liver in most cases.

D. The effects of blood circulation. In order to use most minerals and chemical compounds, the blood circulation must be excellent.

E. Hydration. This is another critical factor in making some substances biologically available to the body. Without enough of the right kind of water, the kidneys, the cell membranes and other structures do not function correctly. Drinking water should hydrate the body such as *reverse osmosis water*. Dehydration impairs or even stops the proper transformation of chemical substances in the body.

6. CONCLUSION

The following four factors are the primary determinants of reduced mineral bioavailability.

1. Shortened transit times, providing less time for mineral absorption to occur.
2. Dilution of intestinal contents and faecal bulking.
3. Chelation of minerals to dietary fibre matrices and their interactions.
4. The property of dietary fibre and incriminating factors to influence active and passive transport of minerals

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PRESS RELEASE

Kemin hosts a seminar on Biosecurity: Profit Beyond Production

Bishkek, Kyrgyzstan(July 2018) – Kemin Industries, a global leader in developing feed ingredients for animal nutrition and health,organizedan exclusive seminar on Biosecurity and its importance for better production for select 21 key consultants. The event also announced Kemin's entry into the farm health division.

Kemin, a market leader in multiple feed additives, is planning to bring new farm health solutions to improve profitability for its customers. The highly differentiated efficient products will be supported by Kemin's various service teams to overcome the shortcomings of current solutions in the market.

Dr. Sudheer Rukadikar,Veterinary Pathologist based at Pune, with over 32 years of experience of Teaching, Research, Extension and Poultry Consultancy, shared important information oncurrent health challenges in layer birds and practical solutions for the problems. "Farm health is an integral part of profitable poultry production, we all must understand the Biosecurity ecosystem and its components" added Dr. Ricardo Munoz, Director of Professional Services, Neogen Corporation

Lexington, Kentucky Area, USA. He also introduced three novel solutions to the consultants- Keciddal™ T Plus, Kem V 260®, Trysil™ V

Dr. Saravanan Sankaran, Head- Technical Services, Monogastric, Kemin Industries South Asia shared insights on present and prospects of Biosecurity in India. He also discussed on an ideal Biosecurity plan for profitable business. The conference was followed by a two-day fun filled exploration of Issyk Kul lake and other local sight -seeing at Bishkek.

The event was followed by an interactive session among the guests and the three-extraordinary speakers. The program gained positive feedbacks from the valuable customers.

About Kemin Industries

Kemin (https://www.kemin.com) has been dedicated to using applied science to improve the quality of life for over half a century. As a global company touching more than half the people of world (3.8 billion) every day with its products and services, committed to improving the quality, safety and efficacy of food, feed and health related products to feed a growing population.

Committed to feed and food safety, Kemin maintains top-of-the-line manufacturing facilities where over 500 specialty ingredients are made for humans and animals in the global feed and food industries, as well as the health, nutrition and beauty markets.

A privately held, family-owned and operated company, Kemin has more than 2,000 global employees and operates in 90 countries including manufacturing facilities in Belgium, Brazil, China, India, Italy, Russia, Singapore, South Africa and the United States.

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+91 9962939608

PRESS RELEASE

Alltech Launches Fourth Annual Art Contest For Children, Invites Nationwide Participation

[BENGALURU, India] – Alltech India, a leading global animal health and nutrition company, announces an art contest for school children. The fourth Alltech India painting competition will accept entries from Aug. 1¬ to Sept. 30. The winner's painting will be featured in the 2019 Alltech India calendar and will also win cash prizes.

As famed American engineer William Hewlett once said, "Creativity is an area in which younger people have a tremendous advantage, since they have an endearing habit of always questioning past wisdom and authority."

"The creative talent of children is truly inspirational," said Dr. Aman Sayed, managing director of India and regional director of south Asia at Alltech Biotechnology. "At Alltech, with our culture of contagious curiosity, we love finding new ways to help you encourage your kids' creativity! We want children to paint their imaginative ideas on canvas and encourage the world to see through their eyes."

Alltech's mission is to improve the health and performance of people, animals and plants through nutrition and scientific innovation. With that in mind, this year's chosen theme is Water and Life.

Participants: All school-age students, between the ages of five and 15, can participate.

When: The contest is open from Aug. 1 to Sept. 30, 2018. The last date to send hard copies of paintings to the Alltech office is Oct. 1, 2018.

Rules and guidelines: The artwork should be A3 size (297 mm x 420 mm or 11.7 inches x 16.5 inches) and made on paper (canvas/drawing sheet). Oil paint, acrylic paint, watercolours, poster colours, coloured pencils or pastels may be used.

Submission: The completed art must be scanned and a soft copy sent to alltechartcontest@alltech.com. The hard copy must be sent to the Alltech Bangalore corporate office by post or courier. For more details, write to alltechartcontest@alltech.com.

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About Alltech:

Founded in 1980 by Irish entrepreneur and scientist Dr. Pearse Lyons, Alltech discovers and delivers solutions for the sustainable nutrition of plants, animals and people. With expertise in yeast fermentation, solid state fermentation and the science of nutrigenomics, Alltech is a leading producer and processor of yeast additives, organic trace minerals, feed ingredients, premix and feed.

Our guiding ACE principle seeks to develop solutions that are safe for the Animal, Consumer and the Environment. Our more than 6,000 talented team members worldwide put this purpose to work every day for our customers.

Alltech is a family-owned company, which allows us to adapt quickly to emerging customer needs and to 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.

BROILER LIFTING RATES FOR THE MONTH OF JUNE 2018

place	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Hyderabad	92	92	92	85	85	88	90	90	93	95	95	97	99	99	99	99	99	99	99	100	100	100	100	102	102	104	104	104	104	104
Karimnagar	92	92	92	86	86	89	91	91	93	95	95	97	99	99	99	99	99	99	99	100	100	100	100	102	102	104	104	104	104	104
Warangal	92	92	92	85	85	88	90	90	93	95	95	97	99	99	99	99	99	99	99	100	100	100	100	102	102	104	104	104	104	104
Mahaboobnagar	92	92	92	85	85	88	90	90	93	95	95	97	99	99	99	99	99	99	99	100	100	100	100	102	102	104	104	104	104	104
Kurnool	92	92	92	85	85	88	90	90	93	95	95	97	99	99	99	99	99	99	99	100	100	100	100	102	102	104	104	104	104	104
Vizag	81	81	81	79	79	82	84	84	86	86	86	88	88	88	88	88	88	88	88	88	90	90	90	90	90	94	94	94	94	94
Godavari	88	88	88	86	86	89	91	91	94	94	94	97	99	99	99	99	99	99	99	99	101	101	101	102	102	104	104	104	104	104
Vijayawada	90	90	90	88	88	91	93	93	96	96	96	99	101	101	101	101	101	101	101	101	103	103	103	104	104	106	106	106	106	106
Guntur	90	90	90	88	88	91	93	93	96	96	96	99	101	101	101	101	101	101	101	101	103	103	103	104	104	106	106	106	106	106

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PRESS RELEASE

trouw nutrition

Controlling enteric challenges in broilers: Feed additive combinations can support growth performance and health comparable to in-feed AGP

As antibiotic-free production systems become increasingly common in poultry operations around the globe, challenges such as Necrotic Enteritis require alternative solutions without compromising productivity and welfare. Research conducted by Trouw Nutrition finds that a combination of feed additives can support broiler growth performance and health at levels comparable to in-feed antibiotics, even when birds are exposed to a necrotic enteritis disease challenge.

During the 2nd International Conference on Necrotic Enteritis, 11-12 of July, Trouw Nutrition researcher Yanming Han presented findings of two trials from China and Canada. The trials evaluated the efficacy of combinations of feed additive solutions to support bird health and performance in the presence of a *Clostridium perfringens* type A challenge. The test results of the feed additive combination were compared to the performance of birds receiving an antibiotic growth promotor (AGP). Both studies found that birds receiving a combination of applied feed additives performed comparable to birds receiving an AGP.

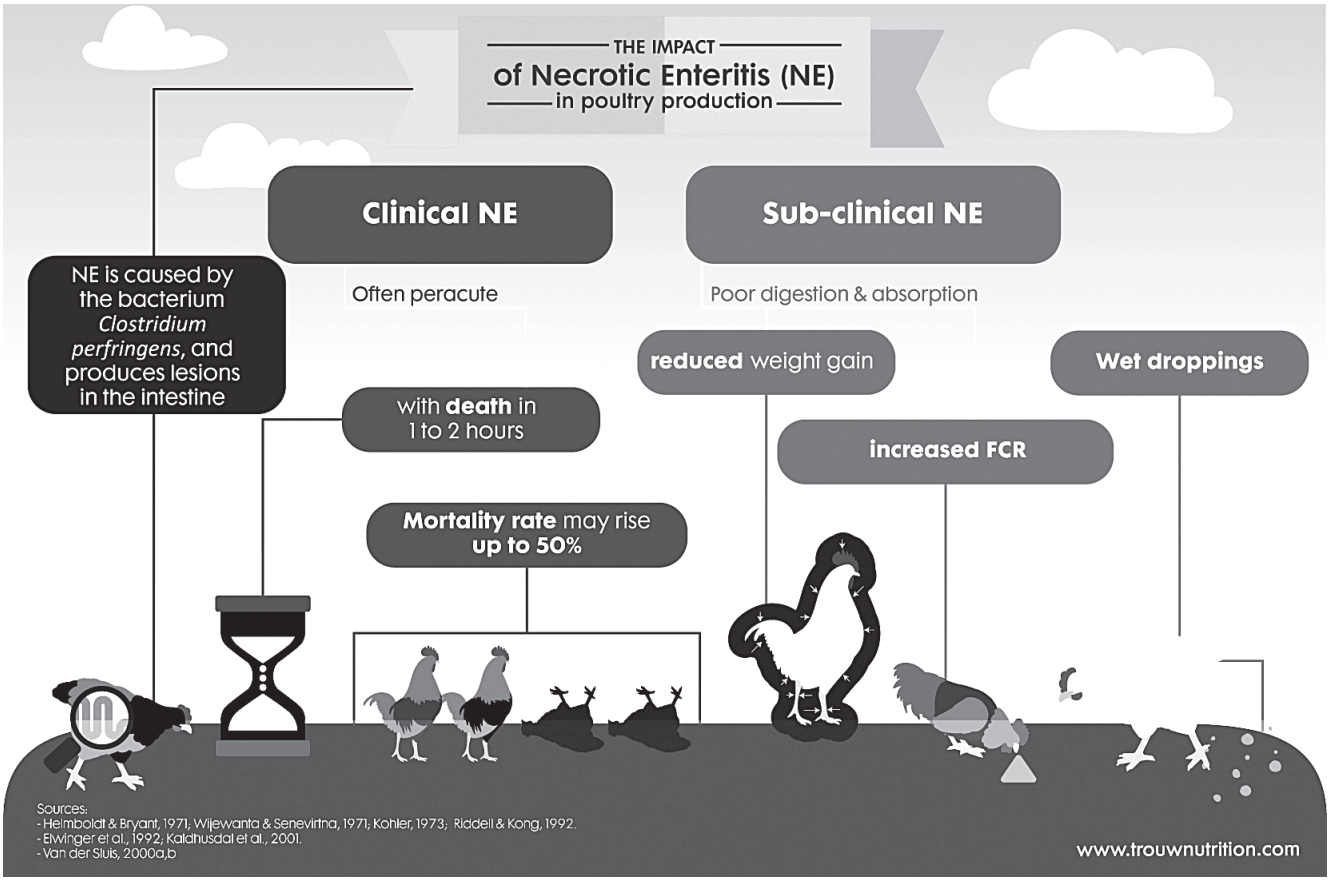
Two studies proving combinations of feed additives perform as good as in-feed AGPs

The first study examined the effect of replacing in-feed AGPs with blends of organic acids via feed and water and hydroxy trace minerals via feed. Broilers under a *Clostridium perfringens* type A challenge received a synergistic blend of gut health improving feed additives, a blend of free and buffered organic acids applied in drinking water, and copper hydroxylchloride. Under disease challenge conditions, the feed additive group had similar growth performance compared to the AGP treatment, while showing a numerically reduced Clostridium count in the intestine.

In the second study, researchers used the synergistic blend of gut health improving feed additives in combination with free and buffered organic acids via feed to replace in-feed AGP. Researchers evaluated the effect on growth performance, carcass quality and the oxidative status of broilers under a *Clostridium Perfringens* type A challenge, compared to birds receiving an AGP. Again, the study found the use of organic acid blends resulted in similar growth performance compared to birds receiving an AGP. Additionally, an increase in breast meat percentage and lower oxidative stress were shown in birds receiving the organic acid blends.

The business impact of Necrotic Enteritis

The research findings come at a time when legislative bans on the use of antimicrobial growth promoters are contributing to an increasing prevalence of economically important diseases such as necrotic enteritis. Caused by *Clostridium perfringens,* necrotic enteritis outbreaks have been estimated to cause more than $2 billion in economic losses annually. Consequences associated with enteric disease include increased mortality, reduced bird welfare and an increased contamination risk for poultry produced for human consumption.



"Antibiotic-free production systems are becoming an integral part of the poultry production chain as governments respond to the threat of antimicrobial resistance and consumers demand more transparency on food production and safety," said Dr. Emma Teirlynck, Global Poultry Gut Health Manager of Trouw Nutrition. "This research shows that by responding to the challenge with an integrated approach, it is indeed possible to achieve growth performance and health goals even when a disease challenge is present."

*The second study mentioned in this article refers to TRS Presan-FY and Fysal SP #22

PRESS RELEASE

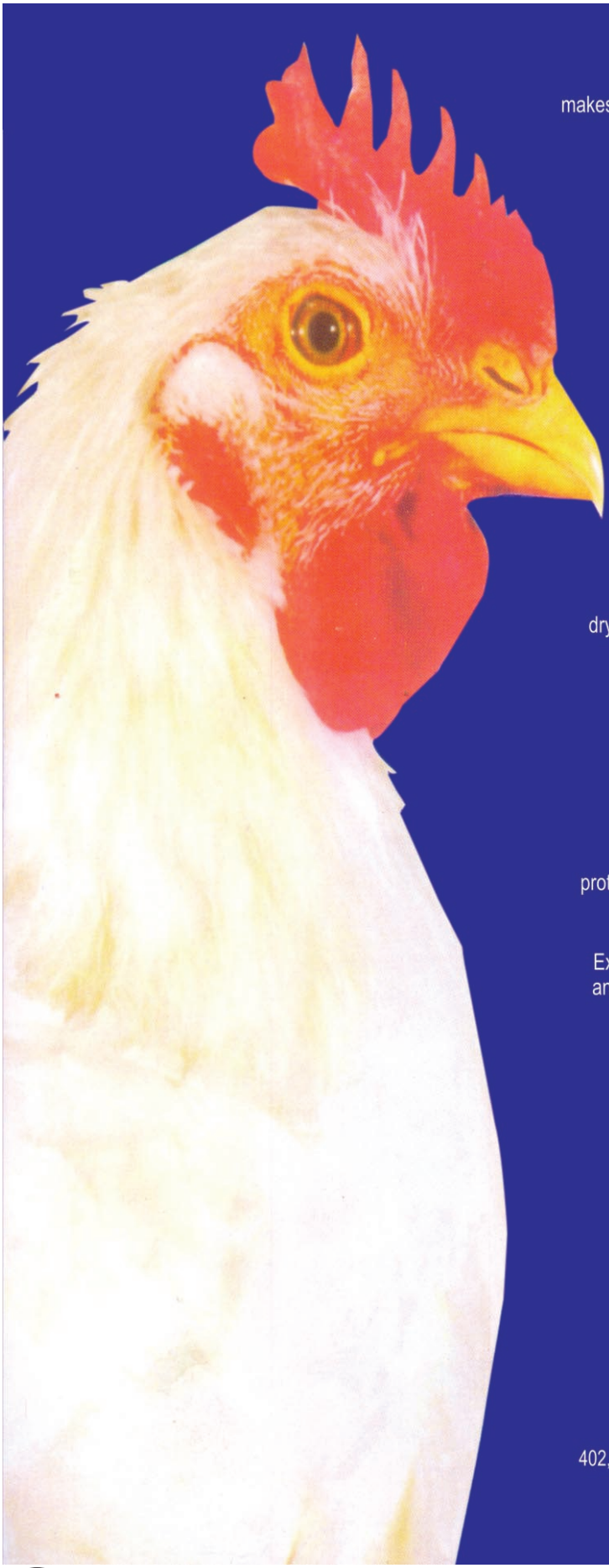
Trouw Nutrition India to build a new factory at Jadcherla

Trouw Nutrition India, a Nutreco Company, is the global leader in innovative feed specialties, premixes and nutritional services for the animal nutrition and aqua industry. On 12 June, 2018, they performed the Ground Breaking Ceremony at Jadcherla(Approx.70 kms.from Hyderabad), Telangana as part of their plans to build a new factory by early 2019.

With the mission "*Feeding the Future*" forming its essence, Trouw focuses on research and innovation for sustainable development. Their ambition is to contribute to meeting the rising food needs of a growing world population in a sustainable manner.Trouw has always believed in "customer-first" approach and in order to service the customers better the new factory is being established at Jadcherla.

Dr. Saurabh Shekhar, Managing Director, Trouw Nutrition India says about the developments that, "India is a key priority market and focus for both Nutreco and Trouw. Opening a factory at Jadcherlaispart of these expansion plans. Further, as a commitment to the mission of "*Feeding the Future"* and to improve access to one of the fastest growing market in Asia, we are investing in a state of the art Greenfield premix and farm mineral production facility.

'Make in India'is one of the several steps being undertaken by Trouw Nutrition to serve the esteemed customers in the animal and aqua feed industry in an agile manner to cater their customized needs and demonstrates the commitment of Trouw Nutrition to establish itself as a sustainable solution provider to the industry.



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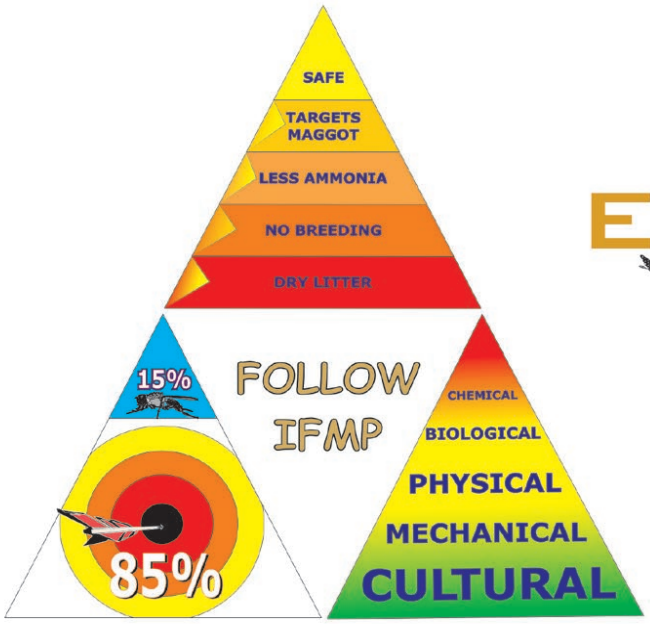

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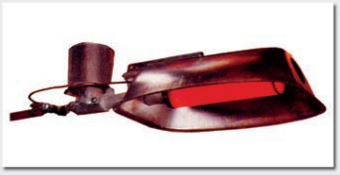

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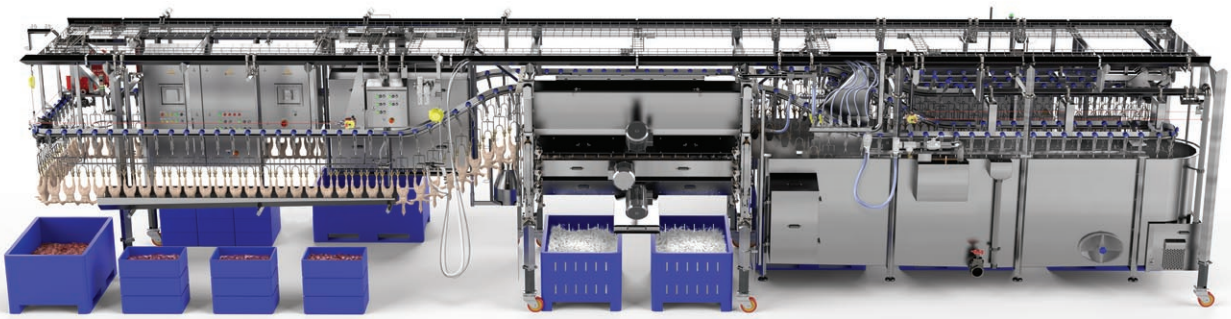

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Effect of Perf-Act™ (Specific Multi-strain probiotic combination) supplementation on intestinal morphology of chicken gut

Saksit Srinongkote[1], Rupesh Rane[2], Sanjay Gapat,[2]Saurabh Agarwal[3]& Rajkumar Patil[4]

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Introduction: Necrotic enteritis (NE) is one of the most widespread diseases in broilers, imposing a significant economic burden on the poultry industry worldwide. Its total global economic loss is estimated to be over $6 billion annually (Wade &Keyburn, 2015 Wade, B. &Keyburn, A. (2015). The intestinal ecosystem of poultry has been inevitably changed as a result of the ban of antimicrobial growth promoters. The re-emergence of necrotic enteritis has been the most significant threat for the poultry industry, which, in clinical form, causes high mortality and in subclinical forms, affects growth and feed conversion. It is one of the most common and economically devastating bacterial disease in modern broiler flocks in terms of performance, welfare and mortality.

The normal microflora in the gut has been shown to play a major role in the digestion and absorption of nutrients in poultry (Coates et al., 1975).

It is well documented that the structure and morphology of villi play a substantial role in the digestion and absorption of nutrients in the gastrointestinal tract (Titus and Fritz, 1971; Yamauchi et al., 1996). Nutrient absorption in the gastrointestinal tract is more effective with increase in the size and height of intestinal villi (Yamauchi et al., 1993). Villi are permanent structures with small finger-like projections and their numbers are greater in duodenum than in jejunum or ileum (Gartner and Hiat, 1997). The height of the villi can decrease from 1.5 µmin the duodenum to about 0.5 µm in the ileum. Gartner and Hiat (1997) also reported that villi increase the surface area of the small intestine by a factor of 10 and thereby increase absorption rate.

Faster-growing birds generally had larger villi surface area. Intense selection for growth rate in broiler is positively associated with digestion and absorption of nutrients (Marks, 1979; Chambers et al., 1981). The efficient feed utilization of broiler chickens could be associated with changes in the intestinal functions, such as microbial population and villi structure.

The objectives of this study were to evaluate the effects of feeding probiotic on the intestinal morphology (height and width of villi of the duodenum and ileum, and columns of the caecum) in the commercial broiler chickens.

Materials & Methods

Treatment design & experimental diets

The study was arranged with 4 treatment group (6 replicates x 10 birds per replicate). A corn-soybean meal diet was formulated & used as a control diet. The test products were added in the diet & the bacteria (*Clostridium perfringens)* was challenged (NE challenge) to the birds in the treatment design below;

T1: Control Diet

T2: Control + Supplemented with **Perf-Act™100 g/MT of Feed**

T3: As T1 + NE Challenge

T4: As T2 + NE Challenge

Birds, facilities & management: The experiment was arranged in a close side house with tunnel ventilation & evaporative cooling system. The birds were raised on the solid concrete floor pens using rice husk as bedding material. All birds were vaccinated for ND & IB at 7 days of age. Feed were provided ad-libitum & access to drinking water freely. House temperature was set maximum to 38^{O}C on the day 1 & gradually reduced to 27-28^{O}C by day 8.

Bacterial Challenge : Birds in the challenge group were orally inoculated with inoculum of mixed *Eimeria tenella, E.maxima, E.acervulina* on the day 7, 1 ml /bird (approx..15,000 sporulated oocytes

Table 1

	Parameter	Negative Control	Negative Control + Perf-Act
	Villus Morphology (35 days)		
Jejunum	Villi (Number per unit area)	14.2	14.3
	Villi Height (µm)	494.5^{c}	580.5^{ab}
	Villus Crypt Depth(µm)	164.7	148.5
	V/C Ratio	3.03b	3.92^{a}
Ileum	Villi (Number per unit area)	14.2	14.5
	Villi Height (µm)	326.6	381.5
	Villus Crypt Depth(µm)	113.9	97.7
	V/C Ratio	2.85^{c}	3.93^{a}

**a,b,c,d means within column with no common superscript differ significantly (P<0.05)*

per ml). The *C. perfringens* Type A (alpha toxin) inoculum given by intra-crop on day 12,13,14 (each day 3ml/bird or approx. 3 x 10^{8}cfu/bird).

Measurements: One bird from each pen were killed for intestinal microflora study (jejunum & ileum). About 1 inch of the intestinal tissue sample was flushed with 10% phosphate-buffered formalin & then fixed in 10% phosphate buffered formalin in room temperature. The tissue samples were prepared into cross-sectional glass slides for villous morphology study by using image-Pro Plus version 5.1 at the Veterinary Pathology lab of Mahidol University. The villus height was measured as the distance from the tip of the villus to the Villus crypt junction. The crypt depth was considered as the depth of the invagination between adjacent villi. Number of villi visible on the microscope field of view was counted (number of villi on the intestinal mucosal layer of 1,224 micron distance). The data were analyzed using the GLM procedure of SAS software for analysis of variance as a randomized complete block design.

Results &Discussion: The size and height of the villi are important for intestinal function (Dowling and Booth, 1967; Yamauchi et al., 1993), and probiotic diet is one of the important factors that could alter the morphology of intestinal villi. The present study shows that villi height and width increased significantly in birds given diet containing 100 gm Perf-Act, suggesting beneficial effect against necrotic enteritis infection. The villus morphology also shown positive effect in **Perf-Act™** treated group as compared to *Clostridium perfringens* challenge group (Jejunum V/C Ratio 3.92 vs 3.03& Ileum V/C Ratio 3.93 vs 2.85). This is shown in Table I.

Conclusion: There is no physiological mechanism to explain the increase in villi height and width as the response to probiotic use.Probiotic may stimulate multiplication of the mucosa epithelial cells&influenced villi height and muscle layer thickness of the jejunum and colon, and crypt depth in the duodenum and ileumand this is an important factor in the efficiency of digestion and absorption of nutrients. The height and width of the villi may reflect the surface area. The increase in villi height suggests an increase in the absorptive surface area and greater absorption of available nutrients and thus, feed efficiency will be improved (Caspary, 1992).

Note: References will be available on request.

Highlight Points

1. Many scientific research reveals importance of probiotics and its application in Poultry nutrition. Probiotics has beneficial effects on gut integrity, reduction of enteric pathogens & immunity development.
2. The research trial conducted at BARC, Thailand shows addition of Perf-Act™ (a specific multi strain probiotic combination) in commercial broiler diet shows improvement in bird production performance and controls enteric pathogens like C*lostridium perfringens.*
3. Perf-Act™ designed & formulated based on gut architecture which ensures intestinal morphology and complete gut care (Crop to Caeca) of birds.

PRESS RELEASE

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LYSOPHOSPHO LIPIDS Role in Nutrient Absorption Enhancement

Bird performance in the commercial poultry industry has shown a consistent improvement over the past few decades. This change has occurred due to improved genetics, well balanced nutrition and better farm management practices. The industry has undergone a remarkable change and growth over the last 30 years, such that today we see 3 Kg broilers before 40 days of age and white egg layers are capable of producing nearly 340 eggs in 52 weeks of lay. Among the above factors, nutrition plays a vital role in supporting the desired growth and production performance of birds. Provision of a good quality feed with all essential nutrients must be ensured. Also, the nutrients supplied through feed have to be effectively digested, absorbed and assimilated. If the nutrients are not absorbed within the time limit, they are attacked by the bacteria in the large intestine or excreted as waste, defeating the purpose for which they are fed and is reflected in terms of inefficient growth and productivity.

Feed accounts for 65-70% of the total costs in animal production. With the rise in feed costs internationally; the birds' ability to absorb nutrients optimally is a very important aspect of overall performance efficiency. Nutritionists are therefore increasinglyemphasizing tooptimise the feed efficiency and reduce feed cost.

Besides having a superior emulsification property, Lysophospholipids (LPLs) are proven to be very effective in enhancing the flux rate of nutrients across the gut membrane, thereby improving the absorption and reducing the nutrient loss through feces.

Phospholipids &Fluidity of Bilayer Membrane

Membranes define the boundaries of the cell and its organelles and act as permeability barriers.One remarkable feature of all biological membranes is their flexibility; their ability to change shape without losing their integrity and becoming leaky. The"Fluid-Mosaic" model (Singer & Nicolson, 1972)of cell membrane indicates that membranes are made up of lipid bilayer and membrane proteins (peripheral and integral).

The lipid component of the membrane is a two dimensional fluid in which the constituent molecules are free to move laterally. TheLipid bilayer functions as both; a solvent for integral proteins and as a permeability barrier.Peripheral membrane proteins are anchored to the surface of the membrane, while integral membrane proteins contain trans-membrane regions that pass completely through the bilayer.These two classes of membrane proteins contribute to the "mosaic" aspect of the fluid-mosaic model.

Phospholipids (PLs) are the most abundant lipids found in membranes. These are amphipathic in nature, having hydrophilic as well as lipophilic properties. PLs are characterized by a glycerol backbone to which a polar hydrophilic Phosphodiester(head) group and two lipophilic hydrocarbon tails are linked. The tails are usually fatty acids derived acyl residues thatcan differ in length (normally contain 14 to 24 carbon atoms).

Along with phospholipids, the animal cell membrane also contains significant amounts of sterols, mainly cholesterol, which is necessary for maintaining and stabilizing the membrane by acting as a fluidity buffer. Though the lipid bilayer structure is quite stable, its individual phospholipid and sterol molecules have some freedom of motion. Lysophosphatidylcholine (LPC) like molecules affect the fluidity of the cell membrane by modifying cholesterol levels in the membrane and thereby dynamics of the membrane.

Lysophospholipids: The Fluidity Modulator

Lysophospholipids (LPLs) are glycerophospho lipids in which one acyl chain is lacking as compared to PLs and therefore only one hydroxyl group of the glycerol backbone is acylated. LPLs which include lysophosphatidylcholine (LPC), lysophosphatidylethanolamine (LPE), lysopho-

sphatidylinositol (LPI) and Lysophosphatidylserine (LPS) are prepared by enzymatic hydrolysis of natural soy lecithin by phospholipase A2.

Each membrane at equilibrium contains pores and holes – these are best thought as gaps or vacancies where phospholipids are missing from the lattice structure. Sometimes there are clusters of these vacancies of various sizes. When additional LPLs are introduced, it is this distribution that is affected, which results in an increase in both the number and the size of pores. Through the normal passive transport processes, nutrients of larger molecular weights can then pass more readily across the membrane. When the membrane comes into contact with a certain ratio of LPLs, these exogenous LPLs quickly get interdigitated into the bilayer membrane. The close packing between the PLs is disrupted and the lipids go from an order to disorder state and the membrane becomes more fluid i.e. the gaps or pores in the membrane form big clusters or larger vacancies in the matrix causing an increase in the number and size of pores. This means that the nutrient absorption profile of the gut is beneficially altered with the passive flux hurdle temporarily lowered.

Also, LPLs have the ability to change the attraction between lipids and displace calcium ions. With this increased freedom of movement, lipids can aggregate closer together making existing holes larger so that larger molecules are easily absorbed.A pre-determined ratio has to be maintained between PLs and LPLs, and also between different LPLs to observe a consistent and desired end result.

The above describes howLysophospholipids(LPLs) act as a membrane fluidity modulator. They increase the number and size of pores by altering the mechanical properties of the membrane, thereby enhancing the flux rate at which nutrients of various molecular sizes pass across the membrane of the gut and thereby act as an absorption enhancer. This is one of the key applications of LPLs in animal nutrition as it is possible to extract more nutrient value from every kilogram of the diet and thereby optimize feed efficiency and therefore feed cost.

For more information on how lysophospho-lipidssupplementation can add value to your operations , please contact,

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PRESS RELEASE

New Vision for Agriculture and Food Processing sectors: Focusing on Infrastructure, Integrated Policies and Innovations

Increasing investments into infrastructure particularly in supply chain; integrated policy making by considering agriculture and animal-husbandry sectors and encouraging innovations will go a long way in ensuring competitiveness of India's livestock sector and help improve farmers income" said Raghavan Sampathkumar, Executive Director, CLFMA of India at the FICCI policy dialogue held at New Delhi on 10 July.

CLFMA of India is the premier industry association that represents the dynamic livestock sector in the country.The FICCI's policy dialogue on New Vision for Agriculture and Food Processing sectors and articulated the short, medium and long-term policy imperatives for agriculture and allied sectors.

He further said, "India's livestock sector provides employment to over 20 million people directly and indirectly and contributes significantly towards food and nutritional security of the nation. For example, the Indian poultry industry has been growing at around 8-10% annually. More than 1 lakh farmers are dependent on the poultry farming in addition to 5 lakh indirect employments. Also, the meat, fish and eggs are considered to be the rich protein source at an affordable cost for the consumers. The livestock sector deserves parity and equal treatment similar to agriculture particularly, in terms of budgetary allocations and other initiatives including credit and financing."

However, for the past 2 to 3 years, volatility in prices of essential raw materials such as maize and soybean had been impacting the sector greatly. Also, the Indian poultry Industry is facing threats from imports of meat in the wake of recent developments in WTO.

"In this context, the policy dialogue on New Vision for Agriculture & Food Processing Sector by FICCI is a welcome step to get the priorities right" he added.

Healso mentioned that in the short-term, some critical issues need to be addressed and the top priority must be on exempting GST on both oilseeds and oilmeals as the tax is impacting the entire value chain. The other suggestion that can be implemented fairly quickly is supporting the sector as per the relevant income tax laws allow higher depreciation for the infrastructure expenditurefor the companies investing in cold chain, processing and distribution.

"CLFMA fully endorses the government's intent of doubling farmers income and the recent announcement on MSP is a welcome step towards achieving it. Besides, more needs to be done in order to ensure and maximise the benefits that the farmers get ultimately. Review of the APMC act is one among the top most concerns impacting the feed sector. Farmers stand to gain more when direct procurement is allowed and the cess that is charged anywhere between 0.50% and upto 3% for maize and soybean is removed for captive consumption by integrators. It would also make sense to subsume the cess within GST. These are some of the policy imperatives that would help the livestock sector to not only increase its competitiveness but emerge as one of the leading exporters globally", Raghavan concluded.

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PRESS RELEASE

World Environment Day: CLFMA highlights top three priorities for India's dynamic Livestock industry

Globally animal-agriculture is facing enormous challenges such as urbanization; reducing land available for cultivation; climate change; growing water scarcity; competition from biofuels for grains; and soil degradation. Meanwhile, developing nations and the growing overall world population are demanding more animal protein. As a proactive industry association, CLFMA is leading the agenda of sustainably increasing animal protein production in the country through focusing on the following top three priorities.

Increase input efficiency – Contrary to the popular myth that the increasing consumption of animal protein is at odds with sustainability, livestock sector is an important contributor to sustainably meeting the world's food demand. Indian livestock industry, as it enters an exciting growth phase, needs to focus on ways they can produce more from less. Be it feed, water, energy or antibiotics, the Indian livestock industry is making all efforts to judiciously use these inputs to maximize the conversion efficiency. For example, through investing in genetic improvement of milch animals, their yields can be boosted significantly when complementing with balanced ration.

Reducing environmental footprint of animal protein – In most developing countries, crop and livestock farming complement each other. Diversifying the feed raw materials for meat production can play an important role in environmental sustainability. By-products from crops; biomass of various kinds; and slaughterhouse wastes (e.g. meat and bone meal) are being utilized by the livestock industry, which rids the ecosystem of burgeoning waste burden. Further, poultry manure or litter, for example, can be used as manure and thereby can replace chemical fertilizers to some extent in modern intensive agricultural production systems.

On behalf of Andhra Pradesh Poultry Federation,Vijayawada, Dr.K.S.Mulpuri, Dr.S.S.Prasad and Dr. N.Subba Rao felicitated the following,

Dr. Manmohan Singh, IAS, Special Chief Secretary, Govt. of A.P

Dr. K.S. Jawahar Reddy, IAS, Special Chief Secretary, Govt. of A.P

Dr.D. Sambasiva Rao, IAS,
Special Chief Secretary, Govt. of A.P.

Additionally, with serious concern globally and in India on the use of fossil fuels, it is important for India, which produces about 450-500 million tonnes of biomass per year, to effectively use them. More research is being pursued in this direction as India still needs to capture more value out of biomass particularly for animal feed. Further, new technologies are being explored to find out alternative sources of proteins (e.g. insects, algae) for feed so that our dependence on the traditional raw materials (maize and soybean) is reduced significantly.

Saving precious natural resources – Recent advancements in animal nutrition are helping the industry maximise feed conversion ratio with less and less inputs. Without these technologies or innovations, far more cultivable land area is needed to produce enough feed grain to cater to the increasing demand from feed sector. So, the ultimate result of these innovations is the reduction of conversion of pristine natural landscape and forests into croplands. To achieve increased animal performance while minimising feed costs, new nutritional strategies, feed additives (e.g. enzymes), must be employed to optimise feed conversion and digestibility.

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NATIONAL EGG CO-ORDINATION COMMITTEE

DAILY/MONTHLY EGG PRICES DECLARED BY NECC AND PREVAILING PRICES AT VARIOUS PRODUCTION CENTRES (PC) AND CONSUMPTION CENTERS (CC) JULY 2018

Name Of Zone \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Average
NECC Prices																																
Ahmedabad	432	434	436	438	440	440	442	444	444	446	448	450	453	455	457	457	459	461	463	465	467	470	472	477	480	482	482	482	-	-	-	456.28
Ajmer	377	377	380	384	387	387	390	393	394	395	400	406	407	407	407	407	409	410	412	415	415	425	425	425	425	425	425	405	-	-	-	404.07
Banglore (CC)	431	431	431	431	431	431	431	431	431	433	435	435	437	439	441	441	443	445	445	448	450	453	455	457	459	460	462	462	-	-	-	442.1
Chennai (CC)	457	457	457	457	457	457	457	457	457	457	457	457	460	460	465	465	470	470	470	475	475	485	485	490	490	490	495	495	-	-	-	468.71
Chittoor	450	450	450	450	450	450	450	450	450	450	450	450	453	453	458	458	463	463	463	468	468	478	478	483	483	483	483	483	-	-	-	461.35
Delhi (CC)	393	395	395	400	403	405	407	410	412	412	415	421	425	428	428	428	428	428	428	428	428	428	428	428	428	428	428	420	-	-	-	418.03
E.Godavari	383	386	389	392	395	397	399	402	405	408	411	414	417	420	423	425	427	429	431	433	435	436	437	438	439	440	441	442	-	-	-	417.64
Hyderabad	386	388	390	392	393	395	397	399	401	403	405	407	409	411	413	415	417	419	421	423	425	427	429	431	433	434	435	435	-	-	-	411.89
Miraj	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mumbai (CC)	440	442	446	448	450	450	453	455	455	459	461	463	465	467	469	469	473	475	477	479	481	483	483	487	489	491	492	493	-	-	-	467.67
Mysore	435	435	435	435	435	435	435	435	440	440	440	445	445	449	449	452	452	452	455	455	460	460	465	465	465	468	468	468	-	-	-	449.03
Nagapur	403	403	405	405	405	407	410	420	423	425	425	430	-	-	-	430	430	430	433	437	440	440	440	440	440	440	-	-	-	-	-	424.39
Namakkal	440	440	440	440	440	440	440	440	445	445	445	450	450	455	455	460	460	460	465	465	470	470	475	475	475	480	480	480	-	-	-	456.42
Pune	445	445	447	448	450	450	450	450	450	455	460	460	465	470	473	473	478	480	480	480	482	480	480	485	487	488	488	489	-	-	-	467.42
Punjab	416	421	-	-	-	-	-	-	-	-	-	-	-	-	-	408	408	408	408	408	408	408	408	408	-	-	-	-	-	-	-	409.9
Vijayawada	383	386	389	392	395	397	399	402	405	408	411	414	417	420	423	425	427	429	431	433	435	436	437	438	439	440	441	442	-	-	-	417.64
Vizag	400	400	400	400	405	407	409	412	415	418	421	424	427	430	433	435	437	439	441	443	445	445	445	446	446	446	446	446	-	-	-	427.17
W.Godavari	383	386	389	392	395	397	399	402	405	408	411	414	417	420	423	425	427	429	431	433	435	436	437	438	439	440	441	442	-	-	-	417.64
Warangal	386	388	390	392	394	395	397	399	401	403	405	407	409	411	413	415	417	419	421	423	425	427	429	431	433	435	436	437	-	-	-	412.07
Prevailing Prices																																
Allahabad (CC)	428	424	424	428	428	428	428	428	428	433	433	438	440	440	442	443	448	448	448	457	457	467	467	467	467	457	457	448	-	-	-	442.89
Barwala	377	377	377	385	387	389	392	394	394	397	401	403	407	410	410	410	410	410	410	410	410	410	410	410	410	410	400	400	-	-	-	400.35
Bhopal	415	415	420	422	425	427	430	435	438	440	442	445	450	450	450	450	450	450	450	450	450	450	455	455	458	460	460	455	-	-	-	442.75
Hospet	396	396	396	396	396	396	396	396	396	398	400	400	402	404	406	406	408	410	410	413	415	418	420	422	424	425	427	427	-	-	-	407.1
Indore	405	405	408	415	418	419	431	425	427	427	425	430	433	433	435	435	430	435	435	435	450	460	463	465	466	460	450	448	-	-	-	434.57
Jabalpur	415	421	421	421	425	427	435	436	439	441	445	448	451	451	451	451	451	451	451	453	451	457	462	462	462	462	462	458	-	-	-	445
Kanpur (CC)	390	395	395	400	400	405	409	414	424	424	424	428	433	433	433	433	433	433	424	433	433	424	424	424	424	424	424	424	-	-	-	420.14
Kolkata (CC)	427	427	430	433	439	444	444	450	455	460	465	465	468	468	470	473	475	477	477	480	481	483	485	487	489	490	490	490	-	-	-	465.07
Luknow (CC)	427	437	437	440	440	440	440	440	450	450	453	460	460	460	460	460	460	460	460	460	460	460	460	463	460	460	460	460	-	-	-	452.75
Raipur	420	423	425	427	427	432	432	440	442	444	447	450	453	455	455	455	455	455	455	455	457	461	461	461	463	463	463	455	-	-	-	447.53
Varanasi (CC)	433	433	437	440	440	440	443	447	447	447	450	457	457	460	460	460	460	460	460	460	460	460	463	463	463	463	463	457	-	-	-	452.96

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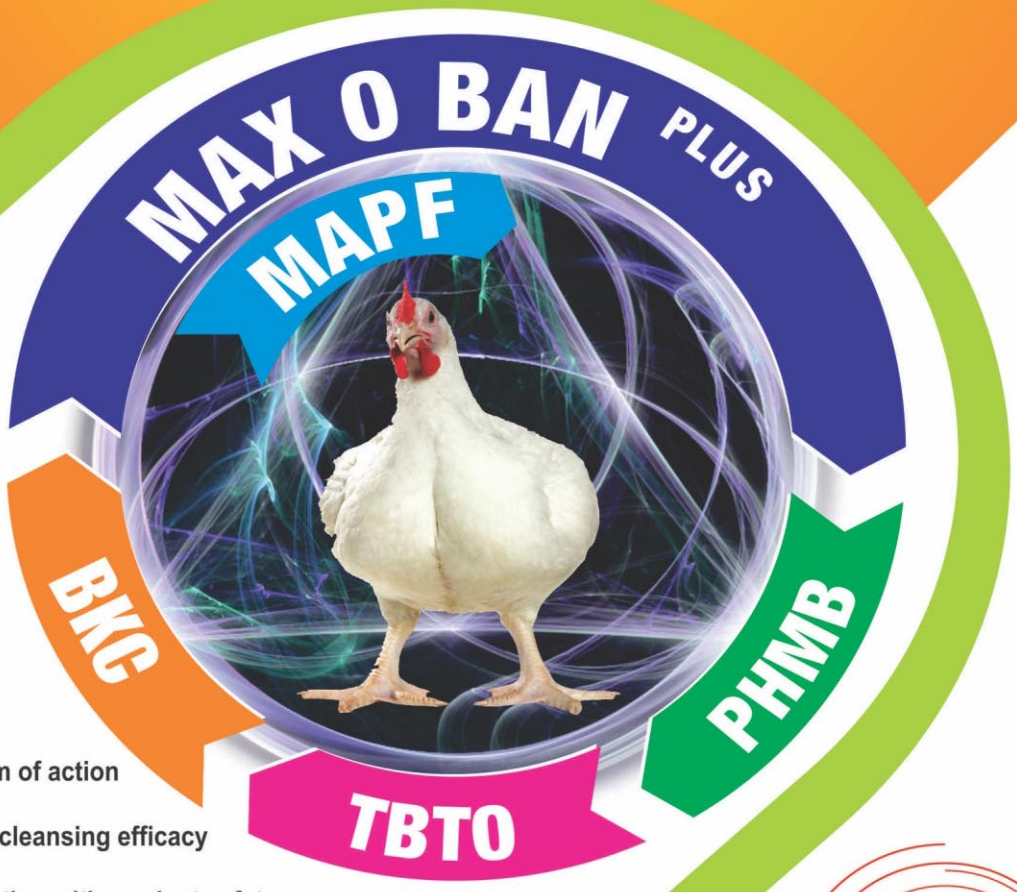

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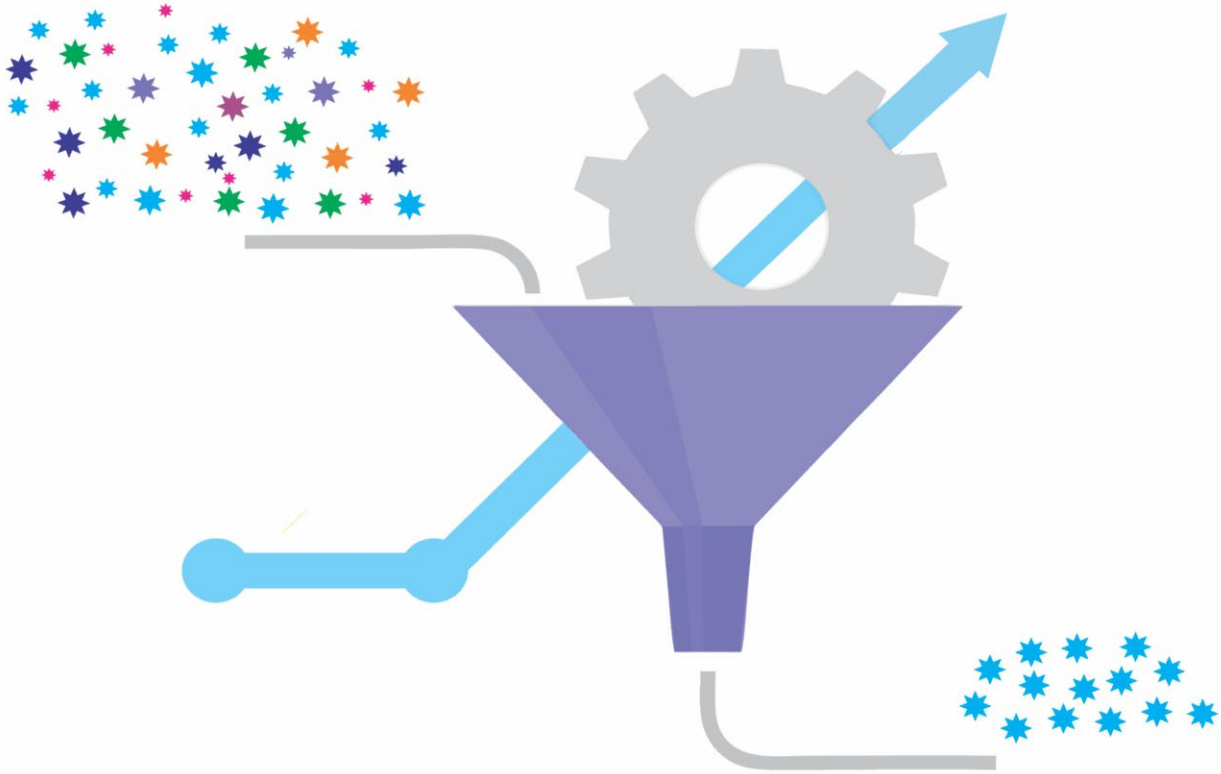

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