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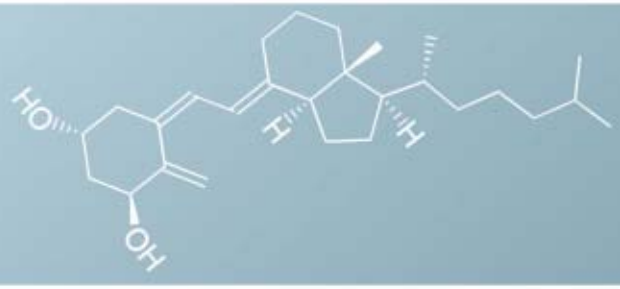

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Message from Chairperson, V.H. Group on Nashik Expo.

22nd March 2019

Dear Mr. Shiv Shankar,

I am pleased to learn that the 19th India Poultry Expo 2019 was held successfully at Nashik

It is heartening to note that inspired by the Late Padmashri Dr. B.V. Rao's message that small farmers are the backbone of our industry, you have been making a committed effort for the past fifteen years, to help the farmers to enhance their productivity by spreading knowledge about the latest technologies and good management practices, through these exhibitions as well as through your magazine "Poultry Line"

I congratulate you and your colleagues and wish you all success in your future endeavors.

With Best Regards,

Yours Sincerely,

Anuradha J. Desai

VOL.19 ISSUE 4 APRIL 2019

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POULTRY

CONTENTS

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INDEX OF ADVERTISEMENTS

Artificial Insemination Technology in Poultry

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Dr.SurajAmrutkar

Introduction: The study of the reproductive biology and controlled breeding programme is important for the development of poultry industry in more organized and scientific ways.Artificial insemination (A.I.) has become the focal point of genetic improvement of poultry birds as well as practiced to alleviate the unsatisfactory fertility problem in birds; resulting from impaired mating as a consequence of large, heavily muscled birds (turkey) orof reduced libido. Artificial insemination (A.I.) is the manual transfer of semen into the female's vagina. Basically, it is a two-step procedure;(1) collecting the semen into the males and (2) inseminating the semen into the female. Artificial Insemination (A.I.) is very prevalent in breeding meat producing turkeys and for production of meat type ducks (Muscovy male X Pekin female). Sometimes, it is also used in breeders of egg type chicken at parent and grant parent levels by primary breeders. It can be easily exploited when fertility is poor because of large differences in weight, size and shape between male and female making copulation difficult. These days, it is being practiced in chickens extensively; since the birds are kept in individual cages for recording the performance accurately. Semen must be diluted carefully, if it is to be stored for more than one hour. Spermatozoa are able to live in the oviduct for atleast 5 to 11 days in duck, geese and fowl and 4-6 weeks in turkeys. The optimum fertility throughout the breeding season is maintained by repetitive insemination at intervals determined by many factors. In farm conditions, it should be a weekly insemination. About 80-100 million spermatozoa per insemination are necessary to maintain good fertility. The distal portion of the vagina must be well averted before semen is inserted into the oviduct. This can be achieved by first putting pressure on the abdomen of the female and then releasing it allowing the oviduct to resume normal position before actually ejecting the semen from the syringe. This procedure helps to deposit sperm as near as possible to the sperm storage glands in the proximal vagina.Insemination should be carried out when no hard shelled egg is likely to be present in the uterus or atleast not within three hours of an oviposition. Rough treatment of hens must be avoided during capture before insemination and each female must be released gently after insemination otherwise semen may be regurgitated from the vagina. It is possible to obtain semen artificially from the male chicken to inseminate females. The soft part of the abdomen below the pelvic bones of the male is massaged to protrude the papillae and the semen is gently squeezed (milked) out, beginning closest to the body and collected in the vial. The semen is then transferred to a syringe, diluted with special diluents, and about 0.025 to 0.035 ml are forced into the oviduct of the hen to a depth of about 1-2 inch (2.5-5.0cm), depending on the size of the bird. The semen must be fresh, and inseminations must be repeated every 5 to 7 days to maintain optimum fertility. Fertility through artificial insemination is better in leghorns than in meat-type strains, but the reason is unknown.

Fewer males needed:

For natural mating, one male is usually required for about every ten females, but with artificial

insemination, one male can produce enough semen to fertilize 100-150 females on a weekly basis.

Semen not stored easily:

Avian semen is difficult to store, but new diluents show hope of extending the viability of storage. Males should be ejaculated about three times weekly, although fertility will not be impaired if semen is collected as often as once a day, but the semen volume will be lower. Insemination must be made quickly after the fresh semen is collected. It will not withstand freezing, for when frozen and thawed, fertility will drop to about one half.

Time of semen collection:

Semen collected in the morning will have greater volume, greater sperm motility, and slightly higher sperm concentrations than that collected in the afternoon.

Insemination should be completely in late evening:

In a test at Auburn University of chickens, meat type females inseminate at 9:00 p.m. gave the best fertility. Mid-morning and mid-afternoon inseminations produce no difference in fertility, but both were lower than at 9:00 p.m. There was no difference between young pullets and hens.

Increased cost the economic:

Artificial insemination of chickens under present procedures is costly. It requires one man hour to collect the semen from 145 males. About 200-260 females can be inseminated per man hour, but besides this cost there is the expense of keeping the females in two to four bird cages and the males in single bird cages. The procedure has more economic merits with meat type birds than with egg type birds.

Techniques in Artificial Insemination and Fertility evaluation in Poultry:

Semen collection: Due to the anatomical variation of the phallic region in different birds, semen collection techniques will also vary. In contrast to water-fowl with an intromittent phallus, Galliformes birds (chicken, turkey, and quail) do not have an intermittent organ. Their non-intromittent organ consists of folds and bulges that make contact with the female's cloaca at the time of mating. The rooster has a prominent medial phallic body and relatively small lateral phallic bodies and lymph folds. Conversely, the turkey tom has no medial phallic body but prominent lateral phallic bodies and lymph folds. The goal of semen collector is to obtain the maximum volume of clean, high quality semen with the minimal amount of handling. In chickens and turkeys, the abdominal massage technique involves massaging the cloacal region to achieve extrusion of phallus. This is followed by a 'cloacal stroke', squeezing of the region surrounding the sides of the cloaca to express the semen. Little additional semen can be expressed after two cloacal strokes. Additional cloacal strokes may cause damage to the phallic and cloacal regions and contribute to semen contamination.

Quality of Semen and Diagnostics Employed:

Semen should be pearly white, viscous, and clean. The semen collector should perform a visual examination of the semen at the time of ejaculation from each bird. This is easier with the turkey because the ejaculate accumulates on the phallus before it is collected. Off-color or watery semen, and semen contaminated with blood or faecal/ urates debris should not be used for insemination. Due to the increased secretion of a transudate derived from the phallus at the time of ejaculation, chicken semen is less viscous and sperm concentration lowers than that of turkey semen.

Evaluation of fertility:

The measure of a successful AI program is nothing but the sustained hen fertility. With AI programs, it is desirable to determine the fertility status of a flock before the next weekly insemination. There are several options to determine the fertility status:

breaking-out fresh eggs and examining the germdisc to differentiate a fertilized from an unfertilized or early dead embryo; setting normal but culled eggs in an incubator for 24-36 hr before breaking-out; counting sperm in the outer perivitelline layer (PL); and counting sperm holes in the inner PL. The sperm penetration assay is not only used to determine true fertility, but also to estimate the number of sperm in the use SSTs at the time of ovulation. The major drawback to the sperm penetration assay is time consuming, particularly with respect to isolation, washing, and positioning the PL wrinkle-free on the slide. The preparation of PL slides from can be done by following method: the albumen is removed from the ovum; a square is outlined on a slide using super glue; the slide is placed firmly on the ovum's surface with the GD centered in the square; after the glue is set, the PL is cut and washed to remove adhering yolk. This method is quicker and the PL remains wrinkle free. A modified assay of the sperm penetration can be done by placing Herea filter ring over the GD (inside diameter slightly larger than the GD), cutting around the outside diameter of the filter ring and lifting the filter ring off the ovum. The filter ring with the adhering PL is washed gently with saline to remove the yolk and GD material until transparent, placed on a slide, and then fixed and stained with saline washes after each step.

Sperm concentration:

If semen is to be diluted, it should be done with a known volume of semen diluent at ambient temperature in the semen receptacle before collection begins. For routine AI of hens, semen from 10-12 males is pooled in a single receptacle, mixing the semen gently after each male is collected. Semen volume is determined and if the AI dose is based on numbers of sperm (generally 250-350 million sperm per dose), sperm concentration should be determined. The most popular techniques for determining sperm concentration are the packed cell volume (PCV/ spermatocrit), and optical density (by photometry).

Sperm motility and mobility:

Sperm motility can be progressive (forward direction) or non-progressive (random movement or oscillations) movement. Generally, progressive motility is determined at ambient temperature using a microscope at low magnification or objectively using a computer-assisted semen analysis system. Motility evaluated by microscopy has been shown to have little correlation with fertility and simply reveals that the sperm are motile. The sperm mobility assay has gained popularity as a measure of an individual male's ability to produce highly mobile sperm. Mobility defines the ability of sperm to move progressively against a viscous medium like Accudenz at 41°C. Mobile sperms are more likely to fertilize an ovum than males producing less mobile sperm. The sperm mobility assay is a powerful tool for the selection of the most fecund males to be used in AI.

Sperm viability:

In the context of semen evaluation, 'viable' sperm implies that such sperm possess an intact and functional plasmalemma. Plasmalemma integrity is frequently determined using either a dead-cell (commonly practiced) or a live-cell stain. The dead-cell stains are excluded by sperm with an intact plasmalemma but stain dead sperm possessing a permeable plasmalemma. Live-cell stains permeate the intact sperm plasmalemma and become visible only after reacting with cytosolic enzymes or interacting with sperm nuclear proteins. Both eosin and propidium iodide are popular dead-cell stains while calcein AM and SYBR-14 are frequently used live-cell stains. The nigrosin/eosin (N/E) technique is most likely the procedure to be used to determine sperm viability. Briefly, sperm are stained with N/E and a smear of the stained sperm is made on a slide. Under a bright field microscope the viable sperm remain pearly white,

while eosin will stain non-viable sperm a pink to magenta color. The nigrosin serves as a background to enhance differentiation between the non-viable and viable sperm. A more sophisticated laboratories use flow cytometry that sorts out viable from non-viable sperm after staining with calcein AM or SYBR-14 and propidium iodide.

Semen preservation:

In contrast to domestic livestock species, cryogenic storage of poultry semen is not reliable enough for germplasm preservation. The low fertilizing ability of frozen/ thawed poultry sperm results from physiological sensitivity to the cryogenic process coupled with the requirement for prolong sperm functionality in the hen reproductive challenge has been underemphasized. For example, alterations in membrane carbohydrate content and diminished energy production in frozen/ thawed sperm have important implications for successful gamete interaction. Adenosine triphosphate (ATP) generations are affected by cryopreservation. Moreover, susceptibility to the cryogenic process seems to vary among lines and strains of birds.Poultry hens are managed to produce eggs daily for either 5-7 month period in Turkey hen or 12-14 month period in chicken layer hen. Hens are inseminated once per week during egg production period. Weekly insemination requires that a relatively high number of poultry sperm remain viable for a minimum of 7 days within the hen's sperm storage tubules (SST) to ensure fertilization between inseminations. Even with fresh, unstored semen, only 1-2% of inseminated sperm reach the SST, therefore it is likely that any sperm damage from a cytogenic cycle could affect the numbers being stored in the SST. Comparatively, this

Table1.: Composition of extenders used for storing chicken semen for 24 hours at 4°C

Components (Values are given in grams per 100ml of double distilled water)	Extender describe by Lake	Ex extender by Lukaszewicz	Extender by Tselutin
Sodium glutamate	1.35	1.40	1.92
Potassium citrate x H_2O	0.128	0.14	-
Potassium acetate	-	-	-
Sodium acetate	0.51	-	-
Magnesium acetate x $4H_2O$	0.08	-	-
Glucose	0.8	0.7	-
D-Fructose	-	0.2	0.8
Inositol	-	0.7	-
Poly vinyl pyrrolidone	-	0.1	0.3
Potaminesulphate	-	0.02	0.32
Anhydrous Sodium Hydrogen Phosphate	-	0.98	-
Anhydrous Sodium Dihydrogen Phosphate	-	0.21	-
pH	7.2	7.3	7.05
Osmotic pressure (mOsmol/kg)	310	390	320

requirement for prolong sperm functionally means that there is a much lower tolerance for poor sperm survival after cryopreservation of poultry semen compared with bovine semen. The average ejaculate volume of bull (cattle) ranges from 5-8 ml, whereas semen volume collected from poultry considerable less ranges from 0.1-0.5 ml. Although, it is true that the sperm concentration of poultry semen is much higher 6-10 x 10^9 than bull semen 1-2 x 10^6/ml. Poultry sperm function is adversely impacted by excessive dilution. Thus dilution effect may lower the overall fertilizing ability of frozen/ thawed poultry semen. The increasing importance of artificial insemination in poultry reproduction has caused investigators to become interested in developing the proper condition for frozen (long term). The possibility of dilution and storage of avian sperm would make the work of poultry breeders much easier, enabling them to transport semen even to distance farms, to inseminate larger groups of females, and to improve the utilization of sperm from superior males. The most common procedure for short term fowl semen storage (hours to day at refrigerator temperature) requires suspending sperm in an extender to retain their viability in vitro. Comparison of diluted and undiluted stored semen showed that applying extender to retain viability and morphology of the semen. Wide range of extenders is available for storing fowl semen.

Semen Extender:

Semen extender is a liquid diluent which is added to semen to preserve its fertilizing ability. It acts as a buffer to protect the sperm cells from their own toxic byproducts, and it protects the sperm cells from cold shock and osmotic shock during the chilling and shipping process. The sperm is chilled to reduce metabolism and allow it to live longer. The extender allows the semen to be shipped to the female, rather than requiring the male and female to be near to each other. Special freezing extender use also allows the cryogenic preservation of sperm (frozen semen), which may be transported for use, or used on-site at a later date.The addition of extender to semen protects the sperm against possible damage by toxic seminal plasma, as well as providing nutrients and cooling buffers if the semen is to be cooled. In case of freezing extenders, one or more penetrating cryoprotectant will be added. Typical cryoprotectants include glycerol, DMSO and dimethyleformamide. Egg yolk, which has cryoprotectiveproperties, is also a common.

Conclusion:

Artificial Insemination is a common practice in poultry industry for the production of hatching eggs. The broiler industry has not adapted AI for reasons because; 1. Broiler breeders need to be inseminated weekly; 2. Labor cost would be very significant; 3. The initial investment in special housing for the males is high; 4. After a few generations of breeding broilers by AI, the behaviors associated with natural mating may be less dominant.The benefits of AI for broilers would include; need of fewer males. The male : female ratio would be increase from 1:10 for natural mating to 1:25 with artificial insemination. In future, further progress in research concerned with poultry sperm biology, the cellular &molecular basis of oviductal sperm transport, selection and storage may lead to the innovative AI technology like insemination intervals increased to 10-14 days (versus 7 day) with fewer sperm per insemination; *in vitro* sperm storage for 24-36 hr at ambient temperature with minimal loss of sperm viability; and the possibility of transgenic progeny following the insemination of sperm carrying transgenes.

NATIONAL EGG CO-ORDINATION COMMITTEE

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

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	440	440	430	430	430	430	430	400	400	390	390	390	390	380	380	375	375	375	375	375	375	375	375	375	375	355		-	-	-	-	394.42
Ajmer	395	395	395	395	388	378	370	355	345	348	348	345	340	335	335	330	330	325	320	315	315	312	312	312	303	-		-	-	-	-	345.64
Banglore (CC)	435	435	420	420	410	410	413	413	413	395	395	375	375	375	360	360	360	360	360	360	360	360	360	360	360	350		-	-	-	-	384.38
Chennai (CC)	460	460	445	445	435	435	435	435	435	415	415	395	395	385	375	375	375	375	375	375	375	375	375	375	375	365		-	-	-	-	403.07
Chittoor	453	453	438	438	428	428	428	428	428	408	408	388	388	378	368	368	368	368	368	368	368	368	368	368	368	358		-	-	-	-	396.07
Delhi (CC)	435	427	-	418	415	415	415	405	395	390	385	380	375	370	365	360	360	355	355	355	355	355	343	340	335	325		-	-	-	-	377.12
E.Godavari	422	422	413	413	413	406	406	396	396	380	380	380	371	360	360	360	360	360	347	347	347	347	337	337	337	317		-	-	-	-	373.61
Hyderabad	410	400	400	392	392	392	375	375	365	365	355	355	345	335	335	335	335	335	335	335	335	335	335	335	320	-		-	-	-	-	357.04
Miraj	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-
Mumbai (CC)	460	460	452	445	445	442	442	430	430	415	415	405	405	395	385	385	385	385	385	385	385	385	385	385	380	365		-	-	-	-	409.07
Mysore	452	435	435	418	418	418	418	418	400	400	385	385	385	370	370	365	365	365	365	365	365	365	365	365	355	355		-	-	-	-	388.53
Nagapur	392	390	385	377	375	373	370	367	360	350	348	343	340	330	325	325	325	325	320	315	313	310	310	310	308	-		-	-	-	-	343.44
Namakkal	450	435	435	425	425	425	425	425	405	405	385	385	385	370	370	370	370	370	370	370	370	370	370	370	360	360		-	-	-	-	392.3
Pune	450	445	435	435	425	420	410	405	405	395	385	375	375	365	355	355	355	355	355	355	355	355	355	350	350	340		-	-	-	-	383.07
Punjab	412	405	396	393	393	393	390	386	375	361	361	-	-	-	-	340	340	330	330	325	321	321	-	-	-	-		-	-	-	-	365.11
Vijayawada	422	422	413	413	413	406	406	396	396	380	380	380	371	360	360	360	360	360	347	347	347	347	337	337	337	327		-	-	-	-	374
Vizag	437	430	420	415	415	410	410	400	400	400	400	400	400	385	385	385	385	385	375	375	375	375	360	360	360	350		-	-	-	-	392
W.Godavari	422	422	413	413	413	406	406	396	396	380	380	380	371	360	360	360	360	360	347	347	347	347	337	337	337	327		-	-	-	-	374
Warangal	412	413	403	403	395	395	395	378	378	368	368	358	358	348	338	338	338	338	338	338	338	338	338	338	338	323		-	-	-	-	362.03
Prevailing Prices																																
Allahabad (CC)	443	443	438	438	440	438	433	419	419	405	400	395	390	381	375	376	362	362	357	357	357	357	352	343	343	343		-	-	-	-	391
Barwala	402	396	396	396	396	390	380	370	360	360	360	352	343	343	340	335	331	331	325	325	325	321	317	317	308	-		-	-	-	-	352.76
Bhopal	425	415	405	405	405	405	400	395	395	375	375	370	365	365	355	350	350	350	350	350	350	350	350	340	340	330		-	-	-	-	371.73
Hospet	400	400	385	385	375	375	378	378	378	360	360	340	340	340	325	325	325	325	325	325	325	325	325	325	325	315		-	-	-	-	349.38
Indore	410	410	410	410	410	405	400	400	380	380	365	365	365	360	355	355	355	350	345	345	345	345	335	335	335	330		-	-	-	-	369.23
Jabalpur	425	422	415	410	410	405	405	397	397	397	377	372	369	360	353	350	345	345	345	345	345	345	345	338	335	325		-	-	-	-	372.19
Kanpur (CC)	433	433	433	433	424	424	419	419	400	400	390	381	371	371	371	371	371	362	362	362	362	362	362	362	362	348		-	-	-	-	388
Kolkata (CC)	462	454	454	454	440	440	440	425	410	410	410	404	398	398	398	398	398	386	386	386	386	375	375	375	375	350		-	-	-	-	407.19
Luknow (CC)	470	470	470	460	450	450	450	450	450	440	440	430	430	420	420	410	410	410	400	400	400	400	393	390	390	380		-	-	-	-	426.26
Raipur	430	420	420	420	420	412	412	402	402	382	387	387	380	370	370	360	360	360	360	360	360	360	355	345	345	345		-	-	-	-	381.69
Varanasi (CC)	467	467	460	460	460	453	447	440	433	427	420	410	410	403	400	400	397	393	387	387	387	387	380	373	373	373		-	-	-	-	415.15

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Kennady Vijayalakshmy[1,]*

[1,]*Research Scholar, Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana – 125004

*Corresponding Author e-Mail: drviji.vet6115@yahoo.com

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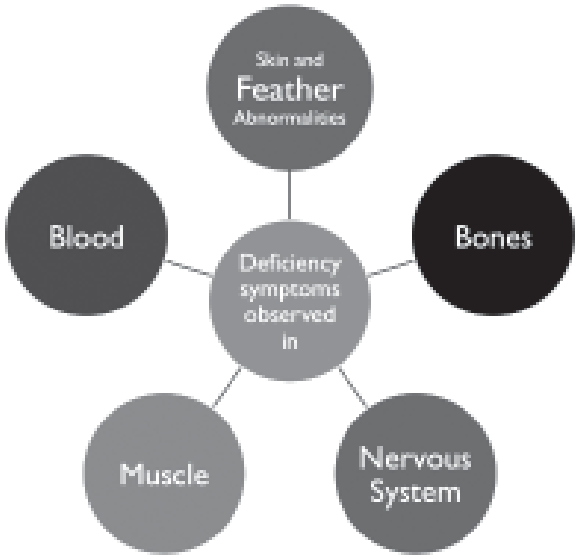

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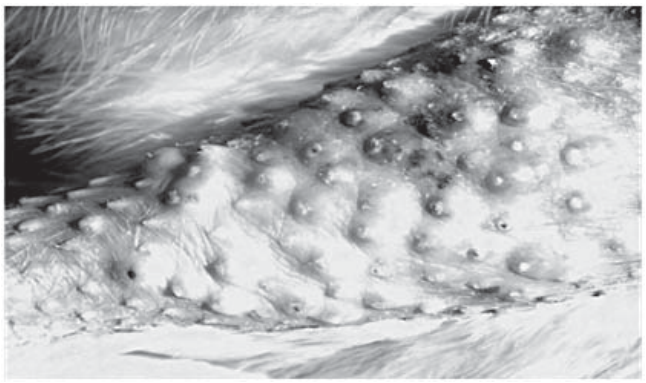
CURLED TOE PARALYSIS
Riboflavin Deficiency

PEROSIS OR SLIPPED TENDON -
Manganese, Choline, Folacin, Biotin, Vit B12

CRUSTY SCABS
Pantothenic Acid Deficiency



4. Folacin Deficiency results in Macrocytic, hyperchromic anemia
5. Deficiency of Thiamin causes Convulsions with head retraction / head drawn over back or polyneuritis in chicks, pigeons and quail

6. Pyridoxine Deficiency results in Convulsions and hyper-excitability in chicks, poults, duckling.

7. Deficiency of Riboflavin end up in Curled – toe paralysis, gross enlargement of sciatic and brachial nerves with degeneration of myelin in chicks

8. Pantothenic Acid Deficiency causes Dermatitis, scabs and crusts around eyes, beaks and on the upper surface of the feet in chicks, poults, Crusty scabs around vents

9. Pantothenic Acid Deficiency results in Frizzled and rough Feathers in chicks and poults.

10. Folacin deficiency end up in Cervical Paralysis, Neck extended in poults , quail.

11. Biotin Deficiency causes Dermatitis, Incrustation in bottom of feet (ulcerated foot pad dermatitis) hemorrhagic cracks and necrotic toes in chicks and poults.

VITAMIN SUPPLEMENT (For General Use)

S. No.		Units/ Kg diet
01.	Vit B12 ,mg	0.01
02.	Choline chloride ,mg	1000
03.	Folacin , mg	0.5
04.	Niacin , mg	30
05.	Pantothenic Acid, mg	15
06.	Pyridoxine, mg	2
07.	Thiamin , mg	2
08.	Riboflavin , mg	4

CONCLUSION

Even though, vitamins don't play a major role in maintaining the nutritive status in birds. The nutritional requirements of all necessary vitamins have to be taken into consideration. Deficiency in any vitamin requirements will end up in the development of various deficiency syndromes and nutritional disorders. This is mainly because of the impairment in the availability of all the vitamins in the practical feed. In this case, vitamin supplements can be given to the poultry as mentioned above, in order to avoid further complications.

Chicken infectious anaemia - Clinical manifestations and its prevention

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Introduction: Poultry industry is one of the fastest growing segments in Agricultural sector. In present scenario egg and meat production is increasing in both developed and developing countries. The major economic losses due to mortality, morbidity and production losses come from various infectious diseases. One of the dreaded infectious diseases affecting poultry industry is Chicken Infectious Anemia (CIA) which is characterized by aplastic anemia,generalized lymphoid depletion, subcutaneous and intramuscular hemorrhages, immunosuppression and increased mortality due tosecondary complications.

Synonyms

- Blue wing disease
- Anemia dermatitis syndrome
- Hemorrhagic aplastic anemia syndrome

Etiology

- Chicken anemia virus (CAV) is a single-stranded, circular DNA virus, the only member of the *Gyrovirus*genus of the Circoviridae family.
- Very resistant small virus

Susceptibility

- Chickens of all ages are susceptible to infection with CIAV.However, chickens younger than 2 weeks are more prone to be affected.
- Both broiler and layer breeder chickens are affected by this virus.
- Clinical disease is seen only during the first two to three weeks of life although immuno compromised chickens may suffer from anemia later in life.
- Chicken infectiousanemia virus persists only for 3 to 4 weeks in chickens with an intact immune system, butfor as long as 7 weeks in immunocompromised chicks.
- Age resistance to clinical disease caused by CIAV develops rapidly and becomescomplete by 2 to 3 weeks of age.
- The age resistance can be overcome by coinfection with other viral diseases causing immunosuppression.
- The period of susceptibility to disease may be extended by early exposure to infectious bursal disease virus, Marek's disease virus or selected avian reoviruses that interfere with normal immune system development.
- Maternal antibodies from immune hens prevent clinicaldisease in young chicks. Because of passive immunity and age resistance, most infectionswith CIAV are subclinical.

Transmission: Horizontal transmission

- Fecal-oral route
- Respiratory route
- Infectedfeather follicle epithelium

Vertical transmission

- Chicks hatched from eggs laid bysero-negative hens
- Chicks hatched from these eggs are viremic and CAV can rapidly spreadhorizontally from these chicks to susceptible, maternal antibody-negative hatch mates.
- Roosters shedding CAV insemen
- Contaminated live vaccines prepared from infected embryos

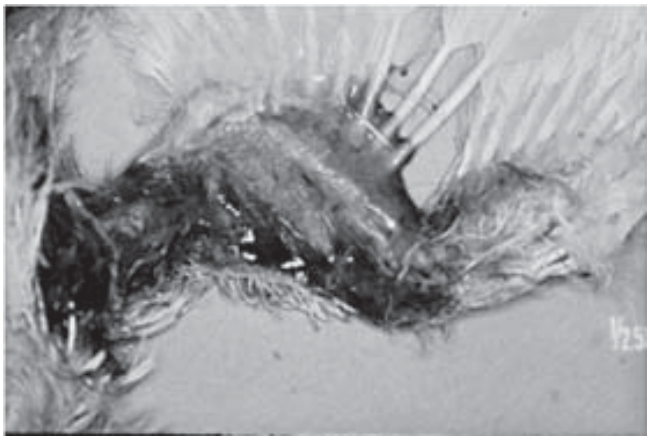
Clinical manifestation

- Only specific clinical sign of CIA is severe anaemia, reaches apeak at 14 to 16 days post infection.
- At this time, hematocrit values can range from 6 to27% (normal 35%). Levels of thrombocytes and white blood cells are reduced and theblood may be slow to clot.

- Bone marrow aplasia.
- Decreased resistance to secondary bacterial diseases such as gangrenous dermatitis.
- If coinfected with infectious bursal disease virus, may develop a profound immunosuppression with enhanced susceptibility to a wide range of viral and bacterial pathogens.
- Affected birds appear depressed and pale, stunted.
- Signs of illness or adverse effects on egg production do not occur when sero-negative adult chickens become infected.
- Death occurs in 2-3 weeks after infection.
- Latent infection causes decrease in productivity.

Lesions

Pale bone marrow indicating immuno suppression associated with chickanemia virus.



Wing of 14-day old broilershowing edema, subcutaneous hemorrhage, and transudate due to chick anemia virus

- Marked pallor that may extend to the internal organs.
- Hemorrhages in the proventricular mucosa, and subcutaneous and muscular hemorrhages.
- Enlarged and mottled livers, in association with severeanemia.
- The bone marrow is pale or yellow in color and may have a fatty consistency. Microscopically, the bone marrow of CAV-infected chickens is depleted of erythrocytes, thrombocytes, and granulocytes and their precursor cells, which are replaced by adipose tissue.
- Thymicatrophy and congestion.
- Bursal atrophy is generally modestand transitory, typically occurring at 10 to 14 d of age inchickens vertically infected.
- Because of the immunosuppression, affected chickens frequently develop secondary infections with *Clostridium perfringens*and *Staphylococcus aureus*in the subcutaneous tissuesand musculature that results in gangrenous dermatitis in the extremities (Blue wing).

Morbidity and Mortality

- Morbidity and mortality rates are influenced by several factors such as immuno suppressionby other agents, secondary infections, age of infection, route of infection, and environmental factors.
- Mortality is usually between 5 and 10%, but can be as high as 60%.
- Morbidity and mortality are severe if chicks are dually infected with CIAV and MDV, reticuloendotheliosis virus (REV) or IBDV.
- Infection of chicks with CIAV in the early partof life can interfere with vaccination against MDV or IBDV.
- Mortality rates vary from 20 % to 70 %. Affected flocks will show poor growth reflected in economiclosses.

Diagnosis

- A tentative diagnosis is based on history, signs, and gross and histopathologic lesions.
- ELISA and Viral Neutralization serology can confirm infection of flocks.
- The PCR(polymerase chain reaction) assay can identify CAV.
- Diagnosis of CAV infection is done by detecting the viral agent, antigens and viral specific antibodies in thymus or bone marrow.
- Isolation of virus is done either in MDCC-MSB1 or MDCC-147 (lymphoblastoid cell line derived from Marek's disease tumor) or using day old chicks.

Treatment and Prevention

- There is no specific treatment. Secondary bacterial infections may be treated with antibiotics.
- The affected bird should be diagnosed and isolated earlier to prevent the horizontal transmissions.
- Live vaccines areavailable for vaccination of antibody-negative breeder flocks before the start of egg production to prevent vertical transmission.
- Immunization of breeder flocks during the age period 12-15 weeks usingan attenuated vaccine. Either vaccination or natural exposure will conferimmunity to progeny through maternal antibody transfer.
- Biosecurity procedures are required to prevent horizontal infection.
- Proper hygienic and sanitation conditions in the farm and persons working in the farm can reduce the horizontal transmission of viruses from farm to farm.
- To check the immune suppression and secondary infections the flocks should be vaccinated with other viral and bacterial vaccines.
- Although it is not feasible to totally prevent exposureto CAV, it is important to minimize its effects by propersanitization and by optimizing the control of otherfactors that can contribute to an enhancement of theinherent immunosuppressive nature of CAV.

Economic Significance

- The infection is widespread in broiler and replacement parent and laying strain pullets.
- Chicken infectious anemia virus (CAV) is immunosuppressive and is responsible for mortality of up to 10% in affected broiler flocks.
- The virus causes stunting and increased susceptibility to secondary viral and bacterial infections including dermatitis which results in downgrading.
- Infections with CAV are considered to be economically significant because of the clinical disease associated with vertical transmission and because of its potential for inducing immune dysfunction alone on in combination with other pathogens.
- Apparent subclinical infections of commercially produced broilers may result in increased mortalityand condemnations.
- Chicken infectious anaemia (CIA) is a dreadful disease in poultry which causes drastic economic losses and it is difficult to control because of the vertical transmission. It is necessary to follow strict biosecurity and managemental practices to reduce the dissemination of the disease.

Moringa oleifera: Its effect on Poultry diet

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Introduction: India, a country having 1.23 billion population is rapidly growing every year and around 60% of the rural population depends on agriculture. The share of agriculture to India's GDP is 16% whereas Livestock and Poultry contribute 4.11%. In poultry, feed accounts for 65-70% of total cost of production. Therefore, feeding of adequate amount of balanced and wholesome feed is important for optimum production. Increasing cost of feed ingredients and persistent shortage of protein- and energy-rich animal feeds due to enhanced needs of ever growing human population are the major threats to reassemble the poultry industry into an economic enterprise in India. With the continuing increase in demand of raw feed materials that will suffice the needs of animal growers, a call for extensive search on utilization of the cheap and quality alternative feed sources from indigenous plant species was formulated. India is rich in heritage of medicinal plants with traditional Ayurvedic therapeutic knowledge giving us an opportunity to use them for ethno-veterinary medical practice. *Moringa oleifera* used as medicine, low cost water purifier (flocculent), human food and animal feed, hedge, seed oil, fibre, it's easy propagation and pan tropical cultivation justifies more intensive research into its biological and economic possibilities particularly as useful feed ingredients and medicine.

Moringa oleifera:

Moringa oleifera is a widely grown crop throughout the world. This plant is a fast-growing, deciduous tree that can reach a height up to 10–12 m (32–40 ft). The fruit is a hanging, three-sided brown capsule of 20–40 cm size which holds dark brown, globular seeds with a diameter around 1 cm. It is reported that, on a dry matter basis, *Moringa oleifera* leaves contained 251 g/kg-crude protein, 150 g/kg- total ash, 54 g/kg- Ether extract, 106 g/kg Nitrogen free extract, 225 g/kg- crude fibre with gross energy content of 18.7 MJ/kg. Further studies revealed that on dry matter basis, *Moringa oleifera* seeds contained 43.60 % crude fat, 43.71% crude protein, 17.60 % fiber, 3.38 % Ash, and 3.36 % carbohydrate content. Also the sulphur containing amino acids and essential amino acid contents of the leaves were higher than the amino acid pattern of the FAO reference protein, but other essential amino acids were deficient (Sodamade *et al.,* 2017). Regarding antinutritional factors, Makkar studies showed that the concentrations of antinutritional factors (trypsin, tannins, and lectins, amylase inhibitors and glucosinolates, cyanogenic glucosides, and saponins) were either undetectable or negligible in leaves, twigs, and stems of this plant However, hemolytic activity was observed in kernels Hemagglutination activity was detected in kernels and meal but not in their extracted samples.

Properties of Moringa:

Antihypertensive, diuretic and cholesterol lowering activities

The widespread combination of lipid and blood pressure lowering constituents along with diuretic activity make this plant highly useful in disorders related to cardiovascular system. Moringa leaf juice is known to have a stabilizing effect on blood pressure. Substances responsible for the blood pressure lowering effect such as Nitrile, mustard oil glycosides and thiocarbamate glycosides have been isolated from Moringa leaves. Most of these compounds, bearing thiocarbamate, carbamate or nitrile groups, are fully acetylated glycosides, which are very rare in nature. Moringa leaves, roots, flowers, gum and the aqueous extract of seeds have been found to possess diuretic activity. Moringa fruit has been found to lower the serum

cholesterol, phospholipids, triglycerides, low density lipoprotein (LDL), very low density lipoprotein (VLDL) cholesterol to phospholipid ratio, atherogenic index lipid and reduced the lipid profile of liver, heart and aorta in hypercholesteremic rabbits and increased the excretion of fecal cholesterol.

Antimicrobial activities:

Moringa roots are reported to be rich in antimicrobial agents. Compounds like pterygospermin, 4-á-L-rhamnosyloxy benzyl isothiocyanate and aglycone of deoxy-niazimicine (N-benzyl, S-ethyl thioformate) which has powerful antibacterial and fungicidal effects mostly found in this plant. A similar compound is found to be responsible for the antibacterial and fungicidal effects of its flowers. The bark extract also has been shown to possess antifungal activity.

Hepatoprotective, antiulcer and antispasmodic activities:

Moringa oleifera roots have been reported to possess antispasmodic activity. Moringa leaves have antispasmodic effects possibly through calcium channel blockade. The antispasmodic activity of the ethanol extract of M. Moreover, spasmolytic activity exhibited by different constituents provides pharmacological basis for the traditional uses of this plant in gastrointestinal motility disorder. The aqueous and methanol extract of M. oleifera leaf, root and flower showed antiulcerogenic and hepatoprotective effects due presence quercetin, a well known flavonoid with hepatoprotective property.

Antitumor and anticancer activities:

Moringa leaves have a potential source for antitumor activity. O-Ethyl4-(á-L-rhamnosyloxy) benzyl carbamate together with 4(á-L-rhamnosyloxy)-benzyl isothiocyanate, niazimicin and 3-O-(62 -O-oleoyl-â-D-glucopyranosyl)- â-sitosterol have been tested for their potential antitumor promoting activity using an in vitro assay which showed significant inhibitory effects on Epstein– Barr virus-early antigen. The seed extracts have also been found to be effective on hepatic carcinogen metabolizing enzymes, antioxidant parameters and skin papillomagenesis in mice.

Antioxidant activities:

Antioxidants play an important role in inhibiting and scavenging free radicals, thus providing protection to human, animals and birds against infections and degenerative diseases. The enriched polyphenols and flavonids presence in Moringa leaf contributes towards the anti-oxidative property.

Effect of moringa leaf meal on performance of the layers

Several studies have been conducted in context to the supplementation of Moringa leaf meal in the layer diet. It was found that use of *Moringa stenopetala* leaf meal in the diet of Rhode Island Red chicks produced significant increase in feed and crude protein intake, average weight gain, feed efficiency ratios, and protein efficiency ratios. It is due to the presence of readily available protein in moringa leaf meal, which is convenient for monogastric animals, and also to the higher levels of methionine and other essential amino acids. Thus, *Moringa stenopetala* leaf meal can be included up to 6% in the diet of growing chicks to replace expensive conventional protein sources such as soybean meal and has no negative effects on the chicks (Melesse *et al.,* 2011)

It has been reported that, an addition of 10% Moringa leaf meal to the laying hen diet, as a substitute for sunflower seed meal, significantly increased feed intake and dry matter feed intake and decreased egg mass production. Feed conversion ratio (kg feed/kg egg) increased when 20% Moringa oleifera leaf meal was added to the laying hen diet. An additionof 5% Moringa oleifera leaf meal significantly increased egg weight, but lower egg weight was observed at a level of 20%. Thus, Moringa leaf meal can be added to the layer ration up to a level of 10%. Also, dietary

supplementation with 5% could improve yolk colour value and protein absorption without adverse effects on laying performance and egg quality (Wei *et al.,* 2018).

Effect of moringa leaf on performance of the broilers

Studies revealed that broiler diets included at 7.5% Moringa oleifera leaf meal significantly affects average final body weight, average daily gain, average daily feed intake and feed conversion of broiler. Broiler starter and finisher diets when supplemented with Moringa leaf meal (MLM) upto a level of 7.5% showed an increase in carcass colour was well tolerated and can only be included in the feed to levels of up to 7.5% as higher levels affected weight gain, feed intake and digestibility. Experimental results showed that *Moringa oleifera* meal as protein supplement in broiler diets at 25% inclusion level produces broilers of similar weight and growth rate compared to those fed under conventional commercial feeds (Gadzirayi *et al.,* 2014). Also, supplementation of Moringa oleifera leaf powder in broiler diets at 2-4 g/kg of feed is found to improve growth performance. The scientific studies showed dietary MLM supplementation linearly and quadratically increased feed conversion ratio. Abdominal fat decreased linearly and quadratically, both on days 21 and 42. In breast muscle, dietary supplementation with MLM quadratically increased the contents of C18:2, C18:3n-3, C20:4, polyunsaturated fatty acids (PUFA), n-3 PUFA, n-6 PUFA and decreased thrombogenic index. Dietary inclusion of MLM improved meat color. Plasma total anti-oxidative capacity, total superoxide dismutase, glutathione peroxidase activities increased quadratically whereas MDA decreased quadratically, in response to dietary MOL supplementation. In précis, MLM could be used as a feed ingredient for broilers to improve PUFA contents, oxidative stability, color of breast muscle, and abdominal fat without adverse effects on growth performance, with an inclusion of 1.56% in the diets. Several other studies reported that addition of the two levels (0.05% and 0.1%) of moringa leaf powder in broiler rations have the potential to improve the growth performance and carcass yield of broilers. Researchers observed the positive effect of MLM supplementation on productive performance, intestinal integrity, digestive organ size, digestibility, bone breaking strength and bone ash content, and meat yield of broiler chickens throughout the production period (Nkukwana *et al.,* 2014).

Conclusion: Moringa leaf meal can be used safely at levels of 5% to 20% in broiler diets and up to 10% in layer diets without deleterious effects on performance. Also, it can be used as a replacer of antibiotics in the poultry ration.

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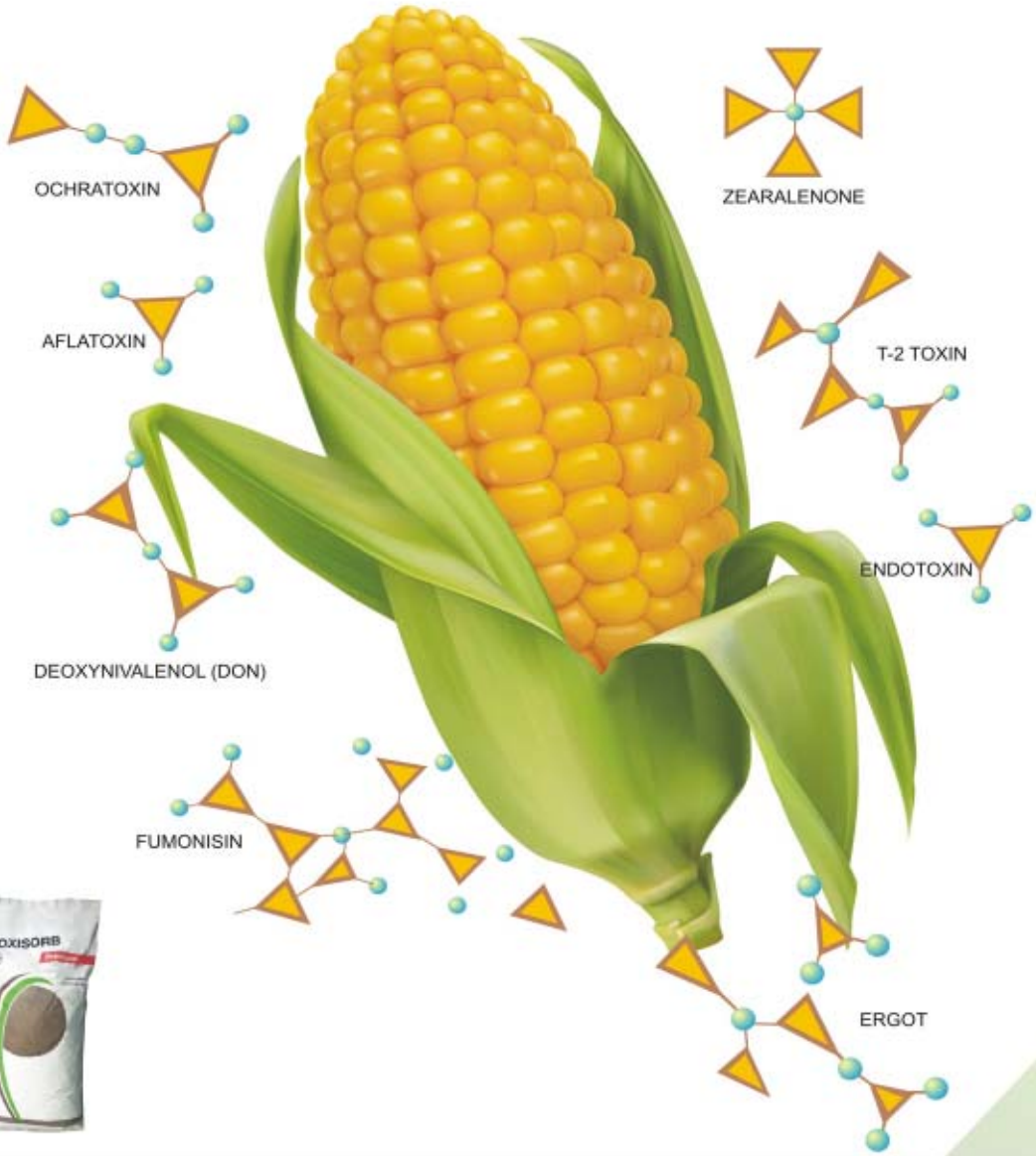

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How to improve poultry drinking water quality with acidification

Author: Andrew Robertson - Poultry Technical Manager

Without enough water, chickens are unable to reach their performance potential. However, ensuring an adequate water supply is not enough. Careful and thorough water management is necessary on a daily basis to prevent any of a number of health issues that will result from poor water hygiene. Adding an acidifier to the water can help maintain water quality and promote bird performance.

Water has often been called "the forgotten nutrient" and not without reason. In many cases, it is assumed that water will be available for the chickens to drink, and that it requires little or no maintenance to keep an adequate supply. Often, little thought goes into whether or not the water is suitable for the birds to drink.

A chicken will drink anywhere between 1.8 to 3 times the amount of food it eats, dependent on the strain, housing conditions and temperature. An inadequate quantity of water will therefore directly reduce feed intake, negatively affecting performance. The removal of water from a flock in lay will halt egg production very rapidly, and when combined with the removal of feed as well, will induce moulting.

Water vaccination

Water is also the medium of choice for administering live vaccines to chickens. This method is applied whenever possible as it has a markedly reduced stress factor for the chickens, as well as a lower cost of administration. Vaccination is always best carried out in the morning when the birds have had a natural period of water deprivation overnight, and will be less stressed compared to inducing thirst through a physical deprivation later in the day. The early morning is also the natural time for the birds to eat after the night, so they will eat and drink more readily at this time.

Water quality

Water is one of many vectors that can transport pathogens such as bacteria, viruses or protozoa into the poultry house. Some diseases, such as infectious coryza and Haemophilusparagallinarum can also spread through the drinker system, especially if it is a non-nipple system. Therefore, water hygiene must be considered an integral part of any biosecurity programme. Part of this will include regular water quality checks, including measuring both dissolved salts and, more importantly, bacterial contamination. To be considered acceptable, water should contain less than 100 CFU/ml of coliforms and less than 100,000 CFU/ml of total bacteria (Table 1). There should be no Salmonella contamination in the drinking water. Where water does not comply with this standard, steps should be taken as quickly as possible to rectify the areas that are failing.

FIVE TIPS FOR ENSURING GOOD WATER QUALITY

Tip 1 - Apply water sanitization

In order to maintain water quality, it is advisable to use some form of water sanitization. The most

common method uses chlorine, dosed either into a holding tank or directly through a dosing machine into the water in the house. Town water is usually chlorinated to a level of 3 ppm at the point of entry into the house. However, by the time water reaches the last drinker in the house, this may have reduced significantly depending on cleanliness and any organic matter in the pipes. It may be advisable to increase the level of chlorination on farms to offset this possible loss in efficacy.

Tip 2 - Test water quality regularly

Water should be tested frequently in order to ensure that its quality is stable, and that dosing equipment is functioning correctly. To do this, water should be collected from the farthest point of entry into the house, the last drinker. The degree of water sanitation, or lack of it, varies considerably across the globe, from sophisticated systems in some developed countries to no sanitation at all in several developing countries.

Table 1.
Parameters of acceptable water quality

Parameter	Drinking water for poultry	
	Good quality	Do not use
pH	5-8.5	<4 and >9
Ammonium* (mg/l)	<2.0	> 10
Nitrite (mg/l)	<0.1	>1.0
Nitrate (mg/l)	<100	> 200
Chloride (mg/l)	<250	> 2,000
Sodium (mg/l)	<800	> 1,500
Sulfate (mg/l)	<150	> 250
Iron (mg/l)	<0.5	> 2.5
Manganese (mg/l)	<1.0	> 2.0
lime/chalk content (°dH)	<20	> 25
oxidizable organic matter (mg/l)	<50	> 200
H_2S (mg/l)	non detectable	non detectable
Coliform bacteria (CFU/ml)	<100	> 100
Total germ count (CFU/ml)	<100,000	> 100,000

*If the pH becomes alkaline, ammonium (NH_4^+) turns into ammonia (NH_3), the toxic form

Source: ISA Management guide. 2014

Table 1. Parameters of acceptable water quality

Table 2.
Some of the pathogens isolated from biofilms

E. coli spp.	*Staphylococcus aureus*
Salmonella spp.	*Listeria monocytogenes*
Pseudomonas spp.	*Mycobacteria* spp.
Helicobacter spp.	*Cryptosporidium parvum*
Legionella spp.	*Giardia lamblia*
Vibrio cholera	Amoeba
Klebsiella spp.	Enteroviruses (and other viruses)

Source: BIOMIN

Table 2. Some of the pathogens isolated from biofilms

Tip 3 - Check for biofilm

In many parts of the world the levels of hardness, dissolved solids in the water, are quite high, which increases the pH to the upper end of acceptable levels. These salts, especially calcium or magnesium salts, can form deposits in the water pipes that can ultimately reduce water flow. Additionally, they can also encourage the build-up of biofilm in the pipes by providing attachment sites for bacteria to lodge. Biofilm is a living colony of microorganisms comprising bacteria, algae, fungi and even protozoa. This living colony is protected by an accumulation of filamentous proteins excreted by some of the bacteria, which over time can further reduce the flow of water through the pipes. The different types of pathogens found in biofilms are quite extensive as shown in Table 2.

Tip 4 - Thoroughly clean the water system between flocks

Thorough cleaning of the water system between flocks is strongly recommended, using products that can remove both the biofilm and any limescale present. This often requires a two-strategy approach with a product such as hydrogen peroxide to remove the biofilm, and an acid product to remove the limescale in hard water areas.

The build-up of biofilm can be reduced during production by regularly flushing out water lines. This should be done under water pressure of between 1.5 and 3.0 bars (20 – 40 PSI). Flushing of water

lines should be carried out at least once per week, and more often in hot climates to ensure good results. This will reduce the risk of parts of the biofilm breaking loose in the water pipes and causing an obstruction in the drinker valves, or releasing undesired pathogens into the water supply. Any remaining residues of water treatment should be removed immediately after the treatment by flushing the system.

Hard water increases the pH of the water. Today, there is some debate over the recommended acidity/alkalinity of water, with current views tending towards reducing the pH to the lower levels, between pH 4 and pH 5. This is in order to create a pathogen-static environment, thereby limiting their development in the water lines.

Tip 5 - Aim for the optimal pH level

When chicks hatch, they have an immature gut, and the production of acids in the proventriculus and gizzard is reduced in the first seven to fourteen days. Experimental work showed that the pH level of the proventriculus ranged from 5.2 at day one to 3.5 at day 15, with a linear reduction between hatching and day ten of age. Similarly, the pH in the gizzard dropped from 3.5 to 3.3 between day one and day ten, then stabilizing at a pH of 3.3 at day 15 (Rynsburger, 2009).

Care needs to be taken when acidifying water to ensure that the correct amount of acids are applied to reach the desired pH of 4.5 of the drinking water. Failure to do this can result in either over-acidification of the water, which can hinder water intake and damage the equipment, or an under-acidification, which can then provide an energy source to the bacteria residing in the water line.

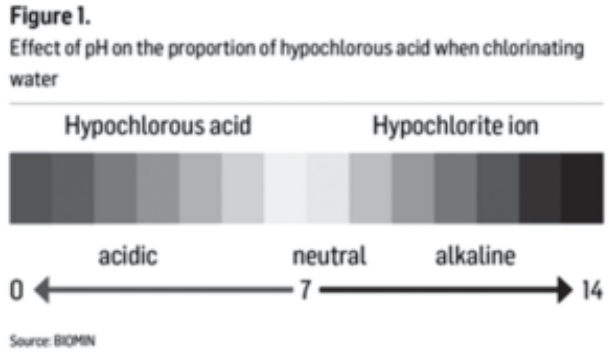

Figure 1. Effect of pH on the proportion of hypochlorous acid when chlorinating water

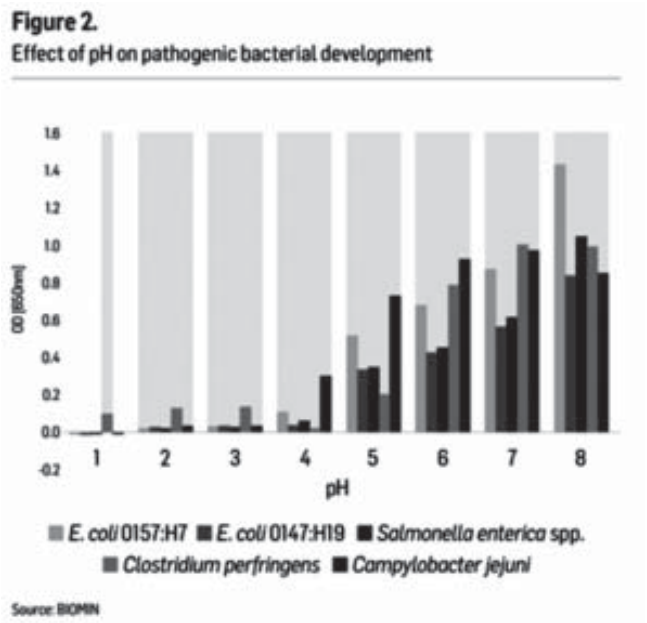

Figure 2. Effect of pH on pathogenic bacterial development

FOUR BENEFITS OF WATER ACIDIFICATION

Many companies are employing chlorination as a way to sanitize water, either by having access to town water or adding chlorine to water on the farm. However, the efficacy of chlorination depends on the formation of hypochlorous acid, which has stronger antimicrobial activities than the hypochloride ion. The level of hypochlorous acid produced will be dependent on the pH of the incoming water (Figure 1).

Benefit 1 - Acidification prevents bacteria from reproducing

Most pathogenic bacteria are Gram-negative and as such are sensitive to acidic environments, which have a bacteriostatic effect. When a chicken is drinking twice the quantity it eats, the acids in the drinking water can have a beneficial effect in the crop, reducing pathogenic development.

Figure 2 shows that below pH 5, many pathogens are stable and not increasing. However, pathogenic bacteria will start rapidly multiplying once the pH

goes above pH 5, peaking at pH 7 – 8. While Gram-negative bacteria are sensitive to acids, they also have an in-built protection against water-soluble agents in the lipopolysaccharide outer membrane of their cell wall. This limits the passage of antimicrobial agents into the cell wall, thereby giving them a degree of protection.

However, adding a permeabilizing agent to the acidifier, for instance Biotronic® Top Liquid, can increase the direct antimicrobial activity in the drinking water and in the upper intestinal tract. This is due to the disruption of the outer lipopolysaccharide layer by the permeabilizing complex, enabling a greater uptake of acids into the cell, enhancing the antimicrobial effect.

Benefit 2 - Acidification does not affect in-feed probiotics (direct-fed microbials)

Many of the probiotics rapidly gaining popularity in poultry production are Gram-positive. They are either lactobacilliales, lactic acid producing bacteria, or sporulated bacillus bacteria, which are much less sensitive to acidic environments. As a result, acidifying drinking water has no impact on probiotic products in feed.

If probiotics are administered in the drinking water via a dosing machine, and only one dosing machine is available, water acidification should be stopped during the time the probiotics are administered, and then recommenced once they have been consumed. A similar approach should be taken when vaccinating through the water supply. If the vaccine is applied directly into the header tank, this will have no detrimental impact on the probiotics, but the water should not be acidified when vaccinating.

Benefit 3 - Acidification helps keep limescale and biofilm at bay

Acidification of the drinking water can also reduce the build-up of limescale in the drinker lines, which in turn will also reduce the levels of biofilm due to a lower level of bacterial contamination. This will not negate the need to clean the drinker lines between flocks, but it may help prevent blockages or leaking drinkers caused when biofilm breaks loose within the pipelines, affecting drinker function.

Benefit 4 - Acidification can help early protein digestion

Acidity also plays a major factor in the transformation of pepsinogen to pepsin, which is essential for protein digestion. Lysine digestibility in day-old broilers is 78%, but rises to above 89% by 14 days of age (Batal and Parsons, 2002). Therefore, acidification of the water may benefit early protein digestion by slightly reducing the buffering of the feed passing from the crop to the proventriculus.

Chick starter diets are one of the most buffered diets the animal will receive, with the exception of layers and breeders in production, due to the calcium and protein content. This may explain increasing successes in acidifying drinking water in the early stages of production.

Biotronic® Top liquid

The correct acidification of drinking water with an enhanced acidifier, such as Biotronic® Top liquid from BIOMIN, will benefit performance and enhance gut health through microbial modulation, reducing the pathogen challenge in the intestine and increasing protein digestion. Adding Biotronic® Top liquid goes further to inhibit bacterial growth and prevent limescale and biofilm build up, while also boosting early protein digestion without interfering with in-feed probiotics.

Conclusion

Water is an essential part of optimal flock performance. However, since water is able to transport pathogens into the poultry house, its quality and management is extremely important. Sanitization, regular testing, checking for biofilm in pipes and thoroughly cleaning lines between flocks can all help to ensure water quality is as high as possible. Adding an enhanced acidifier product will deliver additional performance benefits as well as reducing the level of bacteria in the water.

PRESS RELEASE

BIOMIN exhibits strong presence at Kolkata Poultry Expo

By consecutively recording its presence at Kolkata International Poultry Expo for the fourth straight year, BIOMIN became a pioneer to accord importance to east region in India and reiterated its commitment to the customers and stakeholders in this part of the country.

6 March 2019 – Animal nutrition and health company BIOMIN displayed strong presence at the Kolkata International Poultry Expo, which was held between February 19 and 21 at Eco Park in Kolkata. This regional level expo created an ideal platform for customers and stakeholders in West Bengal, Odisha, Bihar and other neighboring states, as well as from Nepal, to visit the booth and to gain further understanding about the products and services of BIOMIN.

Dr. Sujit Kulkarni, BIOMIN India Managing Director said: "This expo provides us the opportunity to be in the midst of regional level poultry integrators and farmers, which help them in getting our solutions on mycotoxin risk management and improving gut health."

He underlined that the presence of sales, technical and marketing team at the BIOMIN booth in Kolkata made a great impression in the market. "We had good discussion with the key customers and stakeholders and informed them about various knowledge sharing initiatives from BIOMIN like World Nutrition Forum, Mycotoxin Academies, etc.," he added.

It may be noted that on February 12 and 13, BIOMIN conducted Mycotoxin Academies in Chitwan and Kathmandu in Nepal, respectively, with focus on increasing the awareness of

mycotoxins and the innovative solutions from BIOMIN on mycotoxin risk management. "We were happy to receive poultry farmers from Nepal, who attended the Academies, at our booth," said Bubun Mukherjee, Technical Sales Manager based in east India.

"Kolkata fair has thus provided an excellent opportunity for BIOMIN to have follow-up meetings with the prospective customers from Nepal," he added.

In the backdrop of growing awareness in the poultry industry to reduce antibiotic usage, BIOMIN showcased its combination of feed additives i.e. Biotronic® acidifier, Digestarom® DC phytogenic, PoultryStar® probiotic and Mycofix®, the mycotoxin risk management product line, which can help poultry producers achieve their antibiotic reduction goals successfully. Visitors at the booth were explained about the services offered by BIOMIN through sister company Romer Labs such as feed sample analysis, where the raw material/ feed is sent to Romer Labs in Singapore, which offers the most comprehensive portfolio of mycotoxin test kits for detection of mycotoxins.

With the poultry industry in West Bengal, Odisha, Bihar, Jharkhand and Chattisgarh states continuing to grow at a rapid pace, fueled by increase in consumption of eggs and chicken meat, the mood at BIOMIN booth was encouraging as good number of customers and potential players showed interest in BIOMIN products and services.

Passive Immunity in Infectious Bursal Disease; Role of Maternally Derived Antibodies (MDA) on Active Immunization Programme.

Dr. K.L. Revappa, Dr. S.K. Maini, Dr. Suresh Sharma,
Vaccine Division, Vesper Pharmaceuticals, Soladevanahalli, Bengaluru – 560 107.

Infectious Bursal disease (IBD) is a viral infection, affecting the immune system of poultry. The disease is highly contagious, affects young chickens and is characterized by the destruction of the lymphoid organs, and in particular the bursa of Fabricius, where B-lymphocytes mature and differentiate. The target cell of virus is the B-lymphocyte in an immature stage, and the infection when not fatal, causes an immune-suppression in most cases temporary, the degree of which is difficult to determine. Direct losses due to IBD are linked to specific mortality, and depend on the dose and virulence of the virus strain, the age and breed of the birds, and the presence or absence of passive immunity. The indirect economic impact of the disease is also considerable, due to virus-induced immune-suppression and/or potential interactions between IBDV and other viruses, bacteria or parasites, (Van den Berg et al., 2000). Infectious Bursal disease is currently an international problem almost all countries of the world have encountered the incidence of the disease.

Humoral immunity plays a very important role in protecting the birds against Infectious Bursal Disease Virus (IBDV). There is a direct correlation between the level of neutralizing antibodies and protection, (Jack wood et al., 1999, Nakamura et al., 1994). High levels of neutralizing antibodies in the chicken block the virus infecting the bursa. With lower level of antibodies, sufficient virus is neutralized to prevent clinical disease. The role of the humoral immunity is also evident by the passive protection provided to young chicks by the maternally derived antibodies. (Against Bursal lesions, and immune-suppression). (Van den Berg and Meulemans 1991).

Inactivated vaccines are essentially used to produce high, uniform and persistent antibody titers in the hens prior to lay that have been vaccinated with a live virus or have been naturally infected through exposure to the virus on the farm.

(Cullen and Wyeth., 1976, Wyeth and Cullen., 1978, Wyeth and Cullen., 1979). These vaccines are administered by the subcutaneous or intramuscular route, at the age of sixteen to twenty weeks. Progeny of hens that have been vaccinated in this way have protective antibodies until the age of approximately 30 days. Howeve, the duration and uniformity of the immunity thus conferred upon chicks, will to a great extent, depend on the antigenic specificity of the virus present in the vaccine used to hyper-immunize the hens, (Box., 1989, Wyeth and Cullen., 1976, Wyeth et al., 1992). The chicks are thus protected during the period of susceptibility to the IBDV strains that only provoke immune-suppression. However, the chicks are not protected from other highly pathogenic strains that may inflict high mortality rates at later stages, (Van den Berg and Meulemans., 1991, Wyeth and Cullen., 1979).

Vaccination of breeders is based on a process called “hyper immunization.” This then results in high levels of circulating antibodies in the laying hens, resulting in high levels of passive antibodies being transmitted to the chick via the egg. The rate of transmission is proportional to the level of maternal antibodies; the higher the antibody titer in the breeder, the stronger the protection transmitted to the chick.

The uniformity of MDA is the direct result of vaccination program of the breeders. Breeders vaccinated with live and inactivated vaccines during their prime period of around 20 weeks of age are most likely to present with high and uniform MDA titers. Breeders vaccinated with only live vaccines are likely to show low and uneven MDA titers. Exposure to any challenge with field virus has positive influence on the MDA titers. Breeders at the end of their production cycle (60 weeks of age) are likely to have low and uneven MDA titers.

The decay rate of MDA in chicks; Fast growing birds like broilers have a fast and uniform MDA decay rate with a half-life of 3 - 3.5 days. Birds exhibiting a slow growth rate such as pullets of layers or breeders have a slow and uneven MDA decay rate with half-life of 5-6 days. The nutrition and environmental conditions also influence the rate of MDA decay.

An effective immunization program changes the birds from passively immune by MDA’s into actively protected bird through the development of its own antibodies. The correct timing of vaccination, taking into consideration the titers of MDA in chicks is critical in this operation. If the vaccine is applied too early, while the maternally derived antibodies titer is too high, the vaccine virus is neutralized and no protection can be expected. On the

other hand, if the vaccine is applied too late, then the exposure to field virus and consequent disease outbreak may occur. Therefore the accurate identification of the window of opportunity is extremely important and here the half-life of maternal antibodies comes to picture.

All the attenuated IBD vaccines are susceptible to virus-neutralizing maternally-derived antibodies, which can totally neutralize them or delay their action. Serological monitoring is usually necessary to predict the optimal timing for the vaccination. Age at vaccination should be decided according to the level of and homogeneity (uniformity) of MDA present ;in the day old chicks, (Dewitt, 1999). Quantitative serological tests, like the virus neutralization test or the more commonly used ELISA test, evaluate antibodies levels in chicks (expressed in geometric mean titer (GMT) and calculate the optimal age for vaccination is rarely identical for all chickens of the same flock. One can therefore use mean values, which is acceptable if MDA titers are homogenous or increase the number of vaccine application if MDA titers are heterogenous. By serological monitoring a calculation of the MDA level at which the vaccine can break through is possible and the data to be used to schedule the vaccination program.

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Common poultry diseases in wet and cold weather

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Poultry birds are one of the important species of food animals as they produce valuable foods of animal origin like meat and eggs. But their production is readily affected by seasonal fluctuations as well as climatic adversities. In wet and/or cold season, feed intake of birds increases in order to generate metabolic heat so as to keep themselves warm. Whereas, feed consumption decreases and water intake increases in the hot season in order to cool their body. In extreme conditions, birds get stressed, thus their ability to withstand diseases and the immune response is seriously compromised. Additionally, the onset of rain favors the propagation and spread of the causative organisms of many infectious diseases leading to high economic losses to the poultry owners. Some of the poultry diseases common during the rainy season are:

1. Bacillary White Diarrhoea (Pullorum Disease)

Bacillary White Diarrhoea is caused by bacteria, *Salmonella Pullorum*. Transmission of the diseases can occur from infected birds, their feces, and their eggs; ingestion of contaminated food, water or bedding, and contact transmission; mechanical spread; vertical transmission may occur in newly-hatched chicks due to transovarial transmission. Thus, chicks are highly susceptible to this condition than adult birds and may show extensive mortality up to 3 weeks of age. Clinically young birds show pasted vent, white diarrhea, huddling, lameness, somnolence (sleepy), labored breathing and blindness etc. Morbidity may range from 10 to 80% and mortality usually increases at 7 to10 days in stressed or immune-compromised flocks and may reach up to 100%. Adults are usually subclinical and a drop in egg production, fertility or hatchability may occur. Depression, anorexia, diarrhea, and dehydration are occasionally seen.

2. Fowl Cholera

Fowl cholera is a bacterial disease of birds caused by organism *Pasteurella multocida*, affecting birds of 6 weeks old and above. It is a serious and highly contagious disease which can range from acute septicemia to chronic and localized infections and the morbidity and mortality may be up to 100%. The disease gets transmitted via nasal exudates, feces, contaminated soil, equipment, and people. Clinical findings vary greatly depending on the course of the disease. In the acute form, witnessing a large number of mortality without any prior clinical signs is usually the first indication of disease. In more protracted cases, depression, anorexia, mucoid discharge from the mouth, ruffled feathers, diarrhea, and increased respiratory rate are usually seen. In chronic form of fowl cholera, signs and lesions are generally related to localized infections of the sternal bursae, wattles, joints, tendon sheaths, and footpads, etc. which often are swollen. There may be exudative conjunctivitis and pharyngitis. Torticollis may result when the meninges of the brain and spinal cord, middle ear, or cranial bones are affected.

3. Aspergillosis/ Brooder's Pneumonia:

Aspergillosis is the fungal disease caused by *Aspergillus fumigatus* in poultry birds. In wet and cold season due to the high humidity and insufficient sunlight, feed or litter dampens is common, thus creating a favorable environment for fungal growth in poultry environment. The spores of aspergillus are inhaled by birds and these spores subsequently develop into lesions filling the lungs, thus causing respiratory problems with very typical signs like are gasping or open mouth breathing. Birds under intensive management systems would experience high disease spread if the stocking density is high and ventilation facility is inadequate. **Factors causing the spread of**

disease are aerosol of spores, which are common in the hatchery, contaminated dust, and litter in the house. Aspergillosis may exhibit 2 forms *viz.* acute or chronic:

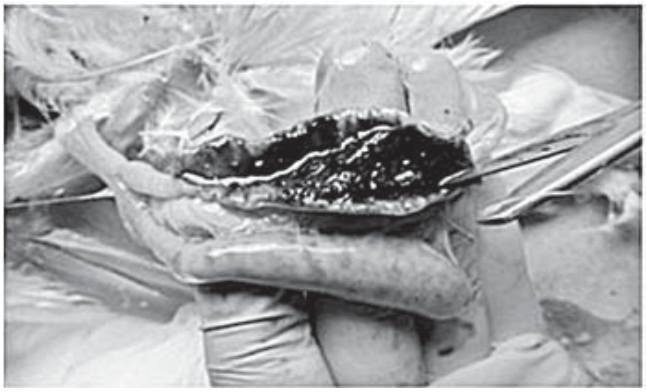
A) Acute form: This occurs generally in young chicks which are reared under brooders hence called as brooder pneumonia. Onset is very quick causing high morbidity and mortality. Death of affected birds occurs within a few days of onset of infection. The most common signs include; Lethargy, depression, loss of appetite, labored breathing, and cyanosis (bluish/ purplish comb) and mortality.

B) Chronic form: This may take several weeks or months to develop. It commonly occurs in older birds, having malnutrition, stress, concurrent illness, or prolonged antibiotic/ corticosteroid use. The most common clinical signs include weight loss, reduced appetite, exercise intolerance, increased respiratory rate, changes in vocalization (voice) often more apparent in roosters, audible respiratory sounds (rales), tail bobbing, open-mouthed breathing (gasping).

4. Coccidiosis

Coccidiosis is a protozoal disease caused by various intracellular species of genus *Eimeria* in poultry, characterized by enteritis and bloody diarrhea. Coccidial parasites are ubiquitous in poultry environment and can cause the clinical disease in favorable conditions, thereby exhibit the opportunistic behavior. The infectious process is rapid (4–7 days) results in parasite replication in host cells with extensive damage to the intestinal mucosa. Poultry coccidia is generally host-specific, and the different species parasitize specific parts of the intestine.

The wet litter and the hot pen temperature commonly observed in the rainy season favors the sporulation of the coccidial oocyst and therefore, the outbreak of coccidiosis. Clinically bloody feces, ruffled feathers, anemia, and somnolence are observed. Other signs of coccidiosis range from decreased growth rate to a high percentage of visibly sick birds, severe diarrhea, and high mortality. Reduced feed and water consumption, weight loss, development of culls, decreased egg production, and increased mortality may accompany outbreaks. Mild infections which can be classed as subclinical, may cause depigmentation of feathers and potentially lead to secondary infection, particularly of *Clostridium* spp. Survivors of severe infections recover in 10–14 days but may never recover lost performance. The lesions are almost entirely in the intestinal tract and often have a distinctive location and appearance that is useful in diagnosis such as blackish red to brown colored hemorrhages in caecae.



Coccidiosis - caecal hemorrhages

5. Bumblefoot (**Ulcerative pododermatitis**)

Bumblefoot is the term used for swelling of a chicken's toe or *footpad* (the spongy bottom of the foot). This is an inflammatory condition, extremely common problem for older backyard hens and bird reared on unhygienic floors or on damp litter. The bacteria, such as *Staphylococcus* are in ample number on such floors and thus, invade and cause infection in the skin of a chicken's foot, creating a pus-filled abscess. A cut, scrape, injury or even simply a raw spot on the skin caused by walking on wet, dirty bedding can be the entry point for bacteria and may aggravate the severity of foot lesions manifold. The most common behavioral symptoms of bumblefoot include limping and the affected bird doesn't use the leg at all due to unbearable pain. By the time limping is noticed, the infection has most likely been festering for quite some time. Footpad examination may reveal

redness, swelling, abscess and either a callous-like lesion, a lump between the toes or a black scab on the footpad.

Bumblefoot

6. Infectious Bursal Disease (Gumboro, IBD, infectious bursitis, infectious avian nephrosis)

A highly contagious and fatal viral disease mostly affecting young birds aged between 3-6 weeks, caused by RNA virus belonging to the family *Birnaviridae*. The disease attacks the bursal component of the immune system resulting in immunosuppression due to the destruction of immature B lymphocytes and thereby increases susceptibility to secondary infections. Disease gets transmitted by bird-to-bird contact, as well as by contact with contaminated people and equipment. Birds shed virus in droppings and can be spread by air on dust particles. Dead birds are also a source of the virus and should be incinerated. The disease may appear suddenly with a sudden drop in feed and water consumption. Chickens may exhibit severe prostration, incoordination, watery diarrhea leading to soiling of feathers around the vent feathers, vent picking, and inflammation of the cloaca, etc. Flock morbidity is typically 100%, and mortality can range from 5%–20%. Chickens infected when less than 3 weeks of age do not develop the clinical disease but show severe and permanent immunosuppression due to the destruction of bursal plecae and subsequent atrophy.

Treatment:

Disease	Treatment
1. Bacillary White Diarrhoea	Antibiotics- Potentiated sulphonamide, tetracyclines, fluoroquinolones, neomycin, enrofloxacin
2. Fowl Cholera	Antibiotics - Sulfa drugs, tetracycline, and erythromycin
3. Aspergillosis	Amphotericin B and Nystatin Antifungal drugs - Thiabendazole or Nystatin can be used in feed
4. Coccidiosis	Anticoccidial drugs- Amprolium, toltrazuril, sulfaquinoxaline
5. Bumblefoot	Soaking the foot in a solution of Tricide Neo (antibiotic), $KMnO_4$. Surgical removal of bumble (encapsulated abscess which can be full of hard waxy/cheesy substance) if needed
6.Infectious Bursal Disease	No specific treatment Multivitamin-electrolyte therapy is helpful Live vaccines of the chicken embryo or cell-culture origin and of varying low pathogenicity can be administered by eye drop, drinking water, or SC routes as a preventive measure

Common preventive measures to be taken to minimize disease outbreaks:

- Basic hygiene is the first step in the prevention of contagious diseases. It is good to ensure that the poultry house is generally clean and dry.
- Ensure that the water is clean and fresh. Keep feeding areas clean and dry.
- Ensure that the birds have enough living space i.e. overcrowding should be prevented as it is a predisposing factor for many diseases. Chickens need an average of a square meter for 3-5 birds.
- An all-in all-out method should be employed in order to prevent a horizontal transfer of infection. If this method is not feasible, quarantine the new batch for a minimum of two weeks, to protect the current stock.
- Electric bulbs or heater should be provided in the pen to serve as a secondary source of heat for the birds. This would help the birds drink enough water and stay warm without getting the reserved energy used up in the process.
- Ensure the adequate air movement in the shed to clear the dampness and ammonia from the shed and therefore to keep litter dry and clean.
- Construction of a generous roof overhangs over the entrance and sides of poultry house to prevent rainwater from getting into the pen whenever it rains.
- Construct a foot dip at the entrances of the poultry house and a strong disinfectant solution should be added in the foot dip always.
- Follow the vaccination schedule strictly against the diseases for which vaccines are available.
- Practice a high level of biosecurity and prevent entry of rodents, wild birds, other animals and unauthorized personnel in the farm area, which may be the sources of infection.

Essential Oil in Poultry – A Review

Contributed by technical team of Rossari Biotech Limited AHN Division - *Dr. Vishal Surve, Dr. Sumanta De, Dr. Aashaq Hussain, Dr. C. Seenivasan, Dr. Nagarajan L., Dr. Shruti S., Dr. Anish Kumar & Mr. Edward Menezes*

Random use of antibiotics and antibiotic growth promoters in the poultry industry has caused severe public health concerns. Human health can either be affected directly through residues of an antibiotic in meat, which may cause side-effects, or indirectly through the development of antibiotic resistant bacteria (Barton, 1998) that may spread to humans. So the recent trend towards reducing the use of synthetic antibiotics and antibiotic growth promoters (AGPs) has put tremendous pressure on the poultry industry to search for viable alternatives.

In this context, phytogenic feed additives have been developed to improve poultry performance without using antibiotics. Phytobiotics, especially the essential oils (EOs) are showing us a new opportunity in replacing the antibiotic growth promoters. However, EOs are not simple compounds, rather a mixture of various compounds (mainly terpenes and terpene derivatives), which are concentrated hydrophobic liquids containing volatile aromatic compounds obtained from plants. Essential oils could be obtained through various methods like fermentation or extraction; however, steam distillation is the commonly used method for commercial purpose.

Different roles of Essential Oil

Antimicrobial activity

The antimicrobial properties of the diverse chemical compounds present in EOs are not the result of one specific mode of action, but a cumulative effect

EOs Present as Active Principles in Some Herbs

Sr No	Herb/ Spice	Botanical Name	Active principle (EOs)
1	Oregano	*Oreganum vulgare*	Carvacrol, Thymol
2	Thyme	*Thymus vulgare*	Thymol, Carvacrol
3	Garlic	*Allium sativum*	Diallyldisulfide, Allinin, Allicin
4	Horseradish	*Armoracia rusticana*	Diallyldisulfide, Allinin, Allicin
5	Chilli (Cyanne)	*Capsicum frutescen*	Capsaicin
6	Peppermint	*Mentha piperita*	Menthol, Carvacrol
7	Cinnamon	*Cinnamomum cassia*	Cinnamaldehyde
8	Sage	*Salvia officinalis*	Cineol
9	Eucalyptus	*Eucalyptus globulus*	1,8 cineole, α-pinene, ß-pinene
10	Clove	*Syzygium aromaticum*	Eugenol
11	Cumin	*Cuminum cyminum*	Cuminaldehyde
12	Corriander	*Coriandrum sativum*	Linalo

on many different targets in various parts of the cell (Burt, 2004). The antimicrobial action of essential oils is due to the presence of phenolic compounds in their composition which are known to cause structural and functional damage to plasma membranes. The permeability of cell membranes is dependent on the hydrophobicity of the solutes that have to cross the membrane and the composition of the membrane. Unlike many antibiotics, the hydrophobic constituents of essential oils are capable of gaining access to the periplasm of Gram-negative bacteria through the porin proteins of the outer membrane.

For example the major constituents of Ajwain oil is thymol (36.7%) and its precursors, c-terpinene (36.5%), and ñ - cymene (21.1%). Thymol and its precursors, cymene and terpinene, have strong antimicrobial activities. It has been reported that thymol induces its antimicrobial action by perturbation of the lipid fraction of the plasma membrane of the microorganism, resulting in alterations in membrane permeability and leakage of intracellular materials. Acting on the permeability barrier of cytoplasmic membrane, essential oils cause leakage of various substances such as ions, ATP, nucleic acids and amino acids, glutamate, etc. The mechanism of action for thymol and carvacrol is that they disrupt the cell membrane thereby decreasing the intracellular ATP pool and increasing the extracellular ATP pool in *E. coli and S. typhimurium* , indicating disruptive action on the cytoplasmic membrane. Further damage may be related to nutrient uptake, nucleic acid synthesis and ATPase activity, etc.

Gut health improving activity

Essential oils favorably affect gut functions by stimulating digestive secretions *e.g*. bile and mucus, and enhanced enzymatic activity. In broilers, EOs enhance the secretion of trypsin, amylase and jejunal chyme, and reduce the adherence of pathogens (for example, *E. coli* and *Cl. perfringens*) to the intestinal wall. Furthermore, several studies have observed positive effect of essential oil on the morphology of small intestine, such as increased villus height, decreased crypt depth, and increased goblet cell counts.

Antioxidant Activity

Herbs and spices are harmless sources for obtaining natural antioxidants. Thymol and carvacrol inhibit the peroxidation of some lipo-phospholipids in a concentration dependent manner. The inhibition of oxidation by essential oils from plants of oregano species was highly dependent on the content of carvacrol and thymol. Thymol also acts as an antioxidant. Its phenolic OH groups act as hydrogen donors to the peroxy radicals which are produced during the lipid oxidation and thereby reduces hydroxyl peroxide formation. Oregano enhances the in vivo antioxidant systems, which includes superoxide dismutase, glutathione peroxidase and vitamin E.

Anti-inflammatory Activity

The anti-inflammatory activity of essential oils is attributed not only to their antioxidant activities but also to their interactions with signaling cascades involving cytokines and regulatory transcription factors, and on the expression of pro-inflammatory genes. EOs have a negative effect on pro-inflammatory cytokines - Interleukin-1â (IL-1â) and tumor necrosis factor-á (TNF-á). Limonene, linalyl acetate, â-trans-caryophyllene, 1,8-cineole, p-cymene, thymol and eugenol predominated in different EOs act as anti-inflammatory agents by showing strong lipoxygenase inhibitory effects on the arachidonic acid metabolism. EOs also help in modulation of pro-inflammatory gene expression.

For example, identified principles present in the essential oil *Origanum vulgare* are trans-sabinene hydrate, thymol and carvacrol. Ocana-Fuentes *et al*. (2010) observed a decrease in pro-inflammatory

TNF-a, IL-1b and IL-6 cytokines synthesis, as well as an increase in the production of anti-inflammatory cytokine IL-10 in a cellular model of atherosclerosis in presence of oregano extracts. Thyme (*Thymus vulgaris)* has been used against respiratory ailments for its infection-fighting and cough suppressive qualities. Thyme tea is an old time favorite cough and cold remedy. The essential oils of thyme are grouped into three main types: thyme oil, which contains 42-60% phenols and is mainly thymol; origanum oil, which contains 63-74% phenols and is mainly carvacrol; and lemon thyme oil, which contains citral. Juhas *et al*. (2008) noticed that dietary addition of 5000 ppm of thyme essential oils decreased paw edema and ear swelling and the microscopic and macroscopic scores of colitis BALB /c mice.

Immunomodulatory activity

The exact mechanism of action by which the EOs stimulate immune responses in poultry birds is largely unknown. It is possible that the components of the EOs and also other phytogenic feed additives could act as additional ligands of Fc receptors of immunoglobulin molecules, which bind to immunoglobulin G and stimulate the immune response. Some plant bioactive compounds regulate expressions of various genes involved in immune response. This result suggests that EO may be an effective tool to augment immune responses in birds, which can be explored to enhance vaccine-induced immunity for NDV and other contagious diseases in chickens.

In conclusion we can say that in recent years, EO has attracted increased attention in poultry industries. But the future of using EOs in poultry feeding will in great measure depend on the knowledge of chemical structure, value and characteristics of EOs or their actives components for physiological needs and well-being of the birds.

BROILER LIFTING RATES FOR THE MONTH OF FEBRUARY 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
Hyderabad	85	80	80	74	74	70	70	72	72	72	72	72	66	66	66	68	68	68	70	72	74	76	78	83	83	83	83	78
Karimnagar	84	79	79	74	74	71	71	71	71	71	71	71	66	66	66	68	68	68	70	72	74	76	78	83	83	83	83	78
Warangal	83	78	78	72	72	70	70	70	70	70	70	70	66	66	66	68	68	68	70	72	74	76	78	83	83	83	83	78
Mahaboobnagar	85	80	80	74	74	70	70	72	72	72	72	72	66	66	66	68	68	68	70	72	74	76	78	83	83	83	83	78
Kurnool	85	80	80	74	74	70	70	72	72	72	72	72	66	66	66	68	68	68	70	72	74	76	78	83	83	83	83	78
Vizag	83	83	83	78	78	72	72	78	78	78	78	78	73	73	73	75	75	75	77	77	77	77	77	79	79	79	79	74
Godavari	84	81	81	76	76	75	75	75	75	75	75	75	67	67	67	69	69	69	71	71	71	75	75	77	77	77	77	72
Vijayawada	86	83	83	78	78	75	75	75	75	75	75	75	70	70	70	72	72	72	74	74	74	78	78	81	81	81	81	76
Guntur	87	84	84	79	79	76	76	76	76	76	76	76	71	71	71	73	73	73	75	75	75	79	79	82	82	82	82	77
Ongole	88	85	85	80	80	77	77	77	77	77	77	77	72	72	72													
Namakkal	80	80	82	82	82	80	80	80	77	77	77	77	77	80	80	78	78	78	76	74	74	68	70	70	70	70	67	65

EGG, CHICK, CHICKEN TOTAL PROTECTION

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PRESS RELEASE

Srinivasa Farms and Hy-Line International enter in North India

A Partnership that has the potential to change more than just the poultry business in India.

This 18 month old partnership is already a huge success story in South India.

Farmers over-joyed with the new breed of layers and seeing profits!!

15th March 2019 Chandigarh: Srinivasa Farms, the industry leader in poultry breeding announces extension of its strategic partnership with Hy-Line International, the world leader in layer poultry genetics into North India. Through this partnership Srinivasa Frams will distribute Hy-Line commercial layers throughout India.

Srinivasa Farms entered into a strategic partnership with Hy-Line International in June 2017 in South India and the association is proving itself very successful. This partnership is seeing breakthrough results and beating performance standards through excellent customer service and technical assistance down south. Srinivasa Farms & Hy-Line International are now ready to extend this association into North India aiming for bigger success.

The size of the poultry industry in India is around INR 1000 Billions and is expected to grow at the rate of 8-10% over the next few years. The potential is enormous when one considers the fact that just 65 eggs are consumed per capita in India compared to a country like Japan where it is 330 eggs per capita.

This partnership has relevance much larger than just a business association – it has enormous potential of making use of the genetically superior Hy-Line layers to feed the rising population of India with an economical source of animal protein.

Srinivasa has earned a reputation of being one of the best poultry breeding companies in the country, adopting international standards of quality, hygiene and efficiency. And this partnership with Hy-Line will ensure that they are the leaders in this market on all fronts.

China, USA and India are the world's top three layer producers. Out of this Hy-Line dominant player in China and USA, but has a limited presence in India. With this new strategic partnership Hy-Line can, through an established and reliable partner like the Srinivasa Farms become the top layer breed in the world's 3rd biggest layer market within a short period of time.

According to Mr. Suresh Chitturi, Managing Director of the Srinivasa Farms, "We as an organization have grown leaps and bounds in the last few years by innovating and forging strategic partnerships like this one with Hy-Line. I am sure that joining hands with a world leader like Hy-Line will enable us to deliver international quality products to the Indian consumer Apart from securing an exclusive license to sell genetically improved Hy-Line layer birds to Indian farmers, the company is taking part in a joint venture with Hy-Line for establishing layer bird breeding farms". "Layer bird business holds high-growth potential in the country and is expected to double the size to close to 500+ million birds in the next four-five years as the per capita consumption is expected to grow four-times from the present 65 eggs level, Chitturi added.

Mr. Jonathan Cade, President of Hy-Line International added, "We see the enormous potential of genetically superior Hy-Line layers to feed the growing population of India an inexpensive source of protein through a partnership with the Srinivasa Farms as we found a suitable partner in them, which has a rich experience in poultry management. Our success in South India is a proof to our commitment in delivering Quality produce".

About Srinivasa Farms

The origin of Srinivasa Farms dates back to 1965. We have been a brand leader in the Indian Poultry industry since five decades and has over the years earned the reputation of being one of the best poultry breeding company adopting international standards of quality, hygiene and efficiency.

Srinivasa Farms is one of the Industry leaders in the Poultry industry and has more than 3000 employees. The company has a diverse portfolio of products and serves more than 2000 customers in more than ten cities of India.

Srinivasa Farms operates in sectors related to its core business such as Poultry Breeding, Broiler Integration, Agriculture, Chicken Processing, Poultry & Animal Feed, Goat Breeding, Food Retailing and Realty. A collaboration between Srinivasa Farms and Malaxmi Group, has resulted in setting up a Mega Food Park Project (MFP) in Prakasam District, Andhra Pradesh.

Srinivasa supports and mentors its farmers and customers with modern production practices and technical expertise through a team of pathologists, microbiologists, nutritionists and veterinarians and positioned itself as one of the country's largest producer of layer birds. *For more, log on to www.srinivasa.co*

About Hy-Line

Hy-Line International is a world leader in poultry layer genetics with a rich history of innovation. Founded in 1936, by Henry A. Wallace, Hy-Line was the first poultry breeding company to apply the principles of hybridization to commercial layer breeding.

Today, Hy-Line International continues to be a pioneer as the first company with its own in-house molecular genetics team leading the industry in application of DNA-based technology to its breeding and genetics program.

Hy-Line produces and sells both brown and white egg stock to more than 120 countries worldwide and is the largest selling layer in the American egg industry and around the world.

Hy-Line brand brown and white egg birds are sold in the northern and southern hemispheres and from the arctic to the Antarctic through a network of national distributors, wholly owned subsidiaries and joint venture organizations.

For more, log on to www.hyline.com

PRESS RELEASE

Grand participation of Indian Herbs in 7th Kolkata International Poultry Fair 2019, Kolkata from 19 – 21 February, 2019

INDIAN HERBS, the pioneer and market leader and **No.1 Company** in Herbal Animal Health Care Products Industry since 1951, showed strong presence in **7th KOLKATA INTERNATIONAL POULTRY FAIR, 2019 at Eco Park, New Town, Kolkata from 19th to 21st February, 2019.** It participated with its strong technical & marketing team which include their **top officials, Mr.Balaram Bhattacharya, Executive Vice President (Mktg. & Sales), Dr.Shivi Maini, DGM (Technical) and senior marketing managers.** The marketing & technical team gave a heartiest welcome to all guests at **INDIAN HERBS** stall. Their stall was very much impressive, decorative and attractive. **INDIAN HERBS** has been awarded **1st Prize** for its stall.

The company's portfolio includes herbal healthcare and nutritional products catering to wide range of animal species including poultry, ruminants, equine, swine, pets, aquatic and other animal species for more than six decades.

INDIAN HERBS is the first company to introduce the research oriented herbal products in important segments such as Choline (**BioCholine**), Vitamin C (**Herbal C**), Natural Vitamin C with Chromium (**HeatBeat**), Vitamin E (**E-Sel Power**), Methionine (**HerboMethione Plus**), Lysine (**HerboLysin**), AGP (**Herbiotic FS**), Respiratory Antiseptic (**Animunin**), Immune Potentiator (**ImmuPlus)**, Metabolic Stimulant and Liver Tonic (**LivoLiv-DS & LivoLiv 250**), Coccidiosis (**CocciBan**), Natural Calcium (**MagaCal**), Antistress & Adaptogen (**StressCheck**), Renal Tonic (**NephTone**) etc. These products are brand leaders in their respective segments and are being used successfully by leading institutional customers in India as well as abroad with excellent results. The products are not only most economical and ecofriendly but also improve the quality of feed, productivity and profitability. These products are suitable to produce **ANTIBIOTIC FREE CHICKEN / EGGS.**

Looking to the harmful after-effects of synthetic medicines, the veterinarians, consultants and farmers all over the world are now taking keen interest in the use of herbal feed supplements and health care products. **INDIAN HERBS** is dedicated to promote the use of natural products for the betterment of animal health and production performance.

INDIAN HERBS is successfully exporting its products to more than 50 counties across four continents including Asia, Europe, Latin America and Africa. In many countries, these products are under active consideration for granting registration or authorization for marketing. **INDIAN HERBS** has received the certificate from **EXPORT INSPECTION COUNCIL OF INDIA**, Ministry of Commerce and Industry, Govt. of India and it was the first Herbal Company to get this recognition.


INDIAN HERBS


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INDIAN HERBS

The R&D Centre of **INDIAN HERBS,** which is approved by the Ministry of Science & Technology, Govt. of India since 1986, is well equipped with the best available state of the art modern facilities for standardization and quality control of herbal products. **The R&D Centre** is consistently working hard on herbal ingredients to provide the industry with the best quality herbal alternatives of synthetic products.

It has been informed by **Dr.Shivi Maini** that scientific evaluation on its herbal products in comparison to synthetic products in India and abroad is a continuous process to ensure best quality and efficacy of the products. More than 200 scientists have been awarded Masters and Doctorate degrees for their research work which has resulted in publication of more than 1000 research papers in the eminent national and international scientific journals. **INDIAN HERBS** has the distinction of getting more than 22 Patents in USA, Europe, India etc. and many Patents are pending in USA and other countries for innovative research on herbs and herbal products.

It has also been informed that recently, **INDIAN HERBS** had collaboration with premier foreign and domestic research institutes and universities of high global ranking for in-depth research on its products. A research study on **BioCholine** based on transcriptomics and hepatic mRNA expression of key genes regulating intricate metabolic pathways in the liver was undertaken at University of Georgia, USA. Dr. Shivi Maini, DGM (Technical) gave detailed technical information to the guests on underlying mechanism of action of **BioCholine** to potentially regulate key allosteric effectors of glucose and lipid metabolism on basis of transcriptomics and to completely replace synthetic choline chloride in feed.

INDIAN HERBS is regularly making strong presence in Kolkata International Fair to aware the customers / consultants about the benefits of usage of its novel herbal concepts for better poultry production and profitability.

The stall of **INDIAN HEBRS** attracted a large number of visitors. All the queries of the visitors were answered by the technical team of **INDIAN HERBS** to their best satisfaction.

PRESS RELEASE

Trouw Nutrition India: Technical Session at Bangkok

Trouw Nutrition India, a Nutreco Company, organised a technical session on 13 March, 2019 at ourregional office in Bangkok. Customers from India and Nepal joined the technical session which was held with the objective of introducing the latest innovations that can help poultry business.

Trouw Nutrition is the global leader in animal nutrition that has been supporting farmers, integrators and the feed industry around the world for over 80 years. With innovative solutions like NutriOpt On-Site Adviser (NOA), Mycomaster, and Masterlab among others, Trouw has been continuously striving to bring practical solutions to the animal industry.

The session began with Dr. Chandani Parihar, Marketing Manager, Trouw Nutrition India welcoming the participants and setting the tone for the evening.

Dr. Saurabh Shekhar, Managing Director, Trouw Nutrition India, spoke about the new developments at Trouw Nutrition. He stressed on the fact that in a world with limited natural resources and growing pressure on the feed-to-food value chain, Trouw Nutrition works with customers to increase their productivity and profitability. The main challenges being faced today are doubling food production, halving the pressure on the planet & feeding a 9.8 billion World Population by 2050. Trouw Nutrition's strong belief and investment in research and innovation is helping it realise the necessary growth for farmers and integrators in the food industry. Dr. Shekhar also gave the audience an overview of the company's global operations and the key focus areas.

Mr. Grego Bekke, Global Feed Additives Director, Trouw Nutrition Global gave an overview of the solutions from Trouw with a focus on why safe feed production is necessary. Salient features of his presentation are:

- Trouw as a complete solution provider believes in bringing products and practical services as a solution to existing challenges.
- We bring programmes like Feed Safety, Mycotoxin Management, Antimicrobial Resistance, Trace Mineral Management Programme to cater to the different needs of the customers.
- Feed Safety Programme is especially important considering the rising demand for safe food and feed.
- Mould and mycotoxin control for safe feed production is essential which can be achieved through products like **Fylax** and **Toxo**.

Dr. Sabiha Kadari, Technical Manager, Trouw Nutrition India discussed how innovation is central

to everything that Trouw does. Salient features of her presentation are:

- Poultry faces many challenges from feed safety, gut health disruptions, heat stress, meat quality issues, and lack of facilities for diagnosis in the field.
- Trouw brings practical solutions to these challenges through services like NutriOpt, NOA, Mycomaster, Masterlab, Mobile Dosing System, FaaS and other concepts.
- Services like **NOA** and **Mycomaster** from Trouw provide quick and accurate analysis to meet the quality demands of the feed industry.
- **Masterlab**, which is the largest network of professional laboratory in the world, is also available at Hyderabad and brings state of the art equipment for varied analytical assays for complete feed, raw materials and water.
- Formulation software – **FaaS** – with updated database of nutrients provides an edge with respect to precision in nutrient offering.

Dr. Chandani concluded the seminar by thanking the participants for their presence and promoting an interactive session.

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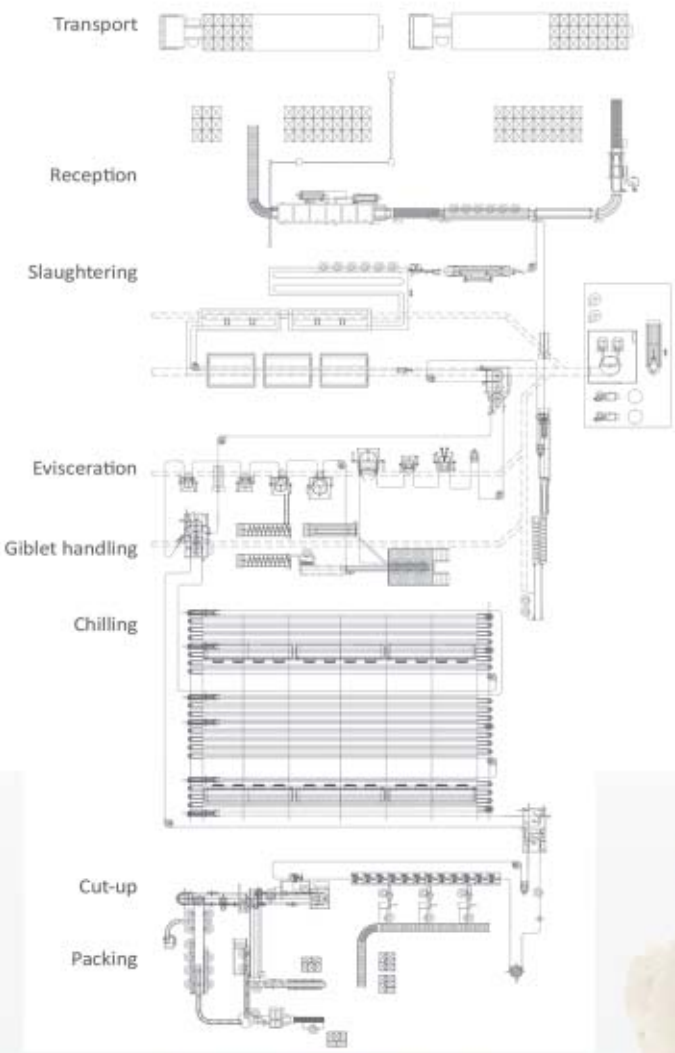

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*D. Michael Fry - Department of Avian Sciences, University of California, Davis, California - Environ Health Perspect 103(Suppl 7):165-171 (1995)

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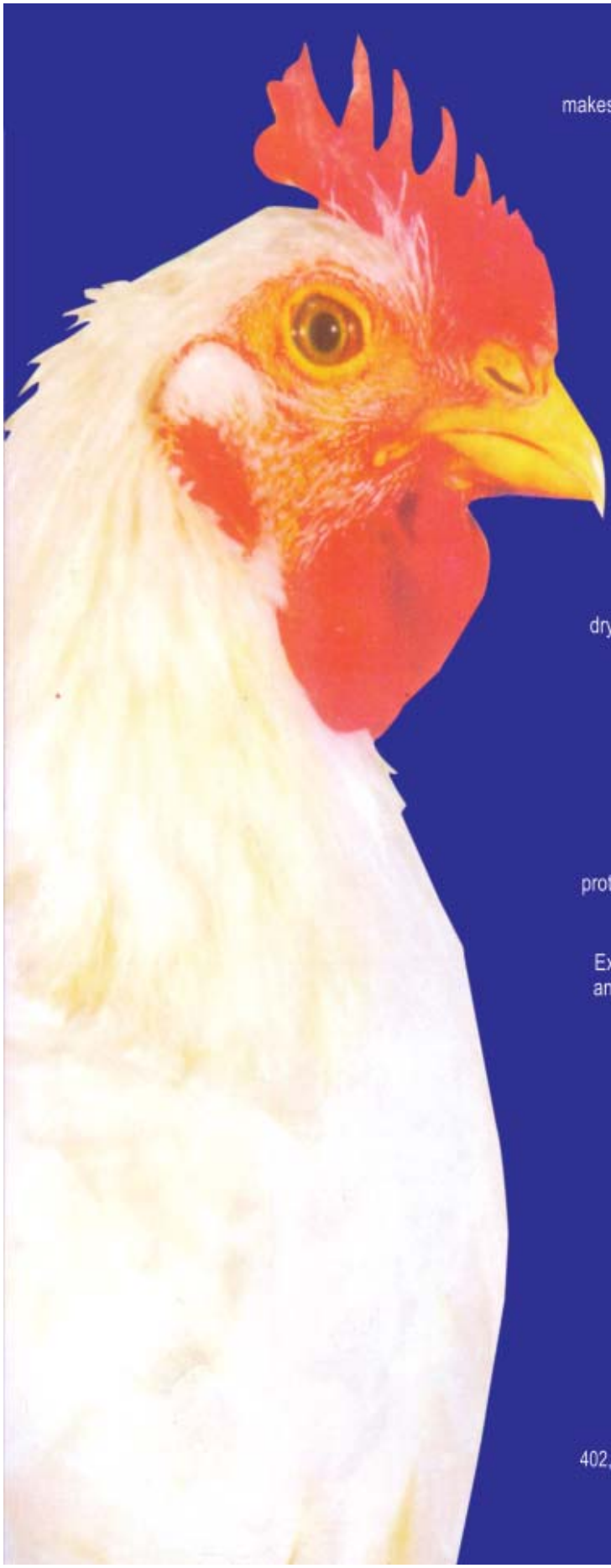

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September 2019

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Dates and Venue will be announced soon...

PRESS RELEASE

Indian herbs conducted a 'Technical Seminar at Vijayawada' on "Phytogenic Feed Supplements (PFS) for sustainable and profitable Poultry farming"

Mr. Balaram Bhattacharya, giving corporate Presentation

INDIAN HERBS, the pioneer & global market leader and **No.1Company** in Herbal Animal Health Care Products Industry since 1951, conducted a Technical Seminar at Gateway Hotel, Vijayawada on its unique range of herbal poultry products on 26thFebruary, 2019. The aim of Technical Seminar was to spread the awareness about herbal poultry feed supplements which are the best alternatives of synthetic products and are helpful to reduce the production cost of feed for better profitability.

The technical seminar was conducted by highly professional marketing and technical team of **INDIAN HERBS.** Those present on the occasionwere Mr.Balaram Bhattacharya, Exec. Vice President (Mktg. & Sales), Dr.ShiviMaini, DGM (Technical), Mr.V. Rangacharya, Regional Manager, AP and Mr.A.Harikrishna, Area Manager, Vijayawada.**Dr.V.Ramasubba Reddy**,Retd. Professor & Head, Hyderabad was the **Chief Guest** of the Seminar.This Seminar was attended by the important Poultry Farmers and Feed Millers.

Dr. Ramasubba Reddy presenting technical presentation

The Technical seminar commenced with the welcome address of Mr.V. Rangacharya, Regional Manager, Andhra Pradesh. He greeted all the guests.

Dr. Shivi Maini, giving technical presentation of products

Mr.Balaram Bhattacharya, Executive VP (Marketing & Sales) had given corporate presentation on **INDIAN HERBS** and informed the participants about the activities being undertaken at R&D Centre of **INDIAN HERBS** for ensuring best quality and result oriented herbal poultry products. He has also informed the guests about the various achievements of **INDIAN HERBS** during its long journey since 1951. Today **INDIAN HERBS** is the leading company of the world which is providing the efficacious herbal products on much economical prices than synthetic products.

Dr.V. Ramasubba gave a detailed and comprehensive presentation on fundamentals of

Mr. Rangacharya giving welcome address

poultry management and practices. He apprised the participants that sound management practices are essential to optimize production and maximizing returns on investment. He elaborated the importance and benefits of alternate and natural feed additives in optimizing feed efficiency, nutrient utilization and for sustainable and profitable poultry farming.

Dr.ShiviMaini, DGM (Technical) gave detailed presentation on the products of **INDIAN HERBS** such as **BioCholine, Herbiotic FS, Herbal C, E-Sel Power, LivoLiv-DS, Animunin, MagaCal, ProLibid** etc. In the presentation she elaborated the unique features and benefits of the natural products of **INDIAN HERBS** and also showed results of the studies conducted on the products of **INDIAN HERBS** in India and abroad.

She mentioned that in view of major food and feed safety concerns, scientists, academicians and poultry producers around the world are looking towards the alternates to synthetic, chemical feed additives and antibiotic growth promoters (AGPs). Indian Herbs Phytogenic Feed Supplements (PFS) are natural, safe, highly efficacious, environmental friendly solutions for sustainable and profitable poultry production.

The participants had taken keen interest in the presentation and they appreciated the efforts of **INDIAN HERBS**for undertaking in-depth research based on latest techniques of molecular biology and genomics.

Mr.A. Harikrishna, Area Manager thanked all the participants for their active participation in the seminar.

It is high time that the farmers and consultants should support these eco-friendly cost saving natural poultry products for the common objective of profitable poultry farming



Audience at seminar

PRESS RELEASE

Cargill and Heifer launch Hatching Hope Global Initiative in India

Program will engage women poultry farmers to tackle hunger and poverty through the power of poultry.

(New Delhi, India) March 25, 2019 – Cargill and Heifer International have joined forces to create **The Hatching Hope Global Initiative**. The bold initiative aims to improve the nutrition and economic livelihoods of 100 million people around the world by 2030 through the production, promotion and consumption of poultry. Hatching Hope will work directly with women smallholder farmers, initially in India, Mexico and Kenya.

The initial phase of Hatching Hope in India will focus on improving the nutrition and income of 1.7 million peoplethrough backyard poultry farming and increased consumption of poultry products in Mayurbhanj, Odisha. The program will also expand its reach through innovative mass media and advocacy campaigns, highlighting the importance of poultry production and consumption for improved nutrition.Farmers will be connected to markets and equipped with the goods and services that they need to be successful participants in the poultry value chain.Hatching Hope will support farmers to bepart of the solution to bridging the global food and nutrition security gap and boosting the local economy.

ImreHavasi, Managing Director of Cargill'sanimal nutrition business in India said, "In India, communities will benefit from this program which will address poverty and malnutrition through access to efficient animal agriculture and high-quality protein diet. With this project, Cargill is helping transform smallholder farmers into highly productive and successful entrepreneurs who can lift their families and communities out of poverty."

"Through Hatching Hope, we're investing in smart, resourceful women farmers, working with them to improve their products and access new markets,"said Avni Malhotra, Country Director of Heifer India."We're excited to launch Hatching Hope along with Cargill to support poultry farmers in India, bringing Heifer's community-led development expertise to thisimportant global initiative."

Cargill and Heifer share a common belief in the power of poultry to improve nutrition and a commitment to improving the livelihoods of smallholder farmers. Heifer has a long-term presence, development expertise and strong relationships in rural communities that build social capital. Cargill has best-in-class expertise in animal health and productivity with deep knowledge in the poultry industry and the global market. Both have a strong global footprint and on-the-ground presence in developing countries and the ability to mobilize staff to address specific issues facing the poultry value chain in the countries where Hatching Hope will operate.

Learn more about the Hatching Hope Global Initiative and how to get involved at hatchinghopeglobal.com.

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About Cargill

Cargill's 155,000 employees across 70 countries

work relentlessly to achieve our purpose of nourishing the world in a safe, responsible and sustainable way. Every day, we connect farmers with markets, customers with ingredients, and people and animals with the food they need to thrive.

We combine 153 years of experience with new technologies and insights to serve as a trusted partner for food, agriculture, financial and industrial customers in more than 125 countries. Side-by-side, we are building a stronger, sustainable future for agriculture. For more information, visit Cargill.com and our News Center.

Cargill Helping the world thrive

About Cargill in India

In India, Cargill started operations in 1987. It has businesses in refined oils, food ingredients, grain and oilseeds, cotton, animal nutrition, bio-industrial and trade structured finance. Cargill in India market leading consumer brands of edible oils such as Nature Fresh, Gemini, Sweekar, Leonardo Olive Oil, Rath and Sunflower brand of hydrogenated fats. It also markets wheat flour under Nature Fresh brand.

The animal nutrition business of Cargill provides animal feed and premix and nutrition for aqua, dairy and poultry. It markets animal feed and premix under the brands such as Provimi, Purina, and EWOS. The Cargill's grains and oilseeds crush business originates grains and oilseeds at 200 storage locations. Overall the company employs more than 3,500 employees working across offices and plants and a network of offices, warehouses and depots.

HEIFER INTERNATIONAL

About Heifer International

Heifer International's mission is to end hunger and poverty while caring for the Earth. For 75 years, Heifer International has provided livestock and sustainable agricultural training to improve the lives of farmers and rural communities. Heifer currently works in 20 countries, including the United States, supporting communities to become self-reliant and farming families to reach living incomes. For information, visit Heifer.org, read our blog, follow us on Facebook, on Twitter @Heifer and @HeiferCEO or call 888.5HUNGER (888.548.6437).

About Heifer International in India

Heifer's India program started in 1955, when 20 Jersey cows were sent to India through the Ministry of Agriculture, Government of India. Since then Heifer has been working in disaster rehabilitation, technical training for the government on improved animal management practices, and to support local NGOs in Socio-Economic Development Projects.

In 2008, Heifer India was registered as a representative office and began partnering with local NGOs in Odisha, Bihar and Rajasthan to socially and economically empower marginalized communities. Currently, Heifer's programs are spread across 1,505 villages in these three states and aims to reach over 70,000 families across the country.We partner with institutions and stakeholders at every level to build an ecosystem that fosters scaling of community-based enterprises and generates sustainable and equitable return to the producers and small holder farmers.

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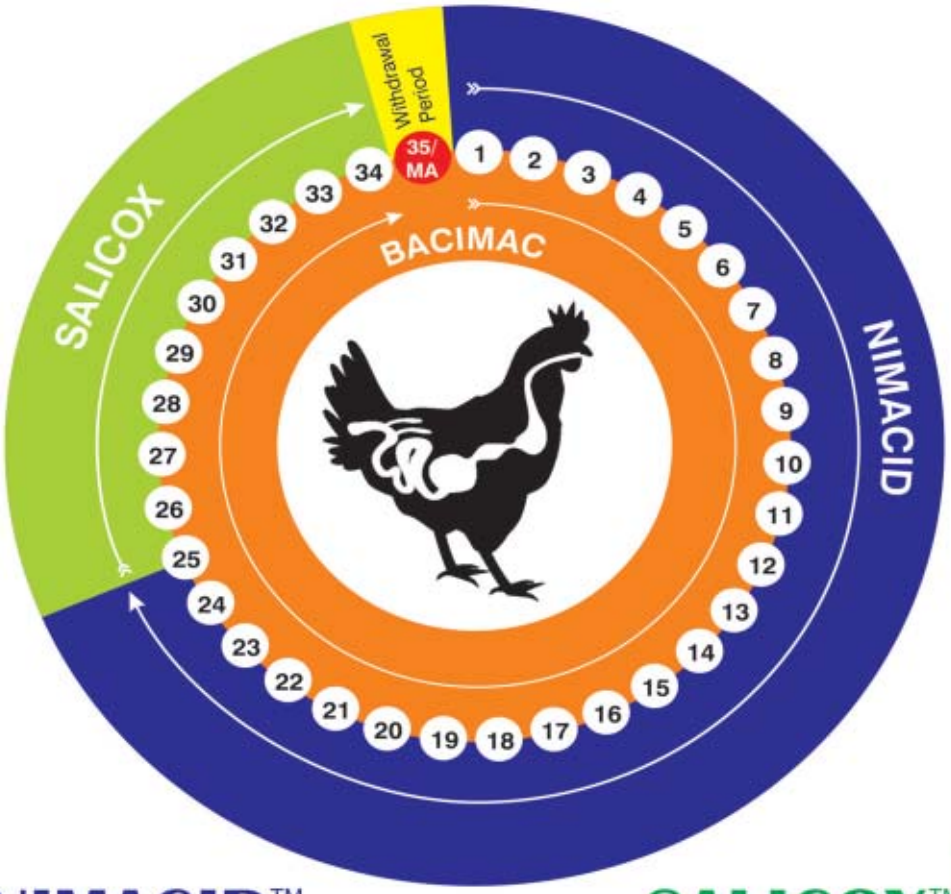

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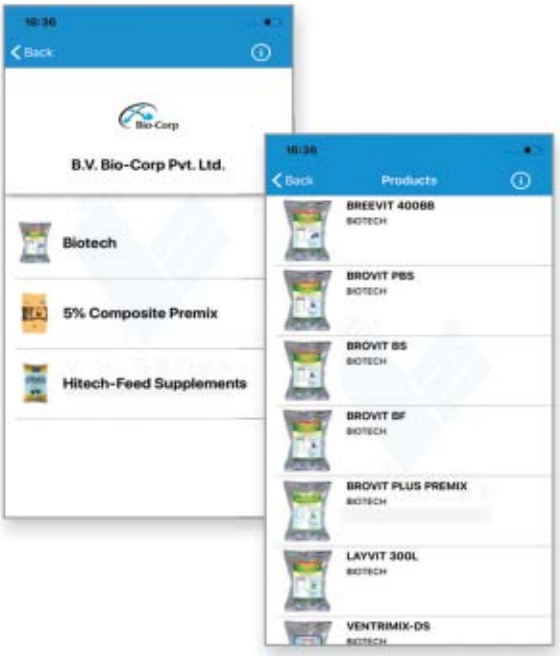

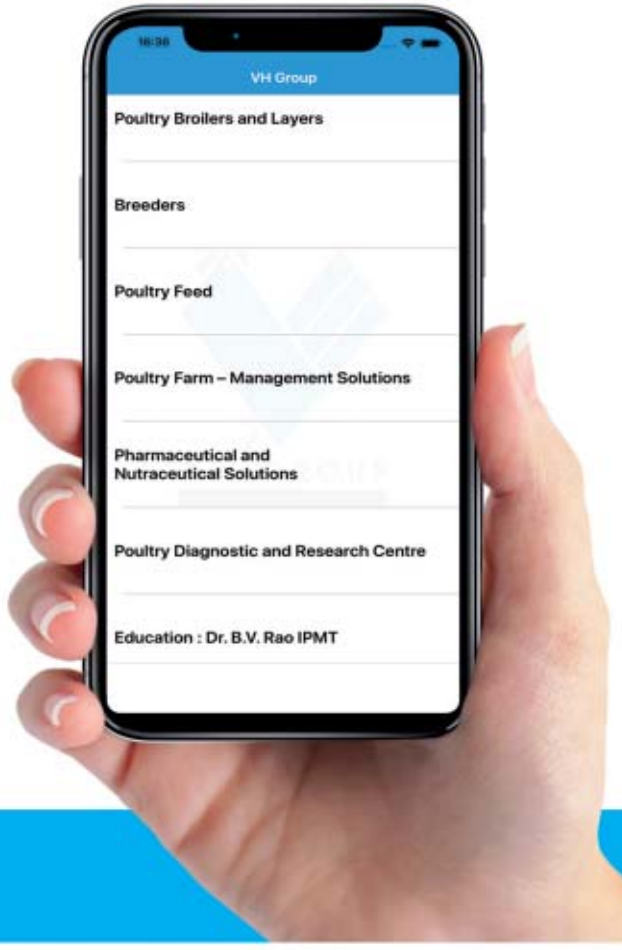

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