

Introducing

**YEATRACE™**

Organic Trace Minerals as Yeast Proteinates

## A step ahead in trace mineral nutrition

### Experience the benefits

- Better bioavailability of trace minerals
- Better trace minerals retention
- Better bond strength

### Peptide advantage

Yeast peptide complex ensures better bioavailability of trace minerals during times of stress.

### Usage

Broilers -	500 g per tonne of feed
Layers < 45 weeks -	350 g per tonne of feed
Layers > 45 weeks -	500 g per tonne of feed
Breeders -	1 kg per tonne of feed

Ensure thorough mixing in feed for best results.  
Recommended for use during pelletization.

### Pack & Presentation

10 kg paper poly laminated bag



# POULTRY HEALTH BULLETIN

An Inhouse Newsletter by Vamso Biotec Pvt. Ltd. dedicated to Poultry Customers *A Scientific Update*

Volume-VI No.1 Jan. - Feb. 2012

From Editor's Desk...

Dear Readers,

Firstly, I would like to apologize to all our readers for a long gap in the publication of Poultry Health Bulletin that happened due to some technical glitch. I assure that the same would not be repeated and we would put our best efforts for the timely delivery of the newsletter.

The current issue of the PHB covers an article on "Trace Minerals in Poultry" a topic of high interest amongst the poultry fraternity since the trace mineral supplementation has a direct impact on the farm productivity and profitability. The choice of right trace mineral is a must to maintain the farm economy. The current article covers all the important aspects of trace mineral nutrition in poultry including role of trace minerals, sources of TMs and their benefits, actions of various TMs and their deficiency symptoms. Also covered at length is the digestion and absorption of various forms of trace minerals. We are sure that the article would give very useful information and will assist in making a right choice of TMs.

We take this opportunity to congratulate Dr. S. Mahendran, Lotus Farms, Bangalore, Karnataka, who is the winner of Quiz No. 23. Dr. Mahendran will be awarded with a token gift and certificate of appreciation. The technical quiz is a regular part of PHB and based on the right responses a lucky winner is selected each time. We request you to continue your sincere participation in the technical quiz that is a simple means of updating the technical knowledge. We continue to offer the best of the products and services for the upliftment of the poultry fraternity.

We would like to shower our greetings for a very happy & prosperous new year ahead.

Wish you a happy reading...

Mukesh Agarwal

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The information & views shared in the newsletter are directed towards upliftment of poultry industry. It does not necessarily imply the publisher's endorsement.

### LATEST DEVELOPMENTS IN POULTRY INDUSTRY

#### In ovo vaccination technology

More than 80% of the U.S. broiler industry has converted to the in ovo vaccination process for control of Marek's disease. Providing certain criteria are met, including timing and site of vaccine placement, vaccine mixing, machine sanitization, and hatchery management specifications, this has proven to be an efficacious and convenient method of vaccination. Efforts to extend the technology for other viral vaccines including Newcastle, bronchitis and bursal disease and bacterial and parasitic vaccines are in progress. Collectively, these studies demonstrate that in ovo vaccination technology using approved vaccine is a safe, efficacious and convenient method for vaccination of poultry.

#### Centre Urged to Support Poultry Sector's R&D Efforts

The Union Minister of State for Agriculture and Food Processing Industries, Charan Das Mahant, has urged representatives of the poultry sector to put forth their suggestions in the next couple of months to be incorporated in the 12th Five-Year Plan. Inaugurating Poultry India 2011, the Minister said poultry continued to be one of the most resilient fast-growing sector among agriculture and allied sectors in the country. The meet saw representatives of the sector seeking research and development support and an enabling policy network from the Government of India. The Andhra Pradesh Minister for Information Technology, Ponnala Lakshmaiah, a poultry farmer himself, said the Centre should constitute a task force to solve the sector's problems.

#### Mass application of live vaccines

Most broiler companies still use eye drop and intranasal vaccine administration methods to deliver live vaccines to the birds. Such individual vaccine application methods have the benefits of ensuring that every bird receives one full dose of vaccine. However, in a commercial chicken flock of many thousand individual vaccination can be outweighed by the increased stress caused to the birds as a result of individual catching, handling and vaccine application. The impact of this on the birds is visible and measurable: reduced weight gain, poor uniformity and eventually vaccine reactions. Mass vaccine application methods are less stressful for the bird but require careful management if they are to be as effective as individual vaccine administration.



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## TRACE MINERALS IN POULTRY

Trace minerals are the elements which are required in traces or small amounts but are highly essential for various physiological functions of poultry. The important trace minerals in poultry are Iron (Fe), Manganese (Mn), Copper (Cu), Zinc (Zn), Iodine (I), Chromium (Cr) and Selenium (Se). The trace minerals are highly useful in poultry nutrition since they affect the metabolism of all important nutrients. The trace minerals act as coenzymes to catalyze various metabolic reactions throughout the bird's body. In poultry, trace minerals affect growth, FCR, livability, skeletal development, egg quality and hatchability. In addition the trace minerals provide antistress and free radical scavenging activity that improves the cellular activity of various organs. Nutritional therapy of various diseases by the means of trace minerals supplementation is now-a-days being adopted. The trace minerals are supplemented in poultry ration either in Inorganic form or Organic form, the organic form being more bio-available to the birds. While the inorganic form is available as mineral salts and ores, the organic form is synthesized as chelates of various compounds viz., organic acids, amino acids, peptides, proteins & carbohydrates. The recent advancement in trace mineral nutrition is the development of Yeast proteinates wherein the trace minerals are biologically chelated to yeast peptides through the process of fermentation.

### Sources of Trace minerals

**Inorganic sources:** Mineral salts (oxides, chlorides, carbonates, sulphates etc.)

- Natural sources of inorganic trace elements are rock phosphate, green sand, granite dust, basalt.
- Sulfates of Zn, Fe, Cu and Mn, Citrate of Cu, Oxide and monoxides of Mn, Zn, carbonate, chloride of Zn are generally used.

**Organic sources-** Chemically or biologically chelated trace minerals

- Chelated minerals (can be chelated with organic acids, amino acids, proteins, carbohydrates, peptides etc.)
- Yeast Proteinates These are biologically chelated trace minerals produced by fermentation with yeast

### Types of organic trace minerals

- Metal (Specific Amino Acid) Complex: Product resulting from complexing a soluble metal salt with a specific amino acid.
- Metal Amino Acid Complex: Product resulting from complexing a soluble metal salt with an amino acid(s).

- Metal Amino Acid Chelate: Product resulting from the reaction of a metal ion from a soluble metal salt with amino acids with a molar ratio of one mole of metal to one to three (preferably two) moles of amino acids to form coordinate covalent bonds.
- Metal Proteinate: Product resulting from the chelation of a soluble salt with amino acids and/or partially hydrolyzed protein.
- Metal Polysaccharide Complex: Product resulting from complexing a soluble salt with a polysaccharide solution declared as an ingredient as the specific metal complex.
- Metal Propionate: Product resulting from the reaction of a metal salt with propionic acid.
- Yeast Proteinates: Product resulting from biological chelation of metal ion with yeast peptides through the process of fermentation.

### Common dietary source of trace minerals

**Iron:** Bone meal, liver and meat meal, yeast.

**Zinc:** Wheat standard middlings, safflower seed oil meal, molasses, fish meal, yeast, corn soya meal.

**Copper:** Liver meal, corn distillers dried soluble, dried whey, peanut meal, cotton seed meal, fish meal.

**Manganese:** Whole rice, maize.

**Iodine:** Fish meal, meat and bone meal, molasses, synthetic iodized salts.

**Selenium:** Liver meal, fish meal.

### Role of trace minerals in poultry

- ❖ TM govern the metabolism of carbohydrates, fats & proteins
- ❖ Zn, Mn and Cu are important activators and cofactors of several enzymes catalyzing metabolic activities
- ❖ Mn & Se protect cells against damaging effects of free radicals from tissue oxidation
- ❖ Zn, Mn, Cu & Se collectively strengthen the defense mechanisms of immune system
- ❖ Zn, Mn & Cu help enhancing the fertility and hatchability
- ❖ Zn and Mn are the cofactors and /or structural components of carbonic anhydrase which are inherently involved in egg shell formation
- ❖ Chelated trace minerals lowers levels of lipid hydroperoxidase indicating lower oxidative stress

### Actions of various trace minerals

**Zinc:** Zn plays an important role in poultry particularly in layers as a component of a number of metalloenzymes such as carbonic anhydrase which is essential for egg shell formation in the hens shell gland. The others are carboxy peptidase and DNA polymerase. These enzymes play important roles in the hen's immune response, skin and wound healing and for hormone production. Classic deficiency symptoms of a Zn include immunosuppression, poor feathering, and dermatitis, infertility and poor shell quality. Zn-dependant enzyme collagenase is reduced in the tibia during Zn-deficiency. This suggests that effects of Zn on bone may be the result of decreased bone collagen turnover. Zn is essential for regulation of DNA transcription which controls the differentiation of many cell types, including T-lymphocytes and myeloid precursor cells. Chicken maintained on a Zn-deficient diet are unable to produce antibodies against T-cell dependant antigens even though lymphocytes are capable of immunoglobulin production. Zinc is literally essential for embryonic development of all species, including poultry.

**Copper:** Copper is closely associated with iron as it is a part of ceuloplasmin involved in RBC production. Its deficiency cause microcytic hypochromic anaemia. Cu with lysyl oxidase helps in elastin, collagen synthesis which prevents tibial dyschondroplasia. It also helps for feather development and its colour by disulfide bond formation. Cu deficiency is associated with changes in the central nervous system that may affect the developing embryo. These may be related to reduced activity of cytochrome c oxidase, a Cu containing enzyme in the electron transport chain. Cu is also required for the development of strength and elasticity of the skin. Cu is involved in pigmentation because the enzyme polyphenoloxidase which catalyzes the production of melanin is a Cu containing enzyme.

**Manganese:** Manganese helps in the formation of chondroitin sulfate. This mucopolysaccharide is an important component of bone cartilage. Its deficiency results in perosis, bone shortening, bowing, poor egg shell quality, low hatchability of fertile eggs and chondrodystrophy in embryos. The peak of mortality for such embryos occur on the 20th and 21st days of incubation. Chondrodystrophic embryos are characterized by very short, thickened legs, short wings, parrot beak, globular contour of head, protruding abdomen and retarded body growth. Chicks hatched from eggs produced by hens fed a diet deficient in Mn sometimes exhibit ataxia, particularly when excited. Ataxic chicks grow normally and reach maturity but fail to recover completely. They also retain the short bones characteristic of embryos and newly hatched chicks from Mn-deficient dams.

**Selenium:** Selenium with glutathione peroxidase functions in the cell as its first line of defence against oxidation. Se with Vit-E boosts immune status of poultry. Dietary Se improves vitelline membrane strength without affecting yolk Se content. Chicks severely deficient in Se exhibit poor growth and feathering, impaired fat digestion, pancreatic atrophy and fibrosis.

**Iron:** Iron is an essential component of heme the porphyrin

nucleus of hemoglobin and the cytochromes and is a component of several enzymes including catalase, peroxidase, phenylalanine hydroxylase, tyrosinase and proline hydroxylase. Iron deficiency results in a hypochromic, microcytic anemia and reduced concentration of non heme Fe in plasma and prevents normal feather pigmentation in breeds having coloured plumage. A deficiency in laying hens also causes anemia in the developing chick embryo and reduced hatchability. Chicks that survive incubation are weak and listless, however, they recover when given supplemental Fe. The hemoglobin level of hens falls with the beginning of egg production, but this apparently is not related to the Fe or Cu content of the diet. Since the hemoglobin level rises rapidly with onset of broodiness, it is more probable that low levels prevailing in egg production are caused by changes in hormone activity rather than Fe or Cu deficiencies. Considerable research information has been reported on the effects of iron deficiency and its relationship to microbial growth and infections in animals. A deficiency of iron appears primarily to effect the antibody formation associated with B-cell lymphocytes.

**Chromium:** For approximately 40 years chromium has been considered by many nutritionist as an essential nutrient for animals. Cr which exists in nature mostly in the trivalent form (Cr+3) is thought to be essential for activating certain enzymes and for stabilizing proteins and nucleic acids. Its primary role in metabolism however is to potentiate the action of insulin through the presence in an organometallic molecule called glucose tolerance factor (GTF). Research also has shown that supplementation of dietary Cr is beneficial for animals undergoing stress conditions. It is reported that Cr is needed for the normal glucose utilization. The importance lies in the fact that it acts as a cofactor with insulin at the cellular level through the formation of a complex with membrane sites, insulin and chromium. In the metabolism of lipids it might have got a significant role since it has been observed that when Cr is added to low Cr diets it reduces the level of serum cholesterol. Similarly Cr is also involved in protein metabolism. The amount of chromium in body tissue is maximum at birth, falls quite rapidly during the early years of life and then levels off throughout the rest of life.

**Iodine:** Traces of iodine are required for normal functioning of the thyroid gland in poultry as in other animals. Thyroxine contains approximately 65% iodine and acts as an important regulating agent in body metabolism. When the intake of iodine is suboptimal the thyroid tissue enlarges and goiter results. It is reported that iodine deficiency results in enlarged thyroid and in some cases lower body weight in growing chicks. The congenital goiter develops in baby chicks hatched from hens receiving 0.025 ppm iodine in the ration and mortality late in incubation is retarded. Embryo size was reduced and yolk sac resorption was retarded. Use of 0.25% iodized salt in chicken and turkey rations should prevent development of iodine deficiency. It was recently reported that dietary supplements of iodine increased the permeability of egg shells and hatchability of turkey eggs. Iodine

deficiency in poultry has been largely offset by widespread use of iodine either in ionized salt or as part of the trace mineral premix.

#### Deficiency conditions of various trace minerals

**Mn:** Shortened bones, perosis, skull deformities, parrot beak, low egg production.

**Zn:** Skeletal deformities involving the head, limbs and vertebrae, faulty spine and limb development, caudal part of trunk absent, small eyes, limb missing.

**I<sub>2</sub>:** Enlarged thyroid gland, incomplete closure of navel, prolonged incubation time, decreased hatchability, decreased egg production.

**Se:** Exudative diathesis, poor growth and feathering, impaired fat digestion, pancreatic atrophy, fibrosis.

**Fe:** Hypochromic, microcytic anaemia, reduced hatchability.

**Cu:** Anaemia, improper feather pigmentation, aortic rupture, bone fragility,

#### Economical aspects of trace minerals:

Meat yield and product quality have become driving forces in broiler production and nutritional products that improves processing yield have become important tools for broiler companies interested in increasing broiler product output. In addition, fillet colour measurements indicated that broilers fed OTMs showed darker fillets with soft and juicy meat. Organic trace mineral in diet also improves the egg quality, both internal and external, and it is also associated with better selection percentage in breeder flock along with an improvement in hatchability.

#### Inorganic Vs Organic forms of Trace Minerals

Historically, trace minerals have been supplemented in poultry diets using the inorganic salts such as Zn and Cu oxide (ZnO, CuO) or Zn and Cu sulfate (ZnSO<sub>4</sub>, CuSO<sub>4</sub>). Inorganic minerals have also been used in the development of mineral requirements for poultry diets. However, use of inorganic salts can result in poor bioavailability of the minerals, primarily because of the numerous nutrient and ingredient antagonisms that impair absorption. Perhaps the most important antagonism in the mineral nutrition of poultry is that between the divalent minerals, including Zn and Cu, and phytate. Phytate is able to form chelates of these minerals that are very stable and highly insoluble. The antagonism is mutual in that the binding of calcium, Zn and other minerals also reduces the availability of phytin phosphorous, even in the presence of exogenous phytase. Antagonisms also occur between one mineral and another. For example, high levels of Zn reduce the availability of Cu. The availability of inorganic sources of minerals can also be reduced by other nutrients; for example, Cu availability is reduced by ascorbic acid. The common denominator in these interactions is the dissociation of the inorganic salt in the relatively low pH of the upper gastrointestinal system. When the mineral reaches the higher pH of later gut segments it ionizes and can bind to a number of minerals, nutrients and non-nutritive

components of the digesta that render it insoluble. Insoluble forms of minerals are excreted.

The advantage of organic trace minerals is that the binding of the mineral to the organic ligand provides stability to the complex in the upper gastrointestinal system. Organic trace minerals resist dissociation in the crop, proventriculus and gizzard, thus allowing the intact complex to be delivered to the absorptive epithelium of the small intestine. It should be noted that different organic ligands will not necessarily increase the bioavailability of a given mineral to the same extent. The reason to feed an organic trace mineral (OTM) over an inorganic trace mineral (ITM) is to deliver more minerals to the blood and tissues of the animal. It is important to understand that because different OTMs use different ligands, not all OTMs accomplish this goal equally well. The peptide and amino acid linkage provides a better bio-availability hence are more effective in biological system. Yeast proteinates provide a better bio-availability, bond strength and retention compared to the other organic chelates because of the presence of peptide ligands that offers more absorption sites and stronger bond strength to prevent dissociation. This superior bioavailability of OTMs helps producers address some of their key production challenges including meat and egg quality, better productivity, structural integrity and protection against oxidative stress, while reducing the environmental deposition of trace minerals.

#### Advantages of inorganic trace minerals:

- ❖ Easy availability
- ❖ Low cost

#### Limitations of Inorganic Trace Minerals

- ❖ Invariably ionize and interact with bioinhibitors in gut (phytates, tannins, enzymes etc.)
- ❖ Low bioavailability of nutrient mineral
- ❖ Limited use in special physiological or biological demands
- ❖ Uncertainty in availability of nutrient to animals
- ❖ Scope of toxicity to animal
- ❖ Source for environmental pollution
- ❖ Excretion via feces

#### Advantages of organic trace minerals

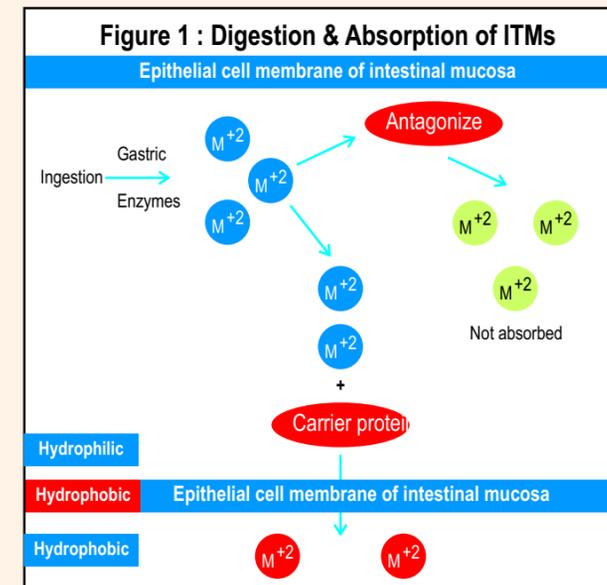
- ❖ Do not ionize in gut
- ❖ Bioinhibitors cannot interact
- ❖ Absorbed directly and without change in conformation
- ❖ Stable in both acid and alkaline pH
- ❖ Better bioavailability and retention in the body

#### Disadvantages of OTM

- ❖ Higher cost
- ❖ Not easily available.

#### Digestion and absorption of trace minerals

Firstly mineral source undergoes solubilization from the original mineral source in the gastrointestinal lumen before entering into circulation. This process is pH dependant and therefore the acidic environment in the proventriculus enhances solubilization whereas the neutral or alkaline pH of the small intestine reduces it. Solubilized metals in the gastric environment can potentially form insoluble precipitates in their course through the small and large intestine. The presence of active ligands such as phytic acid can intensify the formation of



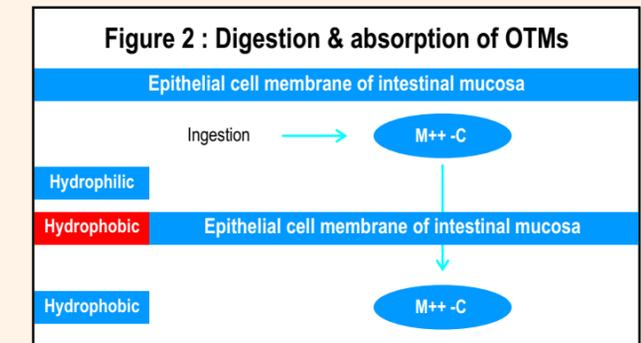
precipitates. This situation is significant in high phytate diets such as those with high levels of soybean meal or rice bran and can strongly affect minerals availability. (Refer figure 1).

In case of chelated minerals due to their stability and small size most chelated minerals are not altered during their passage through the digestive tract. They are not altered during the course of transport at crop, proventriculus and stomach region and are completely available for absorption with no breakdown of their organic ligand. (Refer figure 2).

#### Absorption from gastrointestinal tract

ITMs possess an inherent property to ionize and antagonize due to the presence of variety of antagonizing agents present in the GI tract. Some of the common examples of antagonizing agents are phytate, macro-minerals like Ca & P, Enzymes, other trace minerals etc. The trace minerals subsequent to antagonism form a complex that cannot be further absorbed and is excreted. Small portions of ITMs that escape antagonism can only be absorbed through the small intestine subject to the availability of carrier proteins present in the enterocyte membranes. The ITMs binds to the carrier protein that transport it through the intestinal layer. Rate of absorption varies between various metals. (Refer figure 1).

The organic (chelated) minerals are chemically inert due to



covalent and ionic bonds between the minerals and the ligand and therefore are not affected by factors that lead to precipitation as it happens to minerals ionized after salt solubilization. Due to their stability and small size most chelated minerals are not altered during their passage through the digestive tract and are completely absorbed with no breakdown of their amino acids. Some minerals can be chelated to 2 or 3 amino acids and absorbed as di or tripeptides. After absorption the final separation of the metal from the chelate is expected only when the final physiological site is reached. Therefore chelated minerals are absorbed and transported as integral part of an organic molecule until effectively used. (Refer figure 2).

#### CORRECT RESPONSES OF QUIZ NO. 23

1. d) 300 ppm
2. c) Both of the above
3. b) 20-25%
4. d) All of the above
5. d) All of the above

#### WINNER OF THE QUIZ NO. 23

The winner of the Quiz No. 23, March - April, 2011 is **Dr. S. Mahendran**, Lotus Farms, Bangalore, Karnataka. He was adjudged winner on the basis of lucky draw from the lot of correct responses received by us. Let us all congratulate **Dr. S. Mahendran**. He gets a certificate of appreciation & a token gift. The prize along with the certificate will be sent directly to the winner within 15 days.

### Trace mineral metabolism in avian embryo

Trace mineral metabolism in the developing avian embryo begins with the formation of the trace mineral stores contained within it. Vitellogenin, the yolk precursor protein, serves as a trace mineral transporting protein that mediates the transfer of these essential nutrients from stores within the liver of the hen to the ovary and developing oocyte, and hence, to the yolk of the egg. Lipovitellin and phosvitin, derived from intraoocytic proteolytic processing of vitellogenin, are also trace mineral binding proteins that form important storage sites within the granule sub-fraction of yolk. The mobilization and uptake of egg trace mineral stores is mediated by the extra-embryonic membranes, principally the yolk sac membrane. The yolk sac also serves as a short-term storage site for trace minerals. Because it is an important site of plasma protein synthesis, the yolk sac has the ability to regulate the export of trace minerals to the embryo during development. Within the embryo, specific metallo-proteins function in the inter organ transport cellular uptake, and intracellular storage of trace minerals. Thus, embryonic trace mineral homeostasis is established through the coordinated actions of the yolk sac, which mobilizes and exports trace minerals derived from egg stores; the vitelline circulation, which transports them to the embryo; and the liver, which accumulates trace minerals and distributes them to the rest of the tissues of the embryo via the embryonic circulation.

#### Key points

- ❖ Trace mineral are highly essential for poultry.
- ❖ Organic forms are more advantageous than inorganic form.
- ❖ Proteinates are more useful than organic chelates since they have better bioavailability and retention in the tissues
- ❖ Role of trace minerals in immunomodulation is crucial.

- ❖ Oxidative stress can be reduced by the supplementation of trace minerals.
- ❖ Trace minerals are very useful in improving the skeletal development and egg quality
- ❖ Trace minerals improve the quality of produce (meat and egg) and improves the processing yield
- ❖ Trace minerals are important for maintaining the reproductive efficiency of hens and it accounts for the improvement in hatchability
- ❖ Feeding organic minerals replacing inorganic sources may have benefits in FCR in young broilers.
- ❖ Trace minerals can limit various diseases in poultry birds
- ❖ Progeny from hens fed organic trace minerals (OTM) appear to have an advantage in cellular immunity after hatch compared to those fed inorganic trace minerals (ITM).
- ❖ OTM are more stable than ITM at upper gastrointestinal tract minimizing losses to antagonists.
- ❖ Due to higher bioavailability of OTMs low level is included in diet resulting in reduced excretion to environment.
- ❖ Broiler producers and nutritionists in countries and regions with ground water pollution due to excess mineral levels can utilize organic minerals in poultry diets to reduce the risk of contamination from manure without compromising animal performance.

Services being offered by **Vamso Biotec Pvt. Ltd.**

### ASK THE EXPERT

Ask The Expert is a specialized service being initiated by Vamso Biotec Pvt. Ltd., that connects the poultry customers all across India to the experts of poultry industry. This service can be used to get an answer to any of your query pertaining to the field of poultry nutrition, disease and management. Your query will be answered by the top most poultry experts in India.

Send in your query to us through post, fax or E-mail and get an answer within 15 days by the top most poultry experts of the country.

Please mention your name and full address along with telephone number and E-mail for correspondence.

Please mention "Ask The Expert" on the envelope or post card.

### CUSTOMER LOYALTY PROGRAM

Customer Loyalty Program is the service being initiated by Vamso Biotec Pvt. Ltd. for its loyal customers. This service can be utilized to get your poultry feed analyzed from one of the best feed analytical laboratory in India.

After every three purchase of Vamso Biotec products, you will receive a free feed testing coupon that can be utilized for feed testing at **Animal Feed Analytical and Quality Control Laboratory, Namakkal.**

*For details about the service, please write to us*

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## VAMSO BIOTEC PVT. LTD. PARTICIPATION IN POULTRY INDIA 2011

**Vamso**  
Biotec Pvt. Ltd.  
An ISO 9001:2008 & GMP Certified Company

Vamso Biotec Pvt. Ltd. (VBPL), a company known for its innovative 'Natural and Biotechnology' range of poultry health care products, participated in Poultry India 2011, Hyderabad with great zeal and enthusiasm. A fine display of company's flagship products along with company's vision, mission and landmarks was done.



The sales, marketing and technical team was present to provide quality service to the visitors from all facets of the industry. During the three day exhibition (23rd to 25th November, 2011), there was a great influx of visitors from all across the country and abroad. Apart from the key Indian visitors, a lot of foreign customers including those from Taiwan, Bangladesh, Oman, Egypt, Africa, Sri Lanka, U.S.A. and Europe visited the stall to understand the



products and services being offered by the company along with the possibility of business tie-ups. The corporate heads and their representatives, academicians, students and media persons also visited the stall and had a fruitful discussion. The technical interaction with the visitors was well supported by the company brochures and literatures. The visitors emphasized their faith in the VBPL products and services. The visitors were full of praise for the products and services. The participation of VBPL was highly appreciated by all types of customers. The customers were very optimistic about the future of the poultry market that made the show a grand success.

