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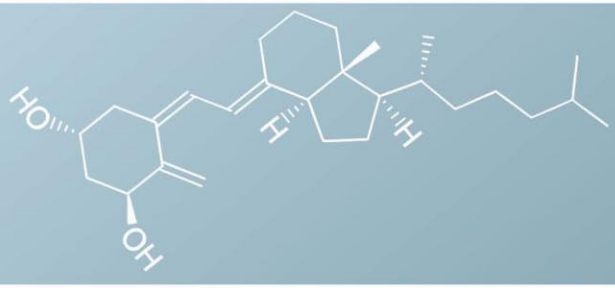

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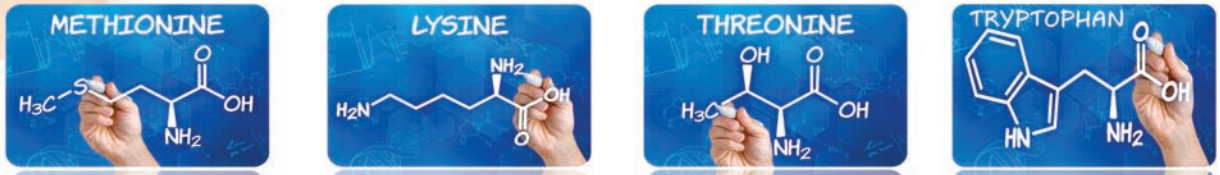

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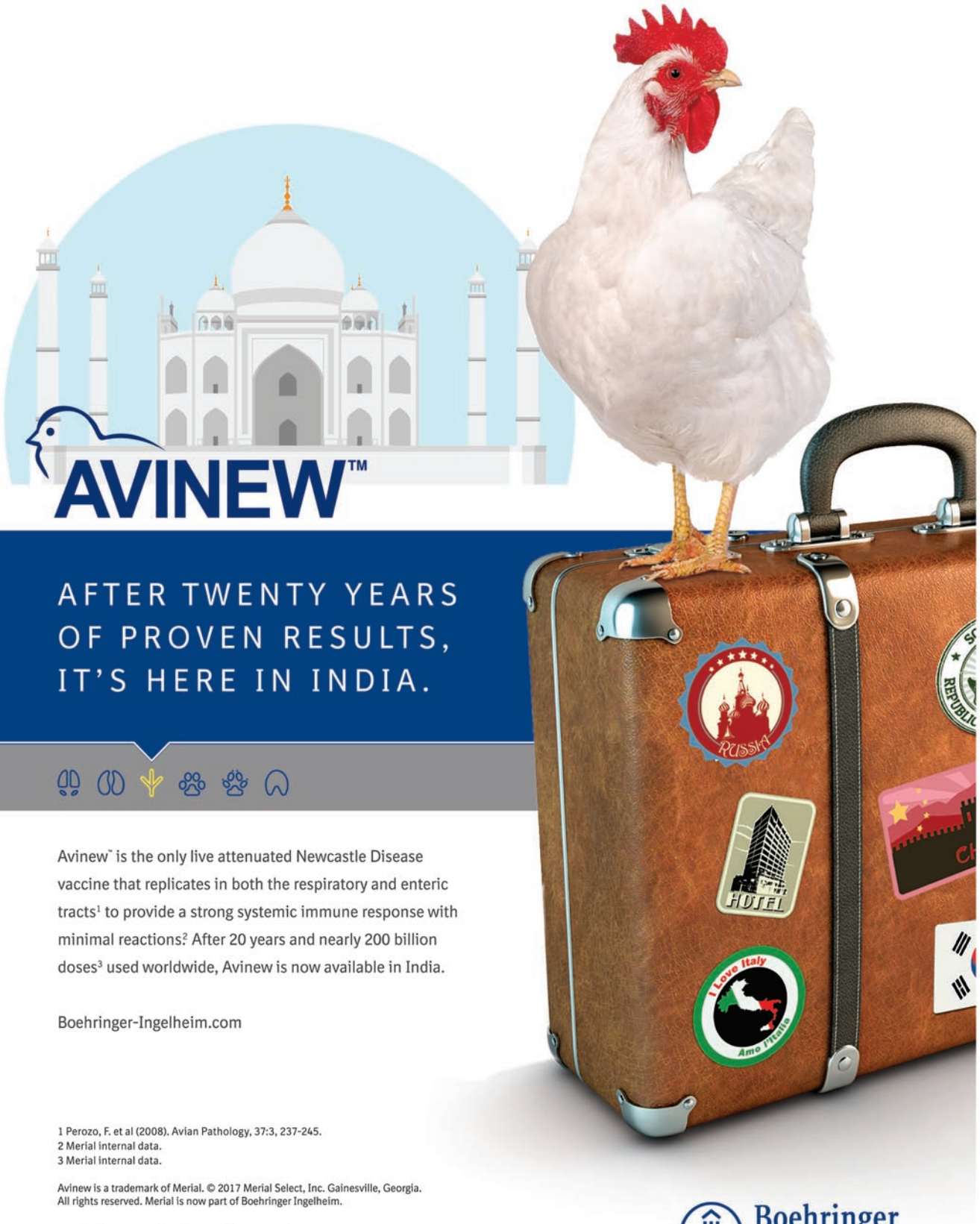
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1 Perozo, F. et al (2008). Avian Pathology, 37:3, 237-245.
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INDEX OF ADVERTISEMENTS

Female Avian Reproduction: Formation of Egg and its Managements

[1]Karuna P. Bambode &[1]Rajesh Kumar
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In almost all species of birds, including poultry, only the left ovary and oviduct are functional. In early stages of embryonic development, each female bird has two ovaries, only the left one develops into a functional organ. The right one typically regresses during development and is nonfunctional in the adult bird.In some birds, such as hawks, the right ovary and oviduct usually develop. The demand for calcium to make the egg shell is very high, and so the circulating levels of blood calcium in birds are greatly elevated compared to mammals.

Avian Reproduction:

Ovary

Ovary is located in the laying hen just in front of the kidneys in the abdominal cavity and is firmly attached to the wall of the cavity. The ovary is well endowed with blood vessels to ensure there is no hindrance to the transport of nutrients to the developing yolk.A mature ovary looks like a cluster of grapes and may contain up to 4,000 small ova which can develop into mature ova. The ovary enlarges greatly during the breeding season. When the hen is in lay the ovary will be active. The size of the follicles will vary from very small to those approaching the normal yolk size in the egg which can be up to 40 millimetres in diameter, and will contain a fully matured yolk ready for release into the oviduct. To find the five stages of development in the active ovary:

1. Primary follicles – follicles that have not yet commenced to grow
2. Growing follicles
3. Mature follicles – follicles ready or nearly so for release
4. Discharged follicles – where the yolk has just been released
5. Atretic follicles – those from which the yolk has been released some time ago

Yolk

It takes approximately 10 days for a yolk to develop from the very small to the normal size found in eggs and during this time it is contained in the follicle. The follicle acts as a sack during this period of development supplying it with the nutrients required for its growth. When a mature follicle is examined an elongated area virtually free of blood vessels will be found on the distal surface of it. This area, called the **stigma**, is where the follicle normally splits to release the yolk into the oviduct. If, for some reason, the follicle splits at other than the stigma, the numerous blood vessels that rupture will result in free blood being found in the egg i.e. a blood spot will form.

Oviduct and Formation of egg

The reproductive system becomes active, it grows to a length of 70-80 centimetres with a variable diameter depending on the function. The oviduct opens medially to it in a funnel-shaped ostium. Ovulation results in the release of an egg from a mature follicle on the surface of the ovary.The oviduct consists of five distinct parts or sections, each having different functions:

- Infundibulum
- Magnum or ampulla
- Isthmus
- Uterus or shell gland
- Vagina
- Cloaca

1. Infundibulum (or funnel):

The first part of the oviduct, the **infundibulum** is 3 to 4 inches long and engulfs the ovum released from the ovary. This section has very thin walls and

is 6-9 centimetres long. The yolk remains in the infundibulum for 15 to 17 minutes. Fertilizationoccurs in**Infundibulum of oviduct.**

2. Ampulla or magnum:

The next section of the oviduct is the **magnum**. At 13 inches long, it is the largest section of the oviduct. The yolk remains here 3 hours, during which time the thick albumen (egg white) forms. At approximately 40 centimetres long it secretes more than 40% of the albumen.

Albumen in a normal egg consists of four different layers as follows:

Albumen layer	Percentage (%)
Chalazae and the chalaziferous layer	2.7
Liquid inner layer	17.3
Dense layer	57.0
Outer liquid layer	23.0

3. Isthmus:

The third section of the oviduct is the**isthmus,** which is 4 inches long. At about 12 centimetres in length, it secretes some albumen and the shell membranes. The isthmus is where the inner and outer shell membranes form. The developing egg remains in Isthmus for 75 minutes.

4. Uterus or shell gland:

The next section of the oviduct is the **shell gland**, which is 4 to 5 inches long. At about 12 centimetres in length it secretes about 40% of the albumen and the egg's shell. The shell largely is made of calcium carbonate. The hen's body mobilizes 8 to 10 percent of body calcium from its bones to make the egg's shell. Bone calcium provides 47 percent of the calcium required to make a shell. Pigment deposition, if there is any, occurs in the shell gland. The egg remains in uterus for 20 or more hours.

5. Vagina: The last part of the oviduct is the **vagina,** which is about 4 to 5 inches long. At about 12 centimetres in length, it secretes the egg's outer cuticle and possibly the shell pigment.The vagina does not really play a part in egg formation but is important in the laying of the egg. The vagina is made of muscle that helps push the egg out of the hen's body.

6. Cloaca

The egg is held in the cloaca immediately prior to being laid. It may be in the cloaca for several hours, but usually is held there for a much shorter time. Although the egg usually enters this organ small end first, it usually rotates there to be laid by the large end first. The time taken from ovulation until when the egg passes through the vent varies with individuals within the range of 23 to 26 hours.

There are many factors that influence egg quality:

1. Length of time in lay: The longer the bird is in lay, the weaker the shells will become because of her inability to obtain enough daily calcium from her diet to supply all of her needs for one egg. As a consequence, better layers will deplete their skeleton calcium supply.

2. Increased environmental temperature:

This results in reduced food consumption (and calcium) and the reduction of carbonate ions because of panting.

3. Egg laying time: Eggs laid early in the morning are more likely to have thinner shells than those laid by the same bird later in the day. This is because in the case of those eggs laid early the shells have been deposited during the hours of darkness when the bird does not eat, and therefore no dietary calcium for the shell formation.

4. Stress: Stressed birds lay thinner shelled eggs.

5. Body checked and misshapen eggs: Most of these defects are caused by the birds being startled shortly after the egg has entered the uterus and the first layers of calcium carbonate have been

deposited. At this stage the shell is very fragile and weak and when startled the hen's muscles contract (including those in the wall of the uterus) and thus crack the newly forming shell. These are covered by subsequent depositions of shell but the damage remains in the form of body checks and/or misshapen eggs.

6. Disease: Certain diseases can cause weak shell and misshapen eggs.

7. Drugs: Certain drugs influence eggshell formation and deposition.

8. The shell of an egg contains openings or pores. There are approximately 8,000 such pores in the shell of a normal hen's egg. The function of these pores is to provide for the gaseous exchange during incubation and embryonic development. The developing embryo requires oxygen and gives off carbon dioxide. When the egg is first laid most of the pores are closed. However, as the egg ages more and more pores open up. During the laying process the cuticle acts as a lubricant, but once laid, the egg's surface soon dries and the residue, which is mainly protein, closes off most of the pores as a barrier to the invasion of bacteria and fungi.

9. The color of the yolk comes from fat-soluble pigments, called xanthophylls, contained in the hen's diet. Hens fed diets with yellow maize (field corn) or allowed to range on grass typically produce eggs with dark yellow yolks. Hens fed diets with white maize, sorghum, millet, or wheat typically produce eggs with pale yolks.

Management of Laying Chickens

Feed a completely balanced ration. Feed an 18–20 percent protein starter for the first 6–8 weeks, and then feed a 14–15 percent protein grower or developer to 18 weeks of age. For laying hens over 18 weeks of age, feed a 16–18 percent protein layer ration with grit and a calcium source like oyster shells free choice in a separate feeder. Provide 3 inches of feeder space per bird. The lip of the feeder should be level with the birds back height and the trough feeder filled only one-third to one-half full to prevent feed wastage. Ventilation Windows or a fan should provide adequate ventilation to keep the pen dry. Floor space Allow at least 1.5 square feet per hen, although chicks can be started in a smaller brooding space at 0.5 square foot per bird for the first 6–8 weeks. Most laying pullets are housed in cages and should be moved to these facilities at least 1 wk before egg production begins. Breeders moved from a growing house to an adult house should also be given at least 1 wk to adjust to their new environment before the stress of egg production begins. Beaks should be retrimmed as necessary, and cull birds removed at the time of rehousing.Day length should be increased gradually as the pullets come into egg production and should reach a 14 to 16hr light period/day at peak production for both market-egg and hatching-egg layers. An intensity of at least 1 foot-candle of light (10 lux) about equal to one 60-watt light bulb to each 100 sq ft (~9 sq m), hanging 7 ft (2.1 m) above the birds. Production may decrease if day length or light intensity is reduced during the laying period. Successful intensive poultry keeping requires good records of all flock activities, including hatch date, regular body weights, lighting program, house temperatures, disease history, medication and vaccination dates, quantity and type of feed given.

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Economic importance and treatment of Vitamin-A deficiency

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[3]Principal Scientist and Head, Krishi Vignan Kendram, Guntur.

Vitamin A is unique in the sense that it is a requirement for all species of livestock, poultry and humans. It is easily furnished in the rations of cattle if they have access to good quality green hay, silage or pasture. Such roughages are rich in carotene, precursor of the vitamin, which is changed into active vitamin A upon absorption through the intestinal mucosa (Eden and Sellers, 1949 and Thompson et al., 1949). If the diet is inadequate for only a short period, enough of the vitamin A is stored in the liver to sustain the animal (Radostits et al., 2003). Primary vitamin A deficiency is noticed when the animals are not adequately supplemented with Vitamin A. Secondary vitamin A deficiency may occur in cases of chronic diseases of the liver or intestines because much of the conversion of carotene to vitamin A occurs in the intestinal epithelium.

Economic importance :-

Primary vitamin A deficiency is of major economic importance in groups of animals on pasture or fed diets deficient in the vitamin or its precursors. Animals at pasture receive adequate supplies of the vitamin, except during prolonged drought, but animals confined indoors and fed prepared diet may be deficient if not adequately supplemented. For example, a diet of dried sugar beet pulp, concentrates and poor quality sugar beet pulp, concentrates and poor quality hay can result in hypo-vitaminosis A in confined cattle. These conditions result in vitamin A deficiency characterized by night blindness, xerophthalmia, retarded growth rates, failures and increased mortality (Remillard et al., 1990). A maternal deficiency of vitamin A can result in herd outbreaks of congenital hypo-vitaminosis A in calves (Vander Lugt and Prozesky 1989). Blindness with dilated pupils, nystagmus, weakness and incordination were characteristics. The status of the dam is reflected in that of the fetus only in certain circumstances, in that carotene, as it occurs in green feed, does not pass the placental barrier and a high intake of green pasture before parturition does not increase the hepatic stores of vitamin A in new born calves, lambs or kids and only to a limited extend in pigs. However, vitamin A in the ester form, as it occurs in fish oils, will pass the placental barrier in cows. Feeding of these oils, or parenteral administration of a vitamin A injectable preparation before parturition, will cause an increase in stores of the vitamin in fetal livers. Young animals depend on the dam's colostrums for their early requirement of the vitamin A, which is always highest in colostrums and returns to normal levels within a few day of parturition (Radostits et al., 2003).

The continued ingestion of mineral oil, which occurs when the oil is used as a preventive against bloat in cattle, may cause a depression of plasma carotene and vitamin A esters and the carotene levels in buffer fat. In one study, 42-92 percent of the vitamin A in several mineral supplements was destroyed after one week of exposure to the trace minerals, high relative humidity, sunlight and warm temperature (Divers et al., 1986).

Treatment :-

Animals with curable vitamin A deficiency should be treated immediately with vitamin A such as injection Intavita (Intas Pharmaceuticals Ltd., Ahmedabad, each ml contains vitamin A as

palmitate 2,50,000 I.U., Vitamin D3, 25000 I.U.) at a dose rate equivalent to 10 to 20 times the daily maintenance requirement. As of an aquous rather than an oily solution is preferred. The response to treatment in severe cases is often rapid and complete, but the disease may be rapid and complete, but the disease may be irreversible in chronic cases. Calves with the convulsive form due to increased CSF pressure will usually return to normal in 48 hours following treatment. The injection of a mixture of Vitamin A, D and E fo feeder cattle in Northern Australia prior to transport did not, contrary to anectodal evidence, reduce weight loss associated with transportation (Jubb et al., 1993). The oral administration of single bolus of vitamin A at the dose of 2.8 mg/kg body weights to debilited cattle during dry period was effective in raising the milk levels of Vitamin A and was as effective as adding gm of the powder to the dringking water (Remillard et al., 1990).

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place	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Hyderabad	78	78	74	75	78	78	78	78	73	73	70	70	70	71	73	73	73	73	74	74	74	74	75	75	77	77	77	78	78	78	74
Karimnagar	78	78	74	76	79	79	79	79	74	74	71	71	71	72	74	74	74	74	75	75	75	75	76	76	78	78	78	78	78	78	75
Warangal	78	78	74	75	78	78	78	78	73	73	70	70	70	71	73	73	73	73	74	74	74	74	75	75	77	77	77	78	78	78	74
Mahaboobnagar	78	78	74	75	78	78	78	78	73	73	70	70	70	71	73	73	73	73	74	74	74	74	75	75	77	77	77	78	78	78	74
Kurnool	78	78	74	75	78	78	78	78	73	73	70	70	70	71	73	73	73	73	74	74	74	74	75	75	77	77	77	78	78	78	74
Vizag	85	80	78	78	78	78	78	78	72	72	70	70	70	70	72	72	72	72	73	73	73	73	73	73	73	73	73	75	75	75	75
Godavari	82	82	77	77	77	77	77	77	77	77	74	74	74	74	76	76	76	76	77	77	77	77	78	78	80	80	80	81	81	81	81
Vijayawada	82	82	77	77	77	77	77	77	77	77	74	74	74	74	76	76	76	76	77	77	77	77	78	78	80	80	80	81	81	81	81
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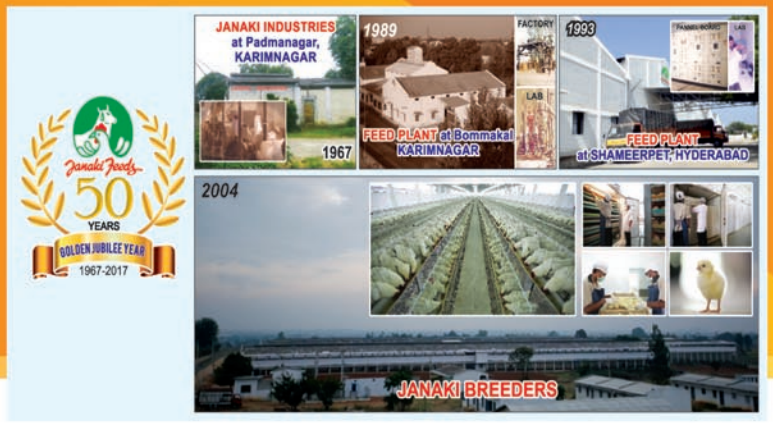

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*D. Michael Fry
Department of Avian Sciences, University of California, Davis, California
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Cardiovascular System of Poultry

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Dr.Suraj Amrutkar

Introduction:

Birds have evolved with a high performance cardio-vascular system to meet the rigorous demands of running, flying, swimming or diving in a variety of environments. Sustained high levels of activity in these environments place severe demands on the transport capabilities of the cardiovascular system to provide adequate delivery of oxygen to working vascular beds and to provide efficient removal of metabolic products. Furthermore, birds are homeothermic organisms and the cardiovascular system plays a major role in conserving and removing body heat.The cardio-vascular system not only delivers oxygen to body cells and removes metabolic waste but also plays an important role in maintaining a bird's body temperature. The avian circulatory system consists of a heart plus vessels that transport nutrients, oxygen and CO_2, waste products, hormones and heat. In birds, the blood vascular systems operate at much higher pulse rate and blood pressure level. The heart beats of a mature small fowl as a white leghorn is about 350 beats per minute. Larger breeds such as Rhode Island Red have lower rates averaging about 250 beats per minute.The blood of the fowl clots very rapidly.The major organ involved in this system is the heart, which is responsible for pumping and distributing blood to all parts of the body through veins, arteries and capillaries. This system provides the route of transportation to bring nutrients, enzymes, hormones, etc. to each part of the body, and helps to dispose the waste products of cells.

Position of heart in fowl and its structure:

In birds, the heart is located in the cranial part of the common thoraco-abdominal cavity, with its long axis slightly to the right of the midline. It is partly enclosed dorsally and laterally by the lobes of the liver. A very thin but tough, fibrous pericardial sac encloses the heart. This sac contains a small volume of serous fluid that provides lubrication for the rhythmic motion of the cardiac contraction cycle. The pericardium is loosely attached to the dorsal surface of the sternum and the surrounding air sacs and more firmly to the liver. It is also attached, via the peritoneum of the hepatic peritoneal cavities, to the vertebral column. These attachments secure the apex of the heart within the median incisura of the liver and in the caudoventral axis of the thoracoabdominal cavity. Apex is placed between the cranial parts of the lobes of the liver. Right auriculo ventricular valve is guarded by only one strong muscular leaf. The AV valves are thick. Birds, like mammals, have a 4 chambered heart (2 Atria and 2 Ventricle), with complete separation of oxygenated and de-oxygenated blood. The right ventricle pumps blood to the lungs, while the left ventricle pumps blood to the rest of the body. Because the left ventricle must generate greater pressure to pump blood throughout the body (in contrast to the right ventricle that pumps blood to the lungs), the walls of the left ventricle are much thicker and more muscular. Birds tend to have larger hearts the mammals (relative to body size and mass). Avian hearts also tend to pump more blood per unit time than mammalian hearts. In other words, cardiac output (amount of blood pumped per minute) for birds is typically greater than that for mammals of the same body mass. Cardiac output is influence by both heart rate (beat per minute) and stroke volume (blood pumped with each beat). Active birds

increase cardiac output primarily by increasing heart rate. The purpose of circulatory system is to transfer blood from the heart to the cells of the body, and return it. The avian heart, like of the mammals, is of four chambered, muscular fluid pump that intermittently pressurized the central arteries, inducing blood flow to the capillary beds of both the systemic and pulmonary circulation. When compared with mammals, birds of a given body mass have a significantly heavier heart. This may be due to the high aerobic power input needed to sustain flapping flight. Furthermore, unlike mammals in which heart mass is almost directly proportional to body mass. This means that larger birds like swans, ducks and geese tend to have proportionality much smaller hearts in relation to their body mass than do smaller birds. Thus, the heart represents about 1.1% of body mass for a bird like the racing pigeon (421 gm.) compared with 0.8% for the 2.95 kg Pekin duck. Humming birds have proportionally larger heart than all other birds, probably reflecting the high aerobic demand of flight.

Coronary circulation:

Oxygenated blood destined to supply the avian myocardium via the right and left coronary arteries enters the right ventral and left aortic sinuses, which lie immediately downstream from the cusps of the aortic outflow valve. In chickens, the right ventral sinus leads into the right coronary artery, which then divides immediately into a superficial and a deep branch. The superficial branch follows the groove (coronary sulcus) between the right ventricle and atrium and supplies the cardiac muscle of both chambers. In most species, the right coronary artery is dominant and also supplies the ventricular septum, the heart apex, and much of the left ventricular myocardium. The left coronary artery arises from the left aortic sinus and also has a superficial branch which follows the left coronary sulcus.

Composition of blood:

The blood consists of the blood plasma and the blood cells. The plasma is a viscous, aqueous solution of various proteins (albumen, globulin and fibrinogen), carbohydrates, salts and it also contains fats and lipids in fine suspension. These substances, as well as hormones, vitamins and enzymes which may also be present in blood, all are necessary to maintain the body cells. The plasma has the ability to coagulate blood. This is an enzymatic reaction requiring the participation of special blood cells, the thrombocytes, by which the fibrinogen of the plasma is changed in a series of steps to fibrin. Together with the blood cells, it forms the red blood clot. The cellular components of the blood are i) the red blood cells or erythrocytes ii) the white blood cells or leucocytes and iii) the thrombocytes which in birds are true cells, sometimes called “spindle cells”, because of their

Table 1. Average number of cells in domestic birds:

Species	Erythrocytes	Leococytes						Thrombocytes
	Number million per cu mm	Number thousand per cu mm	Percentage (%)					Number thousands per cu mm
			Lymphocytes	Heterophils	Eosinophils	Basophils	Monocytes	
Fowl	3.5 (3-4.5)	20-30	60 (65)	30 (20-50)	5 (2-8)	3 (1-5)	2 (1-4)	30 (75)
Turkey	2.5	33	62.2 (59-64)	28.65 (28-29.4)	3.9 (3.6-4.2)	2.95 (2.6-3.4)	2.3 (1.8-3.2)	-
Duck	2.8	23.4	64.25 (60.2-68.4)	21.05 (19-24.2)	5.75 (5.4-6.4)	5.4 (4-6)	3.55 (3-4.2)	-
Goose	2.8 (2.6-3.3)	24.5	49.20 (40.6-55.6)	34.15 (32-35.8)	14.5 (12.6-16)	1.25 (1-1.4)	0.85 (0.4-1.2)	-
Pigeon	2.45-3.9	9.9-22.3	57.9 (49.2-60.6)	31.15 (29.4-33.2)	6.15 (5.8-6.6)	2.35 (2-2.6)	2.45 (1.8-3)	7-27

shape. In birds, the erythrocytes are nucleated, oval cells. They contain the blood pigment which is the iron containing hemoglobin, this substance enable the erythrocytes to carry oxygen. The white blood cells include the polymorphonucleargranulocytes, the lymphocytes and monocytes.The blood of a chicken contains about 3 million erythrocytes per cubic millimeter. The spleen serves as a reservoir for the erythrocyte, and expels its contents into the circulatory system. Blood constitute about 12% of the weight of a newly hatched chick, and about 6-8% of the mature chicken.

Erythrocyte (RBC):

In birds, the erythrocytes are nucleated, oval cells. They contain the blood pigment which is the iron containing hemoglobin; this substance enables the erythrocytes to carry oxygen. The red blood cells are small and oval in shape, unlike mammals contain a large nucleus and average long diameter is around 13µm, short diameter is 7.0 µm with a thickness of about 3.0 µm. the number of RBC varies due to age, sex, hormones, hypoxia and other factor. The number is always more in adult male averaging 3.8 million cubic millimeters whereas in adult females the number hardly exceeds 3.0 million. The erythrocytes are generally elliptical and quite large. The nucleus is condensed and in the center of the cell. Hemoglobin concentration (MCHC) is lower in avian cells than in mammalian erythrocytes, probably because of the space occupied by the nucleus. The life span of chicken's erythrocyte is about 28-35 days, which of human 120 days.The hemoglobin content of whole blood in male average 11.3 gm per 100 ml and in female it varies between 9 to 10 gm. /100 ml. there is every reason to believe that avian hemoglobin concentrations contain the four iron containing "heme" units in mammals, but the protein moieties (globin) are different being atleast of two types, one (70-80%) exhibiting slow and the other (20-30%) fast electrophoretic mobilities. A mature RBC derives its energy mainly from anaerobic glycolysis and from thephospho-gluconate. The haematocrit value (percentage by volume of whole blood that is composed of erythryocytes) is about 30 in young chicken and laying hen while 40 in adult males. As a rough guide, values in other domestic species are in sheep: 32, cow: 40, dog: 45, horse & pig: 42.

Leucocytes (WBC):

The white blood cells include the polymorphonuclear granulocytes (Heterophils, Eosinophils, Basophils) and agranulocytes (the lymphocytes and the monocytes).The white blood cells (WBC) or leucocytes are the mobile units of the body which protect the system. They are formed partially in the bone marrow (the granulocytes) and partially in the lymph nodes (lymphocytes and monocytes), but after formation, they are transported in the blood to the different parts of the body where they are to be used as rapid and potent defense against any infectious agent that might be present.Five different types of WBC are normally found in the blood. There are granulocytes (Neutrophils, Eosinophils and Basophils) and agranulocytes (Monocytes and Lymphocytes). The granulocytes and the monocytes protect the body against invading organisms by ingesting them. Total number of WBC in birds ranges from 20-30 thousand per cubic millimeter.The lymphocytes are far more numerous than any of the other white blood cells. Although similar in shape and staining reactions, large and small varieties of lymphocytes are differentiated. The leucocytes are capable of amoeboid movement and can leave the intact blood vessels. During this process, known as leucodiapedesis, the leucocytes slip through the thin capillary wall into the surrounding tissues at the same time considerably modifying the shape of their cytoplasm and nucleus. A property of the granulocytes is that of phagocytosis, they are attracted to slip through the thin capillary wall into the surrounding tissues at the same time considerably modifying the shape of their cytoplasm and nucleus. The granulocytes are nearly spherical in shape and they have a polymorphic nucleus. Their cytoplasm contains granules which react differently to various dyes and

it is possible, by using appropriate strains, to subdivide this class of leucocytes. By for the greatest number contain rod shaped, acidophilic or eosinophilic granules and they are known as pseudoeosinophils or heterophil granulocytes. A small number of these white blood cells contain round eosinophilic granules and these are the eosinophil granulocytes.

A) Granulocytes:

They contain granules within the cytoplasm. The nuclei are lobulated and appear in many shapes and forms. They remain functional for 10 hours to 3 days. They are formed in red bone marrow. On the basis of the shape of nuclei and staining reaction of their granules, they are classified as i) Heterophils ii) Eosinphils and iii) Basophils.

i) Heterophils:

Heterophils is a term which is used only for avian and reptile neutrophils.This type of leucocyte is sometimes designated as a polymorphonuclear pseudo eosinophilic granulocyte, but for the sake of brevity, it is usually designated "heterophils". In chickens, there are generally round and have a diameter of about 10-15µm. the characteristic feature of these cells is the presence of many rod or spindle shaped acidophilic crystalline bodies in the cytoplasm. The nucleus is polymorphic with varying degree of lobulation. They contain very fine granules which strains faint or grayish pink. They possess multilobed nucleus and hence also called as polymorphs. Their number increases rapidly in acute infection. They constitute first line of defense against infection. They are **highly phagocytic**. *Phagocytosis is the process of engulfing and destroying foreign materials like microorganisms.*

ii) Eosinophils:

Polymorphonucleareosinophilic granulocytes are of about the same size as the heterophils. They contain large red staining granules in their cytoplasm. They commonly possess two or three lobed nucleus. Their number increases in chronic parasitic diseases and in allergic reaction. They are little phagocytic and inactivate histamines and histaminic substances. Their primary function is detoxification of bacterial toxin and foreign proteins.

iii) Basophils:

Numerically, very small, groups are the basophil granulocytes, so called because of the selective affinity of their granules to basic dye.Electron microscopy reveals that granules of basophils are variable in size and are fibrillar in nature.They contain blue staining granules in the cytoplasm. Their nucleus is less lobulated. They are very rare in blood. They are non-phagocytic. They contain heparin which prevents clotting of blood.

B) Agranulocytes:

They usually show few granules. The nuclei are non-lobulated. They are formed in lymphoid organs and bone marrow. They are classified as i) Monocytes and ii)Lymphocytes.

i) Monocytes:

The avian monocytes are difficult to differentiate from the large lymphocytes, because they are similar in shape and size. However, unlike the round nucleus of the large lymphocytes shows an irregular indentation, so that it sometimes appears kidney shaped. In general, the monocytes are large cells with relatively more cytoplasm than the large lymphocytes. The cytoplasm of these cells has blue grey tint. The nucleus is usually irregular in outline. The nuclear pattern in monocyte is of a more delicate composition than that in the lymphocyte. These are the largest leucocytes. They possesses kidney shaped nucleus and abundant cytoplasm. They are highly phagocytic. Their number increases in chronic infection.

ii) Lymphocytes:

Lymphocytes constitute the majority of the leucocytes in the blood of the fowl. There is a wide range in the size and shape of these cells. The cytoplasm is usually weakly basophilic. They are variable in size and appearance. They have a relatively large spherical nucleus surrounded by a small amount of cytoplasm. They constitute greatest number amongst all the WBC's i.e. 55-65%. They produce antibodies and antitoxins. They are non-phagocytic.

Thrombocytes (Platelets):

Although, the terms thrombocytes and platelets are synonymous in mammalian haematology, only the term thrombocyte should be used in descriptions pertaining to avian species. Avian thrombocytes show considerable variation in size and their shape may vary from oval to round. However, the typical one is oval, unlike mammals the cells are provided with a round nucleus in the center of the cell of a clear cytoplasm. A constant feature is the one or more brightly red stained granules present at the poles of the cell when stained with weight's stain. The total number ranges in most species between 20000-30000/cubic millimeter. Platelets are involved in blood clotting. Thrombocytes appear to function in haemostasis in birds analogously to the platelets of mammals. Birds and mammals also differ in coagulation. Blood coagulation is initiated by the break down of the thrombocytes, which unlike the functionally homologous thrombocytes or blood platelets of mammals are true nucleated cells.

Function of blood:

Blood has numerous functions, including the following:

i) It moves O_2 to the body cells and removes CO_2 from them.

ii) It absorbs nutrients from the alimentary tract and transports them to the tissues.

iii) It removes the waste products of cellular metabolism.

iv) It transports hormones produced by the endocrine glands to various sections of the birds.

v) It helps regulate the water content of the body tissues.

Blood pressure:

Blood pressure of chickens of all ages is measured as mmHg. Even the pressure of the developing embryo may be recorded. As with human beings, there are two measures: i) Systolic pressure (arterial) and ii) Diastolic pressure (as the blood returns to the heart). Following are the recognized blood pressures of adult chickens.

Sex	Systolic pressure mmHg	Diastolic pressure mmHg
Adult female chicken	140-160	130-134
Adult male chicken	180-195	145-150

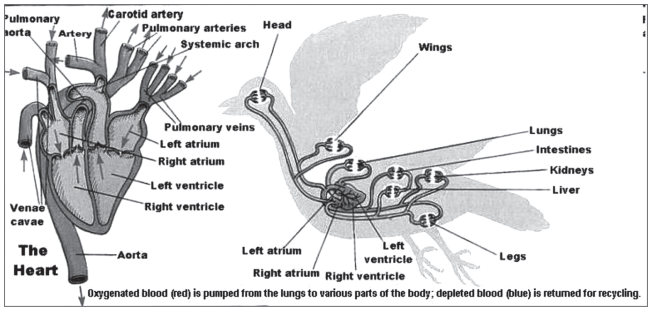


Fig.1. Circulatory system of chicken.

Blood circulation:

In order to accomplish all its functions, the blood has to be maintained in circulation through a closed system of tubes, the blood vessels, by the action of the heart. The left ventricle expels oxygenated blood through the aorta and thus round the body. The arteries arising from the aorta ramify in every organ through branches of ever decreasing diameter and finally, having first become arterioles, end in a dense network of capillaries.These unite to form venuleswhich continue as veins and end in the single caudal and double cranial venacava. In this way, the blood is carried to the right atrium and then the right ventricle. This part of the blood circuit is known as the greater or systemic circulation. The venous, or deoxygenated, blood is carried by the small or pulmonary circulation from the right ventricle through the pulmonary arteries to the lung; the pulmonary veins to the left atrium and then the left ventricle, thus starting a systemic circulation again.

Blood groups:

So far 13 blood groups system have been identified in chickens. These have been designated as A, B, C, D, E, H, I, J, K, L, N, P and R. The gene determining the blood group systems are all located on autosomes. A and E systems are closely linked. All other systems show independent segregation. Multiple gene inheritance has been suggested for control of different blood group systems in chicken.

Study of blood group systems is important in chickens as it helps in accurate identification of the pedigree. Some blood group systems have been found to be associated with susceptibility and resistance to diseases. E.g. Blood group "B" system is used as a marker for Major Histocompatibility Locus. Blood group "C" system used for Minor Histocompatibility Locus. Blood group "R" system has also been seen to be associated with resistance to lymphoid leucosis. It can also be used for culling of individual at an early stage to reduce the breeding cost.

Collection of blood from chicken:

Sr. No.	Bird	Site	Needle size (gauze)
1.	Fowl	Wing vein & Heart	18-20

As per *literature, blood collection site for chicken is wing vein and heart only; but my personal experience is that we can collect blood more easily from jugular veins of chicken also.*

Technique for blood collection:

i) Clip the area from where the blood is to be drawn.

ii) Apply Tincture Iodine or spirit and allow it to dry

iii) Raise the vein by pressure.

iv) Use dry and sterilized needle, as water haemolyses RBC's.

v) Insert the needle into vain and draw the required quantity of blood.

vi) Transfer the blood from the syringe to specimen tube/vial containing anticoagulant mixture, after disengaging the needle.

vii) Place the rubber stopper

viii) Make rotatory movements so that blood mixes with the anticoagulant.

ix) Never shake the blood vigorously otherwise red blood cells will rupture.

x) Label the sample tube or vial properly.

Blood formation:

The first blood cells, and also the endothelial cells lining the blood vessels, arise from mesenchymal elements called angioblasts, which are situated in the blood islands of the area vasculosa of the germinal vesicle and the wall of the yolk sac. Other sites of blood formation during development are the liver, spleen and thymus but the bone marrow finally becomes the organ of blood formation in the higher vertebrates. All types of blood cells, including lymphocytes, are found in various stages of maturation in the bone marrow. However, lymphocytes production in birds also takes place in all types of lymphatic tissue, including the lymph nodes in all types of lymphatic tissue, including the lymphnodes in ducks and geese.

Embryology:

While the developing egg is still within the body of the hen, the blastoderm develops into three layers. The upper layer of cells is called the ectoderm and

Anticoagulants:

There are different types of anticoagulant used.

Sr. No.	Anticoagulants	Amount required for 10 ml of blood	Remarks
1.	**Heparin**1.0 % (Natural anticoagulant)	0.1ml	* Good for analysis of blood gas, BUN and electrolytes * Expensive
2.	**Sodium citrate 3.8%**	1ml	* Good for blood transfusion
3.	**Heller's & Paul's oxalate mixture:** (Ammonium 1.2 gm + Potassium oxalate 0.8 gm + distilled water 100ml)	1ml	* Good for haematological studies * Not suitable for BUN estimation
4.	**EDTA (Ethylene Diamino Tetra Acetate) 1%**	1ml	*Excellent for routine hematology

Daily changes during embryonic growth:

Day of incubation	Hours of incubation	Changes in embryo
First day	4 hrs	Heart and blood vessels start to develop
	12 hrs	Heart starts to beat. Blood circulations begins with the joining of the blood vessels of the embryo and the yolk sac
Third day	64 hrs	The circulatory system rapidly increases during the third day
Fourth day	-	The vascular system is clearly evident to the naked eye
Fifth day	-	The heart begins to take a definite shape and the vascular area of the yolk sacs covers two third of the yolk
Ninth day	-	The embryo begins to assume for the first time something of the shape of a chick and the heart has been incorporated within the embryo framework, with the blood circulation to the outside passing out through an umbilicus or navel

the lower, the endoderm. Soon a third layer, the mesoderm, develops between the ectoderm and endoderm. From these three layers, all the organs and parts of the body develop. The mesoderm is responsible for the development of the blood system. By the time, the egg is laid the developing embryo will be composed of thousands of cells.

Conclusion: The cardio-vascular system is one of the major important systems of poultry. Its growth and development, decide the fate of chicken.

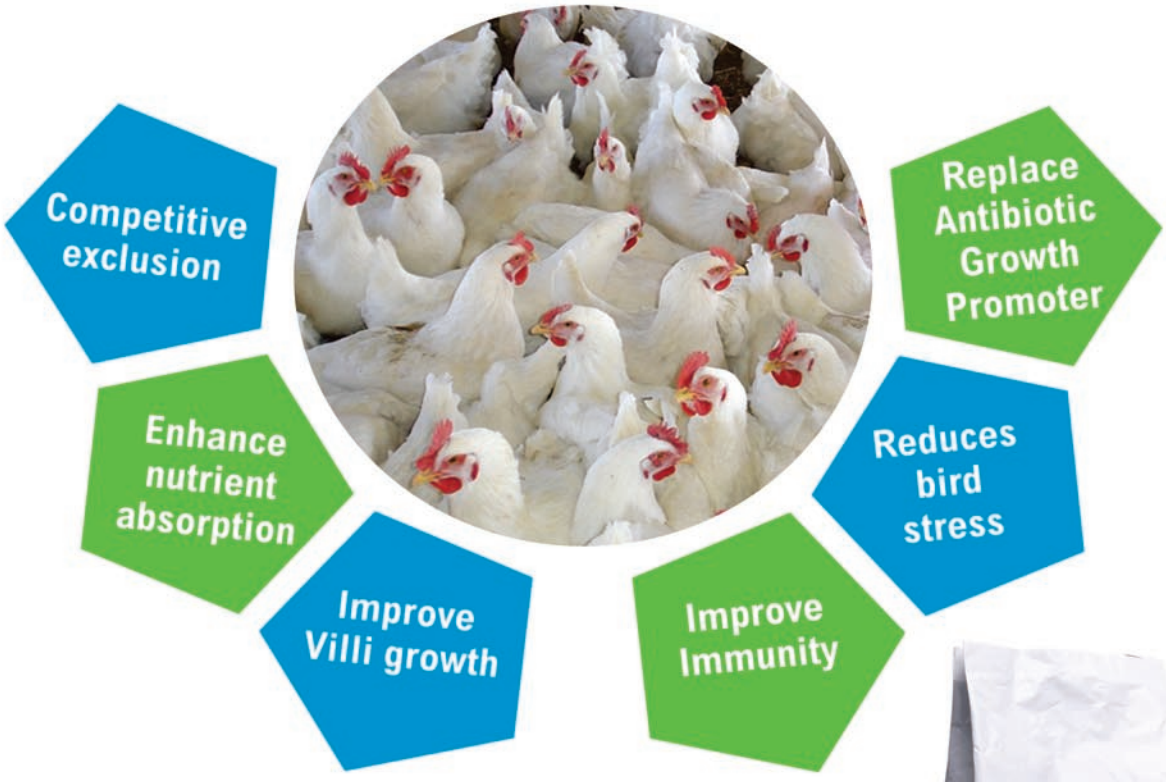
NATIONAL EGG CO-ORDINATION COMMITTEE

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

Name of Zone \ Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Average
NECC Prices																															
Ahmedabad	360	345	345	345	348	350	353	356	360	363	370	375	378	380	382	382	382	382	382	370	370	370	372	375	380	382	382	382	382	-	369.06
Ajmer	323	323	328	333	333	335	342	342	352	360	362	365	355	350	350	350	350	350	350	350	350	353	363	363	360	345	352	352	352	-	348.03
Banglore (CC)	325	325	325	315	320	320	325	335	345	355	360	365	365	368	368	368	368	355	355	355	355	345	345	350	360	360	360	362	362	-	348.82
Chennai (CC)	365	345	345	325	325	325	335	335	350	350	365	365	365	375	375	375	375	360	360	360	345	345	345	345	345	350	350	355	355	-	352.06
Chittoor	358	338	338	318	318	318	328	338	343	343	358	358	358	368	368	368	368	353	353	353	338	338	338	338	338	343	343	348	348	-	345.41
Delhi (CC)	343	343	343	350	355	355	360	365	378	380	385	387	390	390	390	383	383	383	383	378	378	378	378	385	388	388	388	388	380	-	375
E.Godavari	331	331	331	333	338	343	348	353	356	361	366	368	370	372	374	375	376	376	376	376	376	376	376	376	378	380	381	381	381	-	364.1
Hyderabad	310	310	310	313	316	318	320	323	328	335	340	343	346	348	348	348	338	338	330	330	330	332	335	338	340	342	342	342	342	-	332.24
Miraj	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mumbai (CC)	375	355	355	355	355	358	363	370	375	378	388	393	396	399	401	401	401	401	391	383	383	383	385	385	390	397	399	399	399	-	383.2
Mysore	330	325	315	315	315	318	325	340	340	355	363	363	366	366	366	366	350	350	350	340	340	340	340	355	355	355	358	358	358	-	345.41
Nagapur	300	305	305	310	310	315	325	335	340	345	345	345	345	345	345	345	340	336	-	-	-	-	-	-	-	-	-	-	-	-	329.77
Namakkal	350	350	330	330	330	330	330	340	340	350	350	350	360	360	360	355	345	340	340	330	330	330	330	335	335	335	340	340	340	-	340.86
Pune	342	342	342	342	342	343	348	355	370	370	385	390	395	395	395	395	395	395	395	380	365	365	370	370	380	383	386	388	389	-	372.82
Punjab	322	322	330	338	338	338	338	345	345	353	361	361	367	367	369	367	357	350	351	351	351	351	353	364	364	384	358	358	-	-	351.89
Vijayawada	331	331	331	333	338	343	348	353	356	361	366	368	370	372	374	375	376	376	376	376	376	376	376	376	378	380	381	381	381	-	364.1
Vizag	331	331	331	333	338	343	348	353	356	361	366	368	370	372	374	375	376	376	376	376	376	376	376	376	378	380	381	381	381	-	364.1
W.Godavari	331	331	331	333	338	343	348	353	356	361	366	368	370	372	374	375	376	376	376	376	376	376	376	376	378	380	381	381	381	-	364.1
Warangal	332	312	312	312	315	318	320	322	325	330	337	342	345	348	350	350	350	340	340	332	332	332	335	337	340	342	344	344	344	-	333.86
Prevailing Prices																															
Allahabad (CC)	357	357	357	357	362	357	367	371	381	395	400	400	400	395	388	383	383	381	376	371	371	371	381	400	400	395	381	381	374	-	379.03
Barwala	322	322	328	337	338	340	346	348	355	363	365	368	368	368	356	356	356	356	356	356	356	356	363	368	368	368	358	358	358	-	353.68
Bhopal	343	343	343	345	345	345	345	345	365	370	375	385	385	385	388	388	384	380	375	370	350	352	350	360	362	362	362	362	362	-	362.96
Hospet	290	290	290	280	285	285	290	300	310	320	325	330	330	333	333	333	333	320	320	320	320	320	320	320	325	325	325	327	327	-	314.68
Indore	335	335	330	325	330	332	332	340	350	369	370	385	385	385	375	370	365	365	363	360	355	345	345	342	365	365	365	365	355	-	355.27
Jabalpur	343	343	345	340	342	344	350	360	365	373	379	382	384	388	384	384	384	384	369	359	359	350	356	362	366	369	369	369	369	-	364.51
Kanpur (CC)	376	376	376	376	376	376	376	376	386	395	395	395	395	395	395	395	395	395	395	395	395	395	395	395	395	395	386	386	386	-	388.51
Kolkata (CC)	368	368	368	375	380	385	390	395	397	403	408	408	412	412	416	417	417	417	409	405	405	405	405	405	415	415	423	426	426	-	402.58
Luknow (CC)	373	373	373	383	383	383	387	393	400	400	407	407	407	407	407	407	407	407	407	407	407	407	410	417	417	417	417	417	417	-	401.51
Raipur	335	333	333	340	342	345	347	353	360	370	377	381	381	381	381	381	381	370	360	360	360	350	350	355	368	368	368	368	368	-	360.89
Varanasi (CC)	370	370	373	377	383	383	387	390	397	400	403	410	410	413	413	407	407	407	407	400	400	400	403	417	410	410	403	403	403	-	398.48

Grobig BS

The next generation *Bacillus subtilis* QST 713



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Impact of Mycotoxins on Poultry Gut

Eileen HAN, Regional Product Manager - Mycotoxin Risk Management, Mycotoxins, Silent killers

Mycotoxins, secondary toxic metabolites produced from fungi, are present in poultry feed all the time. Even when analysis results show that mycotoxin contamination is below guideline levels suggested by major agriculture countries, there can still be cause for concern. So what does it mean if mycotoxins are present in feed at low levels? Any mycotoxins present in feed are delivered straight to the gastrointestinal tract (GIT) of the birds, the organ most affected by mycotoxins. The GIT is the most important organ for converting feed into energy, and its ability to function properly is directly linked to poultry productivity. The GIT is the biggest immune organ in the body system. Among the major mycotoxins, DON (deoxynivalenol), ZEN (zearalenone) and FUM (fumonisins) are often overlooked when considering their impact on poultry health and productivity since their clinical symptoms are not usually obvious or visible. However, there have been a number of scientific and commercial trials that prove these Fusarium mycotoxins are closely related to some important poultry diseases.

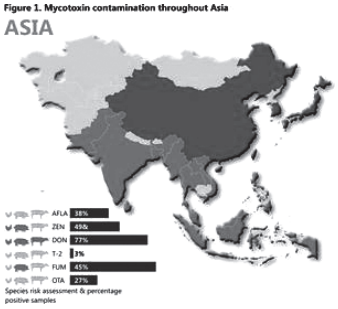

Figure 1. Mycotoxin contamination throughout Asia

Mycotoxin Contamination Situation in South Asia

BIOMIN has conducted the Mycotoxin Survey Program annually since 2004. The accumulated number of samples is already over 75,000, which makes the program the largest worldwide data pool for mycotoxin analyses. In 2017, the analysed number of samples hit a record high. Overall, 2017 was another high-risk year for mycotoxins in Asia, similar to 2016. The infographic (Figure 1) shows

where the major mycotoxins were found throughout Asia in 2017. Taking a closer look at the results from South Asia or India, Aflatoxin (Afla) is still the biggest threat if we also consider the percentage contamination above the risk threshold. The prevalence of FUM and Ochratoxin A (OTA) in South Asia was the highest of all the Asian sub regions (Figure 2). However, Afla has been always the centre of attention that it is relatively well counteracted.

Figure 2. Mycotoxin Occurrence in India in 2017

Mycotoxin	Afla	ZEN	DON	T-2	FUM	OTA
Number of samples tested	234	234	234	234	234	234
% with mycotoxin detected	79%	12%	17%	1%	86%	79%
% above health risk threshold	64%	1%	1%	0%	18%	21%
Average of positive (ppb)	25	22	76	18	362	9
Maximum (ppb)	212	79	872	21	3394	134
Recommended max threshold (ppb)	2	50	150	50	500	10

Figure 2. Mycotoxin Occurrence in India in 2017

Impact of DON and FUM on the poultry gut

More problematic mycotoxins are rather FUM and DON. Unfortunately, in India the awareness of these Fusarium mycotoxins is low. DON is a known protein synthesis inhibitor and can interfere with the metabolism of high turn-over cells such as skin cells (epithelial cells), hepatic cells, immune cells and intestinal epithelial cells. Some of the most frequent sub-clinical symptoms of DON contamination in feed are the reduction in feed intake, wet-droppings and a reduction in vaccine

efficacy. On the other hand, FUM blocks the synthesis of complex sphingolipids that play a pivotal role in protecting nerves, muscles and membranes.

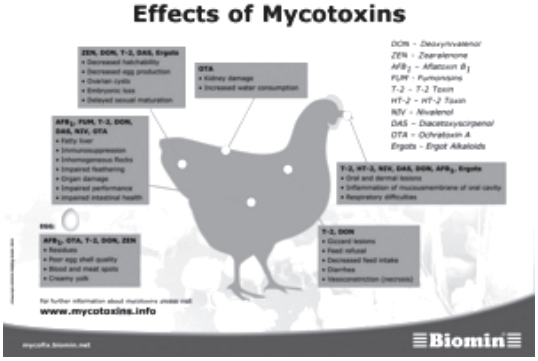

Figure 3. Effects of mycotoxins in poultry

Several poultry feeding trials clearly show that Fusarium mycotoxins such as DON and FUM lead to an up-regulation of pro-inflammatory cytokines in the gut. Seventy percent of immune system is located in the gut, promoting a rapid mucosal inflammatory response, even when mycotoxins are present at low concentrations in feed. Tight junction proteins in the intestinal epithelium are also regulated by such cytokines. Loosened tight junctions can cause "leaky gut syndrome" resulting in pathogens and toxins entering the blood stream and moving to target organs. As a result, the permeability of intestine is increased and the frequency of intestinal disorders and disease outbreaks can consequently increase as well (Figure 4).

Impaired immunity at low mycotoxin contamination levels

DON and its co-occurrence with FUM are known to modulate the immune function. One good example is the reduction in the number of antibody titres against vaccine programs in poultry. Several research results have shown that DON and FUM reduce antibody response to Newcastle Disease (ND) and Infectious Bronchitis Virus (IBV). In one experiment conducted in Austria, the feeding of a DON-contaminated diet decreased serum antibody titres against the IBV vaccine (Figure 4) compared to the control diet.

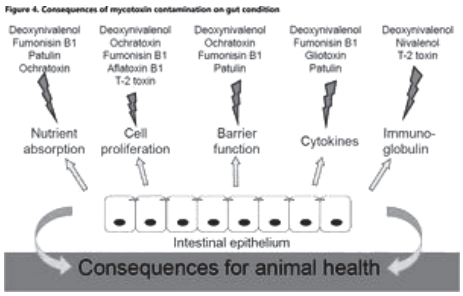

Figure 4. Consequences of mycotoxin contamination on gut condition

However, the antibody titres for IBV improved when the DON-contaminated diet group was fed with Mycofix® Select (MSE), a mycotoxin deactivator that includes the DON-biodegrading bacteria, BBSH 797.

Mycotoxin risk management in poultry

When it comes to counteracting mycotoxins, the poultry industry tends to think of "toxin-binders" first. However, clay mineral binders are not an effective answer to all major mycotoxins. Especially not against Fusarium mycotoxins since their structures are not suitable for adsorbing by binders. Biotrans formation using microbes and enzymes is the most effective strategy. It provides reliable protection for birds against Fusarium mycotoxins by biodegrading mycotoxins into non-toxic metabolites. The transformation is fast, specific and irreversible.

In addition to biotransformation, a bioprotection strategy is also important. Variety of feed additives is available that contains plant and algae extracts to provide a hepato-protective effect and to overcome the immune suppression caused by mycotoxins. A combination of different strategies can counteract the negative effects of mycotoxins in poultry more completely, especially in cases of multi-mycotoxin contamination with the poorly absorbed Fusarium mycotoxins in poultry feed.

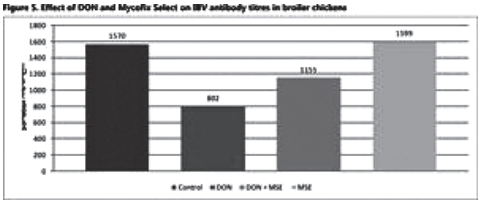

Figure 5. Effect of DON and Mycofix® Select on IBV antibody titres in broiler chickens

Water Quality for Poultry Birds

Anjali Kumari, Ph.D. Scholar, L.P.M. Section, ICAR-NDRI Karnal

Introduction

Birds require water nearly about 2 litres/ everykg of feed at 70°F. For 1°C of temperaturerise about 75°F, birds will drink about 4% morewater. The normal intake of feed: water is 1:2. But thisratio rises to nearly 1:4 or even more whentemperature exceeds 95°F.Birds prefer cool water between 45°F to 80°F. Exceptfor day old chicks, the temperature of drinking waterfor all categories of chickens should always be lowerthan the roomtemperature. Provision of extra waters on deep litter is a mustalong with filling up these with cold water for 4-5 times a day. Birds on cages should also get a continuous supply offresh and cool water. Where there is a provision forautomatic drinking devices, if necessary small icepieces may be placed in drinking reservoirs.When using water medication during severe summerheat, recommended concentration must be reducedas high amount of waterconsumption may increaseexcess of the normal levels, resulting in an overdoseof the drug.

Interpreting Bacteria Test Results

If number of microorganisms found in water sample is too high, it indicatesthat water supply is contaminated. Well water is normally tested for totalbacteria level, coliform bacteria level and occasionally for the faecal coliformbacteria level. Coliform bacteria are organisms normally found in the digestivetracts of livestock, humans, and birds. Their presence in water is used as a sign offaecal contamination.Standards for animal drinking water indicate that there should be fewer than 100bacteria of all types /ml of water and fewer than 50 coliformbacteria/ml. Recent field research indicates that a bacteria level of zero maybe desirable to obtain optimum performance.

Nitrates and Nitrites

Nitrates are produced during the final stage of decomposition oforganic matter. Their presence in water usually indicates contaminationby runoff containing fertilizer or human and animal wastes. Nitrates aresoluble and may move with surface runoff or leach into the groundwaterby percolation through the soil. Nitrates from sources such as animaland human wastes, nitrogen fertilizer, crop residues, and industrialwastes may move considerable distances in the ground. Nitrite isproduced during intermediate stages of the decomposition of organiccompounds. The toxicity of nitrates to poultry varies with the age of the birds, olderbirds being more tolerant. Levels in excess of 50 ppm for chickens and75 ppm for turkeys have proven harmful in laboratory trials. A recentstudy with commercial broilers showed that nitrate levels greater than20 ppm had a negative effect on weight, feed conversion, orperformance. Levels between 3-20 ppm were suspected to affectperformance. Nitrites are toxic at much lower levels than nitrates;concentrations as low as 1ppm can be toxic.

Acidity and Alkalinity

Well water normally has a pH in the range from 6.8-7.8, although itis not uncommon for the pH to be either higher or lower. Acid drinkingwater can affect digestion, corrode watering equipment, and beincompatible with medicines and vaccines. Field research indicates thatdrinking water with a pH> 6 can impair broiler performance.Water with a pH between 6.0-6.3 is suspected of having a negativeeffect.

Hardness

Although hard water may cause stains, leave residues, or cause other physicalproblems in water-handling equipment, hard water has not been demonstrated tohave either a positive or negative impact on poultry performance. In treating hardwater that is to be used as drinking water poor poultry, however, care should betaken not to increase any existing chemical imbalance in the water.

Naturally Occurring Minerals

A large number of chemicals occur naturally in well water. They are usuallypresent in amounts that do not interfere with the metabolism or digestivefunctions of chickens or turkeys. When the levels of certain chemicals are out ofbalance, however, they can, by themselves or in combination with otherchemicals, affect poultry performance.

Sodium - Excessive levels of sodium have a “diuretic effect”. Studiesindicate that a sodium level of 50 ppm is detrimental to broiler performanceif the sulfate level is also 50ppm or higher and the chloride level is 14 ppmor higher.

DRINKING WATER QUALITY GUIDELINES FOR POULTRY

Contaminant	Level considered Average	Maximum Acceptable Level	Remarks
Bacteria Total Bacteria Coliform Bacteria	0 / ml 0 / ml	100 / ml 50 / ml	0/ ml is desirable 0/ ml is desirable
Nitrogen Compounds			
Nitrate	10 ppm	25 ppm	Levels from 3-20 ppm may affect performance
Nitrite	0.4 ppm	4 ppm	
Acidity and Hardness			
pH	6.8 - 7.5	8	pH of less than 6.0 is not desirable. Levels below 6.3 may degrade performance
Total Hardness	60 - 180	. . .	Hardness levels <60 are unusually soft, those> 180, very hard
Naturally Occurring Chemicals			
Calcium	60 ppm	500ppm	
Chloride	14 ppm	250 ppm	Levels as low as 14 ppmmay be detrimental if thesodium level is >50 ppm
Copper	0.002 ppm	0.6 ppm	Higher levels produce abitter flavour
Iron	0.2 ppm	0.3 ppm	Higher levels produce abad odour and taste
Lead	. . .	0.02 ppm	Higher levels are toxic
Magnesium	14 ppm	125 ppm	Higher levels have a laxative effect. Levels>50 ppm may affect performance if the sulfate level is high
Sodium	32 ppm	50ppm	Levels > 50ppm mayaffect performance if thesulfate or chloride level ishigh
Sulfate	125 ppm	250 ppm	Higher levels have a laxative effect. Levels>50 ppm may affectperformance if magnesiumand chloride level is high
Zinc	. . .	1.50 ppm	Higher levels are toxic.

Chloride - Consuming too much chloride has a "detrimental effect onmetabolism". Studies have shown that a level of 14 ppm in drinking watercan be detrimental to broilers if combined with 50 ppm of sodium. Chloridelevels as high as 25 ppm are not a problem if the sodium level is in thenormal range.

Sulfate- High sulfate levels have a "laxative effect". Levels as lowas 50 ppm can have a negative effect on performance of either the sodiumor magnesium level is 50 ppm or more.

Magnesium - A symptom of a high magnesium level is "loosedroppings". Thischemical may interact with sulfate. Studies indicate thatmagnesium alone at 68 ppm does not adversely affect broiler performance,but a level of 50 ppm can be detrimental if the sulfate level is also 50 ppmor greater.

Other Minerals:

1.Excessive amounts of manganese can produce a "flavour problem".

2.Too much copper can give the water a bitter taste and may cause"liver damage".

3.High phosphate levels may indicate contamination from sewage.

4.Calcium does not seem to have any negative effect at levels as highas 400 mg/l, and it appears that a level of 35 ppm or more may be desirable.

5.High levels of iron, up to 25 ppm, have not been shown to be detrimental to broiler performance, although staining of waterers is evidentat much lower levels.

Water Management Measures:

Conduct water tests

Each farm should have its well water tested. Water qualitycan change during periods of heavy rain or drought andadditional water tests during these periods will ensure thatwater lines continue to deliver adequate water volume forboth the birds and the cooling systems.

Change filters regularly

Sediment and other particulates can cause leaky waternipples that can have negative effects on litter quality.Clogged filters restrict water flow to the drinker and coolingsystems. In some cases, simple cartridge filters may not beadequate, such as for water with high iron. In those casesother water treatments will need to be considered.

Flush water lines regularly

A high pressure flush should be performed on water linesbetween each flock and after adding supplements throughthe medicator (e.g. vaccines, medications, vitamins,electrolytes, etc.).

Plan ahead before treating water

Before implementing water treatment or sanitation programs, consult your county agent to ensure thatcontaminants in your water will not react negatively andcause the water system to become clogged.

Control of microbial level in drinking water

It is not advisable to use disinfectants to maintain safe bacteriallevels in a highly contaminated well. Any disinfectant method islikely to fail at some time and expose the poultry to high levels ofbacteria. Even if the water source has a low bacteria level, poultrymay be exposed to the microorganisms that grow in waterers.Because these organisms can develop very rapidly, waterersshould be cleaned properly each day. Chlorination or use of otherdisinfectants in the water along with good waterer cleaning is aneffective way of controlling microbial levels.Chlorination using an in-line proportioner (adevice for accurately injecting the correct proportion of chlorine intothe water line) has been successful in poultry operations if the residualchlorine level in the waterers is at least 1 mg/l.Once the water is exposed to the air, however, the dissolved chlorinequickly dissipates. To accurately determine the residual chlorine levelin the water that the poultry drink, the chlorine concentration shouldbe measured using a standard test (such as orthololidineprocedure) as soon as possible after samples are obtained from thewaterers. Superchlorination or continuous treatment of the well withchlorine pellets can also be effective, but the level of chlorine in thedrinking water must be controlled because excess chlorine will causepoultry to lower their water consumption.Use of an iodine-base disinfectant to control bacteria in drinking wateris effective and provides more residual activity but is usually moreexpensive than chlorination. Be sure to use only approved chemicals atthe recommended rates and ensure that the chemicals are compatiblewith watering equipment. Also, be sure to remove the disinfectantfrom the waterers and water lines before using a water vaccine ormedication that is incompatible with the disinfectant.

Effect of Different Energy Inclusion Level in Poultry Feed

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Introduction:

Most of the energy comes originally from the sun; and initially stored in plant materials as a result of photosynthesis. Chicken require energy for growth of body tissues, production of eggs, carrying out of vital physical activities and maintenance of normal body temperature.It is derived from carbohydrates, fats and proteins in the diet. It can supply the energy for activity, it can be converted to heat or it can be stored as body tissue. Dietary energy exceeding than needed for normal growth and metabolism of the bird, is usually stored as fat. Excess available energy can not be excreted by the animal body. Optimum nutrient utilization by the chicken is achieved when the diet contains the proportion of energy to other nutrient to produce the desired growth egg production or body composition. The major portion of all feed consumed by an animal is used for energy. Carbohydrate is the principal energy source in food of poultry. Carbohydrate is chief constituents of plant. They form 50-80% of the dried weight of plants. The carbohydrate content in the animal body is negligible i.e. less than 1%. Some carbohydrates have a special role in structure, function and metabolism of cells. Chickens have a remarkable ability to monitor their energy intake, and adjust feed intake as diet energy concentration changes. Starch is the reserve carbohydrates of seeds and tubers. It is polymer of glucose. On digestion, starch yields glucose. Glycogen (animal starch), found in animals is similar to starch but is more branched.

Sources of energy in cell:

The ultimate source of energy for the chicken is obtained from high energy phosphate bonds. When adenosine triphosphate (ATP) loses a phosphate group to form adenosine diphosphate (ADP) around 7.2 kcal/mole are liberated. The synthesis of ATP from ADP occurs as a result of oxidation of various dietary substrates, such as carbohydrates, proteins and fats. Adenosine triphosphate is distributed in every cell of the body. When a chemical reaction within a cell, calls for energy, it is derived by coupling with the breakdown of ATP.

Sources of energy:

The energy stored in carbohydrates, fats and proteins nutrients is released in the body during metabolism. Carbohydrates and fats are the principal sources of energy, while amino acids (proteins) are primarily utilised for synthesis of body proteins. Excess amino acids are catabolised and released energy. However, the use of protein as energy source is costlier than from carbohydrates and fats.

Energy content of feed ingredients:

The cereals grain being relatively high in digestible carbohydrates is the major energy sources. Corn has become the cereals of choice in many areas of the world, because of its high energy value and the content of xanthophylls which import a yellow colour to the skin and yolk. In some areas of the world, sorghum grain and wheat are more plentiful and lower in cost per unit of energy than is corn. These grains may be used as the major carbohydrates source with very satisfactory results, if care is taken to balance the diet. Milo and wheat usuallycontain less energy, less linoleic acid, less methionine and certainly less xanthophylls pigments than does yellow corn. At times, wheat by-products and barley becomes so economically priced in relation to corn that these feed stuffs can be used to advantage to provide a large portion of the carbohydrates in the diet. In some areas, rice polishing are an excellent energy source. Rice polishing and rice bran usually contain about 12-13% oil. Unfortunately, the oil in these feed stuffs is vulnerable to oxidative rancidity, which may cause a severe reduction in energy value. Fish meal is also a relatively high energy ingredient especially if its unsaturated oils are protected from

oxidative rancidity by antioxidant treatment during processing.

Characteristic of Energy Deficiency:

As the energy content of the diet is reduced; chickens increase their feed consumption. A deficiency of energy can be produced only by using very low energy diets.Very low energy diets are usually quite bulky. The minimum feed density which allows chicks to obtain adequate energy is approximately 1.5 kcal metabolizable energy per cubic centimetre. Therefore, a diet containing 2600kcal ME/kg must have a density of at least 0.58gm/cc. As the energy content of the diet of growing chicks drops below this critical level, growth is reduced and the amount of fat deposited in the carcass is decreased. However, as long as the energy content of the diet is adequate for maintenance; no other deficiency symptoms are observed. When the energy level is decreased below that required for maintenance, the animal loses weight (using up its own body fat and protein tissue for energy), until this wasting process becomes severe enough to affect a vital function, at which time the animal will die. Under energy starvation conditions; body energy stores are utilized in the following sequence.

i) First, the small amounts of glycogen normally stored in the body are exhausted.

ii) Secondly, there is concomitant loss of labile protein reserves and initiation of fat catabolism. Because body protein is associated with about 80% water (as muscle etc.), then this first loss of labile protein causes the initial sudden loss in weight. Subsequent loss of fat reserves causes a slower rate of weight loss because adipose tissue contains little water and continuation of loss of fat reserves from adipose tissue and liver.

Characteristics of Energy excess:

Slight excesses of energy cause no detectable signs other than extra deposition of fat and a slight decrease in growth rate. If the energy content of the diet is grossly excessive, feed consumption is so curtailed that severe deficiencies of protein, amino acids, minerals and vitamins occurs. Under such abnormal conditions growth may cease entirely, the chickens may become very fat but at the same time show signs of protein and vitamins malnutrition. Under practical conditions as excess of dietary energy is not likely to occur. If birds consume marginally higher levels of energy than needed, then the most obvious sign is increased growth and obesity in mature birds and simply obesity in juveniles. An exception to this is so called erotic ovulation and defective eggsyndrome (EODES) seen in heavy breeders fed excess energy. Birds multiple ovulate, often with 2-4 mature ova being released from the ovary at any one time. Such EODES rarely occurs in egg strain layers, even if they are force fed 2-3 times of their normal energy intake.

Energy requirement of chicken:

Experimental studies have shown that the Metabolizable Energy (M.E.) requirements are approximately 18% higher than the Net energy requirements. This is due to the specific dynamic action of nutrients, while consumption of carbohydrates and fat yield 15 and 10% heat increment, respectively. In a well balanced diet containing 20% protein, 5% fat and 65% carbohydrates, the average heat increment is 18%. Thus, the Net energy requirements are approximately 82% of the M.E. requirements. Since the chicken has a higher body temperature than mammals, its energy expenditure for maintenance is greater.

Energy metabolism in the chicken:

All materials containing carbon and hydrogen in forms that can be oxidized to carbon di-oxide and water represent potential energy for animals. The amount of heat produced when a feed is burned completely in the presence of oxygen can be measured in a bomb calorimeter and is termed the gross energy of the food. The percentage of the gross energy that can be taken into the animal body and used to support the metabolic processes depends upon the ability of the animal to digest the feedstuffs. Digestion represents the physical and chemical processes which take place in the gastro-intestinal tract and result in breaking down the complex chemical compounds in feed into the

smaller molecules that can be absorbed and used by the animal. This absorbed energy is termed digestible energy. Further losses of energy occur in the urine in the form of nitrogenous waste and other compounds not oxidized by the animal body. When the digestible energy is corrected for these losses the resultant energy is called the Metabolizable Energy value of the food or feedstuff. During metabolism of the nutrient further losses of energy occur (heat increment). The remaining energy of feed that is available for the animal to use for maintenance and productive purpose is called Net Energy.

Environmental influence on energy metabolism:

Most environmental parameters influences energy metabolism of birds because birds are homoeothermic. The temperature has the most noticeable and predictable effect. At comfort or thermal neutral zone of environmental temperature, within which there is minimal energy expenditure as basal metabolism. For chickens, this zone changes with age as per a consequence of reduction in the body surface area per unit of body mass and due to the insulating effect of feathers that develop in the first 3-4 weeks of life. In chick stage, temperature requirement is higher because of undeveloped hypothalamus (Centre which regulates body temperature). Egg production and growth will be maximizing within the comfort zone. Outside of this range, egg production will decline because of a deficiency of energy.

Ingredients and its energy content:

Sr. No.	Ingredients	ME (kcal/kg)
Cereals and by-products		
1	Yellow corn	3340
2	Wheat	3140
3	Barley	2795
4	Oat	2550
5	Sorghum	3288
6	Milo	3263
7	Wheat bran	1540
8	Rice bran	1900
9	Rice polishings	2750
10	Bakery by-products	3200
11	Molasses	1962
Vegetable proteins		
1	Soybean meal	2540
2	Full fat soybean	3880
3	Pea nut meal	2205
4	Flax seed	3500
5	Sunflower meal	2205
6	Cotton seed meal	2350
7	Canola meal	2000
Animal proteins		
1	Meat meal	2500
2	Fish meal	2720
3	Poultry by-product meal	2950
4	Feather meal	3000

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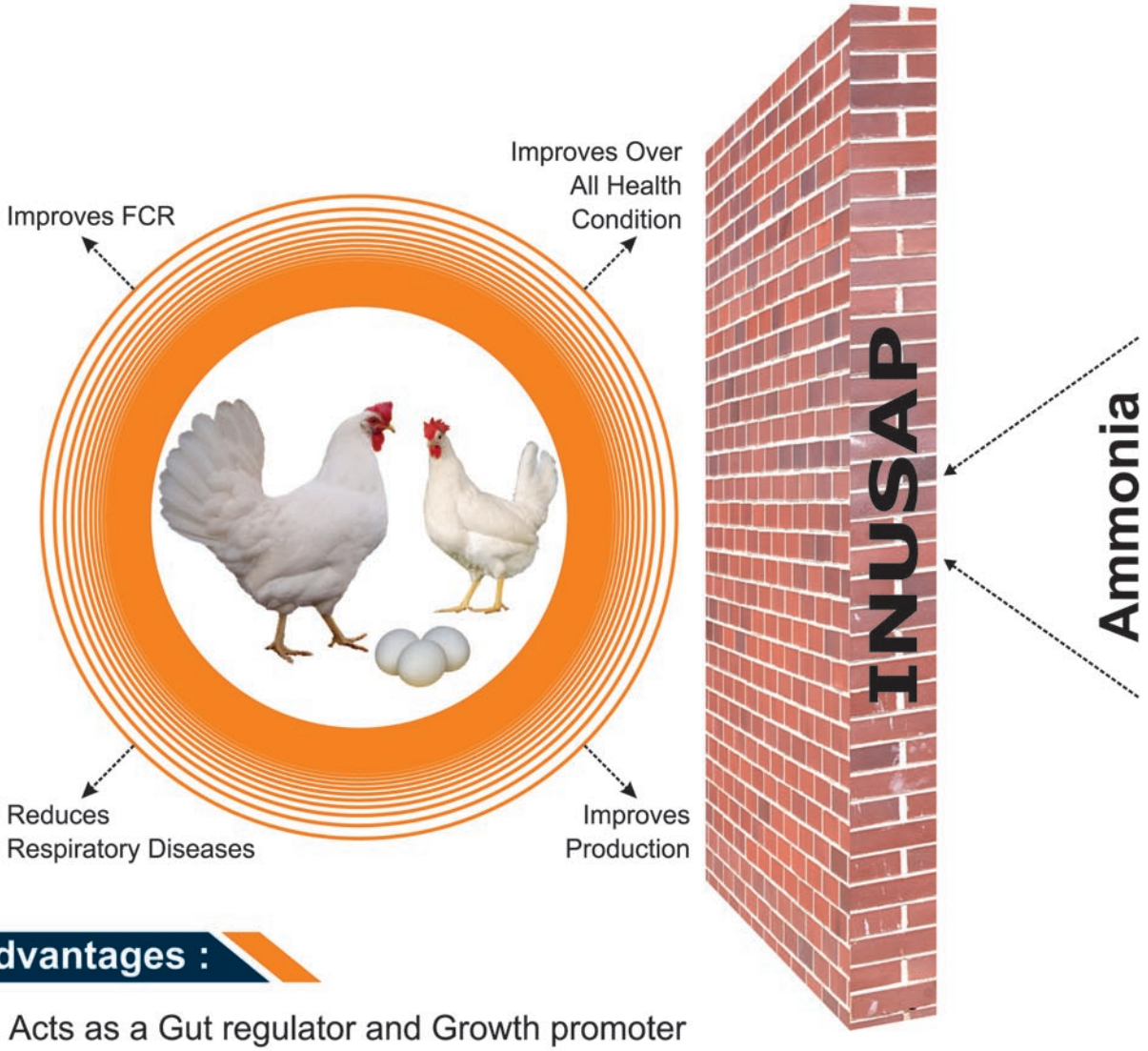

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Reference:- The Gazette of India , Page No.-21, No.-155, Date:- 13-04-2018

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PRESS RELEASE

Biomin takes Mycotoxin Academy to more regions in India

Date: 2018-09-17

Following the success of the first edition of Mycotoxin Academy concept in India in July, BIOMIN in association with its supply chain partners extended the success streak to four more locations in India.

A total of over 500 customers and poultry players participated in these Academies, which facilitated knowledge transfer between BIOMIN experts and customers. The events were also the testimony to the commitment by the innovative feed additive firm in creating awareness about the mycotoxin risk awareness in India and providing innovative solutions to the problem.

Following the first leg of Mycotoxin Academies in north India in July, the second leg of these signature events began in Hyderabad. On August 14, the event was held at Radisson Hitec City in Hyderabad, followed by another event in Coimbatore, held at Le Meridien on August 16.

At the Coimbatore Mycotoxin Academy, Dr A Natarajan, Professor and Head, Animal Feed Analytical and Quality Assurance Laboratory of Veterinary College and Research Institute, Namakkal participated as guest speaker and offered invaluable insights to the participants.

The final leg of the Mycotoxin Academies began in Pune on August 29 at Hotel Conrad, followed by another event at Hotel Swissotel in Kolkata on August 30.

In his introductory speech, Edward Manchester, Regional Director, BIOMIN Asia Pacific highlighted the company values and explained that Mycotoxin Risk Management and Gut Health Management are the two pillars for BIOMIN.

"R&D is the cornerstone for BIOMIN and we are the first and only company with an EU authorization of three ingredients in the group of feed additives for mycotoxin deactivation," he added.

Participating in all the Mycotoxin Academies as lead speaker, Eileen Han, Regional Product Manager – Mycotoxin Risk Management, BIOMIN Asia-Pacific explained about the risks and impacts of mycotoxins in poultry with data from BIOMIN Mycotoxin Survey Report.

"When it comes to counteracting mycotoxins, the poultry industry tends to think of 'toxin binders' first. However, clay mineral binders are not an effective answer to all major mycotoxins," said Ms Han, and added that a combination of different strategies like biotransformation and bioprotection can counteract

the negative effects of mycotoxins in poultry more completely.

It may be noted that the key to the effectiveness of Mycofix® product line from BIOMIN is its three-pronged strategy of mycotoxin control, namely: biotransformation, adsorption and bioprotection.

Gangga Widyanugraha, Regional Technical Sales Manager – Poultry in his presentation on "Feed testing and Necropsy" highlighted the prevalence of mycotoxin in poultry in India. He also quoted various instances of the mycotoxin risks he found from the extensive postmortem analyses of birds he had done across India.

Keerthivasan Chandrasekar, Digital Marketing Executive in his presentation on the digital media initiatives being done by the company in India and pointed out that staying connected with the official social media handles of the company on Facebook and Twitter will be of immense benefit to the farmers.

Apart from this, he also explained about using Mycofix® App and accessing key findings of the BIOMIN Mycotoxin Surveyand articles from Science & Solutions to the farmers.

BIOMIN has conducted the Mycotoxin Survey Program annually since 2004 and the accumulated number of samples is already over 75,000, which makes the program the largest worldwide data pool for mycotoxin analyses.

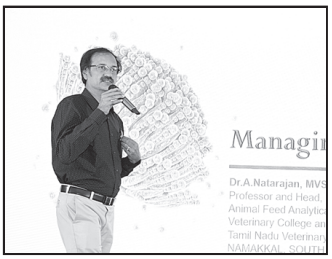
On the success of Mycotoxin Academies in India, Sujit Kulkarni, Managing Director, BIOMIN India commented that the company has now reached all key locations in India in creating awareness about mycotoxin risk management.

"It is a proud moment for all of us and I would like to thank the entire BIOMIN team for their support and commitment in making this concept a great success," he said and added that BIOMIN will continue to do such innovative programs, which sets them apart.

The Mycotoxin Academies were a cobranding initiative by BIOMIN, which was supported by its supply chain partners, Tara Group, Sri Amman Enterprises, Ayugen and SM Marketing for the events held in Hyderabad, Coimbatore, Pune and Kolkata respectively.

Sales Directors Shriraj Sirmokadam, Rajan Seralathan, Neeraj Singh and Regional Sales Manager Praveen Reddy took active part in planning and coordinating the events in their respective territories and ensured the success of the Mycotoxin Academies.


SAFE FOOD
Fact


Dr.A.Natarajan, MVS
Professor and Head,
Animal Feed Analytical
Veterinary College and
Tamil Nadu Veterinary

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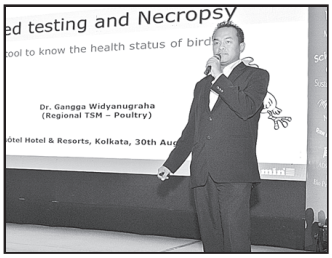
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Dr. Gangga Widyanugraha
(Regional TSM – Poultry)




Mycotoxin

Mycotoxin
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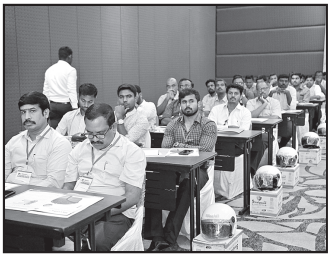




How to achieve successful coccidiosis vaccination

by **Ben Dehaeck,** Global Product Manager, Anticoccidials, Huvepharma, Belgium.
www.huvepharma.com

Coccidiosis is an infectious disease caused by protozoa from the genus Eimeria. The parasite is host specific and has a direct lifecycle. Birds get infected by ingestion of live sporulatedoocystsomni present in poultry houses. Once ingested by the chicken, the parasites invade and multiply in epithe-lial cells and hereby cause significant damage.

Day-old chicks spray vaccinated with coccidiosis vaccine

The severity of infection will depend mainly upon the number of infective oocysts ingested, i.e. on the infection pressure in the poultry house.

Birds suffering from clinical coccidiosis will show typical signs like diarrehea, bloody droppings, increased mortality, decreased feed intake and impaired performance insufficient control of coccidiosis also leads to impaired growth and feed conversion ratio, without the presence of evident clinical signs, so called subclinical coccidiosis or coccidiasis.

Intensive methods of production of poultry greatly favor the reproduction of Eimeria. As a consequence, coccidiosis is a continuing problem requiring constant attention and, in the case of broilers, a need for continuous supplementation with anticoccidial drugs or coccidiosis vaccines. The latter is becoming more important in recent years as it can be an alternative to manage coccidiosis and it can restore sensitivity of the Eimeria species in case of decreased efficacy of the current registered anticoccidials. The prevalence of clinical coccidiosisis estimated at 5% and of subclinical coccidiosisat of 20% of the global poultry production. This demonstrates that under current production systems, coccidiosis is still a major issue.

Coccidiosis vaccination

Coccidiosis control by means of vaccination is standard practice in breederand layer flocks housed in alternative systems. For vaccination live vaccines are being used, resulting in controlled contact, with minimal intestinal damage, with the different Eimeria species at an early age of life; the contact being necessary to establish immunity against the pathogenic field strains.

The reasons to consider coccidiosis vaccination in broilers (at least those slaughtered at younger ages, 6 weeks of age) are different. The main reason for vaccination in these broilers is not for immunity build-up, but for improvement of the sensitivity of the Eimeria field strains to anticoccidial compounds, the so called ‘restoration of sensitivity’ concept.

Furthermore, changing demands of retailers for specific labels, like ABF & NAE policies are, especially in the US, drivers for the increased use of coccidiosis vaccines in broiler flocks.

The success of coccidiosis vaccination is influenc-ed by two important parameters; the intake of the vaccine immediately after vaccination and the consecutive cycling of the vaccine. Firstly, special attention must be paid to vaccine application.

In most cases, coccidiosis vaccine administrations are mass applications by spraying the vaccine on the birds (in the hatchery or at arrival in the poultry house), spraying on the feed or by adding it to the drinking water. Although individual application of coccidiosis vaccines (for instance by eye drop) is the golden standard for guaranteeing the correct dosing for each individual bird, it is rarely performed because it is very labor intensive.

Mass application, if not applied properly, might result in incomplete vaccination of a part of the population as not every bird will swallow equal amounts of the vaccine.

Coccidiosis vaccination in the hatchery using the spray methodhas long judged as a convenient and successful method to vaccinate chicks, with coccidiosis vaccines applied to day-old chicks using standard cabinets which have been set up to maximize droplet size.

In order to optimize chances for good control, it is important to take notice of

some specific guidelines during the application and in the management of the farm.

Seven critical steps of good coccidiosis vaccination

Correct application in the hatchery:

Temperature:

A coccidiosis vaccine contains live parasites and transport and storage of the vaccine should be temperature controlled. A coccidiosis vaccine is sensitive to temperature variation. The optimal temperature for transporting and storage of the vaccines is between 2° and 8° Celsius.

It is advisable to monitor temperatures during transport and storage and any abnormalities should be reported. Extra care should be taken to ensure the vaccine is never frozen in transport or storage as freezing oocysts will kill them. Check for cold spots in the refrigerator.

Vaccine preparation:

The dilution should always be made according the specifications of the manufacturer for a specific vaccine. Preferably distilled water should be used as chlorinated water might have a negative effect on the viability of the parasite. In order to remove all the oocysts from the vial, the vial should be shaken before emptying and rinsed at least 2-3 times. Next to diluting the vaccine with water, a dye is added to the solution. The reason for adding a dye is to make the droplets more visible to the chicks and promote preening and in this way the intake of the vaccine. The dye should be diluted according to the manufacturer specifications.

Application:

Use a clean spraying vaccine device which provides a droplets size of e”100µm. In spraying devices containing a filter it is advised to remove the filter during vaccination. Once the vaccine solution is prepared it must be constantly mixed. Oocysts are heavier than water so they would sink to the bottom if not constantly kept moving (stirring can be done by means of air or magnetic rod).

It is very important that the oocysts are evenly distributed in the solution to ensure that each bird is vaccinated with the same dosage. When the chick crates pass the nozzles of the spray cabinet, the distribution of the spray should be carefully adjusted so that it covers the entire box (not too much or too little). This should be tested and adjusted before the first batch of birds pass through the spraying machine.

The volume for spraying one box of 100 chicks is usually around 25ml. The dilution of the vaccine is calculated based on the number of chicks inside one box, the flow rate and the package of the vaccine. For example for boxes containing 100 chicks, a vaccine vial of 10,000 doses should be diluted in 2.5 litre of water, if the spray cabinet is spraying 25ml per box. This should be checked before and during application and adjusted when needed.

The spray should be coarse meaning that the chicks need to see the droplets. When a mist is created, the droplets size is set too small and the birds will be less stimulated to start preening. A coccidiosis vaccine is intended to be ingested and not inhaled. Important to note is that an unsprayed

Spray vaccination in the hatchery

chick does not necessarily mean that it is not vaccinated. As described below, preening is essential for vaccine uptake.

Preening:

This is essentially the most important part of the vaccination as the chicks will actually be vaccinated by ingestion of droplets (= preening). When the box passes under the nozzles the birds get wet and colored (in case of using a dye). It is not because a chick has droplets on its head that it is vaccinated.

The real vaccination is obtained when they ingest the droplets from another chick in the crate! Important to allow preening is to have sufficient light after the vaccination ideally this light should not only come from the celling but also from the sideways.

If crates are stacked too high the lower boxes might not get enough light and the birds will not be stimulated enough to preen. Correct temperature between 24° and 27° Celsius without draft in the waiting room is also important to have sufficient activity for preening. Attention should be paid that the birds are completely dry before they get transported so it is recommended to have at least a time span of 15-20 minutes before loading the crates.

Coccidosis vaccines are live vaccines and in order to obtain a solid immunity, each of the different Eimeria species in the vaccine needs to replicate. Eimeria replication takes place in, for each species, specific region in the intestine. At the end of the replication new vaccine parasites are excreted and when these are again picked up by the chickens, a second wave of vaccine replication will start.

It has been demonstrated that a second and even a third contact with replicating parasites is necessary to obtain a solid immunity. This indicates the importance of the Eimeria species in the vaccine to be capable of multiplying themselves.

In order to allow this cycling of the vaccine, certain measures on the farm are advisable:

On Farm

Preparation of the poultry house:

Before entering new birds in the house it should be thoroughly prepared. Special attention should be given to the feeding and drinking lines. It should be carefully checked that no feed is left in the feeders and the silo's from the previous flock as this might contain medication and/or anticoccidials that might interfere with the vaccine.

It is paramount for the success of a coccidiosis vaccination not to have any kind of drugs in the feed that could kill the vaccine! The same applies for the drinking water. This is especially important in the first weeks after vaccination until solid immunity has been developed.

Next to this, if vaccination is done alternately with anticoccidials between flocks, one can optimize vaccination by doing, a cleanup (with chemical anticoccidial) the flock before as this will lower the coccidiosis infection pressure considerably, giving an advantage to the vaccine strains to dominate the poultry house.

Environment:

Both temperature and humidity are very important parameters for the cycling of the vaccine. Next to

the general advice for good brooding management (CO_2:<2,000ppm, maximum 3,000ppm/NH_3: <10ppm/minimum 32°C at chicken height/ temperature of the floor: ideal: 30°C/ warm the house before placing the litter) these are specific requirements when coccidiosis vaccination is applied.

For optimal sporulation of oocysts a relative humidity in the house of 60%, dry matter content in the litter of maximum 80% and a litter temperature of minimum 25°C is advisable. For cycling of oocysts contact between excreted vaccine and the birds is necessary. This is guaranteed if broilers are floor reared and under normal commercial density.

Monitoring:

It is advisable to monitor the flock after vaccination. This can be done by performing necropsies or by doing OPG counts. It is expected to have high OPG counts after vaccination as this is crucial to allow the vaccines to cycle. AS for necropsies the ideal age of the birds to check for coccidiosis lesion would be between 15 days of age until slaughter age.

It can be expected to see some coccidiosis lesions as the birds received the parasite but the scores should not be too high and they should disappear early (earlier than normal) as the vaccine strains have a shorter life cycle and will induce lower lesions.

Monitoring should be done regularly and any deviation reported to the manufacturer.

Conclusion

Coccidiosis vaccination in broilers is becoming increasingly popular. Crucial for successful vaccination is a correct application and management afterwards to allow cycling of the vaccine.

PRESS RELEASE

BIOMIN Malaysia Announces Move to New Office Space to Support Rapid Growth

BIOMIN, the global leader in mycotoxin deactivation and gut performance management, has moved its Malaysia office to the Meru Industrial Park in Klang, Selangor.

21 September 2018 – BIOMIN is expanding its presence in Malaysia with a new integrated office space in Klang, the main port-city gateway into the country.

"This new location strengthens the presence of BIOMIN Malaysia and offers an integrated facility for the sales, support and distribution of BIOMIN products throughout the country," said Steven Tan, Managing Director of BIOMIN Malaysia. "Our continued growth in Malaysia over the last 26 years has necessitated this relocation to a bigger office and warehouse space in Klang, Selangor. It is our pleasure to celebrate our ongoing commitment to the industry on 18 September, at the official opening of our new office."

Standing at 7,315 sq. ft and designed with wood elements, the new three-storey building reflects the

Steven Tan

BIOMIN innovative company goals that focus upon delivering natural, safe and quality products to its customers. In addition, it houses a conference center, and an expanded, dedicated warehousing facility to serve customers better.

BIOMIN Malaysia Team at the Office Opening

BIOMIN Malaysia Building

BIOMIN Malaysia Office Space

ENCIKOL-PH

The superior multi-action, multi-functional disinfectant

- Very fast acting due to synergistic action, with long time residual activity
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- Broad spectrum of activity against algae, bacteria, fungus and virus, being totally cidal
- Avoids development of resistance due to multi ingredients system

ENCIFORM-RM

Litter Disinfectant cum Powder Fumigant

- Lethal to all bacteria, molds and virus
- Best for use in hatcheries, in chick nest pots, incubators and litter management
- User friendly. No corrosive liquids to spatter and no stained clothing.
- You can release the gas either quickly or slowly, by controlling the amount of heat.
- No evaporation.

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The Super drinking water protection system

- Specifically effective against E.coli, fungus, algae and pathogens in drinking water
- Immediate acting
- Remains active for several hours, there by preventing re-infection of disinfected water.
- Gives consistent performance with increased weight gain
- Reduced loose droppings, hence better litter management

EGG-KLEEN

(Multi spectrum EGG Cleaner)

- EGG-KLEEN combines superior cleaning power with outstanding degreasing and deoiling capacity
- Rapid activity hence requires less contact time
- Excellent foaming characteristics
- Compatible with all NARSIPUR disinfectants
- Safe, non toxic and easy to use
- Very low corrosivity

UNIDROP

Liquid Detergent Concentrate

- Soluble in water in all proportions forming highly foaming solutions.
- Excellent surface tension reducing, powerful wetting and penetrating properties.
- Excellent emulsifying and dispersing powers.
- Stable to high temperatures.
- Stable to dilute acids, alkalies and metallic ions such as Ca,
- Non-flammable, non-volatile, non-toxic.

ENCIPHOR- PLUS

Liquid Iodophor Detergent cum Disinfectant

- Non-toxic, non-corrosive and non-irritating
- Effective in hard water and in presence of soil
- Good surface wetting and soil penetration
- No build up of resistance
- Cleans and disinfects at the same time
- Acts as an effective deodorant
- Built in colour indicator for its potency

C-909

Premium Disinfectant Concentrate

- Broad spectrum activity against bacteria, fungi, molds and viruses, being cidal
- Powerful wetting and penetrating properties.
- Non-flammable, non-volatile, non-toxic at user dilutions.
- Totally safe for handling and use at user dilutions.
- Non corrosive and non staining

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Water Acidifier

- Non corrosive and non staining at user dilution
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- Avoids multiplication of entero pathogens
- Helps control scale formation in pipelines
- Absolutely safe
- Very economical
- Just a few drops is sufficient

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PRESS RELEASE

Egg Industry Announces Commitment to United Nation's Sustainable Development Goals

12th September 2018

Today in Kyoto, the World Egg Organisation (WEO) announced the global egg industry's pledge to work in partnership with the United Nations, to fulfil its Sustainable Development Goals (SDGs).

The UN's SDGs represent a shared vision to eradicate poverty and social inequality, and to tackle climate change by 2030. A social contract between the world's leaders, the successful delivery of this ambitious blueprint is dependent on engagement and participation from international industry. The WEO has outlined key areas where it is delivering positive outcomes in line with the UN's targets.

Of the UN's 17 goals to transform our world, the WEO has identified six primary objectives where the egg industry is already making a significant impact through a range of dedicated sustainability initiatives. These specifically address the following goals:

- **Zero Hunger**

Eggs are a sustainable, affordable source of the highest quality protein for everyone. Through its charitable work, the International Egg Foundation (IEF) is tackling food poverty experienced in developing countries, such as Swaziland and Uganda, through an ever-broadening range of community-based programmes.

- **Good Health and Wellbeing**

Eggs fulfil numerous nutritional requirements and the industry is dedicated to educating the world about the positive benefits that this natural resource delivers as part of a balance diet.

- **Quality Education**

Egg consumption supports brain development and concentration, particularly in young children. Additionally the IEF is responsible in its role as educational trustee for initiatives in Mozambique, Zimbabwe and Swaziland, providing resources that enable communities to become successful egg producers.

- **Responsible Consumption and Production**

Building trust and transparency in our food supply chains is essential. To help overcome the threat of Avian Influenza the industry has published its biosecurity recommendations. Secondly, the issue of animal welfare is driving the operations of all international egg industry producers and country associations. This is evident in the WEO's role supporting the OIE in establishing a framework of Global Standards for Laying Hens.

- **Climate Action**

The egg industry strives to continually reduce the resources it uses whilst ensuring the same output. Best commercial practice regarding sustainable intensification is regularly shared throughout the industry's member organisations.

- **Partnerships for the Goals**

Collectively managing the future of our planet and its inhabitants is vital to the success of the sustainability agenda. There is a need for international discourse, interaction and unified policy making. The WEO recognises the need to be proactive and accountable. To this end, the organisation continues to develop constructive relationships with the OIE, CGF and the major egg associations worldwide and its leading companies.

This is supported by ongoing communication with the WHO, UN and WWF to address a range of sustainability issues.

This latest announcement marks the launch of the egg industry's Global Initiative for Sustainable Eggs (GISE) which will support a range of ambitious sustainability objectives – helping to deliver the organisation's vision of continuous improvement. These cover the following industry specific criteria:

- Preventing the diseases of animals becoming the diseases of human kind
- Improving nutrition
- The elimination of forced labour
- Environmental sustainability - the prevention of deforestation through the sustainable sourcing of soy
- Working to ensure the responsible use of antimicrobials
- Working to improve animal welfare

WEO Chairman, Tim Lambert, explains; "*Kyoto is the perfect location for our sustainable development announcement. Many members of the international egg industry are gathered for our Global Leadership Conference and this ancient city has been the site of previous historic agreements, that seek to change our world for the better. The UN's Agenda for Sustainable Development calls on us collectively, to initiate efforts to achieve the seventeen SDGs over the next twelve years. The global egg industry is absolutely committed to the cause.*

Society wants reassurance that companies are actively engaged with their customers and communities. Businesses have an inherent responsibility to do the right thing, for the right reasons. Through our own clearly defined goals, the egg industry is addressing the needs of people in both developed and developing countries - socially, economically and environmentally."

GISE's work co-exists alongside the framework of the UN's Sustainable Development Goals. From social responsibility and environmental sustainability to nutrition and better operational practices – every aspect has a humanitarian focus and benefit.

***

Source: **Srinivasa Hatcheries, Vijayawada**

Up to 13% gain in production capacity due to a liquid feed additive

Fylax® Forte HC proves why moisture management is key to profitability

- By **Dr. Swamy Haladi**, Feed Additive Manager, Trouw Nutrition India

When added to feed material, thefeed additive Fylax Forte HCcompensated moisture loss during the production process by up to 1.5%, increased production capacity by up to 13%, and reduced energy use by as much as 12%.

Why moisture management is important

Variability in the final feed product has an impact on profitability. One of its main causes is moisture lossduring thegrinding process. A consistentfeed input to the pelletizeris better for the machinery and helps ensure a smoother production process.

The moisture levelof raw material drops during grinding and mixing and increases during conditioning. The addedsteam, however, will be flushed off again while being cooled. The result is a loss of moisture of about 0.5-1% in the finished product compared to the initial raw material, leading to a loss of 5 to 10 kg per tonne of feed. Losing moisture means losing money.

How Fylax Forte HC works

A hydrating solution of water in combination with Fylax® ForteHC acts as a lubricant for thepelletizer. This reduces friction in the die and lowers its resistance, thereby reducing energy consumption. The production process also runs more smoothly and efficiently, due to a lower risk of blockages. It also compensates for the moisture loss and all of this results in an increase inproduction capacity while pellet quality is maintained or even enhanced.

Surfactants inside Fylax Forte HC have the ability to reduce the surface tension of water, allowing better penetration and improved distribution. Thislubricating effect allows steam to penetrate more easily into the feed particles during the conditioning phase and lowers press resistance during production. This makes the process more efficient, while increasing throughput. In fact, we've achieved improvementsof up to 1.5% in moisture profile and up to 13% in production capacity, and have reduced energy use by up to 12%.

Assuring feed quality

The added free moisture in feed assures optimal circumstances formould growth.This is a persistent problem if the feed is stored for several months, as the nutritional quality deteriorates. Moulds consume the main ingredients in feed materials, resulting in reduced starch and protein content and poorer palatability, which may affect animals' feed intake. Mouldsare also able to produce mycotoxins as secondary metabolites. Even at low levels, thesemay pose a serious threat to animal and human health.

Toinhibit mould development and the possible future generation of mycotoxins, Fylax Forte HC contains activated propionates held in micelles. This combination of micelles and organic acids is very effective. The activated propionates are able to penetrate the strong, thick cell wall of the moulds by creating porosity in the cell membrane. This in turn allowsthe organic acids to enterthe cell, disrupt the DNA structure and exhaust the mould cell. To ensure a long-lasting protective effect, the organic acids are chemically buffered to minimise evaporation.

About Trouw Nutrition

Trouw Nutrition, a Nutreco company is part of the SHV Group. Trouw Nutrition, a global leader in animal nutrition, is a one stop solution provider that has been supporting farmers, integrators and the feed industry around the world for over 80 years.

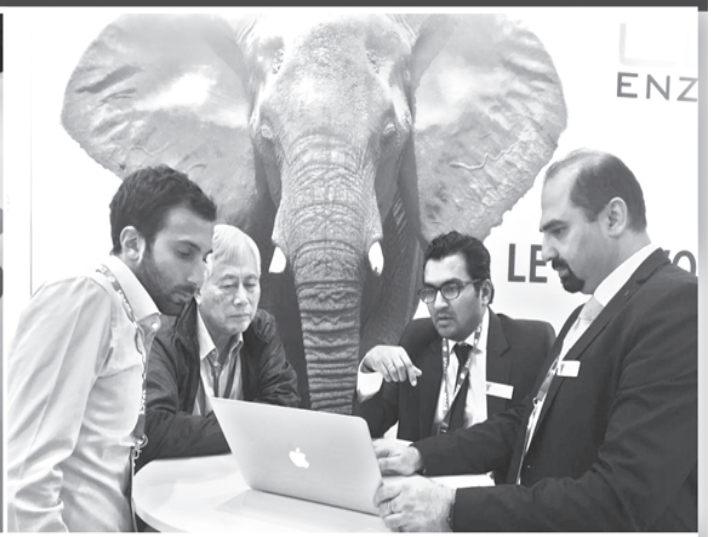
For further information on our innovative products, please contact us at: customercareindia @trouwnutrition.com

LUMIS ENZYMES

AT SPACE EXHIBITION, FRANCE

LUMIS ENZYMES

AT SPACE EXHIBITION, FRANCE



PRESS RELEASE

Food system transitions in India may have profound impact on regional and global food system, says new EIU study

Launch of EIU Report on Fixing Asia's Food System L-R-Krish Iyer, Prof. Ramesh Chand, Smt. Harsimrat Kaur Badal, Siraj Chaudhry, Madhvi Das. Suresh Narayanan and Debashish Mukherjee

- 90% of survey respondents concerned about their food systems' ability to maintainlocal food security.Yetonly 32% feel they have the ability to determine the success of their food systems
- 93% believe inter-regional trade liberalisation is important for their organisation's business. 37% of all 2016 food imports in Asia came from within Asian countries
- Population growth, urbanisation and changing food demandsare already pressuring Asia's food systems and will threaten food security if not addressed
- Stronger partnershipsbetween public and private sectors and across countries are required, as is tighter integration across local and regional supply chains, **India's Lets Millet program a stellar example**
- Smallholder farmers in Asia need to be made profitable and sustainable with training, access to finance and financial literacy education and access to markets

National, September 11, 2018:Today Cargill along with FICCI and EIU launched *Fixing Asia's Food Systems*, a five-part research programme that explores a range of issues and is centred around a survey of 400 business leaders in the region. The first piece, "**Separate Tables: Bringing together Asia's food systems**",is a deep dive into **six key megatrends**: **urbanisation, the double burden of undernutrition and obesity, technology constraints, the need for transparency and sustainability, and politics.**

The report was unveiled by **Smt. Harsimrat Kaur Badal, Hon'ble Union Minister for Food ProcessingIndustries**in Delhi today. An interactive discussion on the challenges and opportunities ahead which was organised during the launch had Prof. Ramesh Chand, Member, Niti Aayog, Madhavi Das from FSSAI and other industry captains.

WithAsian cities set to expand by **578m people by 2030** and **upto 85% of the increase in the global middle class expected to come from Asia,**urbanisation will have significant effects on

food production and demand in the region, says the study.**China, India and Indonesia alone will account for 75% of Asia's total population and 60% of its real GDP by 2030**. Income growth in Asia will continue to drive the transition away from direct consumption of cereals and towards more diverse diet. **Dairy products and eggs account for a larger proportion of calories consumedin India (6%)**and China (4%) than in Indonesia (1%). India has a strong vegetarian culture, butprojections estimate that **India's meat consumption (mainlychicken and fish at 63%) will rise to 9 kg by 2050**, from a base of 3 kg.

People will continue to need access to food that is affordable, safe and nutritious. According to the study, Asia is home to nearly two-thirds of the world's malnourished.Across Southeast Asia an estimated 60 million children under the age of five are stunted. **One in five children in India arewasted**(low weight for height). The government canextend the progress madethrough policy changes, regulatory measures and encouraging public investments to make our food systems more responsive to nutritional needs.Improvements in nutritional status will not happen unless the incomes of rural households increase, prices of nutritious foods are kept affordable, and households are better informed about nutritional content of food and the need to diversify their diets. **Fortification and reformulation focus is already underway in India, ensuring availability of nutritious food to under nourished population.**

On the other hand, there are indications that developing countries have a strong interest in sustainability. However, estimates suggest that **sustainable products are 30% more expensive than traditional products**, which means the shift towards sustainable food is likely to be led by higher-income countries in the period to 2030.The report also mentions **R&D in food production in Asia will remain a key driver of agricultural development.India's investment in R&D needs to be increased from the current figure of 0.40% of the agricultural GDP to enhance productivity,manageresource scarcity and climate change to helpachieve objective of increased farmer remuneration**.

And lastly, **politics will continue to play a key role in food systems due to divergent interests and resource scarcity**. A balance is needed between the approach of protecting farmers' interests through the use of subsidies, price floors or trade barriers and consumer interests as thismay come in the form of higher prices for consumers. **By 2030, Asia is projected to need 65% more water for industrial use, 30% more water for domestic use and 5% more water for agricultural use.** This increased need for water (coupled with declining resources) will drive water politics between upper and lower riparian countries.More technology intensive farming is the need of the hour, for ex-climate smart agriculture, precision and vertical agriculture.

The research shows that business leaders overwhelmingly agree that there is cause for alarm around Asia's food security. The solutions include greater collaboration to enforce food safety standards, educate farmers and improve supply chain infrastructure. Yeta number of other factors-including differing regulations, border policies,

import duties, taxes, food cultures, self-sufficiency programmes and uneven economic development-require more robust thinking and policy solutions for Asia's food system to truly make the needed progress.

Future articles in the series will go deeper into fragmented supply chains, structural changes in Asian diets, water challenges, and innovation's role in creating new solutions and foods for the future.Together, "Fixing Asia's food systems" provides both an in-depth and comprehensive overview of the challenges all stakeholders need to address and a collection of potential solutions to help drive change at the pace that's needed.

"As Asia's population grows and urbanises, it is imperative that regional co-operation improves and food supply chains become smarter, better integrated and more efficient," says **Rashmi Dalai, an EIU managing editor and the project manager for Fixing Asia's Food Systems.** "However, this is no easy task. A complex ecosystem of often divergent policy and societal concerns needs to be brought into alignment. This can only be done by first agreeing on the issues at hand and the urgency with which they need to be addressed."

About the research:

In October 2017 the EIU conducted a survey on Asia's food systems, commissioned by Cargill. The 400 respondents were business leaders in Asia's food industry, located in China, India, Indonesia, Malaysia, the Philippines, Singapore and Thailand. The research was complemented with primary research, including interviews with four regional experts.

About The Economist Intelligence Unit

The Economist Intelligence Unit is the world leader in global business intelligence. It is the business-to-business arm of The Economist Group, which publishes The Economist newspaper. The Economist Intelligence Unit helps executives make better decisions by providing timely, reliable and impartial analysis on worldwide market trends and business strategies. More information can be found at www.eiu.com or www.twitter.com/theeiu.

About Cargill

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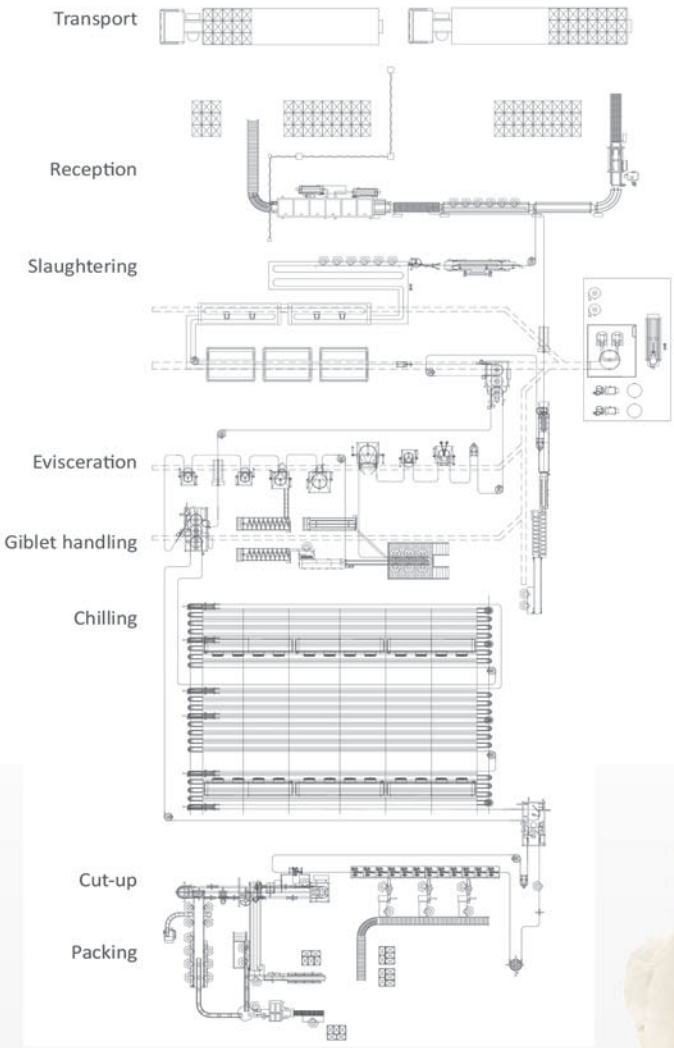

Example of a 3000 - 6000 bph solution

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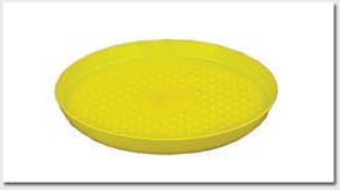
SAI KRISHNA

POULTRY EQUIPMENTS

Chick Feeder

Egg Tray



Chick Feed Tray

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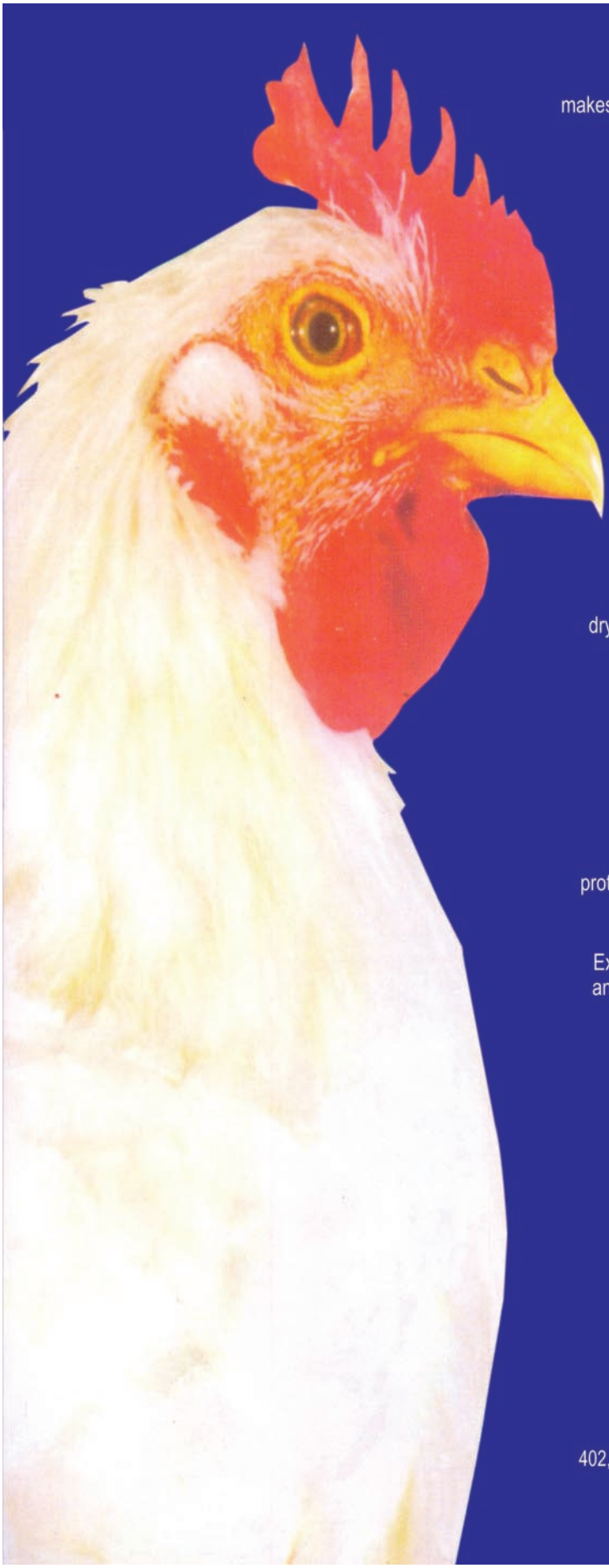

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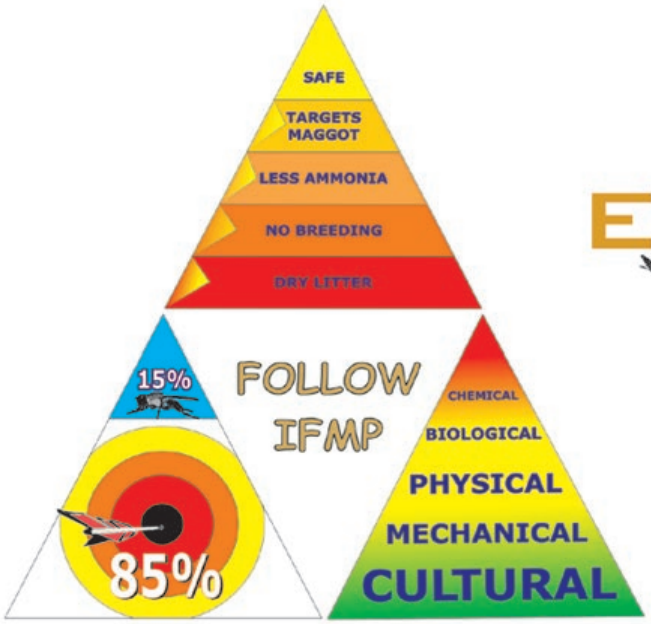

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PRESS RELEASE

BIOMIN Launches Spectrum Top 50® Advanced Mycotoxin Detection Service

Ursula-Hofstetter

The new LC-MS/MS method for multi-mycotoxin analysis can determine over 50 different mycotoxins and metabolites in a single run, making it the most advanced mycotoxin detection commercially available.

10 September 2018 – BIOMIN has recently introduced a new, innovative mycotoxin detection service for customers globally. Spectrum Top 50 allows for the identification of more than 50 different mycotoxins and metabolites in finished feed and raw materials.

"Regular testing for regulated mycotoxins is an accepted part of an effective mycotoxin risk management program," observed Ms Ursula Hofstetter, Head of Global Product Management Mycotoxins at BIOMIN.

"With Spectrum Top 50, customers will have access to a powerful new method to uncover previously undetected masked and emerging mycotoxins lurking in their feed in addition to the regulated ones," explained Ms Hofstetter.

"We expect customers to benefit from getting a full view of the mycotoxin situation in their feed, and the speed and scope of Spectrum Top 50 is unmatched in the market," she added.

Masked and emerging mycotoxins

Scientific research and guidance from authorities have signaled that there is cause for concern regarding masked mycotoxins that cannot be detected by conventio-nal methods, as well as so-called 'emerging' mycotoxins whose effects are still being discovered.

For example, masked and certain acetylated forms of deoxynivalenol (DON or vomitoxin) are readily transformed back to DON in the intestine1 and then able to pose a threat to animal health and performance.

Recent findings in regards to the effects of emerging mycotoxins in livestock show signs of toxicity and underscore the need for further research.

Innovative customer solutions

Jan-Vanbrabant

"Applying the most advanced scientific solutions to issues our clients encounter due to mycotoxin contamination has always been a guiding principle for us as a company," stated Jan Vanbrabant, Managing Director of BIOMIN and Executive Board Chairman of ERBER Group.

The mycotoxin detection service to help BIOMIN clients identify mycotoxin issues closely complements its leading mycotoxin deactivating feed additive, Mycofix®.

"With Spectrum Top 50, we have extended our mycotoxin risk management offering to help customers achieve state-of-the-art detection and protection," noted Ms Hofstetter.

Spectrum Top 50 relies upon liquid chromatography coupled to tandem mass spectrometry (LC-MS/MS) technology using a method developed by Romer Labs. "The new service demonstrates the clear synergies that benefit customers of ERBER Group companies," concluded Mr Vanbrabant. Both BIOMIN and Romer Labs are a part of ERBER Group.

PRESS RELEASE

IVPI ASP on 14 Aug 2018

Veterinarians and entrepreneurs of poultry industry eagerly wait for that one event in their calendar to approach faster, the 14th of August of every year and for the Annual Special Program of the Institution of Veterinarians of Poultry Industry, (IVPI-ASP), Bengaluru. This one would be special to them for the path breaking ideas and initiatives are discussed by innovative entrepreneurs and leading scientists alike during this event. Clutching on to this expectation, IVPI – ASP set a new benchmark this year on Tuesday, the 14th of August of 2018 at Shangri-La Hotel, Bengaluru, with the most relevant theme ever and with a "Life Time Achievement award for the poultry veterinarian".

The theme of the event this year was "Food Safety – Insights into consumer minds". Four speakers from the poultry and food industry who were, in some way, pioneering the marketing outreach to chicken consumers. They were as below:

1. Mr. ArunSubbaiah, AVP, Packaged Foods Division, CPF India, Bengaluru: **Food Safety initiatives in Chicken Meat Marketing**
2. Mr. Narendra Pasuparthy, CEO, Nandu's Chicken, Bengaluru: **Engaging consumers through Quality & Innovation**
3. Mr. Suresh Parameshwaran, CMO, Fresh to Home Meat, Bengaluru: **Concepts of Modern Online Fresh Food Marketing**
4. Mr. Nikunj Sahoo, GM, Meat Procurement Business, Metro Cash & Carry, Bengaluru: **Marketing of Chicken – A metro experience**

Mr. ArunSubbaiah spoke on Food Safety Initiatives in chicken meat:

There are three sets of chicken consumers, by name retail consumers, QSR consumers and food service consumers. While safety (designated residues within regulatory limits), cold chain and

traceability are common for all three segments of consumers, the factors like timeline, certification, value additions are specific to latter two. The speaker dealt in depth with these items. He stressed that the consumers and stakeholders have to wake up to an environment of food safety regulations driven market trends.

1. For traceability, it is important to link all phases of operations, either integrated or well linked processes
2. Branding of chicken meat and value added products, ease consumers purchase process
3. Animal welfare is a duty of every producers. Though regulations give minimum guidelines, producers might have to go well beyond that to earn consumer trust.

Second speaker Narendra Pasuparthy spoke on Engaging consumers through Quality & Innovation. He highlighted the facts as below:

1. Engaging multiple channels to reach to consumers. Seldom today's consumers buy their food from a fixed channel. Hence, it is important to provide the same high quality experience regardless of the channel of service.
2. Mr. Naren explained how did he come out with "Concept Outlets" which are elegantly designed keeping in the insights from modern architecture, aesthetics, functionality of the outlet, hygiene of the place and freshness of meat delivered.
3. The advertisements in social media and in mobile android / iOS apps were another innovation from Nandu's to deliver the messages on safety, residues within approved regulatory limits, hygienic production systems, and trust.

Overall, Mr. NarenPasuparthy's speech gave a lot more core and corollary ideas to the gathered producers and food marketeers.

The third speaker, Mr. Suresh spoke well on **Concepts of Modern Online Fresh Food Marketing**

He brought forward the following points:

#1 - Combining Technology& farming can beamazingly fun & lucrative!

#2 – Technology can bring disruptive changes, just need to be open to change

#3 - Teaching technology to fishermen and farmers can be extremely hard!

#4 – Connecting producers to consumers leads to happierconsumers, producers and CFO!

#5 – The Indian fresh food market is very large

#6 – Consumers do care about residue free fresh &delicious food

#7 – e-Commerce is probably the fastest way to grow a brand, but with caveats

The last but not the least speaker Mr. Nikunj Sahoo spoke on **Marketing of Chicken – A metro experience**

The speaker highlighted the sudden spurt in food consumption outside the traditional home food, in quick service restaurants and casual dine restaurants in the recent past and continuing to a foreseeable future at about 18% compounded annual growth rate.

The speaker highlighted the importance of following in his speech:

1. Up to date technology in food production and processing
2. Monitoring and assuring food safety and quality
3. Building infrastructure for supply chain, storage and logistics

The speaker highlighted the need for all food chain stakeholders to proactively plan actions to build consumer trust in food and defend against the myths spread about scary food. He also highlighted the need for active collaboration of food chain stakeholders and regulators. The other important topics he had touched upon were branding of food

to build trust in consumers and maintain consistency of food quality. He also demonstrated the extensive processes (in the form of check list) required from sourcing to sale to ensure the quality food is delivered to all consumers at all times.

Professor Devegowda, the President of IVPI and the beloved leader in chicken industry inaugurated the conference with his opening remarks. The key attraction was his clarion call to all industry stakeholders and consumers to fight the scare created about food in the recent past by some bad elements in the media. He spoke authentically telling that "Hormones or Steroids were never added to chicken production. Antibiotics are used now only for treating diseases and keep up the health of chicken. Only healthy chicken can produce healthy food. There is a considerable improvement in the chicken production facilities with a huge investments in modern technology".

The Life Time Achievement award for one among the highest contributing veterinarians was awarded to Dr.Kuppuswamy Mohan. Dr. K. Mohan had a profound contribution to the poultry industry in different parts of India and worked tirelessly to lay the foundational values of Institution of Veterinarians of Poultry Industry. In the illustrious career of more than 4 decades he had supported many an entrepreneurs of poultry to give shape to their organisation, by maintaining the health of their poultry stock. Dr. K. Mohan also had been a mentor of a generation of poultry veterinarians.Dr. Mohan was accompanied by his wife and daughter and his close family members. Dr BP Manjunath presented the event with all aplomb. Dr Mohan was honoured with a Petah, garland, fruit platter, shawl, a plaque and a citation. The dignitaries like Mr. Akhilesh Babu, Prof.Srinivasa Gowda, and others were on the dais.

Dr. L Aravind compered the entire function professionally and recognised all speakers with saplings to mark the significance of green earth. Dr.Ravi Kiran proposed vote of thanks. The seminar was concluded with singing of National Anthem by all and with a sumptuous dinner. Hotel Shangri-La served a delicious and nutritious menu to all the delegates and guests.

PRESS RELEASE

Huvepharma® Acquires T-HEXX Animal Health & Qalian, an InVivo & Meriel company

Huvepharma®, a fast-growing global pharma ceutical company focused on developing, manufacturing, and marketing human and animal health products, announces the acquisition of T-HEXX Animal Health, a division of Hydromer, Inc. and the Animal Health Division of Neovia, from InVivo Group, a move that will expand the EU focus on livestock animal health products, and includes Qalian France (Segré), Meriel France (hygiene line, St Etienne, France), Qalian Portugal (Lisbon) and Qalian Italy (Carpi) and the branded veterinary pharmaceuticals (drugs & premix), animal dietetics and hygiene product lines.

The T-HEXX lines of products are based upon innovative hydrophilic polymer technologies for animal health, primarily in the dairy and equine markets. T-HEXX Animal Health manufacturers and sells a broad range of products utilizing patented hydrophilic polymer technologies designed for mastitis management in dairy cattle, hoof care, and unique germicidal topical products for horses. They serve customers in the U.S. and internationally.

On the T-HEXX acquisition, Mr. Glen Wilkinson, President of Huvepharma U.S. remarked "The purchase of T-HEXX Animal Health supports Huvepharma's vision for growth and development. T-HEXX has created great products for the dairy and equine markets and we are thrilled to add these unique product lines to our portfolio."

"Huvepharma will immediately assume marketing and sales of T-HEXX brands to our current customers while utilizing the sales and marketing strengths of AgriLabs. This timely purchase appropriately follows the recent announcement of a new dairy cattle vaccine – KLEBVax SRP", added Mr. Wilkinson.

On the Qalian acquisition, Dr. Christian Vervaet (DVM), EU Sales Director Huvepharma said "We're very excited about this addition to our EU animal health business". "This acquisition furthers Huvepharma's strategy in creating a balanced portfolio of animal health products and enhancing our presence in Europe and our international markets. We will be in a better position to serve our customers with an extended high quality product range, the Qalian team and the complementary production facilities. Huvepharma and Qalian are strong, complementary businesses focused on providing real solutions for animal health," Dr. Vervaet added.

Mr. Alex Klein (DVM), General Manager Qalian France said "We're pleased to join Huvepharma's internationally recognized animal health company. This move will provide us with resources to quickly bring new solutions to veterinarians and producers. It will also allow us to accelerate the international development of our ranges of products".

Huvepharma SEA (Pune) Pvt. Ltd.'s Managing Director, Mr. O.P. Singh expressed his excitement and appreciation of the acquisitions. In his words "Huvepharma Group's dedication to the animal health industry finds its expression time and again through their commitment to expansion, upgrade and increased investments in acquiring specialized products and companies. This dedication is the cornerstone of quality deliverables and makes the Group reliable and lasting. Huvepharma SEA is pleased to be a part of such an organization and we, as always, look forward to our contribution in strengthening the bond with our esteemed customers & stakeholders through the wide range of products and services with the highest degree of technological innovations and scientific platforms."

About Huvepharma®: Huvepharma is a privately-owned company, headquartered in Sofia, Bulgaria. Huvepharma's animal activities are focused on livestock animals. Huvepharma differentiates by producing in-house the Active Pharmaceutical Ingredients that compose more than 80% of its range offering an optimal control on product quality.

About AgriLabs: AgriLabs®, a member of the Huvepharma® group of companies, is a leader in biological innovation for animal health in the United States. Through a product range that includes licensed and custom vaccines, proprietary DNA platform and adjuvant technologies, and other leading brands, AgriLabs is improving animal health, nutrition and productivity. For more information, visit agrilabs.com.

About Hydromer Inc.: Hydromer is an innovative, certified polymer development company engaged in the business of listening to the voices of our clients, focusing on their goals by inventing, developing, patenting, licensing, manufacturing polymer-based products and services. We serve the medical device, pharmaceutical, animal health, biotechnology, industrial, cosmetic, and personal care markets.

About Qalian & Meriel: Qalian & Meriel represent the Animal Health division of Neovia (nutrition & animal health subsidiary of InVivo Group). Qalian's activities are focused on livestock animals. Qalian is a leading player in France and abroad, providing customers with veterinary drugs, medicated premix, animal dietetics and hygiene solutions.

PRESS RELEASE

Change of Guard: New leadershipteam at the helm at CLFMA of India

CLFMA of India is the apex organization and the voice of the country's dynamic livestock sector. The 51-year old industry association is recognized as one among the highly reputed in India. **CLFMA OF INDIA is well recognized by livestock farmers, Central and State Governments, government departments, Agricultural Universities, Veterinary Colleges and also National Research Institutes in India as well as outside the country.**

On 7th September, 2018, CLFMA's 51st Annual General Meeting was held and the new leadership team took charge for the period 2018-20. Speaking on the occasion the outgoing Chairman Mr. B. Soundararajan expressed his appreciations and conveyed best wishes to the new team led by Mr. S. V. Bhave, Managing Director, Berg and Schmidt India Pvt. Ltd, who got elected as the new Chairman.

Mr. B. Soundararajan mentioned that CLFMA is well respected and well recognised in the Livestock Industry. CLFMA is the pioneer organization and voice of the sector, which actively works to protect the industry's interest through policy and regulatory advocacy.

"It wasmy great pleasure and honour to serve as the Chairman of CLFMA of India for the last two years during which the organization made significant progress in terms of 3 I's - "Image, Impact & Income". I am sure under the able stewardship of a visionary leader like Mr. S V Bhave, CLFMA will continue to grow to newer heights. I wish the new Office Bearers and the

Managing Committee Members all the success." Commented Soundararajan.

CLFMA OF INDIA has over 230 members representing diverse subsectors of animal protein value chain including feed manufacturing, poultry, dairy and aquaculture business, animal nutrition and health, veterinary services, machinery and equipment, processing, distribution and retailing of meat and ancillary services such as banking.

Following Office Bearers were elected for the period 2018 – 20.

Chairman	: Mr. S. V. Bhave, Berg and Schmidt India Pvt. Ltd.
Dy. Chairman	: Mr. Rajeev S. Murthy,Godrej Agrovet Limited
Dy. Chairman	:Mr. Neeraj Kumar Srivastava, Novus Animal Nutrition (India) Pvt. Ltd.
Secretary	: Mr. Divya Kumar Gulati, Nurture Aqua Technology Pvt. Ltd.
Treasurer	: Mr. Naveen Pasuparthy, Nanda Feeds Pvt. Ltd.
Immediate Past Chairman	: Mr. B. Soundararajan, Suguna Holdings Private Limited

Theother members of the Managing Committee 2018 - 20comprises of:

1. Mr. Sujit Komarla	: Komarla Feeds
2. Mr. Vijay Bhandare	: Bhavani Agrovet Pvt. Ltd.
3. Mr. Sumit Sureka	: Shivshakti Agro (India) Ltd.
4. Mr. Anil M	: KSE Limited
5. Mr. RamakanthVakula	: The Waterbase Ltd.
6. Mr. Lakshmanan	: Shanthi Poultry Farm Pvt. Ltd.
7. Mr. Suresh Deora	: S. A. Pharmachem Pvt. Ltd.
8. Dr. Saikat Saha	: Evonik India Pvt. Ltd.
9. Dr. Devender Hooda	: Huvepharma SEA (Pune) Pvt. Ltd.
10. Dr. Sujit Kulkarni	: Biomin India
11. Mr. S. Kannan	:Suguna Foods Private Limited
12. Mr. Nakul Vakil	: Cremach Private Ltd.
13. Mr. Abhay Shah	:Spectoms Engineering Pvt. Ltd.
14. Mr. Nissar Mohammed	: Coastal Exports Corporation
15. Dr. Vijay Makhija	: DSM Nutritional Products India Pvt. Ltd.
16. Mr. Balaram Bhattacharya	: Indian Herbs Specialities Pvt. Ltd.
17. Mr. Ramkutty	: Niswin Enterprises

Mr. S. V Bhave, the new Chairman of CLFMA of INDIA, gratefully acknowledged the critical role and valuable contributions of the immediate past chairman, Mr. B. Soundararajan and his predecessors who played the vital role in building the organization all along the past 5 decades.

"The new team of CLFMA has an apt mix of your and experienced professionals.We will strive to uphold the reputation and the legacy of CLFMA and work committedly towards its growth in the years to come" concluded Mr. S V. Bhave.

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