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नोट : जमशेदपुर से पशुधन प्रहरी का प्रकाशन पूर्णता अव्यवसायिक तथा अवैतनिक है । पशुधन प्रहरी के प्रकाशित सामग्री से सम्पादक/
प्रकाशक की सहमति अनिवार्य नहीं है । कुछ फोटो अन्य सामग्री साभार, पशुधन प्रहरी के सभी मामलों का न्याय क्षेत्र जमशेदपुर
(झारखण्ड) होगा ।

पशुधन प्रहरी में प्रकाशित लेख में व्यक्त किये गए विचार लेखक के हैं, यह पत्रिका उसका अनुमोदन नहीं करती - सम्पादक

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A LOOK INTO BOVINE MASTITIS : ITS PATHOPHYSIOLOGY AND MANAGEMENT

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Abstract

Udder Health is one of the most important aspects of dairy cow health. Mastitis causes huge economic losses to farmers every year worldwide and has a negative influence on milk's technological value. A detailed understanding of the pathophysiology of mastitis will help in planning better preventive measures and in formulating new research treatments of mastitic animals. The aim of the article is to understand the pathophysiology of bovine mastitis and focuses on the management, handling, and prevention of bovine mastitis.

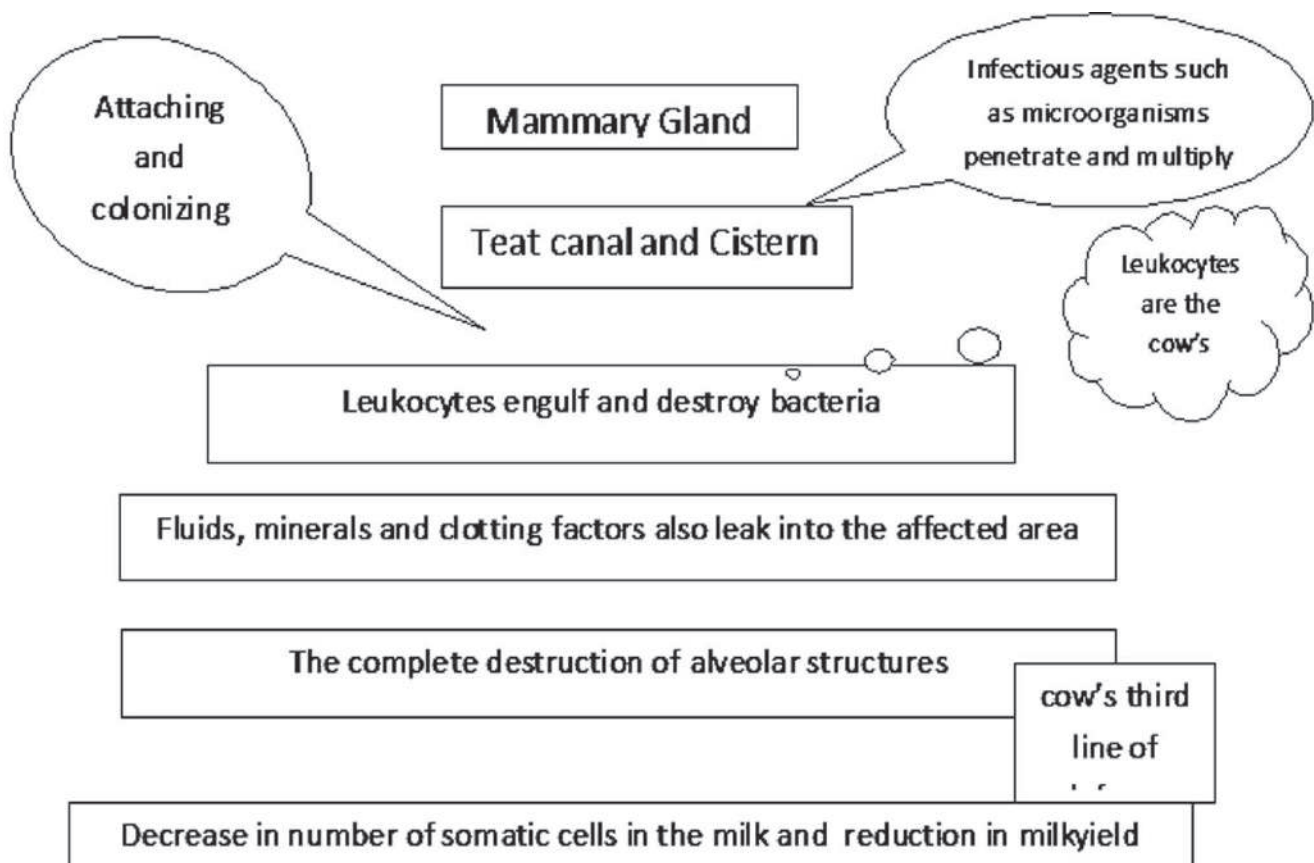
Introduction

"Mastitis" describes an inflammatory reaction in the mammary gland. The term mastitis is derived from the Greek word masto referring to the mammary gland and it is meaning "inflammation" (Blood and Studdert, 1999). Although "mastitis" can technically be used to describe any udder injury which may result in inflammation, it is generally accepted that the causative agents for the inflammatory reaction are microorganisms that have gained entry into the teat canal and mammary tissue. The extent of the infection that occurs as microorganisms multiply and proliferate within the mammary tissue determines the type of mastitis affecting the cow udder. Bovine mastitis is a disease complex that occurs in acute, gangrenous, chronic, and subclinical forms of inflammation of the bovine udder, and is due to a variety of infectious agents, such as microorganisms. Animal care, hygiene, and management are important factors in this dairy cow disease of great economic importance. Field surveys of major livestock diseases have ranked mastitis as number one disease of dairy animals (Khan and Khan, 2006). Mastitis still continues to be one of the most costly diseases of dairy animals. Milk from cows who are suffering from mastitis has an increased somatic cell count. Prevention and Control of mastitis requires consistent care in sanitizing the cow barn facilities, proper milking procedure and segregation of infected animals and extensive use of antibiotics to treat and prevent this disease.

Pathophysiology of mastitis

Invasion of the teat most often occurs during milking. The teat is the first line of defense against invading microorganisms such as bacteria into the udder. Infections start when microorganisms start penetrating the teat canal and multiplying in the mammary gland. The sphincter muscle closes the teat canal tightly when the cow is not being milked. Upon entry of the microorganisms in the milk or at the teat end, organisms are pushed towards and into the teat canal and cistern. Teat canal remains dilated for one to two hours after milking even then the canal of a damaged teat may remain partially open permanently. Organisms from the environment (manure, bedding, etc.) or those found on injured skin at the tip of the teat may easily invade an open or partially open canal. Some bacteria may enter into the udder by attaching and colonizing new tissue while others may move around via milk current produced by the cow's movement. At first the Bacteria will damage the tissues lining the large milk-collecting ducts. During the process of damage of tissues, bacteria encounter white blood cells such as leukocytes which are present naturally in small numbers in the milk. Leukocytes are the cow's second line of defense because they can engulf and destroy bacteria (Harmon et al., 1994) Leukocytes help release substances which causes the movement of additional leukocytes from the blood into the milk. If bacteria are not entirely destroyed, they continue to multiply and begin to invade smaller ducts and alveolar areas. Milk secreting cells damaged by toxins and other irritants release substances that lead to increased permeability of blood vessels. Additional leukocytes along with fluids, minerals and clotting factors move to the site of infection by squeezing between the damaged milk secreting cells. Clotted milk may help isolate the infected regions by closing the ducts. Sometimes the infection is cleared by opening of the clogged ducts which rapidly eliminates the microorganisms which causes the milk

composition and production return to normal. However, if the infection persists, the ducts remain clogged, the entrapped milk causes the secretory cells to revert to a resting (non-producing) state and the alveoli begin to shrink. Substances released by leukocytes lead to the complete destruction of alveolar structures, which are replaced by connective and scar tissues. The damaged milk secretory is in effect the cow's third line of defense to bring the infection under control. Biofilms are a group of cells confined in self-produced matrix, which are tolerant to opsonophagocytosis and conventional antibiotics as a result of which leads to antimicrobial resistance (Stewart and Costerton, 2001).. Recurrent infections are often attributable to biofilms (Vasudevan et al., 2003). Biofilm formation can lead to damage to host tissues since it can promote the phagocyte release of lysosomal enzymes, reactive oxygen and nitrogen species (McAuliffe et al., 2006; Hermeyer et al., 2011). Thus as the disease progresses the number of somatic cells in the milk becomes elevated and associated with a (permanent) reduction in milk yield. Compositional changes accompany the elevation of SCC and inflammation in an infected mammary gland (Kitchen et al., 1981, Matila, 1985). Mastitis or elevated SCC are associated with a decrease in lactose, α -lactalbumin, and fat in milk because of reduced synthetic activity of the mammary tissue. Some components, such as lactose (Shuster et al., 1981) and α -lactalbumin (McFaden et al., 1988), may leak out of the alveolus between epithelial cells; these components have been measured in urine or blood of cows with mastitis. The pH may increase from a normal of 6.6 to 6.9 or higher because of the movement of blood components into milk (Kitchen et al., 1981). Many enzymes and other whey proteins originating from damaged tissue, the blood, or leukocytes are elevated in milk. Examples of enzymes that may have increased activity are acid phosphatase, antitrypsin (antitrypsin or α 1 protease inhibitor), alkaline phosphatase, arylsulfatase, β -glucuronidase, catalase, glutamic-oxaloacetic transaminase, lactate dehydrogenase, lipase, lysozyme, Nagase, plasmin, xanthine oxidase, and various esterases (Kitchen et al., 1981). Plasmin, an important proteolytic enzyme in milk with high SCC is normally found in milk; however, there may be more than 2-fold increases in its activity in milk during mastitis. Figure 1 describes the pathophysiology of mastitis in a flowchart manner



Mastitis causing Bacteria

Pseudomonas aeruginosa, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Streptococcus agalactiae*, *Streptococcus uberis*, *Brucella melitensis*, *Corynebacterium bovis*, *Mycoplasma* spp. (including *Mycoplasma bovis*), *Escherichia coli* (*E. coli*), *Klebsiella pneumoniae*, *Klebsiella oxytoca*, *Enterobacter aerogenes*, *Pasteurella* spp, *Trueperella pyogenes* (previously *Arcanobacterium pyogenes*), *Proteus* spp, *Prototheca zopfii* (achlorophyllic algae), *Prototheca wickerhamii* (achlorophyllic algae)

Staphylococcus aureus is the species most frequently isolated from bovine mastitis, a disease responsible for significant economic losses all over the world (Costa et al., 1998). The organisms that fit into this category include: *Staphylococcus aureus* (coagulase positive staphylococci), *Streptococcus agalactiae* and the less common sources of infection caused by *Corynebacterium bovis* and *Mycoplasma bovis* (Quinn, et al., 1999). Coliform bacteria are normal inhabitants of soil and the intestines of cows. They accumulate and multiply in manure and bedding. Coliforms can cause mastitis only if contaminated particles from the environment come in contact with the udder the coliform do not attach to the ducts and alveoli in the udder, rather they multiply rapidly in the milk and produce toxins that are absorbed into the blood stream. Cows free of other mastitis-causing bacteria (*Streptococcus agalactiae* and *Staphylococcus aureus*) appear to be more susceptible to coliform bacteria.

Many other bacteria and even yeasts may be responsible for causing mastitis, but are less common and occur if conditions change to increase exposure to these organisms. A condition known as "summer mastitis" occurs mostly in European countries in the summer months when wet, rainy conditions prevail. The source of infection is usually traced to an increase in exposure of the cows to flies in pastures that transmit infecting *Arcanobacterium pyogenes* and *Peptostreptococcus indolicus* strains and is more common in non-lactating cows (Sol, 1984)

Type of bacteria	Primary source	Major means of spread	Biofilm formation	References
Streptococcus agalactiae	Infected udder	Quarter to quarter, cow to cow during milking	+	Rosini and Margaret (2015)
Staphylococcus aureus	Infected udder, teat tenderness	Quarter to quarter, cow to cow during milking	+	Darwish and Asfour (2013), fabres-klein et al 2011
Environmental streptococci	Bedding, manure	Environment to cow	+	El hadidy and zahran (2014)
Coliforms	Manure	Environment to cow	+	Costa et al., 2014 Milanov et al., 2015
S. dysgalactiae	Bedding (straw, sawdust), manure	Environment to cow	+	Olson et al., (2002)
S. uberis	Bedding, manure standing water and soils, infected udder, reproductive organs.	Environment to cow	+	Crowley et al., 2011

Main mastitis causing pathogens and their biofilm formation ability. + biofilm formation

Types of Mastitis

There are several ways of classifying mastitis. Mastitis can be divided as two major groups depending upon the type of infectious agent and route of transmission

1. **Contagious Mastitis:** Contagious mastitis is caused by contagious microorganisms such as *Staphylococcus aureus* and *Streptococcus* species bacteria which live on the skin of the teat and inside the udder. Contagious mastitis can be transmitted from one cow to another during milking (Bogni et al., 2011)
2. **Environmental mastitis:** Environmental mastitis is caused by pathogens normally found in feces, contaminated bedding materials, and feed. *Streptococcus* species and Gram-negative bacteria (*Escherichia coli* and *Klebsiella*) are examples of microorganisms included in this group (Bogni et al., 2011). Cases of environmental mastitis rarely exceed 10% of the total mastitis cases in the herd.

Contagious mastitis can be divided into three groups.

1. Clinical mastitis
2. Sub-clinical mastitis
3. Chronic mastitis

Clinical mastitis is characterized by the presence of gross inflammation signs like swelling, heat, redness, pains. Clinical mastitis is caused mostly by organisms such as *Streptococcus uberis* and *Streptococcus dysgalactiae*. *Streptococcus uberis* are found in bedding (especially organic bedding: straw, sawdust, etc.), standing water and soils. They can also be found on the cow's skin (teat and belly) and in the reproductive organs. These two organisms are usually transferred from the environment to the teat between milking, but some transfer can also take place during milking. These organisms cannot be eliminated from a herd because they are part of the normal environment

1. Three types of clinical mastitis exist

a. Peracute mastitis

Peracute mastitis is characterized by gross inflammation, disrupted functions such as reduction in milk yield, changes in milk composition and systemic signs (fever, depression, shivering, loss of appetite and loss of weight)

b. Acute mastitis

Acute mastitis is similar to peracute mastitis, but with lesser systemic signs such as fever and mild depression.

c. Sub-acute mastitis

In this type of mastitis, the mammary gland inflammation signs are minimal and no visible systemic signs.

2. Sub-clinical mastitis

This form of mastitis is characterized by change in milk composition with no signs of gross inflammation or milk abnormalities. Changes in milk composition can be detected by special diagnostic tests. *Streptococcus agalactiae* is the most common cause of subclinical infections but rarely causes severe illness (acute mastitis). This organism lives in the cow's udder and survives only a short time outside the mammary gland. This organism may also infect the udder of a young calf if it is sucked by a second calf that has been fed contaminated milk. The infection can remain indefinitely in the heifer's mammary gland. *Streptococcus agalactiae* can be eradicated from a herd by appropriate treatment combined with good milking practices. However, it may easily spread again in a herd after the purchase of an infected animal.

3. Chronic mastitis

Chronic mastitis is characterized as an inflammatory process that exists for months, and may continue from one lactation to another. Chronic mastitis for the most part exist as sub-clinical but occasionally exhibit periodical flare-ups, sub-acute or acute form, which last for a short period of time.

Mode of transmissions

1. Mastitis is most often transmitted by repetitive contact with the milking machine, and through contaminated hands or materials (figure 2a, 2b).
2. Another route is via the oral-to-udder transmission among calves (figure 2d). Feeding calves on milk may introduce some mastitis causing bacteria strain in the oral cavity of the calf where it will stay dormant until it is transmitted elsewhere. Since grouped calves like to stimulate suckling, they will transmit the bacteria to the udder tissue of their fellow calves. The bacteria will lay dormant in the udder tissue as the calf grows until it begins to lactate. That is when the bacteria activates and causes mastitis.
3. Management practices such as pathogens from manure (figure 2e), contaminated bedding(figure 2c) , soilwater may gain entry into the cows udder and lead to bovinemastitis.



Clean gloved Hands



Contaminated hands



Pathogens from contaminated bedding,



Oral-to-udder transmission among calves



Pathogens from manure,

Management of Mastitis

Effective screening and diagnosis is the proper way of managing mastitis cases. The usual method of screening mastitis cases in cattle is by examining the udder to check for inflammation and swelling or by observing the consistency of the milk, colour of the milk.. The strip cup or strip plate is a simple, rapid and important tool in the milking parlor for determining the presence of clinical mastitis. The test is performed by squirting a few streams of the foremilk onto the strip cup and then it is visually examined for milk abnormalities. Another method of detection is the California mastitis test, which is designed to measure the milk's somatic cell count as a means for detecting inflammation and infection of the udder. The Rapid Mastitis Test (or Californian Mastitis Test) is a cow-side test that detects subclinical mastitis in individual quarters by the presence of cells in milk samples. The test uses a small amount of milk from each quarter which is squirted into a dish at milking and an equal amount of detergent reagent is added. The solution is swirled to mix it, and the amount of gel reaction is assessed. Gel reaction scores are given such as negative if the scc is less than 2,00,000 trace if the scc is between 150,000 - 500,000, and if its more than 400,000 then 1+, 2+, 3+ scoring is given according to visible changes in the milk . Electronic Somatic Cell Count is an automated and centralized system for somatic cell count which is used by Dairy Herd Improvement Associations. The procedure is more precise than the CMT and the WMT.

Other tests include the electrical conductivity (EC) test which measures the increase in conductance in milk caused by the elevation in levels of ions such as sodium, potassium, calcium, magnesium and chloride during inflammation. Advantage: can be used 'on-site'. Disadvantage: non-mastitis- related variations in epithelial cell can present problems in diagnosis. Then the rise in milk pH, due to mastitis, is detected using bromothymol blue. Advantages is it is user friendly, cost effective and rapid. Disadvantage is it is not as sensitive as other tests. Enzymes Assays are used to detect enzymes, such as NAGase and LDH. Advantage: assays are rapid. Disadvantage: assays might be laboratory-based. Wisconsin mastitis test is a on farm mastitis test used to test detect mastitis in bulk samples based on increase in leucocytes is accompanied by an increase in viscosity when a detergent reagent is mixed with a milk sample.

Control of Mastitis

Control of mastitis requires a combination of preventive and therapeutic measures Prevention is the key in mastitis control and which will markedly reduce the incidence of mastitis. The prevention of mastitis can be achieved by:

1. Proper milking hygiene should be followed as bacteria can be transmitted from the contaminated hands of the milker. Thus the milker's hands should be washed thoroughly with disinfectant and soaps before milking and clinically infected cows should be milked last. Teats should be cleaned and dried before milking.
1. Milking machine should be kept in good operating condition. Vacuum level in the milking unit should be between 275 and 300 mm of mercury with little fluctuation. The vacuum regulator should be kept clean and checked regularly.
2. Dipping the teats with suitable disinfectant after milking reduce existing infection up to 50% when suitable disinfectant is used to immerse or spray the teats
3. Dry cow therapy is the best way to cure chronic and subclinical mastitis that are difficult to treat successfully during lactation.
4. Culling of chronically infected cows is an effective method
5. Proper nutrition should be given to animals to avoid deficiencies. Deficiencies of selenium and vitamin E in the diet have been associated with an increased rate of new mammary infections.
6. Treatment with antibiotics may be systemic (injected into the body), or they may be forced upwards into the teat through the teat canal (intramammary infusion). but milk from the treated cows is not marketable until drug residues have left the cow's system. Special tests are there to determine the levels of antibiotic residues in milk
7. Vaccinations for mastitis are available such as Best Vac, Startvac, Hipra, Spain but as they only reduce the severity of the condition, and cannot prevent reoccurring infections, they should be used in conjunction with a mastitis prevention program

Conclusion

Mastitis is one of the most common multifactorial diseases. Mastitis can be prevented by proper management and new effective, innovative solutions to treat mastitis. However, the focus should be in enhancing its preventive measures to avoid huge economic loss especially among dairy farmers. Researchers and scientist must keep on looking new measures and methods to reduce the prevalence of mastitis.

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ANESTRUS IN DAIRY ANIMALS: PREVENTION AND TREATMENT

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Anestrus is a broad term that indicates the lack of expression of estrus (or absence of estrous signs), despite efficient estrus detection. Anestrus is usually characterized by a lack of ovarian progesterone production. It is caused by many factors such as undernutrition, reduction in body condition score, suckling calf, lactation, dystocia, uterine pathology, debilitating disease etc. Treatment involves improvement in energy status i.e. providing optimal nutrition during the transition period and during early lactation and use of various hormones such as estrogen, progesterone, GnRH, PMSG etc.

Introduction :

Anestrus is a reproductive cycle functional abnormality characterised by the absence of overt signs of estrus manifested either by a lack of expression of estrus or by a failure to detect estrus. In animals, physiological anestrus is seen during prepubertal period, pregnancy, lactation, as well as during early postpartum period. Pathological anestrus can result from disruption of the reproductive axis and may be associated with uterine pathology such as pyometra, fetal resorption, maceration and mummification. Anestrus is caused by a variety of factors, but its prevalence indicates a lack of nutrition, environmental stress, uterine pathology, and poor management practices. The condition is diagnosed by looking at the various causal variables that contribute to it. Despite the fact that various treatment agents (hormonal and non-hormonal) have been used, there is no one solution to solve the problem.

Causes and Risk Factors

1. **Nutrition:** Animal's nutrition status has an impact on follicular growth, maturation, and ovulation. (Diskin et al., 2003). One of the most common causes of anestrus in heifers is malnutrition. Shortage of feed and good quality fodder leads to an extended postpartum period of anestrus (>150 days) in cattle of tropical area. Following parturition, animal has high metabolic load because of milk production. If there is shortage of feed during this transition period of the animal, it will lead to negative energy balance (NEB) which will ultimately affect the follicular growth and will hamper the normal cyclic events of the animal. Anestrus is also linked to mineral deficiencies such as calcium (Ca), phosphorus (P), copper (Cu), zinc (Zn), and manganese (Mn). Minerals play an intermediate role in the activity of hormones and enzymes at the cellular level, and their shortage has been shown to impact female reproduction rates.
2. **Body Condition Score (BCS):** Body condition score is a measurement that assesses an animal's nutritional health and is a key component in determining reproductive success. Pre-calving, calving, and early postpartum BCS extremes (very low and very high) delay the onset of cyclicity. BCS at calving, on the other hand, is a greater predictor of postpartum cyclicity resumption than prepartum BCS. At calving, a BCS of 3.5 (on a five-point scale) is required for optimal reproductive function (Shah et al., 2021). Feed restriction during late pregnancy and the early postpartum period results in reduced BCS, which contributes to extended postpartum anestrus.
3. **Management factors**
 - a). **Lameness:** One of the main causes for decreased reproductive performance, output potential, and increased culling rate of affected cows has been their increased vulnerability to certain diseases, including lameness. It has been reported that delay in ovarian activity in earlier postpartum is correlated with lameness and lame cows take 12 days longer to get pregnant as compared to their non-lame counterparts.

- b). Milk production: Expression of estrus can be altered obviously during the period of high milk yielding due to totally an unknown mechanism. There is a negative association between milk period and duration of estrus expression and milk productivity.
 - c). Endocrine hormones: Many studies have suggested that endocrine balances are necessary for maintaining normal estrus and re-establishing fertility following calving. Estrus expression induced by adequate endogenous estradiol production can cause the standing response in cattle. It was found that high levels of estradiol at the end of pregnancy can make a cow refractory to estrus in following normal ovulation, and it was suggested that progesterone treatment prior to the first postpartum ovulation can re-sensitize the brain and allow for estrus to be expressed. In terms of other hormones, gonadotropin releasing hormone (GnRH) can induce leuteal hormone (LH) to be released in estrus range cows, and treatment with 1,000 or 2,000 IU pregnant mare serum gonadotropin (PMSG) can cause ovarian activity to be initiated (Sethi et al., 2021).
4. Environmental Stress: The development of follicles and the appearance of estrus are affected by environmental stress (severe cold and heat). Heat stress significantly reduces ovarian activity, which results in anestrus. Heat stress affects folliculogenesis, follicular fluid micro environment and oocyte quality. Also any form of stress causes, decline in feed intake which results in reduced secretion of gonadotrophins. Furthermore, high ambient temperatures produce hyperprolactinemia and decrease gonadotrophin secretion, resulting in changes in ovarian folliculogenesis and steroidogenesis.
 5. Lactation High yielding cattle and buffalo shows significantly longer postpartum anestrus period or weaker signs of estrus. This is because of prolactin secretion which is anti gonadotrophic.
 6. Suckling Suckling reduces postpartum ovarian activity, resulting in a longer duration of postpartum anestrus. Suckled beef cows have a longer postpartum anestrus than milked dairy cows. Suckling increases the release of prolactin, cortisol, and oxytocin, all of which have a detrimental influence on the GnRH-LH axis. Higher levels of these hormones limit GnRH secretion while increasing the concentration of endogenous opioid peptides; as a result, endorphin reduces LH pulse frequency, delaying the start of postpartum cyclicity.
 7. Parasitic Infestations One of the stressful conditions is heavy parasitism, which is more common in growing cattle than in adult cattle. Parasitic infections in animals, such as fascioliasis, thelariosis, schistosomiasis, and trypanosomiasis, induce anaemia and weight loss, which leads to anestrus.

Treatment

1. Hormonal Treatments:

- a) Estrogens Based Treatment: Because of its positive feedback effect over the pituitary for LH surge, oestrogen treatment causes expression of estrus and ovulation in the presence of dominant follicles. As a result, it has been used to promote ovulation and shorten the postpartum anestrus phase. In the absence of a dominant follicle, oestrogen causes anovulatory estrus. Estrogens have also been demonstrated to promote luteolysis in ruminants most likely by boosting endometrial prostaglandin secretion while concurrently lowering circulating LH levels.
- b) Progesterone Based Treatment: Exogenous progesterone induces a negative feedback effect on LH release in the brain and pituitary, simulating the luteal phase of the estrus cycle. The normal follicular phase of the cycle is stimulated when progesterone is removed from the cycle. However, a dramatic reduction in progesterone levels at the end of treatment is required for such treatment to appear beneficial. PRID (progesterone-releasing intravaginal device), CIDR (controlled internal drug release), and CueMate (intravaginal progesterone-releasing intravaginal device) are all effective in restoring cyclicity in anestrus animals. The concentration of progesterone drops sharply after withdrawal, and estrus and ovulation occur between 2- 8 days following stopping medication.
- c) Gonadotropic Releasing Hormone (GnRH) Based Treatment: The single intramuscular injection of GnRH analogue (10 to 20µg Buserelin) has been used effective in induction of estrus and concurrent ovulation with variable response (45.5 to 87.5%) within 4-22 days. The variable response may be due to differential action of GnRH on different stages of follicular development. It induces ovulation, if mature follicle is present at the time of administration by inducing the LH surge. On the contrary, it stimulate emergence of new follicular wave through enhanced secretion of FSH, thus effective in long

term. Pulsatile/intermittent injections of small dose of GnRH (at every 2 hours, intravenously) has been tried in order to induce LH pulses.

- d) Pregnant mare serum gonadotrophin (PMSG): Because of its main FSH-like activity, pregnant mare serum gonadotrophin (PMSG) or equine chorionic gonadotrophin (eCG) is a potent activator of ovarian activity. As a result, it's been widely utilised to induce superovulation. Anestrus calves and buffaloes have been successfully treated with a single intramuscular injection at modest doses, either alone or in combination with others. Human chorionic gonadotrophin (hCG) has also been used successfully in the treatment of anestrus (Sethi et al., 2021).
- e) Treatment with Prostaglandins: The treatment of choice for persistent corpus luteum and sub estrus is prostaglandin (PGF₂). A single dosage of a natural or synthetic counterpart of PGF₂ has been used to regulate silent estrus in cattle and buffaloes with reasonable success. It's important to remember that PGF₂ is only effective during days 6-16 of the cycle and when the corpus luteum is active. In both cattle and buffaloes, an intramuscular injection of 25mg (total dose) of natural PGF₂ or 250 to 500 mcg of synthetic PGF₂ is necessary to regress the CL. However, a lesser dose of PGF₂ (5 mg) is similarly effective in regressing CL by intra- vulvo-submucosal (IVSM) injections.

2. Non Hormonal Treatments

- a) Plant Based Heat Inducers: Plants produce a variety of phytochemicals such as alkaloids, glycosides, terpenes, and tannins (secondary metabolites) as part of their normal metabolic activity, many of which have medicinal qualities when consumed by animals. Many plants are high in vitamins and minerals, and some have estrogenic properties that can help anestrus animals regain their cyclicity. Several plants, including *Murraya koenigii* (curry leaves), *Nigella sativa* (kalonji), *Abroma augusta* (Ulatkambal), *Saraca asoca* (Ashoka), *Trigonella foenum-graecum* (Methi), *Bambusa aruninacea*, *Carica papaya*, *Asparagus recemosus*, *Leptadenia reticulate*, *Courupita guianensis*, *Prajana HS* (Indian Herbs), *Janova* (Dabur), *Sajani* (Sarabhai), *Heat up* (Century), *Heat raj* (Ranjan), *Fertivet* (Ar Ex Labs), and *Aloes compounds* (Alarsar) are commercially available and efficient in restoring cyclicity with indigenous herbal formulations.
- b) Utero-Ovarian Massage: The oldest, simplest, cheapest, and most successful way of inducing estrus in anestrus cattle and buffaloes is utero-ovarian massage. The exact method by which ovarian massage produces cyclicity is unknown, but it is thought to involve the activation of intrinsic intra-ovarian factors, as well as an increase in blood circulation to the ovaries and uterus, which enhances hormone and growth factor availability.
- c) Lugol's Iodine: Lugol's iodine treatment is cheaper and effective means of management of anestrus but response has been variable (45 to 91.7%) among cattle and buffaloes. Lugol's iodine solution (5%) has traditionally been used as a cervical paint. It is presumed that painting of Lugol's iodine on posterior part of the cervix causes local irritation and brings about reflux stimulation at anterior pituitary for secretion of gonadotrophins and consequently cyclicity. Lugol's iodine is an irritating solution and intrauterine infusion of Lugol's solution (0.5 to 1.0%) causes hyperemia (enhanced circulation) of uterine mucosa resulting into degree of iodine absorption from uterus. The absorbed iodine probably increases the metabolic rate of body through stimulating the thyroid hormone secretion. Increased metabolic rate trigger the ovarian functions by enhancing the energy utilization.

Conclusion: As such there is no single panacea to correct anestrus. Further, research is needed especially at cellular and molecular level for better understanding of its etiology, diagnosis and therapeutics.

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HAEMOPROTOZOAN DISEASES OF THE LIVESTOCK

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Farmers and livestock owners, every year, face huge economic losses with the arrival of monsoon. Rainy Season acts as proliferator of a wide number of diseases including bacterial, viral, parasitic and protozoan. Haemoprotzoan diseases are caused by unicellular protozoan or rickettsial parasites developing in blood or blood cells. The given article describes the various haemoprotzoan diseases commonly prevalent in India in cattle along with their treatment and management strategies.

- Theileriosis
- Babesiosis
- Anaplasmosis
- Trypanosomosis

INTRODUCTION

India is majorly an agriculture based economy and majority of the Indian farmers rely on Livestock farming as an additional source of income. As of 2018-19, Livestock contributed an average of 14% of income for all rural households. Livestock provides livelihood to two-third of rural community. It also provides employment to about 8.8 % of the population in India. Livestock sector contributes 4.11% GDP and 25.6% of total Agriculture GDP.

In such a scenario, the advent of the monsoon acts as both, a boon and curse for the Indian Farmers. On one hand, it acts as elixir for agricultural farms, while on the other hand, it can wreak havoc on livestock health in case of inappropriate and lacking preventive measures. During rainy seasons, the bacterial as well as parasitic microclimate and prospers due to the rise in humidity and warmth inside the animal shed due do expired air, overcrowding, waste from animals and lack of ventilation. Wetting of feed due to leakage of rain water from damaged roof leads to development of moulds. Unhygienic conditions of shed and floor also act as breeding ground for various disease causing organisms.

Haemoprotzoan diseases are one of the major problems in cattle transmitted by arthropod vectors or through blood transfusion, which the farmers face mainly with arrival of the monsoon. It leads to drastic decline in health condition of the cattle, reduced milk production and draught performance, and even mortality, which in turns results in huge economic losses to the farmer. Thus, in this article, some common haemoprotzoan parasitic diseases in cattle occurring in rainy season have been discussed along with the management and control strategies.

1. THEILERIOSIS

Bovine tropical theileriosis is a tick-borne infection caused by *Theileria annulata*, an intracellular protozoan parasite. It is a lymphoproliferative disease with high mortality and morbidity in cattle. *Theileria sergenti/buffeli/orientalis* cause mild or asymptomatic disease in cattle and well known as bovine benign theileriosis. Certain Ixodid ticks, such as *Hyalomma anatolicum*, *H. m. marginatum*, and *H. a. excavatum* known to transmit *T. annulata*, are found in the Mediterranean region, especially in semi-arid areas. Ticks of the genera *Amblyomma*, *Rhipicephalus*, and *Haemaphysalis* were suggested as a possible vector in the transmission of benign *Theileria* species.

The most pathogenic species of *Theileria* prevalent in India are *T. annulata* and *T. parva* and cause Tropical Theileriosis and East Coast Fever in Cattle respectively. East Coast Fever is prevalent in African continent and not in India, due to absence of tick vector in India. Unlike in Babesiosis, in Theileriosis there is no evidence of increased resistance in calves

BOVINE TROPICAL THEILERIOSIS

It is an acute and highly fatal disease of cattle in India, especially for cross bred and exotic animals. Indigenous cattle

act as constant source of infection to the cross bred and exotic cattle.

Etiology and Transmission: Caused by *Theileria annulata*, and transmitted by the tick vector *Hyalomma anatolicum anatolicum*. Prevalence rate is very high in late summer followed by rainy season, when vector population is very high and animal is in stress due to humid and warm climate.

Pathogenesis: The organisms is both haemoproliferative as well as lymphoproliferative and forms piroplasms and Koch's Blue Bodies in Red Blood Cells and Lymphocytes respectively. The sporozoites are injected into cattle by infected vector ticks. After a lapse of 5-8 days of tick attachment, first stages are found in local lymphocytes and stimulates lymphoproliferation. Macroschizonts appear in lymphocytes as Koch's Blue Bodies after several days followed by appearance of annular, ovoid or rod shaped piroplasms in Red Blood Cells 15-20 days post infection.

Clinical Signs: Clinical signs vary according to the level of challenge, and they range from in apparent or mild to severe and fatal.

Early signs include

- Enlarged superficial lymph nodes, especially prescapular lymph node
- Fever (40.5-41.5°C)
- Increased heart rate, laboured breathing, dyspnoea, nasal discharge, coughing, slight anorexia
- Oedema in lungs is the cause of death in acute cases

In Later Stages, signs are-

- Declining fever
- Extreme weakness and prostration
- Anaemia and bilirubinemia may occur
- Jaundice

Diagnosis

- History and Clinical signs and symptoms
- Demonstration of piroplasms in erythrocytes using Thin Blood Smear Examination
- Demonstration of Koch's Blue Bodies in lymphocytes using Lymph node Aspiration Cytology
- Immunodiagnostic and serological tests
- Haematological Tests reveal fall in Haemoglobin and Packed Cell Volume
- Punched necrotic ulcers in abomasum and oedema in lungs on Post Mortem examination

Treatment and Control

- Intramuscular administration of BUPARVAQUONE, drug of choice for Theileriosis.
- Oxytetracycline has proved to be effective against schizont stages of *Theileria* during early stage of disease.
- Immunization by vaccine containing culture attenuated annulata schizont infected bovine lymphocytes, commercially available as RAKSHAVAC-T®
- Treatment and control of tick infestation in cattle herd using acaricides.

2. BABESIOSIS

It is one of the most common tick-borne diseases of cattle causing high mortality in adult cattle, especially exotic breeds. Calves are naturally resistant to the infection upto 9-12 months of age. It is also known as Tick Fever, Red Water Disease and Texas Fever.

Etiology and Transmission: Babesiosis in cattle is caused mainly due to two species: *Babesia bigemina* and *Babesia bovis*. The tick vector involved in its transmission is *Rhipicephalus (Boophilus) microplus*. Babesiosis is commonly found in areas where its arthropod vector is distributed, especially tropical and subtropical climates.

Pathogenesis: The sporozoites are introduced into the host's blood through tick bite. Incubation period under natural conditions is around 1-2 weeks. Organisms enter the erythrocytes and multiply to form trophozoites. Thereafter, they are released from RBCs and invade other erythrocytes. As a result, a large number of Red Blood Cells are parasitized and characteristic pear shaped piroplasms lying in pairs are found in them. A large number of erythrocytes are destroyed resulting into hyperchromic and macrocytic anaemia.

Clinical Signs and Symptoms: Common clinical signs include:

- High Fever (40-41°C, even upto 45°C)
- Severe Anaemia
- Haemoglobinuria, resulting into passage of Dark or Coffee Coloured urine
- Anorexia, Weakness and depression
- Cessation of rumination, salivation and dryness of muzzle
- Reduced milk yield
- Cerebral form may exhibit signs like incoordination and teeth

Diagnosis

- History and clinical signs and symptoms
- Detection of piroplasms in erythrocytes using Thin Blood Smear Examination
- Haematological tests reveal reduced Total Erythrocyte Count and Haemoglobin
- Immunodiagnostic and Serological tests
- Post- mortem examination reveals enlarged liver and spleen, urinary bladder with dark coloured urine and lungs with reddish frothy fluid

Treatment and Control

- Intramuscular administration of DIAMINAZINE ACETURATE
- IMIDOCARB has also been reported to have therapeutic and prophylactic effect against the infection
- Immunoprophylaxis includes vaccination with Live Vaccine- inoculation of infected blood.
- Control and treatment of tick infestation in cattle using acaricides.

3. ANAPLASMOSIS

Anaplasmosis is also known as gall sickness is an infectious non-contagious rickettsial disease caused by *Anaplasma marginale*. This is an obligate intra-erythrocyte rickettsial organism. It spreads through tick bites or by the mechanical transfer of fresh blood from infected to susceptible cattle from biting flies or by blood-contaminated fomites. The infection is also occasionally passed from an infected cow to her unborn calf through the placenta. Bovine anaplasmosis occurs in tropical and subtropical regions mainly due to *A. marginale* and *Anaplasma centrale*. Although cattle of all ages are prone to infection, adult cattle are more susceptible to infection than calves. It is worthy to note that recovered animals from primary attack remain as lifelong carriers. Bovine anaplasmosis is a haemolytic disease of cattle characterised by anaemia, adult mortality, abortion, and performance reduction.

Etiology and Transmission: Anaplasmosis is a world-wide tick-borne disease of cattle caused mainly by the rickettsia *Anaplasma marginale*. The disease is common throughout tropical and sub-tropical regions of the world. Transmission to susceptible animals occurs through a variety of vectors, such as flies, viz. Tabanid Fly and *Stomoxys*, through tick bites (*Rhipicephalus* (*Boophilus*) *microplus*, *Argus persicus*, and *Ornithodoros* spp.) or through veterinary instruments. Cattle that survive infection become persistently infected carriers which serve as the reservoir for other animals.

Pathogenesis: The disease is mostly observed in cattle above 18 months of age. The major pathogenic effects occur due to multiplication in Erythrocytes which results in their destruction.

Clinical Signs and Symptoms: Anaplasmosis is characterised generally by following symptoms:

- Rise in body temperature but it is not a constant finding.
- Anaemia
- Bilirubinemia and sometimes Haemoglobinuria
- Dyspnoea
- Jaundice and pale visible mucus membrane

Diagnosis

- History, Clinical signs and symptoms
- Demonstration of Anaplasma as small spherical bodies, with faint halo around them, inside the erythrocytes on Thin Blood Smear Examination.
- Serological tests

Treatment and Control

- Intravenous administration of TETRACYCLINE has shown to be effective against anaplasmosis. Supportive therapy may be given if required.
- Vaccination with commercially available vaccine line Amvac, Anaplaz, Plasvax and Anavac.
- Control of fly and tick vectors using insecticides and acaricides respectively.

4. SURRA (TRYPANOSOMOSIS)

Trypanosomosis, also known as Surra, is one of the most important haemoprotozoan diseases affecting cattle health in India. The disease prevalence peaks around the monsoon when the animals are under maximum work-stress and other factors, viz., concurrent disease, poor nutrition and parasite pathogenicity. Effective surveillance for Trypanosoma evansi is constrained by a lack of sensitive diagnostic tests and information on T. evansi distribution in India.

Etiology and Transmission: Surra in cattle is caused by Trypanosoma evansi and transmitted mechanically, majorly by Tabanus and Stomoxys fly. It is endemic in most parts of the Indian sub-continent, and epizootics have occurred particularly in cattle and buffaloes with mortality rate ranging from 20 to 90%.

Pathogenesis

Basic mechanism involves in the pathology include utilization of host's nutrients and excretion of metabolites, excretion of toxic substances, mechanical disruption of host's tissue and immunologically mediated injury. The main pathological effects of Trypanosomosis are:

1. Pyrexia with successive waves of parasitemia due to antigenic variation
2. Anaemia with reduced erythrocytes and haemoglobin due to erythrophagocytosis by monocyte-macrophage system and haemolysins produced by trypanosomes. In acute cases, the anaemia is normally macrocytic normochromic and in chronic cases, it is microcytic hypochromic
3. Immunosuppression and decreased blood platelet count

Clinical Signs and Symptoms

- Per acute Form is characterised by nervous symptoms and animals die due to convulsions in 2-3 hours.
- Acute form is characterised by staggering gait, eyes staring and wide open, encircling movement, nervous excitement, apparent blindness and twitching of muscles. Animal appears dull, collapses and dies within 6-12 hours.
- Chronic form is characterised by progressive emaciation, intermittent attacks of fever, anaemia, oedema of legs and genital area, lacrimation from both eyes and the animal may die due to hypoglycaemia and exhaustion.

Diagnosis

- Clinical signs and symptoms

- History of prevalence of biting flies
- Laboratory examinations, microhematocrit technique and direct blood smear examination to detect trypanosomes in blood
- Chemical tests like Stilbamide Test
- Animal Inoculation Tests using white mice or rats
- Immunodiagnostic tests

Treatment and Control

- Quinapyramines like Antrycide Prosalt (TRIQUIN) has both therapeutic and prophylactic effects and provides protection against Surra for about 3 months
- DIAMINAZINE ACETURATE has also been found to be effective against evansi.
- SURAMINS line Antrypol, Gilpol, Naganol are also effective but they are mostly used in evansi infection in camels.
- Control and reduction of fly population using insecticides.

CONCLUSION

The increase in haemoprotozoan infections with arrival of monsoons can effectively be controlled by taking appropriate prophylactic measures. Timely vaccination and deworming of animals before arrival of monsoon and taking effective measures for control of arthropod vectors like flies, ticks, mosquitoes, etc is the key to minimise the economic losses occurring due to these diseases.



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INTESTINAL OBSTRUCTION AND ITS DIAGNOSIS IN DOGS

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INTRODUCTION:-

Intestinal obstruction is defined as the partial or complete blockage of the flow of nutrients, secretions from the stomach into and through intestine resulting in disturbance in fluid balance, acid base status and serum electrolytes concentration due to hyper secretion and sequestration within the intestinal tract which is aggravated by vomiting and impaired oral intake of fluids and nutrients (Boag et al., 2005). Most incidences of foreign bodies are observed in stomach, jejunum and the lower incidences observed in the other parts of the lower digestive tract (Veeder and Taylor, 2009). Obstructing foreign bodies may be linear (Prasad et al., 2010) or discrete (Raghunath et al., 2016). Retrieval of various objects indicated that indiscriminate feeding habits of the dogs and diseases like pica which prone dogs to allotriophagia (Muhammed et al., 2014). Various other causes of intestinal obstruction reported to be are resultant of tumour, hypertrophy, gastric dilatation, volvulus, intussusception (Atray et al., 2012).

Diagnosis of this condition can be challenging and may include abdominal radiographs, ultrasonography, contrast studies, endoscopy and exploratory laparotomy. Abdominal ultrasonography and CT are highly effective and accurate in diagnosis of mechanical intestinal obstruction in dogs (Winter et al., 2017).

DIAGNOSIS

Signalment:-

Most dogs with linear foreign bodies are under 4 years of age (mean age is 4.5 years and the median age is 2 years). Playful young animals seem more prone to foreign body ingestion.

History:-

The presentation and clinical signs depend on the location, completeness, duration of the obstruction and vascular integrity of the involved segment. Occasionally the animal is seen swallowing the object. Profuse vomiting may be seen with complete proximal obstruction, vomiting with partial distal obstructions is usually intermittent. Defecation may be absent or decreased in frequency and stool is occasionally bloody. Diarrhoea is more common in animals with partial obstruction.

Physical examination:-

Classically, animals with high obstructions tend to be severely dehydrated. Abdominal palpation may identify a corrugated-feeling loop of bowel, an abnormal mass of bunched intestines, or may elicit pain. Linear foreign bodies may sometimes be visualized around the base of the tongue, but sedation/anesthesia may be required to visualize this area well enough to detect thin strings or thread. Abdominal pain is common if linear foreign bodies have caused bunching of the intestines. Abdominal auscultation may detect noise from peristaltic activity or silence associated with ileus.

DIAGNOSTIC IMAGING

Radiography:-

Abdominal radiography is frequently used to assess the abdomen in vomiting patients. Radiographic findings associated with a focal foreign body obstruction include intestinal dilatation, presence of ingesta oral to the obstruction and detection of foreign material within the intestinal tract (Tyrell and Beck, 2006). Diagnosis of intestinal distention may be aided by use of the ratio of maximum intestinal diameter to the height of the body of the fifth lumbar vertebra at its narrowest point. Values higher than 1.6 indicate the presence of distention, values higher than 2 indicate a high probability of obstruction.

Presence of luminal gas bubbles that are tapered at one or both ends is suggestive of a linear foreign body and the presence of three or more of these bubbles is always associated with a linear foreign body. The presence of free gas on preoperative radiographs is associated with 100% mortality. Animals with intussusceptions can have radiographic evidence of an intestinal mass effect in addition to intestinal distension however diagnosis of intussusception is not made consistently with plain film radiography (Burkitt et al., 2009).

Contrast radiography can aid in a radiographic diagnosis of an intestinal obstruction when plain film radiography does not

lead to a diagnosis. Barium is the standard for evaluation of the stomach and small intestine using contrast radiography however barium should be used with caution if perforation is suspected or when surgery is inevitable as it is very irritating to the peritoneum. In cases of intestinal obstructions or perforations, it is advisable to use a nonionic iodinated contrast agent with low osmolality such as iohexol to achieve radiographic diagnosis. Barium sulfate enema can be used in patients suspected of having ileocolic or cecocolic intussusceptions. Radiographs will show distension of the intussusciptions while the intussusceptum will appear lucent and there is often an abrupt end to the involved intestinal loop.

Ultrasonography:-

Ultrasonography is readily available in veterinary medicine and is useful for the diagnosis of intestinal obstructions. Ultrasonography can evaluate intestinal wall thickness (a normal small intestinal wall is 2 to 3 mm thick).

Computed tomography:-

Dogs are positioned in dorsal recumbency and routine abdominal-volume acquisition protocols are used. Transverse images are reconstructed with a 2 to 3 mm slice thickness by use of bone and soft tissue algorithms. Data volumes are reformatted in sagittal and dorsal planes with a 2 to 3 mm slice thickness by use of a soft tissue algorithm. CT is often able to reveal the cause of obstruction and remains an important diagnostic tool when managing the cases. The requirement for profound sedation or anesthesia is a major limitation for using CT in small animal medicine. Image analysis for CT includes bowel diameter and ratios are measured at the time of data analysis and compared between dogs with and without obstruction (Winter et al., 2017).

Endoscopy :-

Endoscopy rarely diagnoses intestinal foreign bodies that are not detected radiographically or with ultrasound. This is because the scope seldom cannot be advanced beyond the descending duodenum. However, endoscopy is useful in diagnosing and removing gastric and high duodenal foreign bodies.

interrupted, simple continuous or Connell suture pattern can be followed which will be discussed later.

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CHALLENGES AND STRATEGIES OF SUSTAINABLE DAIRY FARMING IN INDIA

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Prospects of dairy farming

India has become the world dairy industry's "oyster." It provides a vast number of options for businesses who want to profit from one of the world's largest and fastest expanding milk marketplaces. The Indian dairy business is constantly expanding, attempting to keep up with the world's rapid advancement. India now has roughly 250 dairy facilities that process around 20 million litres of milk each day. Milk output has grown by around 4% each year since the white revolution. It increased from 22 million metric tonnes in 1970-71 to 187 million in 2019-20. Even per capita milk availability has grown from 107 to 394 grams per day in 2018-19, compared to a global average of 302 grams. However, India is gradually shifting in the right direction, owing to potential "consumption dynamics" generated by rising packaged milk demand. As a result of the expanding middle class and their greater awareness and needs, the future of profitable dairy enterprise appears bright.

Furthermore, existing reports show that India contributes over 21% of global milk output and accounts for roughly 22% of worldwide milk production. Every year, India's milk output increases, making it an even more thriving industry for business.

White Revolution in India - A glance

India's transformation from a milk deficit to a milk surplus has been remarkable. The white revolution was conceived by Dr. Verghese Kurien, a social entrepreneur and philanthropist. His innovation, dubbed "Operation Flood," gave birth to the "billion-liter notion." Operation Flood, which began in 1970 and ended in 1990, was undoubtedly the world's most comprehensive dairy development initiative, transforming India into one of the world's greatest milk producers. The revolution's main goal was to make the country self-sufficient in milk production, enhance milk productivity, and improve the management of cattle and other dairy animals.

One of the driving forces behind the white revolution's success in India is the livestock population trends. Although India did great in terms of the total milk population and livestock population, it lacked behind when it came to productivity. Therefore cattle owners engaged in crossbreeding program and adequate fodder availability and feed throughout the year. Eventually the crossbred cows turned out to be more productive compared to indigenous ones. For instance the average milk productivity of crossbred cows in Punjab was 8.36 litres/day, whereas it was 2.88 litres/day for indigenous ones.

Milk production and percapita availability of milk in India

Year	Production (Million Tonnes)	Per Capita Availability (gms/day)
1991-92	55.6	176
1992-93	58.0	182
1993-94	60.6	186
1994-95	63.8	192
1995-96	66.2	195
1996-97	69.1	200

1997-98	72.1	205
1998-99	75.4	210
1999-2000	78.3	214
2000-01	80.6	217
2001-02	84.4	222
2002-03	86.2	224
2003-04	88.1	225
2004-05	92.5	233
2005-06	97.1	241
2006-07	102.6	251
2007-08	107.9	260
2008-09	112.2	266
2009-10	116.4	273
2010-11	121.8	281
2011-12	127.9	290
2012-13	132.4	299
2013-14	137.7	307
2014-15	148.3	322
2015-16	155.5	337
2016-17	165.4	355
2017-18	176.3	375
2018-19	187.7	394
2019-20	198.4	406

SOURCE: Basic Animal Husbandry Statistics, DAHD & F,Gol

The core aspect of sustainability have always been an integral part of dairy farmers personal values and daily on farm practices.

Sustainable dairy farming

In India, sustainable dairy farming is a novel idea that advocates for the right and effective use of resources while avoiding over-exploitation. While the approach of this modern dairy farming method appears complex, the majority of its fundamental aspects are taken from old agricultural methods.

Three primary components of sustainable dairy farming are important to consider:

Ensuring that the animals are provided proper care

In dairy farming, the first step is to select the appropriate animal breed. Most farmers select animal breeds based solely on milk yield, disregarding factors such as climate, soil, feed availability, disease and insect resistance, and environmental conditions. Hybrid cattle, such as HF or Jersey cows, are typically vulnerable to severely hot and dry conditions. They also necessitate a great deal of attention in terms of disease prevention and dietary quality. As a result, local varieties such as the Murrah Buffalo or Sindhi cow would be more suited to India's climate.

Another significant factor to consider is the construction of a sterile cowshed. The structure must shield the animals from the elements and provide proper ventilation. The high heat encountered in Indian summer, which is hazardous to any animal breed, necessitates the avoidance of metal GI sheet roofs in particular. To reduce competition among animals, enough space must be allowed at the food and water buckets. Furthermore, an effective herd health management programme must be devised, and animals must be evaluated for illness symptoms on a regular basis. If animals are prevented from falling ill, there is no need for antibiotics.

Another technique that draws from traditional cow herding is free range dairy farming. Cows and buffalos are free to roam and graze throughout the farm and in the open areas. They are herded back after being allowed to graze until after noon. However, this requires more labor.

Management of fodder

The present day high yielding cattle breeds require a steady supply of feed and fodder. While most cattle feeds for conventional dairy farming are bought from the market, sustainable dairy feed need to be grown internally or bought locally in the village. While, dry fodder can be bought locally, green fodder needs to be grown inside the farm. High yielding Bajra Napier hybrids can be grown in fertile and well irrigated land, while Guinea grass can be grown in barren rain-fed land.

Apart from growing organic fodder, it is important to ensure the manure, urine and other waste are disposed off in compost pit. Prevent the untreated sewage sludge from being applied to land used to grow crops. Only composted organic matter must be used for fertilizing crops. Having a Biogas unit will not only solve the problem of waste disposal, but also provide ready manure for fertilizing crops.

Energy production

Although dairy farming is not an energy-intensive activity, there is a need for electric power and heating. Instead of relying on the highly unreliable grid power from the electricity boards, farmers utilize diesel generators, which are costly to run. It would be sensible to utilize Biogas since the fuel input is readily available. Infact the natural gas produced from just four cows can fuel a kitchen of four people. Further, Biogas can be used for milk heating and chilling purposes as well. Biodiesel is another alternative that can be considered for running a diesel generator in remote places where electricity is not available. Solar power panels have become quite cheap today, so that farmers can afford to light up their entire household.

This way, sustainable dairy farming can not only be economically viable to small farmers, but also be eco-friendly by reducing carbon emissions and increasing organic fertility.

Challenges of dairy farming

Unorganized Supply Chain: The dairy industry is mostly decentralised. Only 14 percent of the milk produced in the country is purchased by co-operatives and private corporations (organised), while 32 percent is sold in the unorganised market by milkmen and local sellers, and 54 percent is consumed locally. Because of a lack of resources and a lack of supply chain infrastructure, unorganised market producers/vendors are hesitant to sell milk outside of their comfort zones. Furthermore, because milk is a perishable product, even the organised sector faces significant logistical hurdles in terms of sourcing, processing, warehousing, and distribution to other regions of the country.

Quality Aspect: While the Food Safety and Standards Authority of India (FSSAI) has established quality norms for milk and milk products, there are still concerns about the products available and their acceptability in terms of adhering to the standards. According to the FSSAI's most recent survey, almost 90% of items are found to be safe. Consumers, however, continue to have concerns about the quality of the product.

Underdeveloped Facilities for Quality and Hygienic Livestock Management: Despite having the world's largest livestock population, India's livestock management is inferior to those of other countries. There isn't enough organized area or shelter to house all of the milk-producing animals. The veterinary infrastructure is likewise in need of improvement.

Fodder and Water Scarcity: Animals require dry or green fodder all year, but lack of fodder and water has an adverse

influence on overall milk production and productivity. The scarcity is due to three main factors: the area of natural grassland pastures is rapidly diminishing; crop residues are increasingly being diverted to be used as fuel wood in industrial uses; and the majority of farmers do not build any fodder reserves to sustain them during extreme climatic conditions such as drought or floods.

Lack of Cold Chain Infrastructure: Milk is a perishable and temperature-dependent product. To maintain its purity and freshness while also preventing bacterial deterioration, it requires continuous cold chain storage and transportation facilities. Low-cost technology for chilling milk at the farm level, as well as insulated trucks for delivery, are desperately needed. Huge amounts of milk are wasted as a result of insufficient cold chain facilities. Cold chain infrastructure is currently essentially non-existent, with only a few possibilities. In reality, India's National Centre for Cold Chain Development (NCCD) has identified a 3.2 million MT capacity need in cold storage (comprising all perishables).

Rising cost of inputs and disease management: Dairy farming requires a significant amount of cattle feed, meal supplements, antibiotics, and other inputs. In the last few decades, India's dairy farming industry has grown, resulting in the world's largest animal population. After years of consistent success in milk and cattle production, the industry is now facing a number of challenges.

Farming systems: For maximum productivity, intensive dairy farming necessitates the confinement of the cattle. These closely packed facilities, on the other hand, are overcrowded and unpleasant for animals, making disease transmission easier. Bacteria can easily thrive when thousands of cows are crowded into feedlots full of faeces and urine. Most industrial livestock facilities treat cattle with low-level antibiotics to prevent disease and increase weight gain because overcrowding makes them prone to infection. Not only does this provide a breeding habitat for antibiotic-resistant bacteria, but it also results in milk that is chemically loaded.

Data Deficiency: There is no official estimate of the cost of milk production that is updated on a regular basis. Despite the fact that the value of milk produced in India exceeds the total value of wheat and rice output.

Poor returns: Milk, unlike 24 other key agricultural commodities in the country, such as wheat and rice, has no MSP (Minimum Support Price). Dairy cooperatives are also not the best option for landless or small producers. The cooperatives use a fat-based pricing policy, which is 20 to 30% lower than the open market price. Furthermore, dairy cooperatives purchase more than 75% of milk in the lowest price range.

Competition from alternatives : Some consumers prefer more environmentally friendly alternatives such as 'Soy Milk' or 'Almond Milk' to traditional cow and buffalo milk. They claim that plant-based milk products have a lower carbon impact than typical dairy products.

Education and Training: A substantial education and training programme on excellent dairy practices could lead to the production of safe dairy products, but it must be participative in form to succeed. In this regard, all personnel must be educated and trained so that they understand what they are doing and acquire a sense of ownership. However, in the dairy industry, designing and implementing such initiatives requires a strong commitment from management, which can be a stumbling obstacle at times.

Health: Veterinary health care centres are located in far off places. The ratio of cattle population to veterinary institution is higher, resulting in insufficient animal health care. Routine vaccination schedules are not followed, and regular deworming programmes are not completed on time, leading in high mortality in calves, particularly in buffalo. Against several cow illnesses, no effective immunity has been established.

Hygiene Conditions: Many cattle owners do not provide adequate protection for their animals, leaving them susceptible to harsh weather. Mastitis is caused by unsanitary conditions in cattle sheds and milking yards. Unhygienic milk production reduces storage quality and causes milk and other goods to deteriorate.

Strategies for sustainable dairy farming

Feeding: (cost-effective feeding strategies): A steady supply of high-quality feed and fodder ensures increased output. Feeding accounts for roughly 60-70% of the overall cost of milk production in dairying. A well-balanced diet (green and dry fodder, as well as a concentrate ration) is helpful to the farm's long-term viability and profitability.

High-yielding fodder types such as Bajra, Napier hybrids, Maize, and Sorghum can be cultivated on fertile, well-irrigated

soil, whereas Guinea/Rye grass can be produced on barren, rain-fed ground. Planting native fodder trees in draught-prone locations will keep animal output going during times of scarcity. Because of their excellent nutritional value, trees like *Prosopis cineraria*, *Leucaena leucocephala*, and *Moringa oleifera* are becoming more popular as fodder.

- a) **Baled silage:** In tropical areas, silage is a way of keeping surplus green fodder that is mostly used on large dairy farms. It's the result of a controlled fermentation process that keeps the moisture content of green feed high. Tube silage or bag silage is one of the novel silage-making techniques that has been established for a marginal dairy farmer with one to two dairy cows and limited fodder land in several countries. Baled silage is the most recent advancement in fodder conservation. Forage is baled at a higher moisture level than forage that would be stored as dry hay in this method. Until they are needed, the sealed airtight plastic bundles remain sealed. The high moisture content and lack of air inside the sealed bale encourage fermentation, which helps to protect the quality of the forage.
- b) **Total mixed ration:** The term total mixed ration may be defined as, "The practice of weighing and blending all feedstuffs into a complete ration which provides adequate nourishment to meet the needs of dairy cows." Each bite contains the exact amount of nutrients (energy, protein, minerals, and vitamins) that the cow need. When employing TMR, expect a 4% improvement in feed consumption, improved formulation and feeding accuracy, masking of the flavour of less attractive feeds (urea, limestone, lipids, and some by-pass protein sources), and the use of commodity ingredients.
- c) **Probiotics (prebiotics/synbiotics):** "The procedure of weighing and combining all feedstuffs into a full ration that offers appropriate food to meet the demands of dairy cows," according to the definition of total mixed ration. Each bite contains the exact amount of nutrients (energy, protein, minerals, and vitamins) that the cow need. When employing TMR, expect a 4% improvement in feed consumption, improved formulation and feeding accuracy, masking of the flavour of less attractive feeds (urea, limestone, lipids, and some by-pass protein sources), and the use of commodity ingredients.

Health care: Reduction in milk production is the first indicator of animal distress and disease, and resuming production is one of the most difficult and expensive tasks for small and marginal farmers. There is also a decrease in the animal's per lactation and lifetime production. Antibiotics are required for the treatment of any disease. As a result, it is always preferable to prevent rather than treat diseases. Only via the use of healthcare management could this be accomplished.

- a) **Vaccination:** Livestock vaccination is a new and important socioeconomic breakthrough in the Indian dairy business, with reports that it is more profitable and long-term than artificial insemination. Vaccines are available for most of these diseases, and they can be easily controlled if they are administered on a wide scale and to a large proportion of the susceptible population (at least 80 percent). Farmers must follow the government's prescribed immunization routine, taking all measures and inoculating on a regular basis.
- b) **Communication:** By offering a virtual platform for dairy product production and marketing, information and communication technology (ICT) has the ability to alleviate both ends' needs. Using ICT to transmit information to the dairy industry can greatly improve the quality of decision-making in the dairy farming system.
- c) Internet-enabled mobile phones are one of the successful developments that has benefited a huge number of individuals in the developing countries. Because mobile phones have gained widespread acceptability among all users, they may now be used as a major instrument for communication and information dissemination in order to make better decisions. Dairy producers employ a variety of smartphone apps, web portals such as epashupalan.com, and expert systems. The mobile application for dairy farmers, named 'PashuPoshan', is available on both web and android platform, can be accessed by registering on the INAPH portal (<http://inaph.nddb.coop>).
- d) The Guru AngadDev Veterinary and Animal Sciences University in Punjab, India, has released the 'Precision Dairy Farming' smartphone application, which covers major aspects of dairy farming such breeding, feeding and housing management, record keeping, health management, and economics.

- e) Digital green is a global development organization that empowers smallholder farmers to lift themselves out of poverty. It is an independent non governmental organization that focuses on training farmers to make and show short videos where they record their problems, share solutions and highlight success stories. Digital platforms like kisan dairy, mobile courseware, market engagement, interactive voice response, loop (explores potential models for farm to market linkages that can be made sustainable), satellite yield estimation, video kheti(web responsive application that provides access to video library through an easy to navigate interface for low literate farmers), farmer book (open access platform that displays detailed timeline based activities of farmers).

Breeding: Cross breeding practices have resulted in profitable dairy production while posing major health and fertility difficulties. Native breeds with high-quality genetics would be better suited to the climate in the area. In terms of long-term production, genetic improvement of nondescript animals utilizing superior indigenous germplasm is more effective.

- a) Artificial insemination (AI) technique: It not only eliminates the need to keep a bull for natural service, but it also allows for greater utilization of the outstanding germplasm.
- b) Progeny testing: It's the most practical and effective way to improve the breed's genetics.
- c) Embryo transfer technology (ETT): It is one of the most recent techniques available for rapid livestock improvement around the world, particularly for simultaneously exploiting the genetic potential of high-quality females and males.
- d) Sexed semen: The presence of 'X' chromosomes in sexed semen can ensure the birth of a female calf. The primary benefits popularizing this method among dairy farmers are a reduction in economic load and the generation of a greater number of female calves as future productive animals.
- e) Hormonal synchronization/protocols: For effective and regulated management, different hormone protocols are being used to achieve group calving or target calving in a year. This type of desired calving corresponds to market demand and season. It is planned administration of hormones with fixed time AI for specified calving.

In addition, advanced reproductive techniques such as Multiple Ovulation and Embryo Transfer (MOET), ovum pick-up technique, and embryo manipulation (splitting, sexing, and cloning, among others) allow for faster multiplication of superior germplasm from highly selected elite donors, allowing for the production of a large number of superior bull calves/bulls and adequate semen doses.

Management:

- a) Health tracking devices: These smart animal-wearing devices can be placed in the cattle's ears, tail, legs, neck, or any other part of their bodies. In India, GPS enabled digital chips have been widely implanted to track the health and early identification of medical conditions in dairy cattle. If these devices are used effectively, a large database will be created. The accuracy of such data will aid in the formulation of strong and specific policies for human and animal welfare.
- b) Heat detection systems: It's a heat management software that tracks the cow's activities throughout the day, forecasting heat based on discontent and hyperactivity, and checking milk flow and conductivity for suspected mastitis. It has a clear advantage over eye heat detection, which is based on observation and behaviour and is prone to miss heats or false negatives, resulting in significant financial losses.
- c) Robotic milking machines: Robotic milking robots are effective in reducing physical labour and ensuring a sanitary milking procedure, resulting in a significant increase in milk production. These gadgets use cups with sensors that can be fitted to the teats of individual cows. The sensors are crucial in recognising the readiness of teats for milking as well as identifying contaminants, colour, and milk quality. Unfit-for-human-consumption milk is diverted to a different container. When the task is completed, the machines clean and disinfect the teats automatically.
- d) Digital farm management: Dairy farm management softwares are cutting-edge instruments for atomizing and digitising end-to-end production and operations activities on the market. It gives you a holistic perspective of your entire farm's activities, allows you to manage records, generate reports, and spot inefficiencies, all while ensuring successful dairy farming.

Conclusion:

Dairy producers are moving towards sustainability in various ways these days, and it is expected to continue in the next years. Government assistance in raising awareness of the necessity of implementing sustainability measures in dairy farming should assist farmers in grasping the concept of sustainability and encouraging them to implement the practices. However, in order to attain full sustainability in our dairy farming, the three aspects of sustainability, namely the environmental, economic, and social aspects, must be fully applied and adopted. Dairy farming research should be expanded in all aspects, including economic, social, and environmental, in order to find the most advantageous strategy to assist farmers.

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TRYPANOSOMOSIS AND THEILERIOSIS : HAEMOPROTOZOAN DISEASES OF RUMINANTS (CATTLE AND BUFFALOES)

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The common blood parasitic diseases mainly Theileriosis, Babesiosis, Anaplasmosis and Trypanosomosis are major problem in dairy industry. These diseases cause a heavy loss to the livestock industry throughout the world. It is found that, most of the blood protozoan and rickettsial diseases are transmitted by ticks. It is of great economic importance in India and has always been problem for establishment of dairy industry. The blood parasitic diseases have great impact on cattle health, milk yield, draft and meat production, which in turn affects overall cattle production, hence lowering agricultural and socio economic development in India. However, the most of blood protozoan parasites cause anaemia by inducing erythrophagocytosis. Therefore, it is important to control these blood parasitic diseases by checking the ticks and flies population.

1. Trypanosomiasis or Surra

- ❖ It is an extracellular parasite found in the blood plasma and lymph of vertebrate hosts.
- ❖ It is an important disease of cattle and buffalo.
- ❖ It is caused by Trypanosoma evansi blood protozoa.
- ❖ It is transmitted mechanically by biting flies namely, Tabanus sp., Stomoxys sp., Haematopota sp., Chrysops sp. Tabanus sp. and Stomoxys sp. flies are more common vectors.

Clinical sign and symptoms

- ❖ Buffaloes have a higher incidence rate than in cattle

Peracute case:

- ❖ Nervous signs within 2-3 hours

Acute case:

- ❖ Animals appear dull and sleepy
- ❖ Animals show staggering gait, eyes staring and wide open,
- ❖ Breathing hard and noisy
- ❖ Circling movements, nervous excitement, hitting of head with hard objects
- ❖ Stamping of feet, frequent micturition
- ❖ Rise in body temperature up to 40.60C
- ❖ Bellowing, profuse salivation, shivering of body followed by coma, collapse and death in 6-12 hours

Subacute and chronic case:

- ❖ Animals are sleepy, dull and have bilateral lacrimation
- ❖ Progressive emaciation, rapid pulse, intermittent attack of fever
- ❖ Oedema of legs, diarrhoea and death from exhaustion
- ❖ In buffaloes abortion has been reported

Diagnosis

- ❖ Diagnosis of disease is based on:

1. History of the prevalence of biting flies namely, tabanids

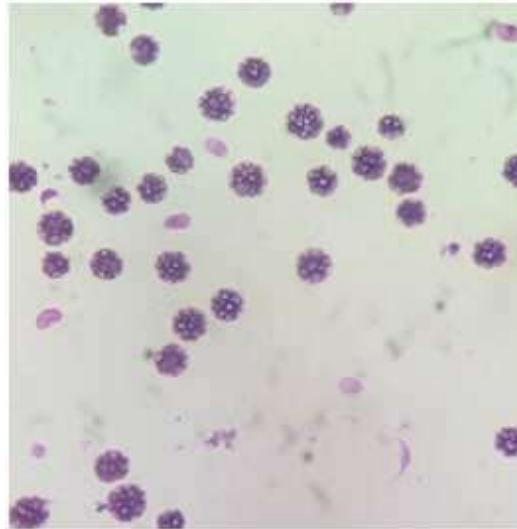
2. Clinical symptoms
3. Laboratory examination of blood and body fluids by
 - a. Direct examination by blood smear
 - b. Chemical tests
 - c. Animal inoculation test -Albino mice and rats are used
 - d. Immunodiagnostic tests
 - e. Molecular test- Polymerase chain reaction (PCR)

Treatment

- ❖ Quinapyramine (Antrycide) methyl sulphate @ 3mg/kg body wt. As 10% aqueous solution, Subcutaneous injection.
- ❖ Diminazine aceturate (Berenil) @3.5mg/kg body wt., Subcutaneous or deep intramuscular injection.
- ❖ Isometamidium chloride @0.5-1mg/kg body wt., deep intramuscular injection or slow I/V injection.

Control

- ❖ Control programme consists of-
 1. Treatment of affected animals
 2. Chemoprophylaxis
 3. Regular spray with insecticides to check the flies population
 4. Proper disposal of manure and treatment of breeding places of vectors to reduce the population of flies



Blood picture showing the Trypanosoma sp.

2. Theileriosis or bovine tropical theileriosis (BTT)

- ❖ It is an intracellular parasite found in the red blood cells, lymphocytes and histiocytes of vertebrate hosts.
- ❖ It is an important disease of cattle and buffalo.
- ❖ Cross bred cattle are more susceptible than indigenous cattle.
- ❖ It is caused by Theileria annulata protozoan parasite.
- ❖ Parasites are pleomorphic and occur as minute round, ovoid, rod like, comma shaped or irregular

forms found in the lymphocytes, histiocytes and RBCs of vertebrate hosts.

- ❖ It is transmitted by ixodid ticks of genus *Hyalomma anatolicum anatolicum*, *Hyalomma dromedarii*

Clinical sign and symptoms

- ❖ Enlargement of regional superficial lymph nodes
- ❖ High fever (40.5-41.50C)
- ❖ Heart rate and pulse rates increase, laboured breathing
- ❖ Serous nasal discharge and coughing
- ❖ Petechial haemorrhages on conjunctivae
- ❖ Post-mortem findings are punched necrotic ulcers in the abomasums and in young calves abomasum is full of undigested clots of milk.

Diagnosis

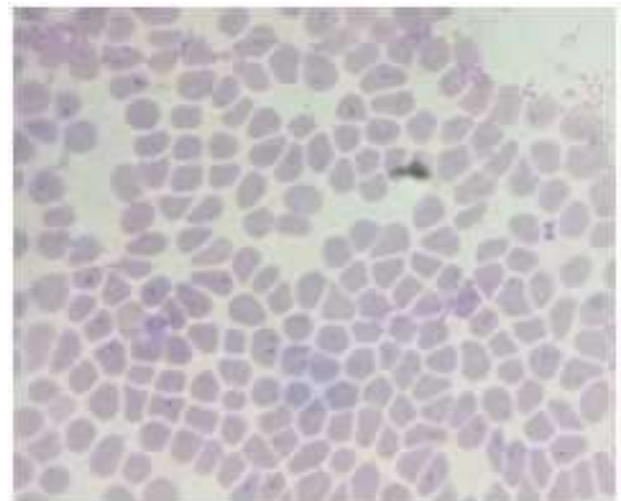
- ❖ Diagnosis of disease is based on:
 1. History of the high prevalence of *Hyalomma anatolicum* ticks
 2. Clinical symptoms- mainly high fever with enlargement of superficial lymph nodes
 3. Demonstration of piroplasms in RBCs and schizonts (KBB) in lymphocytes in biopsy smears from lymph nodes
 4. Serological tests
 - a. Complement fixation test (CFT)
 - b. Capillary tube agglutination test
 - c. Fluorescent antibody technique (FAT)
 5. Molecular test- Polymerase chain reaction (PCR)

Treatment

- ❖ Buparvaquone (Butalex) @ 2.5 mg/kg body wt., intramuscular injection
- ❖ Parvaquone @ 20 mg/kg body wt., I/V route as a single dose
- ❖ Long acting oxytetracycline 20 mg/kg body wt., intramuscular injection every four days
- ❖ Oxytetracycline @ 15 mg/kg body wt., intramuscular injection 4-6 times daily
- ❖ Halofuginone @ 1-2 mg/kg body wt. Orally once

Control

- ❖ Bovine tropical theileriosis control measures include prophylaxis and chemotherapy with supportive treatment.
- ❖ Prophylaxis consists of chemoprophylaxis, immunoprophylaxis and control of ticks.
- ❖ Rakshavac-T is an attenuated tissue culture vaccine contain *Theileria annulata* schizont infected bovine lymphoblasts, recommended for use in crossbred and exotic cattle aged two months and above.
- ❖ One subcutaneous injection of 3 ml is given yearly to the animals.



Blood picture showing the *Theileria sp.* parasite

SOCIO-ECONOMIC PROFILE AND KNOWLEDGE OF DOG OWNERS ABOUT VARIOUS CANINE PRACTICES

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Abstract

This study was conducted in veterinary clinic of CVAS, RAJUVAS, Bikaner. A number of 60 respondents (dog owners) were selected by using simple random sampling method. Data were collected through the personal interview with the help of interview schedule. Majority (58.3%) of respondents were in the young age group, graduate or above (45.00%), small size family (53.33), nuclear family (65.00%), medium annual income (51.70%). The results revealed that 55.00 percent of the respondents were belonging to service as occupation followed by 40.00 percent business and 5.00 percent agriculture as occupation. Dog owners had more knowledge about recommendation of dog bathing material (86.11%) & grooming (80%) among management practices and about vaccination (93.33%) and deworming (88.83%) among health care practices. Majority of dog owners had knowledge about home prepared food (100.00%) & feeding schedule (93.33%) and about breed of dog (93.33%) & breeding methods (80.00%).

Introduction :

Now a day there is increased interest for pets among Indian population. This increased interest has also supported the welfare of pet population. From the time being dogs are associated with mankind, they sometime act as guard as well as companion animal. Man in turn provides protection, companionship and accommodation and a regular source of food for dogs. These mutual benefits have built a trusting relationship throughout history between dogs and people and ultimately have made life easier for both (McGourty, 2002). In the urban areas of the country, dogs are mainly kept for guarding property. A few people in both rural and urban communities keep dogs for both companionship and as pets. The association of human beings with dogs is well known since domestication.

Material and methods:

This study was conducted in veterinary clinic of CVAS, RAJUVAS, Bikaner.

A number of 60 respondents (dog owners) were selected by using simple random sampling method. A semi structured interview schedule was prepared after discussion and consultation with experts. Data were collected through the personal interview. The data were compiled, tabulated, and analysed by using statistical tools (Frequency, Percentage and Mean score).

Results and discussion:

The data presented in Table No.1 showed that majority (58.3%) of respondents were in the young age group followed by adult (30%) and old (11.7%) age groups. These results indicated that majority of dogs were owned by young persons. Majority of respondents were graduate or above (45.00%) followed by intermediate (33.33%), middle (13.33%), primary (8.33%) and illiterate (0.00%).

Majority of respondents (53.30%) had small size family followed by medium (33.30%) and large (13.30%) family. The results revealed that about 65.00 per cent of the respondents had nuclear family followed by joint family (35%). Majority of the respondents (51.7%) had medium annual income followed by low (30%) and high (18.3%) income. The results revealed that 55.00 percent of the respondents were belonging to service as occupation followed by 40.00 percent business and 5.00 percent agriculture as occupation. Lueet al. (2008) reported that households with dogs had higher median incomes (\$57,000) and most of the respondents had some education beyond high school (38%) or vocational training or some college (28%). Sawaimulet al. (2009) found that government servants were more interested in dog keeping which found to be 35% followed by businessmen (33 %) and other (32%) .

Management practices:

A perusal of Table No. 2 showed that majority respondents had knowledge about recommendation of dog bathing material (86.11%), followed by knowledge about grooming (80%), purchasing of dog (57.22%), knowledge about important features during dog purchasing (51.66%), registration of dog (50%), and proper trimming of nails (38.33%). Health care practices:

The results revealed that majority of dog owners had knowledge about vaccination (93.33%) followed by deworming (88.83%), sign and symptoms of common diseases (61.66%), spaying/castration (60.00%), 1st vaccination age (42.22%), 1st deworming age in dog (36.66%) and awareness about euthanasia (35.00%). Matibaget al. (2007) studied on Knowledge, attitudes, and practices of rabies in a community in Sri Lanka and the study revealed that among all the respondents, there was a high level of awareness (90%) that dogs are the most common rabies reservoir followed by the disease is fatal (79%) and rabies can be prevented by vaccination (88%).

Feeding practices:

The data presented in Table No. 2 indicated that majority of dog owners had knowledge about home prepared food (100.00%), feeding schedule (93.33%), quantity of ration (90.00%), balance diet (88.33%), Minerals and vitamins (80.00%) and Processed food/ commercial food (76.67%). Sulukuet al. (2012) studied on post-war demographic and ecological survey of dog populations and their human relationships in Sierra Leone. The results revealed that 81% do not feed their dogs with canned food. About 88% dog owners don't know the cost of feeding their dogs. Approximately, 44% of households allowed their dogs to scavenge garbage dumps and to mix with other dogs.

Breeding practices:

A perusal of Table No. 2 indicated that majority of respondents had Knowledge about breed of dog (93.33%) followed by breeding methods (80.00%) and Mating with same breed or not (78.33%).

Conclusion: In the present scenario attitude of people toward pets (canine & feline) is changing. People who belong to urban society are taking keen interest in pet rearing. The study showed that majority of dog owners were young and well educated. So, they were adopting scientific canine practices properly. They were more aware about vaccination, deworming, grooming, balance diet and breeding.

Table-1: Socioeconomic variables of the respondents

S.N.	Antecedent characteristics	Category	Frequency (F)	Percentage (%)
1.	Age	Young (15-34)	35	58.3
		Adult (35-54)	18	30
		Old (55-74)	7	11.7
2.	Education	Illiterate	0	0.00
		Primary	5	8.33
		Middle	8	13.33
		Intermediate	20	33.33
		Graduate or above	27	45.00
2.	Family size	Small (up to 4 member)	32	53.3
		Medium (5-8 member)	20	33.3
		Large (>8 member)	8	13.3
3.	Family type	Nuclear (1)	39	65
		Joint (2)	21	35
4.	Annual income	Low (up to 1.05)	18	30
		Medium (1.05-7.41)	31	51.7
		High (above 7.41)	11	18.3
5.	Occupation	Agricultural (1)	3	5

Business(2)	24	40
Service(3)	33	55

Table-2: KNOWLEDGE ABOUT VARIOUS PRACTICES FOLLOWED BY PET OWNERS

S.N.	Item	Percent	Rank
General Management practices			
1.	Registration of Dog	50%	V
2.	Source of purchasing of dog	57.22%	III
3.	Important features during dog purchasing	51.66%	IV
4.	Grooming in Dog	80%	II
5.	Use of bathing material (Shampoo)	86.11%	I
6.	Proper trimming of nails in Dog	38.33%	VI
Health care practices			
1.	Deworming in Dog	88.33%	II
2.	Vaccination in Dog	93.33%	I
3.	1st Deworming age in dog	36.66%	VI
4.	1st vaccination age in dog	42.22%	V
5.	Sign and symptoms of common diseases	61.66	III
6.	Awareness about euthanasia	35.00%	VII
7.	Spaying/castration	60.00%	IV
Feeding practices			
1.	Feeding schedule in Dog	93.33%	II
2.	Balance diet	88.33%	IV
3.	Quantity of ration	90%	III
4.	Processed food/ commercial food	76.67%	VI
5.	Home prepared food	100%	I
6.	Minerals and vitamins	80%	V
Breeding practices			
1.	Knowledge about breeding methods	90%	II
2.	Mating with same breed or not	78.33%	III
3.	Breed of dog	93.33%	I

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MANAGEMENT OF DYSTOCIA DUE TO FETAL ASCITES IN NON-DESCRIPT CATTLE- A CASE REPORT

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Abstract

A case of dystocia due to ascitic fetus in anterior presentation was delivered by abdominocentesis and forced extraction in a cow.

Introduction

Dystocia is defined as delayed or difficult calving, sometimes requiring significant human assistance. Dystocia can also occur due to dropsical condition of fetus like hydrocephalus, ascites, hydrothorax and anasarca. Ascites may be caused either by the overproduction or insufficient drainage of peritoneal fluid, Obstruction of lymphatics, for various reasons may prevent disposal of peritoneal fluid. Ascitic foetus in full term pregnancy may cause dystocia in cows. In this case we report a successful management of dystocia due to fetal ascites in cattle by incising the fetal abdomen to take out the fluid from peritoneum.

Case history

An Nine-year-old cow in 5th parity completing normal gestation with the history of dystocia was reported at farmer field. The Animal was straining since previous night and appearance of two fetal limbs in birth canal. Owner had attempted just by pulling limbs, but failed to deliver fetus.

Clinical Examination and Diagnosis

On examination the Respiratory rate, temperature and pulse rate were normal. The per-vaginal examination revealed the completely relaxed cervix with fetus in anterior longitudinal presentation and dorso sacral position and two limbs in birth canal on pelvic region but the fetal abdomen was found greatly distended above the brim, and tense with lot of fluid. By all examination (history and clinical examination), the case was tentatively diagnosed as dystocia due to fetal ascites.

Handling of Dystocia and Treatment

First of all, epidural anaesthesia was administered to check the straining. After that both hand lubricated and then push into cervix through vaginal route then Abdomen of the dead fetus was punctured (abdominocentesis) twice with fetotomy knife, allowing considerable fluid to escape and huge amount (about 15 liters) straw coloured fluid was drained out. The fetal size was reduced and the ascites fetus was removed by gentle traction. Placenta was also taken out by rolling it on the hand. Animal was administered fluid therapy (5% dextrose and calcium borogluconate), corticosteroid to avoid dehydration and shock with other supportive therapy. Subsequently the animal was administered antibiotic to check secondary bacterial infection (inj- Oxytocin 50 IU IM), antihistaminic drugs and decibolics 100 ml orally for 5 days and intrauterine boluses were also administered to prevent uterine infection. Dam recovered uneventfully.

Conclusion

Ascites may be due to hepatic lesions, general venous congestion or urinary obstruction with or without rupture of bladder. The fetal ascites resulted into dystocia as a result of increase in abdominal diameter. The etiology for polycystic kidney was not established yet, however, some etiologies responsible for renal cyst conditions are recognized to be related with autosomal recessive genes chemicals like corticosteroids and diphenylamine.

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CYANIDE TOXICITY IN CATTLE

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Introduction

One of the poisons that affects the cow population most quickly is cyanide. Prussic acid and hydrocyanic acid are other names for it. Because of its acidic character, hydrogen cyanide (HCN), commonly known as "prussic acid," was originally extracted from the blue dye (Prussian blue). A colorless, odorless gas with a bitter almond scent is hydrocyanic acid. The cyanogenic glycosides are found in more than 2000 plant species. The most common sources of prussic acid are tar and sorghum and these plants are typically to blame for poisoning. Although cyanide is utilized in manure, cloth, paint, herbicides and insecticides, plants are the main cause of cyanide poisoning in animals. Cyanide is also present in bitter almond, cherry, peach and plum. Cherry kernels and bitter almond pulp each contain about 170 and 250 mg of cyanoglycoside, respectively, per 100g. Excessive cyanide exposure can be lethal [1, 2].

Etiopathology

As cyanogenic glycosides, cyanogenic plants contain cyanide. These glycosides are normally non-toxic, but when they are hydrolyzed, they become poisonous to both humans and animals. According to reports, injured plant cells can release enzymes in their vacuoles after being frozen, cut or chewed. These enzymes and cyanoglycosides may then interact to form cyanure. The rumen microflora of cattle has bacteria that may manufacture the same enzymes and transform cyanogenic glycosides into cyanure gas. As the most prevalent glycosides in cyanogenic plants, Amygdalin, Lotaustralyn, Vicianyn, Proteacyn, Prunacin, Linamaryn, Dhurryn, Taxiphylyn, and Gynocardyn have been identified. According to reports, ingesting high amounts of cyanogenic plants, ruminal pH and microbiota, cyanogenic glycoside content or free HCN content can all raise the level of toxicity. Older plants and leaves contain less cyanogenic glycoside, which reduces the risk of poisoning. It has been demonstrated that some herbicides, such as 2,4-Dichlorophenoxyacetic acid, can potentially make plants more hazardous following application [3,4].

According to research, having too much nitrogen and not enough phosphorus in the soil might make plants more poisonous. The degree of poisoning is increased by high ruminal and abomasal pH. However, poisoning does not happen if the pH is less than 5.0 because the enzymes that separate the glycosides from the cyano get denatured. For sheep and cattle, the fatal dose of HCN is around 2 mg/kg of body weight. If the plants have more than 200 ppm of these glycosides, they are regarded as dangerous. Upon entering the body, cyanide is quickly absorbed, circulated and combined with methemoglobin to create cyano-methemoglobin. By attaching to the ferric (Fe⁺⁺⁺) iron present in the cytochrome oxidase enzyme, the circulating cyanide renders it inactive. Normally, the final stage of oxidative phosphorylation is catalyzed by the cytochrome oxidase enzyme. This function cannot be carried out because of the enzyme-cyanide complex. This prevents the enzyme from combining with oxygen and inhibits electron transport. Since the patient is unable to use caloric oxygen, cellular respiration instantly stops. Histotoxic anoxia results from this mechanism, which results in death [5,6].

Clinical signs

Cyanure is one of the most potent toxins and can quickly result in death. Affected animals quickly start to exhibit toxication signs; the severity of the poisoning relies on the amount of cyanogenic structure consumed and the pace of consumption. According to Arnold and Gaskill, toxication symptoms might appear anywhere between five minutes to a few hours following cyanogenic structure consumption, however patients typically don't survive past two hours. Clinical symptoms in affected animals include dyspnea, laborious breathing, restlessness, tremors, moaning, terminal clonic convulsions and opisthotonos. Because blood contains a surplus of oxygen while tissues can't utilize it, mucous membranes first seem brilliant and cherry-red. Mucous membranes turn cyanotic when a patient is hypoxic. Symptoms of poisoning do not appear when the intracellular cyanide content is less than 0.2 g/ml. Between 0.5 and 1 g/ml of

cyanide, skin hyperemia and tachycardia are observed, while between 1 and 2.5 g/ml, excitement and unconsciousness are noted. Patients at the levels above will quickly go into a coma and eventually die. Hypoxia can cause poisoning symptoms. Arthrogryposis can be shown in the calves that eat sorghum in cases of chronic poisoning. In some situations, myelomalacia and urine incontinence can develop. Patients may exhibit pawing in the posterior extremities, ataxia, head shaking and lack of coordination. Such patients may also have a decrease in production, difficulties getting pregnant and abortion [6,7].

Diagnosis

For the diagnosis, cyanide analysis must be done on suspicious foods, plants or cattle rumen content. Examples of cyanide detection using sodium picrate test can be found and commercial test kits are also offered. Collection of instances is crucial for carrying out an accurate analysis that results in a correct diagnosis. The sample must be kept fresh; if it is allowed to dry, prussic acid will be lost. According to reports, samples must be frozen, stored in a container that may be tightly sealed and moved in a cold chain in order to be collected and sent [9,11]. Early death attendance formation might be seen during necropsy. Because oxygen couldn't be retained and was consumed by tissues, blood appears red. The mouth and stomach exhibit red and orange coloring. Rumen and internal organs might smell like bitter almonds. All cases had subendocardial and sub pericardial hemorrhages [8, 9].

The difficulties in diagnosing acute cyanide poisoning might result from early, non-specific toxicity symptoms such weakness, disorientation, hyperpnea, and laborious breathing. Patients who exhibit these symptoms may actually have sulphur, organophosphorus, or nitrate poisoning. Because the majority of the clinical indications of prussic acid poisoning resemble those of other poisonings, a precise diagnosis is crucial. To distinguish cyanide poisoning from other incidents, there are some telltale signs. The animal's blood turns a vivid cherry red when exposed to prussic acid, although this won't always happen. In contrast to prussic acid poisoning, giving sodium nitrite to animals with nitrate poisoning may make their condition worse. In the necropsy, cyanide poisoning is indicated by findings including a bitter almond odour and an early onset of death [10, 11].

Treatment

Although early-discovered instances can sometimes be treated, treatment is frequently too late and most cases end in death. However, sick cattle should be quickly given intravenous doses of sodium nitrate and sodium thiosulfate. The rumen contents of the patient should be changed for those of a healthy animal. To guarantee that all cyanogenetic material has been removed completely, this technique should be done right away. The specific antidotes for cyanide poisoning are sodium nitrite and sodium thiosulphate. Animals can receive an intravenous injection of a 20% sodium nitrate and 20% sodium thiosulphate combination. Following the therapy, the cattle's respiration rate slowed and they appeared to be in a more relaxed state. Patients must be positioned in sternal recumbency and an effort must be made to get them to stand up right away [12, 13].

Prevention

When they are young, sorghum and Sudan grass should not be grazed. Before grazing, they must be given time for these forages to grow to a height of 15 to 18 inches. When choosing seed, new sudan grass and sorghum varieties with decreased prussic acid contents should be taken into account. It is necessary to prevent animals from accessing the wild cherry leaves. When growth is drastically decreased during droughts or the plant is wilted or bent, it must not be grazed. Animals must have had enough food, such as hay, so they won't be starving when they move to other pastures. As a result, the animal will ingest less prussic acid and have more time to detoxify low amounts of HCN. Cattle must not have been fed green chop if excessive cyanide levels at the forages are detected. Conclusion One of the most significant poisonings in animals is cyanide poisoning. The ability of animals to pica made it more hazardous. The goal of this review is to focus on cyanide poisoning [14].

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CHALLENGES AND STRATEGIES FOR THE SUSTAINABLE DAIRY FARMING IN INDIA

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Dairy farming is one among the most important industry in India which provides invaluable economic growth to our country's overall income. Dairying is an important activity in Indian economy contributing about 27 per cent of the agricultural gross domestic product (GDP) and around 4.35 per cent of the national GDP. In India many small margin farmers and most of the rural population depends on the dairy practices for their livelihood. The income from the dairy industry exceeds the income from the agriculture produces like rice and sugarcane.

India has a large cattle and buffalo population which inturn makes it one of the largest milk producers in the world. Milk is a major and cheap source of protein for the vegetarian population. Dairy farm provides employment opportunities to many people and comes hand in hand with the agriculture. The rise in this industry is mainly due to a number of functional cooperative societies existing in many corners of the country. Besides all boons the dairy farming comes with a number of tasks which need to be tackled and looked after in order to run the dairy industry smoothly.

Among many challenges faced by the farmers in dairy industry below are some of them along with the strategies to overcome them efficiently-

Selection / Choosing of suitable location for dairy purpose.

Most of the times the area for dairy farming is unsuitable or away from market area which inturn aids in additional transportation cost.

Expert advice/ guidance should be taken to look into the matter so as to avoid future problems. The area should be well ventilated and easily approachable to market i.e., well connected area so that transport expenses can be cut off.

Selection of breeds/ animals for milching purposes

Animals should be of high producing ability now a days crossbreeds are of more importance. Animals should posses dominant milk vein, probably should be in 3-5 lactation so that its production is at peak. Owner should consult a veterinarian/ extension worker for the purpose.

Funding source for dairy farm/ lack of awareness about the various government schemes

Farmer should consult the AH & VS department before the initial setup of dairy farm and ask for any existing schemes/ beneficiaries from government either state or central, loan opportunities if any. This can reduce the burden of high initial cost during establishment.

Lack of awareness about profit/ losses of dairy farming

Farmer should consult/ visit the already established dairy farmers and know the lacunae of dairy farms and try to overcome it. He/ she should have thorough knowledge about the working of dairy farm.

Calf per year should be the sigma rule of ideal dairy farm

For dairy farm it becomes important to have a calf per year so that milk production is at peak all year round. This can be achieved by proper estrous detection techniques and timed artificial insemination at estrous.

Failure in detection of estrous/ longstanding anestrous/ repeat breeders/ reproductive disorders

These things hamper the goal of getting a calf per year. So it becomes important to overcome this. Farmers should not ignore/ neglect heat signs. Detection of estrous is essential task. Timed AI is must. Use of modern estrous synchronization techniques to avoid the delay of calving.

Birth of male calves

For dairy farm to be functional it is important to have female calves so that the cycle of dairying never ends. But birth of male calves is bane to cattle dairy farming and they can't serve the purpose of dairy farm. This can be overcome by using sexed semen straw during AI.

Calf morality/ calf rearing expenses

Special care and attention should be taken while rearing calves as they are susceptible to a number of infections mainly bacterial which can turn out to be fatal. So earlier diagnosis, attention and treatment is must. No negliability should be eneterntained. Separate labour should be assigned to look after the calves and allow them regularly to access their mother cow's milk.

Hygienic practices

This becomes important when the dairy farm is of highly commercial. Good managemental practices counts for the total output. This also avoids infection among animals, regular fumigation, cleaning of farm, dairy utensils is must. This also avoids milk spoilage.

Nutrition/ fodder expenses

This is very important aspect of dairy farm as most of the farmers are unaware about what to feed the high yielding dairy cows so they do not exhaust during high milk production. Fodder should consist of both dry and greens in order to maintain proper dry matter intake. Feeding of oilcakes is must for dairy animals. Many commercial feeds are also available is the market.

High cost of fodder cultivation and oil cakes

This can be avoided by proper timed nutrition diet setup instead of practicing clumsy diet chart. Cultivation of greens with hybrid crops can be effective KMF feed procurement can be helpful.

Skilled labourers availability

Due to modernization very ample amount of labourers are coming into the dairy practices. Technically sound and experienced labour who is completely involved into the dairy farm becomes important. He/she should be trained and updated with the modern dairy practices. Should also be thorough with the milking methods, detecting heat signs, pregnancy, diseased animal, abnormal animal behavior. He should have good observing ability.

Clean milk production

For a profitable dairy farm, milk should be of high quality/ free from pathogen. This can be achieved by good nutrition regular oil cakes and calcium tonics supplement intake. Proper hygiene milking practices such as dipping teat before and after milking is must. Cleanmilk production protocols needs to be followed.

Milk market

This is the biggest challenge in the dairy industry. Dairy farm should be well connected with the market. Direct market can prove to be more profitable without involvement of any middle man. Farmers are getting low cost for production of milk when approached by cooperatives per litres. Farmers should have thorough knowledge /idea about the milk market on howto make goof profit.

Milkprice

In the present time the cost of milk is not increasing whereas the cost of milk production is increasing exponentially. Good market value fetching becomes important. The farmers should know where to cutoff extra expenses so that cost of milk production doesn't exceed cost of milk produced and profit should be made. Lack of bargaining in the market also contributes to existing low prices of milk.

Alternatives to the cow/buffalo milk

The vegan diet includes soya milk, coconut milk, almond milk which can be threat to the dairy industry as modern

lifestyle is switching to the vegan food habit. This can replace milk and decrease its usage.

Lack of dairy cooperative societies

This can be proved to be a disadvantage for a small/ medium margin dairy farmers as they lack the approach to the market. More farmers and local village bodies should come together to create the cooperative and also a medium where they can sell their produce.

Industrialization/ urbanization

People need to be stick to their roots and the dairy farm practices should not be considered the work of illiterate. Even educated person can invest and do wonders in dairy industry. Enough grazing space should be present/ allotted to each village by government as Gomalas. Complete intensive farming can be of high expense.

Disease outbreaks and its control

There are a number of infectious/contagious diseases which can be spread from one to another animal. Separation and isolation of diseased animal is must. Early consultation from a vet is must. Immediate treatment should be given. Regular vaccinations before start of extreme weather conditions. Ample amount of mineral and vitamin supplements should be added in diet in order to avoid their deficiencies.

Udder hygiene and mastitis control

Subclinical mastitis is common among the high yielders. Regular screening of dairy animal's milk is must by milk side test. Often checking of udder and teat abnormalities is advised.

Seasonal management

Heat stress hits harder in the dairy animals. So during summer season it becomes important to use sprinklers and water foggers in the dairy farm whereas in winter it becomes important to look after the calves keep them warm to avoid the hypoxia. Cold stress also leads to decrease in milk yield which can be avoided by using heat waves or hot fans installation in farm during winters.

Milking methods and time of milking, milking person consistency

Faulty milking can decrease the milk let down. Proper full hand milking is advised. Early morning and evening milking is recommended and milking time should not be altered. Irregular milking also causes change in milk outlet. Changing of the milking person oftenly can also contribute to the less milk let down.

Maintenance of proper records

It becomes crucial to maintain proper registers containing the updates of animal estrous date, AI dates, calf born, daily milk outlet of each individual animal. Any changes in the animals can easily be tracked by looking into the registers.

Storage of milk

Large production of milk needs to be stored by maintaining cold chains. Since milk is highly perishable product it becomes primary duty to provide it to the sellers/consumers as early as possible. So that the milk quality doesn't spoils. Maintaining cold chains prevents the bacterial growth temporarily.

Utilizing overproduced milk as milk byproducts

Dairy farms can also further be extended by utilizing the excess milk produced into the milk byproducts which are in high demand in market such as paneer, curd, ghee, khowa etc. These all aids in the value addition to dairy farm provided the owner has enough man power and the funding

Sudden death of animals

High producing crossbreed animals are susceptible to a number of infections and most of them may be of acute so to avoid loss it becomes important to have the animal's insurance. Awareness should be spread among the owners related to the insurance proposals of the animals.

External Parasitic infestation

This is the most common problem faced by the dairy farmers as crossbreeds are not resistant to ectoparasites mainly ticks which inturn results in tick borne diseases outbreak in farm premises. Seasonal screening of blood smears of animals is advised and early treatment can be helpful.

Endoparasites

Gastrointestinal parasites are the common guests in the dairy animals and their number increases during the lactational stress, seasonal extremities. They have very good potential to hamper the normal functioning of the dairy farm. This can be taken care of by following deworming protocols regularly with rotational use of effective anthelminthic.

Silent heat management in buffaloes

Buffaloes are animals showing silent estrous where it becomes difficult for farmers to look for the estrous signs and artificial insemination is not that effective in them as that of cattle. So regular timely per rectal examination is must not to miss out the estrous cycle in buffalo and better to go for natural service for better conception rates.

Conclusion

Ideal dairy farm can only be achieved by practicing clean milk production techniques. It takes a lot of dedication and time for a dairy farmer to look after the farm. Adaption of local crossbreed animals for the dairy purpose instead of other climatic zone animals which cannot acclimatize to the surrounding environment. Regular deworming and vaccination can reduce the risk of major disease outbreaks. Balanced feed and supply of vitamins and mineral supplement is must. Getting a calf per year by following accurate and effective AI. Dipping of teat in PP solution before and after milking can reduce risk of mastitis, and also the farmer should wash his hand properly during the process. Good managemental practices prevents spoiling of milk, which is perishable commodity. Modern equipments such as milking machine should be brought into practice and inturnreduce burden to farmer to some extent. Creating a own milk market channel becomes essential in order to rule the market and inturn not being a puppet to the middlemen/cooperatives who still are the kingpin in this dairy industry. Cutting of cost expenses of milk production also becomes important.

The farmer should not only depend on the milk sale, it should only be his daily source of income. Other value addition milk byproduct should be prepared such as ghee and paneer in wedding and festive season and buttermilk, lassi in summer according to the demand so that he can make good profit out of it. Selling of calves can be practiced as an annual income source. Vermi Composting can also be done once in six months according to the availability of the manure which can fetch good money in the organic farming practices. By following the above strategies one can have sustainable profitable dairy farm in India.

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VETERINARY PROFESSION 'SIGNIFICANT' THAN EVER**Dr Pushpendra Singh Rathore**

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Abstract

Humans continue to interact with pets, livestock, zoo and wild animals. Constantly changing conditions such as the climate, human habitats and wildlife habitats link the environment, people and animals together. Keeping this in mind, our efforts to keep food and water sources safe, protect the environment, and safeguard people and animals from diseases must also overlap. This can only be done by realizing the importance of veterinary profession, by enabling the veterinary fraternity to have their say in this whole process of public health set up, so that they can work hand in hand with the medical, environmental and epidemiological experts and can effectively deliver in this uncertain era of emerging and reemerging of zoonoses.

Keywords : Veterinary, Economy, Zoonoses, One health

Contribution of Veterinary profession in the National economy

Veterinary Services continue to strive and work endlessly in order to address the food security and safety, as well as livelihoods of farmers (breeders), thus ensuring safe food provision for entire human populations and also actively contributing in the economic growth of the country

India continues to be the largest producer of milk in world with 209.96 million tonnes (2020-21). Poultry population in India has grown by leaps and bounds in last few decades, currently the total poultry population in our country is 851.81 million and egg production is around 122.05 billion (2020-21). The per capita availability during 2020-21 is around 90 eggs per annum (dahd.nic.in). Similarly India's share in meat and wool production is also constantly increasing.

The problem of emerging and reemerging Zoonoses

It is one example that indicates how health of people is affected by wellbeing of animals and environment. It has been scientifically proven that at least 75% of emerging diseases have a zoonotic origin, having diverse animal species as their primary reservoirs. An example is the highly pathogenic avian influenza (HPAI), an important economic disease of domestic poultry that evolves from low-pathogenic viruses that circulate in the environment in wild bird populations. While we are in the midst of an ongoing pandemic of COVID-19, there have been other infections in recent years, amongst the more prominent examples are: zoonotic influenza (Bird Flu), pandemic human influenza (H1N1), Middle East respiratory syndrome (MERS), and severe acute respiratory syndrome (SARS), West Nile fever, yellow fever and Zika virus. Worrying examples of these zoonoses include epidemics and/or pandemics such as the Spanish flu, Avian Influenza, Ebola, SARS and MERS. All the etiological agents involved in those cases were more or less found in animals and spread in humans.

As we are discussing zoonoses, first human infection with the H3N8 strain of bird flu has been recorded in China. Last year first human case of H10N3 was also reported in China (as per news published in Times of India). This trend makes it necessary to conduct and intensify studies, in which veterinarians can be handed over the task and responsibility to identify and reveal the detection, identification, risks, surveillance and other epidemiological aspects involved in the transmission of an infectious agent to and from the animal, environment, and human interfaces.

Classification of zoonoses as per etiological agents:

Bacterial zoonoses-- Anthrax, Brucellosis, Plague, Leptospirosis, Salmonellosis etc.

Viral zoonoses-- Rabies, Influenza, CCHF etc.

Rickettsial zoonoses-- Scrub typhus, Q-fever etc.

Protozoal zoonoses-- Toxoplasmosis, Trypanosomiasis, Leishmaniasis

Helminthic zoonoses-- Hydatid disease, Taeniasis etc.

Fungal zoonoses-- Deep mycosis - histoplasmosis, cryptococcosis, superficial dermatophytes etc.

Ectoparasites-Scabies etc.

In India, where approximately 70% of population lives in rural areas in close contact with large domestic animal population and that includes pets and wild animal habitation also, zoonotic diseases assume great public health significance. However, because of inadequate diagnostic facilities still at bay for larger population masses, unfamiliarity of physicians with these diseases and lack of communication and co-ordination between physicians, veterinarians, and epidemiologist, the extent of their existence is obscured and goes unreported at times.

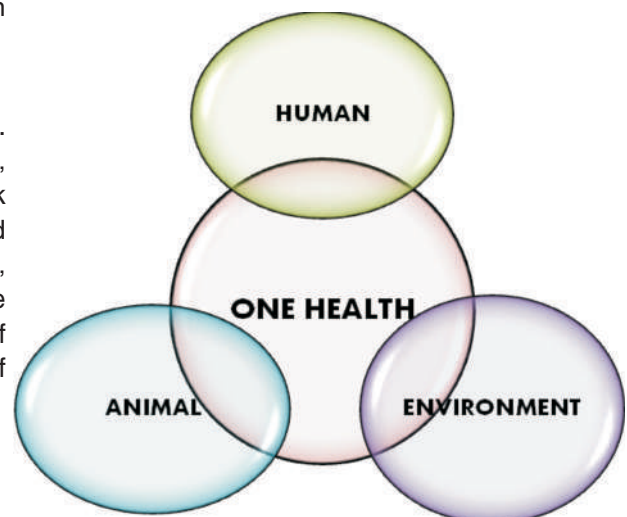
Current scenario emphasizes the necessity to reunite all of the involved stake holders and entities to avoid lack of control and therefore to properly handle any situation arising in the case of new emerging zoonotic diseases. This summarizes the veterinarian's role in public health, framed in the One Health concept and when we consider animal interaction, the complexity of these challenges becomes even more evident. The magnitude of the problem of zoonoses quite clearly depicts, why the efforts of human medicine, veterinary medicine, and public health need to overlap

Some specific actions for involving veterinary professionals can be summarized as:

- ❖ Interdisciplinary approach- Clear and consistent communication and coordination among relevant animal and human health partners across different streams, is the need of the hour to most effectively prevent and control zoonoses. Veterinarians are especially important in wildlife surveillance and epidemiological studies which becomes a fundamental parameter in the control of emerging zoonoses.
- ❖ With the involvement of veterinary community, specific animal models can be developed that shows similarity to human responses and should be used to carry out vaccine and treatment tests before being applied to humans.
- ❖ Veterinarians can show their skills and expertise in comparative medicine that covers field studies in prevention of zoonoses that may involve the monitoring of diseases occurring naturally in animal populations that can signal potential threats to human health.
- ❖ Many of the Veterinary epidemiologists and ecologists have supported in the past and are currently engaged with their medical counterparts in tracking and tracing the disease in humans and thus are helping in development of effective public health interventions. Veterinarians, especially in the field of immunology and molecular biology, are working at the forefront of the one health response at various levels.
- ❖ Physicians may find it particularly helpful to reach out to veterinarians for information on a zoonotic disease history, risk of transmission of infectious disease among humans. In addition interdisciplinary meetings, sharing contact information with veterinarians through patients can be a useful proposition.

One Health

It is a concept interconnecting human, animal and environment. It encompasses different stake holders such as veterinarians, doctors, scientists, wildlife biologists, zoo keepers, livestock breeders, farmers and environmentalists. Today's world is a closed loop and one health is all about communication, collaboration, disease detection, surveillance, education and prevention. One health concept helps in early detection prevention and control of human health emergencies and it also helps in mitigation of epidemics and zoonoses



Need for One Health Concept

It has been well established that majority of infectious diseases in last two or three decades have originated from animals and that too from wildlife. As per WHO, 60% of human diseases are zoonotic in nature. Close contact with animals and their environment provides opportunity for various diseases to pass among humans and animals.

There are many factors that have contributed to the demand for conceptualization of one health concept, to name a few:

- ❖ Climate change
- ❖ Change in land use pattern
- ❖ Changes in human life style and behavior
- ❖ Population explosion
- ❖ Loss of biodiversity and destruction of forests

Major hindrances in effective implementation of one health concept

There are many factors that affect the implementation and outcome of one health concept

- ❖ Zoonoses
- ❖ Antimicrobial resistance-As per WHO, resistance occurs when a microorganism becomes susceptible to a previously non susceptible drug. Resistant bacterial strains have emerged and have spread throughout the world because of the remarkable genetic plasticity of the microorganisms, heavy selective pressures of use, and the mobility of the world population. The problem of indiscriminate use of antibiotics and the problem of spread of resistant genes have emerged as the major challenges that have threatened the very survival of mankind. These issue must be addressed by the collective action of governments, the pharmaceutical industry, health care providers, and consumers.
- ❖ Vector borne diseases
- ❖ Food safety and security
- ❖ Environmental contamination

In 2010, FAO, OIE and WHO started collaborative work to address risks at the human-animal-ecosystems interface.

Conclusion

Variations in human behavior across different countries and regions, different human socio economic activities, such as the consumption and sale of wild animals, ignorance and avoidance of food security rules, the advance of urbanization into rural areas, encroachment in to forest areas, and constant direct and indirect contact with animal reservoirs are recognized as the main risk factors leading to various zoonotic outbreaks. To avoid future emerging zoonoses, it is necessary to be prepared and the most effective way includes applying the conceptualization of the One Health doctrine in these actions. Despite being the least talked about link, the veterinarian must assume a position of leadership in research and actions that primarily involve detection, prevention and surveillance, which must be undertaken by different government authorities, organizations as an important part of maintaining public health, especially related to emerging and reemerging zoonoses.

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DRY PERIOD MANAGEMENT IN DAIRY CATTLE

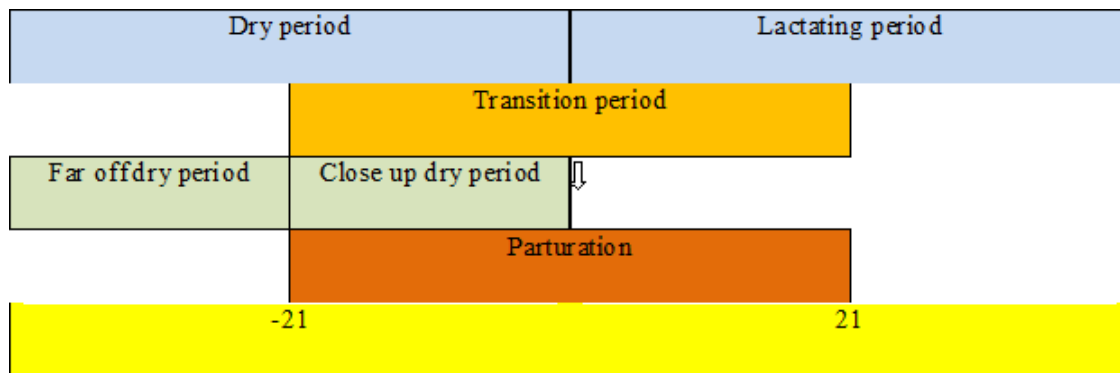
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Dry Cow is a cow that is not lactating or secreting milk after it has completed a lactation period following calving. Dry period (DP) is also called as resting period in which cow udder is prepared for the next lactation period. Conventionally 60 days dry period is given to cow which helps to adapt the cow to several acute changes in metabolic and physiologic states and diets. DP plays an imperative role in restoring the body condition score of the cow as well as for replacing senescent mammary epithelium cells.



Purpose of dry period :

- ❖ Prepare the digestive tract for next lactation.
- ❖ To properly nourish the developing calf.
- ❖ To maintain optimum body condition.
- ❖ To minimize digestive, metabolic and infectious diseases.

Methods of drying off

- 1) Abrupt cessation of milking
 - Milk for 305-day lactation and then stop milking.
 - Infuse with Dry Cow Therapy .
 - Abrupt cessation method is the better one, but not for high yielders.
- 2) Incomplete milking
 - Emptying smaller and smaller quantities of milk from the udder spread over a week.
 - Best method for high yielder cow other wise may cause swelling and pen in the udder.
- 3) Intermittent milking
 - Milking once every second or third day.
 - This method is preferred for cows already having mastitis.

Important points to remember during dry period

- ❖ Conventionally 60 days dry period but it can be modified as for Primiparous : 50-60 days and Multiparous : 35-45 days.

- ❖ Ideally, concentrate should be eliminated about 1-2 weeks before the dry off day.
- ❖ Provide balanced ration (including vitamins and minerals) to dry cows and care of animals should be done in such a way that they should not lose body condition during this time. Losing body conditions during the dry period makes the animal more susceptible to periparturient disorders, such as fatty liver and ketosis, which can act as a main impetus in reducing milk production in the next lactation.
- ❖ The body condition should be maintain at 3 to 4 (3.3 to 3.7). If BCS is maintained at the time of dry-off, then animals should gain about 300 to 500 gm/day to increase BCS by 0.25 to 0.35 units during the early-dry period. Therefore, improving the energy balance in transition period can reduce the incidence of periparturient disorders and decreases the mobilization of fat and reduces the negative energy balance.
- ❖ Controlled-energy , high-fiber diets should be provided as it has many benefits like
 1. No loss in milk production
 2. Lower NEFA BHBA and liver fat
 3. Positive effect on reproduction
 4. Body condition score maintained
 - ❖ Over feeding with high energy diet should be avoided as prolonged over consumption of energy during the dry period can result in poorer transition such as lower post-calving dry matter intake and slower starts in milk production.
 - ❖ The optimum CP requirement for early dry period should be 12-13 CP%
 - ❖ Calcium does not have to be increased beyond 0.6% of dry matter.
 - ❖ Dry cow therapy should be given : Therapy of mastitis directly through the effect of the antibiotic and indirectly by promoting the formation of natural keratin plug.

Advantages of dry cow therapy

1. Higher cure rates than lactation .
2. Retention time of antibiotic in the udder is longer.
3. Incidence of new infections during the dry period is reduced.
4. Damaged tissue is allowed to redevelop before freshening.



EXPERIENCES OF USE OF ETHNO-MEDICINE IN REMOTE AREA OF ASSAM AND HYDERABAD.

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Introduction

Use of Ethno veterinary medicine is concern to animal healthcare. It is as old as the domestication of various livestock species. They consisted of belief, knowledge, practices as well as skills pertaining to healthcare, and management of livestock sector. The Indian subcontinent has highest percentage of ethno veterinary health traditions that are the products of decades of experiences. The ethnics veterinary medicines that are commonly used for animal healthcare can cut down costs considerably. Moreover, they are easily available to the ordinary farmer. The main challenges are to find out the effectiveness and contemporary relevance of these ethno-medicine. Before the introduction of allopathic medicine, all livestock farmers based on these medicinal practices. Livestock sector play a vital role in the uplift men of rural economy of India. The rural and tribal people are not easily accessible to modern veterinary services for their livestock. They are economically poor therefore they depend upon their traditional knowledge of cure of avian as well as animal. These are cheap, non-pollutant, mix with soil, safe, and easily available compared to the synthetic and modern methods of disease control. According to the World Health Organization, at least 80% of people in developing countries depend largely on traditional medicine for the control as well as treatment of various diseases affecting both human beings, and their animals. The farmer of the Assam uses a variety of plants as well as their products to form indigenous medicines for primary health care treatment and maintaining animals productive. The position of India is 12th in term of Biodiversity and it contain 8% of global plant genetic resources. It harbours a variety of herbal medicines. Ethno-veterinary medicine has discovered through a variety of observations, trials and errors. It passes from one generation to the next generation through verbal communication. Hence, these ethno-veterinary medicines are hardly documented as well as unfortunately largely lost, diluted, and distorted. In ethno veterinary medicine, almost all parts of the plant are used by the farmers like bark, leaves, stem, flower, roots, seeds and fruits. The Indigenous technology knowledge of animal healthcare practices requires great attention for pharmaceutical analysis to prospect new drugs in the concerned field. In the current article the documentation of ethnic practices used in remote area of Assam for livestock treatment has been done. The electronic as well as print databases were searched for the preparation of ethno veterinary practices.

Objective

To explore as well as documentation of usages of ethnoveterinary medicinal plants utilized by rural farmers and forest personals, and traditional herbal healers for livestock healthcare in Sipaghar, Nagaon and Morigaon district, and Khanapara as well as forest personals of Kaziranga National Park of Assam

Study area:

The area was agro-climatic condition of Khanapara and remote area of Golaghat district of Assam. The second largest national park (Kaziranga National Park) of Assam harbours huge amount biodiversity and medicinal plants which one is situated in Golaghat district. The latitude: 26.575863 and longitude: 93.167046 of Kaziranga National Park. The National Park roughly experiences 3 seasons viz., summer, monsoon and winter. The dry as well as windy summer extends approximately from February to May with mean maximum and minimums of 37 °C (99 °F) and 7 °C (45 °F), respectively. The hot and humid Monsoon season extends from June to September. During the monsoon, Kaziranga receives mean rainfall of 2,220 millimetres (87 in) brought by the South West monsoon. The winter, extending from November to February, is mild and dry, with the mean maximum and minimum being 25 °C (77 °F) and 5 °C (41 °F), respectively (Kushwaha and Unni, 1986). The Amchang Wildlife Sanctuary is a wildlife sanctuary located on the eastern fringe of

Guwahati, Assam, India. The sanctuary is known for hosting rare and endangered birds and animals (www.nativepanet.com). Amchang's habitat is dominated by tropical moist deciduous forest with semi-evergreen forest in depressions and river-valleys. The remote area of Sipaghar, Nagaon and Morigaon district of Assam and Ramlingampalli, Hyderabad.

Methods

I was worked in the remote villages of Sipaghar, Nagaon and Morigaon district of Assam, Khanapara near Amchang Wildlife sanctuary and Kaziranga National Park, Golaghat district of Assam for period of five years from 2009 to 2014. During that period, I observed that the rural people use the ethno-veterinary medicine for treatment of animal as well as avian species.

Experiences of Usages of Ethno-Veterinary Medicine:

I observed that when I worked in Hitech Hatch Pvt Ltd as a Technical Manager, I found that the farmer of the breeding farm of Ramlingampalli, Hyderabad used the germinated green gram (Fig.1) along with onion for cock during summer season. They used, this combination to increase the semen volume and quality of semen. The germinated green gram contain vitamin -E and onion has antioxidant properties, and it contain vitamin-C. The broiler poultry farmer used mint (*Mentha piperita*) (Fig.2) to increase the body weight. They grind the mint and then, mix with water and feed to the broiler birds.

Then, when I Joined as an Assistant Veterinary Surgeon in Centre for Wildlife for Wildlife Rehabilitation and Conservation (CWRC), I got the opportunity of treatment of injured wild sub adult elephant with turmeric powder and coconut oil. I make a past of turmeric powder (Fig.3) and coconut oil as per the information of Mahut of elephant and I applied regularly to the cut mark of the elephant after proper dressing of the wound of elephant. These findings was in accordance with the findings of Mishra (2011) in cattle. After two month of regular dressing and applying of turmeric powder as well as coconut past, the wound of the elephant is cured. When elephant was musth, some Mahut (elephant rider) used ball of leaves of wood apple (Fig.4) or cannabis (Fig.5) to control the musth of bull elephant. The wood apple prevents the spermatogenesis process and cannabis depress the elephant, when the bull elephant was sexually excited.

I found, when I joined as a consultant veterinary doctor in Lotus Hatch Pvt Ltd, the poultry farmer of the Sipajhar, Morigaon and Nagaon district used ethno-veterinary medicine like local wine, guava leaves, Sajina leaves (*Moringa oleifera*), neem leaves, clove oils, root of kathenda flower, bark of arjun tree, suthi tenga, tengesi tenga, tulsi, bhutjolokia, bird eye chilli, darun flower, basab tita, bark of bhim kal (banana), garlic, kaskal (raw banana) gilloy juice. The poultry farmer used the traditionally made local wine 10ml /100 birds to control the Inclusion Body Hepatitis (IBH) for five days. Apart from the local wine, they used extract of root of kathenda flower (Fig.6) and extract of ash of bark of Bhim kal (banana) (Fig.7) to IBH. During winter season they provide ram to the broiler birds to get rid of the cool. They used extract of guava leaves (Fig.8) and sanjina leaves (Fig.9) along with milk to control the chronic respiratory disease (CRD). The CRD was occurred mainly in winter season. They also used extract of tulsi (basil) (Fig.10) and basab tita (Fig.11) to control the CRD. When the poultry farmer found blood tinge in the faecal material of broiler birds, they used extract of Kaskal (raw banana) (Fig.12) to control the blood in the faecal material. The extract of this banana has astringent effect. Garlic (Fig.13) has anti-viral property and it contain suffer compound. They used this medicine in viral infection. The powder of neem leaves (Fig.14) along powder of turmeric used for treatment of fowl pox. They used spray the neem oil and clove oil to control the fly. When the bird was suffering from Ranikhet disease, they used extract of suthi tenga and tengesi tenga (Fig.15) to control the stress of disease. They also used the extract of the bhutjolokia (*Capsicum annum*) (Fig.16), bird eye chilli and gilloy (Fig.17) juice which boost up the immunity of the birds. Capsaicin rich in vitamin C and E. Various pharmacological properties and some of the clinical applications of capsaicin present in Bhut Jolokia viz., pain relief, anti-inflammatory property, anticancer activity, weight gain in poultry, hepato protective effects, bactericidal effect, cardiovascular activity, antioxidant effects of Capsaicin, antidiabetic activity, anticancer activity, gastric ulcer protective activity and anti-arthritis activity. The darun flower (Fig.18) has antimicrobial property and they used extract of these herbs in fowl cholera diseases. When the broiler was suffering from visceral gout, they used jaggery 10gm/100 birds for five days.

Conclusion

The experiences of practices of ethno-veterinary medicine revealed that the genetic resources of the medicinal plant cannot be preserved without conserving natural habitat of medicinal plants as well as the socio-cultural organization of the local people. The same may be applied to protect traditional knowledge, related to the use of medicinal and other wild plants. Introduction of medicinal plants in government project could be another option for uplift of the rural economy together with environmental conservation, because Assam has huge amount biodiversity along with medicinal plants. But has not received attention in the land rehabilitation programs in Assam.

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Photograph showing the germinated green gram.



Photograph showing the mint herbs.



Photograph showing the turmeric powder.



Photograph showing the leaves of wood apple.



Photograph showing the leaves of cannabis.



Photograph showing the kathenda flower.



Photograph showing the bark of bhim kal.



Photograph showing the leaves of guava.



Photograph showing the leaves of Sajina.



Photograph showing the leaves of tulsi (basil).



Photograph showing the leaves of basab tita.



Photograph showing thekaskal (raw banana).



Photograph showing the garlic.



Photograph showing the leaves of neem.



Photograph showing the leaves tengesi tenga.



Photograph showing the bhutjolokia.



Photograph showing the stem of giloy.



Photograph showing the leaves of darun flower.



GOAT FARMING : CARE FOR A PROFITABLE BUSINESS

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Introduction

Goats, also referred to as "Common man's cows," some of the primary meat-producing animals in India. One of the most expensive meats, (chevon) is already in high demand national and international market. In its broadest sense, goat farming refers to the raising of goats for the production of milk, meat, and fibre. The goat business is more likely to fail if it is started without any planning, seeing the success of other goat farmers without knowing the scientific aspects. The following factors can contribute to the success or failure of a goat business.

Reasons for loss of goat rearing -

- 1) Spending a lot of money on unnecessary places like goat sheds, such as building unnecessary walls of cement concrete, building concrete floor or building barns.
- 2) Goats should not be bought from unfamiliar places, from far away, in large quantities as it increases mortality and causes more losses.
- 3) When selecting goats, not properly looking at breed, breed characters or trait or not checking their heredity.
- 4) Avoid transporting of pregnant goats by long distance.
- 5) Not taking cares before, during and after transportation of goats and mixing new goats into herds of old goats.
- 6) Starting goat rearing with more than 20 + 1 goats.
- 7) Do not managed green, dry fodder to the goats before bringing them in to the barn. If you buying fodder without producing it in your field, it will definitely affect the total profit.
- 8) Neglecting necessary vaccinations and deworming.
- 9) To start goat rearing in large numbers without visiting the successful herds and unsuccessful goat breeders, without explaining the good and bad things in their herds.
- 10) Not keeping necessary records and not making necessary changes in the business considering the records.
- 11) Not be selling the goats according to different purposes, such as goats for Eid, goats for breeding, goats for meat, goats for fairs etc.
- 12) Lack of hygiene in the barn, crowd of goats and lack of air circulation can increase the mortality of goats.
- 13) There should be no separate barns for different groups of goats, such as separate keeping the dry goats, pregnant goats, kids, bucks and disease animals.
- 14) Not offering more than 10% of colostrum to the kids' weight within 2 hours after kidding.
- 15) Lack of preparation of full year plan of sales management such as market sale, fair sale, breed sale, goat for Eid sale, 31st December, sale of Gatari, Dussehra, Dhulivandan etc.

Changes in management -

This business can make a good profit if it is designed in a good way at minimum cost of production using all available resources. Separate the kids that have good birth weight and manage the diet for their rapid weight gain. Sick goats in the

herd should be treated in time and separated from the herd till they recover. If goats are found to show certain symptoms and die, it is necessary to autopsy such goats and find out the cause of death and start first aid on other goats in the herd. The distance between two kidding of goats should not be more than 8 months and the breeding buck should be changed every 2 years. Approximately 20% of the total number of females in the herd (those who fall ill, give birth to one kid, do not breed, do not calm down, age and others) should be replaced by new females in the new herd every year.

It is necessary to take insurance cover if you are doing goat rearing business on a large scale. So that large losses can be avoided. There should be a visit to the veterinarian at least once in 15 to 30 days so that proper advice can be given on business errors. Blood and lentils of selected goats should be tested once a year. This is because the necessary diet, anthelmintics and first aid can be decided accordingly. In order to increase profits, special attention should be paid to clean meat production and export. Goats are required to be given special growing food and feed during their gestation period. Which regulates the growth of foetuses. Goats need to get the required mineral mixture in the form of regular licks or powders. Goat rearing information should be taken from the right place (training) and then the business should be started. The profit margin of goat rearing is depending on the number, the mortality rate in that heard. To the kid's top quality dry and green fodder should be given form dicotyledonous class.

Feeding of goats during pregnancy-

In order to give birth to a good weight, strong kid, it should be properly managed during the gestation period of the goat. Pregnant goats should be given easily digestible fodder and adequate amount of fodder. They use these dietary nutrients for fetal growth; It will also increase the storage of nutrients in the body of the goat. As the kidding date approaches, more food should be offered in addition to fodder to provide high nutritional value. Pregnant goats need to be given extra feed allowance after 90 days of gestation. If good quality fodder and food is not given during pregnancy, goats give birth to small kids or the kids die during pregnancy.

During the last 3 to 4 weeks of gestation, 250 to 350 grams of concentrate should be given daily along with the best quality fodder for good growth of fetus. Extra care should be taken especially during the gestation period of twin or thrice kidding goats. Goats should be vaccinated against intestinal parasites one month before kidding. With proper care during pregnancy, kids are born strong, weighty and active. Further growth of these kids was also rapid.

Care of new-born kids immediately after birth -

- 1) Kids need special care in the first 24 hours after birth. The kids need more energy at this time to adapt the change in to the new environment.
- 2) In general, does clean the kids by licking and dries. If this is not the happening, such kids should be wiped clean with a dry towel. If towel is not available, dry kids with using dried soft grass. The dryness of the kid's body helps to regulate breathing.
- 3) In the first 20 minutes after birth, the kids stand up and try to suckle it mother. If the kids are weak, they need help to stand for sucking.
- 4) Cut the umbilical cord from body distance of 2 to 3 inches with sterile scissors or sharp blades and apply tincture iodine or any disinfectant. This means that the gut will not be infected, the kid will not get sick and die.
- 5) Kids should take colostrum in half to one hour after birth. If the kid does not get a proper sucking by itself, colostrum should be removed from the does and fed with a bottle with a nipple. Total colostrum feeding should be 10 percent of the kids body weight and offered into 3 to 4 times in day.
- 6) Proteins, vitamins, iron, etc., which are essential for the healthy growth of the kids as well as the large amount of protein required for rapid growth.
- 7) If the colostrum is not available for doe it should be used from orphan does or artificial colostrum should be prepared with using water 264 ml + milk 575 ml. + Castor oil 2.5 ml. + 1 egg + 10,000 IU Vitamin A + Aromycin 80 mg. offered into 2 to 3 times a day.
- 8) After colostrum feeding to the kids, wipe the mouth with a cloth or wash it with water. Because due to colostrum sickness flies and ants to settle on mouth and causes irritation to the kid.
- 9) New-born kids need to be fed colostrum or milk at short intervals as their stomach is small. Milk should be given at least four times a day. If new-born kids are kept with their mother all day, the kids can drink as much milk as they need.

- 10) If there is no mother milk for the goat, then feed the milk from another goat. Cow's milk is useful if goat's milk is not available.
- 11) From age of second week, kids do not stop near the mother. It will go away and rest or play, run. This increases the movement of their bodies.
- 12) However, goat milk production is not increasing as required to the kids. Low goat milk production adversely affects the growth of kids and their intensity is felt more in case of twin / three kid. In such cases, high protein creep feed content of 20 to 22 per cent should be given to the kids.
- 13) Kids do not need to be given separate water for drinking in the first week. Then add water in small pots as required.

Fodder Planning -

Kids start chewing fodder from 1 to 2 weeks of age. For the best growth of kid's good quality dried grass or dicotyledonous green fodder should be given (garlic grass, sorghum, berseem) at the beginning. Tie a small straw of fodder and hang it up close to the wall to reach the mouth of the kids. The kids like to eat this kind of fodder. Gradually increase the amount as needed. This leads to the growth and development of useful bacteria in the abdomen. The kids should be separated from the mother after eight weeks. They should be given a small amount of concentrate along with good quality fodder. Don't give too much green fodder to young kids. This may cause diarrhoea also the kids are afraid of intestinal poisoning. For this, don't give too much fodder. Since the kid 25 days old, give a small dose (50 gm) concentrate in the diet will help the goats to grow faster. If good quality fodder is given to the kids (lucerne grass, berseem) the rapid growth of kids occurs also feeding costs can be reduced. Increase the daily diet to 50% with increasing age of kids. In general, a kid can gain 8 kg or four times its original weight in two months.

The growth rate of goats in the first two months is proportional to the milk production of does. In the subsequent period, milk of goats should be gradually stopped and kids are reared on feed and fodder. On a nutritious diet and management, a kid is expected to weigh 15 kg by the age of three months. The growth of kids in the first three months depends entirely on diet. Therefore, it is necessary to take more care of diet management to reduce mortality and rapid growth. About 65% of the expected weight up to one year of age is gained in the first three months. The highest 43 per cent weight gain occurs in the first, 28 per cent in the second and 29 per cent in the third month.

Care at raising kids

The rate of rejection of its own kids is higher in first time kidding. Raising abandoned or mother-dead kids is a bit of a harder. Because orphans do not accept other goats. For this, the orphan kid should be fed on the body of the goat whose kid has gone. Blindfold should be applied while suckling. The goat recognizes its kid by its smell. Therefore, rub the milk on the body of the kids from orphan goat or nose of the does so that the goat accepts the orphan goat. If this is not possible, remove the milk of another does or cow and bottle should be done.

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BABESIOSIS AND ANAPLASMOSIS : HAEMOPROTOZOAN DISEASES OF RUMINANTS (CATTLE AND BUFFALOES)

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Abstract

India is predominantly an agricultural country with about 70% of its population dependent on income from agriculture and livestock industry. Livestock is an important source of animal protein for farm families and also used for draught power in agriculture and transport, and their dung is used to increase soil fertility. Haemoprotzoan diseases are most common in cattle and buffaloes which are mainly transmitted by ticks and sometimes blood sucking flies. These diseases cause great losses to the livestock owners due to decrease in milk production. So it is important to control the diseases by checking the ticks and flies population with the help of insecticides or acaricides.

1. Babesiosis or cattle tick fever or red water disease or Texas fever

- It is an intracellular parasite found in the red blood cells of vertebrate hosts.
- It is an important disease of cattle and buffalo.
- Cross bred cattle are more susceptible than indigenous cattle.
- It is caused by *Babesia bigemina*, a haemoprotzoan parasite.
- These are large, round to pyriform or amoeboid organisms.
- Organisms are characteristically pear shaped and lie in pairs forming an acute angle in RBCs of vertebrate hosts.
- It is transmitted by ixodid ticks of genus *Boophilus microplus*, *Boophilus annulatus*, *Boophilus decoloratus*, *Rhipicephalus appendiculatus*, *R. evertsi*, *R. bursa*.

Clinical sign and symptoms

- First sign of disease is high fever (40-41°C) which may rise up to 45.5°C.
- Conjunctivae appear brick red in beginning and then become anaemic in advanced stage.
- Haemoglobinuria (coffee coloured urine), jaundice which terminate in death.
- Cessation of rumination, salivation, dryness of muzzle, lacrymation, fall in milk yield.
- Death is due to unabated destruction of RBCs because of autoimmune mechanism, failure to recoup blood loss, cerebral anoxia and

accumulation of toxic by-products.

Diagnosis

- Diagnosis of disease is based on-
 1. History of *Boophilus* sp. ticks on infected animals
 2. Clinical symptoms-mainly high fever with coffee coloured urine and jaundice
 3. Blood smear examination
 4. Serological tests
 - a) Complement fixation test (CFT)
 - b) Indirect fluorescent antibody test (IFA)
 - c) Indirect haemagglutination (IHA)
 - d) Capillary tube agglutination test
 5. Molecular test- Polymerase chain reaction (PCR)

Treatment

- Trypan blue (azo dye) @ 50-100 ml of 1% solution, only I/V route
- Acridine derivatives (Acriflavin) @ 2.2 mg/kg body wt., I/V route
- Diminazine aceturate (Berenil) @ 3-5 mg/kg body wt., S/C or I/M route for two consecutive days
- Imidocarb dipropionate @ 1.2 mg/kg body wt. as single dose through S/C route. For prophylaxis 3 mg/kg body wt. as a single S/C route.
- Quinuronium sulphate @ 1 mg/kg body wt. as 5% solution as a single dose through S/C route

Control

- Segregation and treatment of infected animals
- Control of vectors with use of acaricides
- Proper disposal of manure and treatment of breeding places of vectors to reduce the population of ticks
- Immunoprophylaxis of animals
- *Babesia* exoantigen vaccine has been developed through *Microaerophilus* stationary phase (MASP) culture technique which prevents clinical disease and induces protective immunity for at least 13 months.

2. Anaplasmosis

- It is an intracellular parasite found in the red blood cells of vertebrate hosts.
- It is an important disease of cattle and buffalo.
- It is caused by *Anaplasma marginale* OR *Anaplasma centrale*, a rickettsial parasite.
- Organisms are found inside RBCs without cytoplasm and with a light halo around them. They are round, filamentous, oval or disc like.
- It is primarily transmitted by ixodid ticks of genus *Boophilus* sp., *Rhipicephalus* sp., *Dermacentor* sp., *Hyalomma* sp. and *Ixodes* sp.
- There may be mechanical transmission by blood sucking flies, viz., tabanid flies, *Stomoxys* sp. fly, deer fly and mosquitoes.
- The disease may also be transmitted during surgical operations such as dehorning, castration, vaccination, blood sampling etc.

Clinical sign and symptoms

- High fever with irregular periods, anorexia
- Pale/jaundiced mucous membranes after the acute phase passed
- In peracute cases, sudden onset of high fever, anaemia, icterus
- Severe dyspnoea and death often within 24 hours.

- In chronic cases, severe anaemia and animals become prone to other infections.
- Loss of milk production
- Abortion in pregnant animals

Diagnosis

- Diagnosis of disease is based on-
 1. History of ticks and blood sucking flies
 2. On basis of clinical symptoms
 3. Parasite detection in blood smears
 - a. Anaplasma marginale found at margin of RBCs
 - b. Anaplasma centrale found at centre of RBCs
- 4. Serological tests
 - a. Complement fixation test (CFT)
 - b. Capillary tube agglutination test
 - c. Gel precipitation test
 - d. Fluorescent antibody test (FAT)
- 5. Molecular test- Polymerase chain reaction (PCR)

Treatment

- Tetracycline @ 6-10 mg/kg body wt., I/M injection, single for three days.
- Imidocarb dipropionate @ 1.2 mg/kg body wt. as single dose through S/C route. For prophylaxis 3 mg/kg body wt. as a single S/C route.
- Diminazine aceturate (Berenil) @ 3-5 mg/kg body wt., S/C or I/M route for two consecutive days.
- Supportive treatment includes slow administration of blood transfusion.

Control

- Control of ticks and flies population with help of acaricides/ insecticides
- Proper treatment of positive cases
- Segregate the infected animals
- Blood examination time to time
- Surgical instruments properly sterilized before using

Blood picture showing the Anaplasma sp. parasite

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- Blood examination time to time
- Surgical instruments properly sterilized before using



MONKEY POX : AN IMPORTANT ZONOTIC DISEASE

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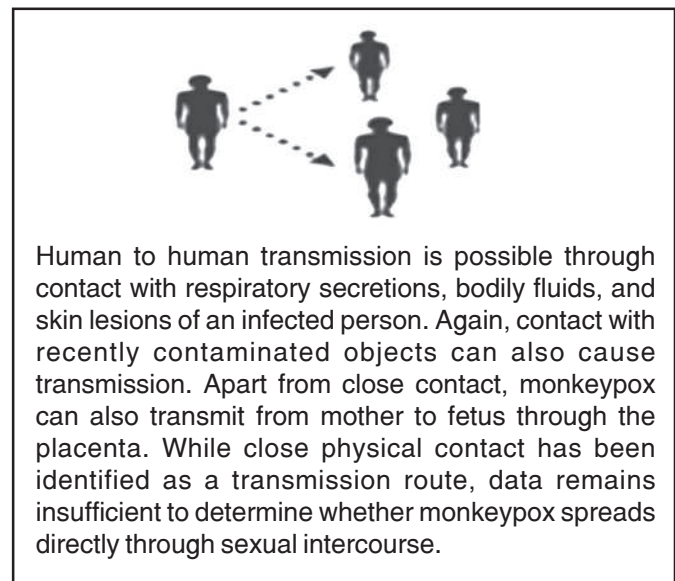
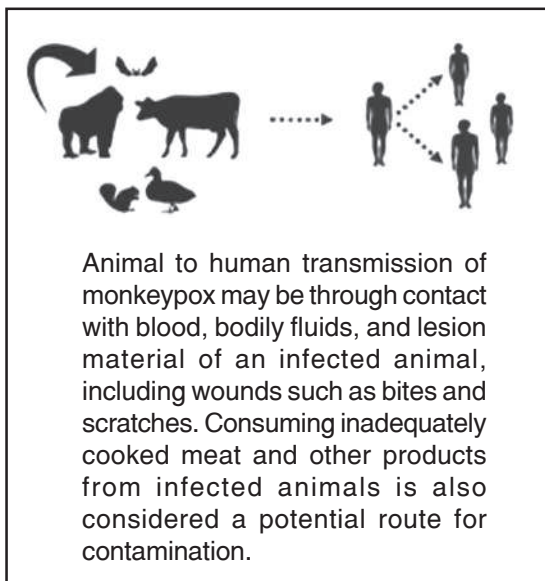
Introduction

After the deadly COVID-19 virus outbreak, the monkey pox virus, another virulent pathogen, is currently experiencing a rise in cases around the world. The monkey pox virus causes the viral ailment known as monkey pox. The monkey pox virus, an orthopoxvirus, is the cause of monkeypox, which is a zoonotic illness that can transfer from animals to humans. Small animals (such as African dormice, giant-pouched rats, and rope and sun squirrels) are thought to keep the virus alive in the habitats of West and Central Africa, while the animal reservoir remains unclear.

Monkeypox cases were found in many non-endemic nations in May 2022. A total of 12 non-endemic nations, including Australia, Belgium, Canada, France, Germany, Italy, Netherlands, Portugal, Spain, Sweden, the UK, and the US, have reported 92 confirmed cases and 28 suspected cases of monkeypox infection as of May 21, 2022, according to the World Health Organization (WHO).

Modes of transmission:

Monkeypox virus was once restricted to specific regions of Africa, but the environment of the disease has expanded, suggesting that human monkeypox infections may continue to intensify. The specifics of viral circulation in animal populations and the exact species that harbor this virus are not entirely known, although research and evidence point to rodents as a likely reservoir. Monkeypox virus spreads through close contact with infected animals and humans, or contaminated materials. The virus may enter through broken skin, respiratory tract, and mucous membranes such as the eyes, nose, or mouth.



Signs and Symptoms:

The incubation period (interval from infection to onset of symptoms) of monkeypox is usually from 6 to 13 days but can range from 5 to 21 days.

The infection can be divided into two periods:

- ❖ Invasion symptoms include fever, severe headache, lymphadenopathy (swelling of the lymph nodes), back pain, myalgia (muscle aches), and severe asthenia (lasts 0-5 days) (lack of energy). Compared to other diseases that may initially seem similar, monkeypox has a specific characteristic called lymphadenopathy (chickenpox, measles, smallpox)
- ❖ The skin eruption often starts one to three days after the onset of a fever. Instead of the trunk, the rash is more frequently found on the face and limbs. In 95% of instances, it also affects the palms of the hands and soles of the feet in addition to the face (in 75 percent of cases). Along with the cornea, oral mucous membranes, genitalia, and conjunctivae are all additionally impacted (in 70% of cases). The progression of the rash goes from macules (flat, firm lesions) to papules (slightly raised, firm lesions), vesicles (clear fluid-filled lesions), pustules (yellowish fluid-filled lesions), and crusts that dry up and break off. Lesions can range in number from a few to several thousand. Lesions may combine in extreme circumstances.
- ❖ In the general population, the case fatality ratio of monkeypox has traditionally fluctuated from 0 to 11%; it has been higher in young children. The case fatality rate has recently been between 3 and 6 percent.

Diagnosis:

The clinical differential diagnosis that must be considered includes other rash illnesses, such as chickenpox, measles, bacterial skin infections, scabies, syphilis, and medication-associated allergies. Lymphadenopathy during the prodromal stage of illness can be a clinical feature to distinguish monkeypox from chickenpox or smallpox.

If monkeypox is suspected, health workers should collect an appropriate sample and have it transported safely to a laboratory with appropriate capability. Confirmation of monkeypox depends on the type and quality of the specimen and the type of laboratory test. Thus, specimens should be packaged and shipped in accordance with national and international requirements. Polymerase chain reaction (PCR) is the preferred laboratory test given its accuracy and sensitivity. For this, optimal diagnostic samples for monkeypox are from skin lesions - the roof or fluid from vesicles and pustules, and dry crusts. Where feasible, biopsy is an option. Lesion samples must be stored in a dry, sterile tube (no viral transport media) and kept cold. PCR blood tests are usually inconclusive because of the short duration of viremia relative to the timing of specimen collection after symptoms begin and should not be routinely collected from patients.

Prevention and Control:

Raising awareness of risk factors and educating people about the measures they can take to reduce exposure to the virus is the main prevention strategy for monkeypox. Through restrictions on animal trade, some countries have put in place regulations restricting the importation of rodents and non-human primates. Captive animals that are potentially infected with monkey pox should be isolated from other animals and placed into immediate quarantine. Any animals that might have come into contact with an infected animal should be quarantined, handled with standard precautions and observed for monkey pox symptoms for 30 days.

Veterinarians should consider all mammals susceptible to monkeypox and be aware of how the disease transmits from animal to animal. Veterinarians who decide to treat animals with suspected monkeypox should use infection control precautions to protect themselves, staff, clients, as well as other animal patients in the clinic.

Treatment:

Clinical care must be properly optimized in order to treat monkeypox symptoms effectively, handle complications, and avoid long-term effects. Fluids and food should be provided to patients in order to maintain a healthy nutritional condition. As necessary, secondary bacterial infections should be treated. Based on information from both animal and human research, the European Medicines Agency (EMA) granted tecovirimat andcidofoviran antiviral drug originally created to treat smallpox, a licence to treat monkeypox in 2022. It is still not readily accessible. If tecovirimat is utilised for patient treatment, it is ideal to monitor it in a clinical research setting with prospective data gathering.

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ORCHITIS AND EPIDIDYMITIS IN DOGS

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Abstract

Orchitis is an inflammatory condition affecting one or both the testes or testicles. It may be acute or chronic, unilateral or bilateral, however, unilateral case is more common. Causes of epididymitis and orchitis are closely related and can be caused by traumatic injury, infection, torsion, bacteria, virus, fungal agents, scrotal hernia, scrotal dermatitis etc. Infection caused by *Brucella canis* is a low risk zoonosis except in immunocompromised animals. In acute condition, there is severe pain and infected dog may fall to sick, fever, lethargy, inappetance, doughy scrotum, infertility, excessive licking in inflamed area. Proper diagnostics tools should be carried out to rule out the route cause of infections and adequate treatment must be followed at the earliest. To prevent from orchitis and epididymitis, castration at an early age is the only option.

Introduction

Orchitis and epididymitis are occasionally occurring inflammatory conditions in dogs, usually together. Orchitis is an inflammation of either one or both the testes or testicles. It may be unilateral or bilateral, however, unilateral condition is more common. Whereas, epididymitis is the inflammatory condition of the testicular tubes which may occur with or without orchitis. Chronic epididymitis may result to cause reduction in the size of testicles and irregular appearance of the adjacent soft tissues (Troedsson and Dickson, 2020). If both the conditions developed, the condition is very serious and proper and immediate care should be taken (www.wagwalking.com).

Causes of orchitis and epididymitis:

The most common cause is Gram negative bacteria such as *E. Coli* and most probably by ascending infection (Robert, 2017). Other source of causes may include *Brucella canis*, *Staphylococcus*, *Streptococcus*, *Proteus* and *Mycoplasma*, Distemper virus, blastomycosis, coccidiomycosis, penetrating trauma to the testicles, testicular torsion granuloma formation, Tick borne diseases (ehrlichiosis and Rocky Mountain spotted fever), agents causing prostatitis, cystitis, neoplasia, scrotal hernia, scrotal dermatitis (Grace, 2015) etc. Infection caused by *Brucella canis* is a low risk zoonosis except in immunocompromised animals (www.vetlexicon.com).



Orchitis and Epididymitis in dog

Transmission:

There are several routes of transmission of both the inflammatory conditions which may include hematogenous, venereal, penetrating wounds, infections ascending from genitor-urinary passage, prostatic secretions, mucus membranes (Brum, 2015) etc.

Clinical signs and symptoms:

The inflammation may be acute or chronic. In acute condition, there is severe pain and infected dog may fall to sick, fever, lethargy, inappetance, doughy scrotum (Robert, 2017), infertility, excessive licking in inflamed area etc. Most of the bacteria that cause acute orchitis are *Brucella canis*. In chronic case, it is difficult to diagnose and also does not show any clinical sign. If the condition is kept unattended there is high chance of causing infertility leading to irreversible damage to the reproductive system.

Diagnosis:

The first and foremost diagnostic test is based on the clinical symptoms. In dog, it is utmost necessary to rule out infection of *Brucella canis*. Cytological examination of semen for presence of bacteria or mycoplasma should be carried out. Examination on complete blood count (white blood cells, red blood cells and platelets, elevated white blood cells indicate infectious testicular swelling), biochemical blood parameters (blood protein, blood sugar, electrolyte level) can be performed. Ultrasonography examination may reveal the inflammatory condition. (epididymis, prostate and testes)- scrotal hernia, neoplasia or granuloma. Analysis of urine for proteinuria may reveal presence of blood and pus indicating the case of prostatitis or cystitis. Fungal serology titers can be done to detect the fungal causative agents.

Treatment

Castration is the major line of treatment when both the inflammatory conditions occur in the same animal (Davidson, 2020). If in case only one side of the testes is affected (unilateral), partial castration should be done. But if both the testicles are affected and the dog is not intended for breeding, full castration is generally recommended. During operation intravenous fluid should be provided. Antibiotic, Anti-inflammatory medications should be given. In unilateral involvement, the healthy testis or epididymis should be protected against trauma, heat, swelling etc. (Davidson, 2020).

Prevention and control

Castration at an early age is the only option to prevent occurrence of orchitis and epididymitis. Isolation of the infected animal from the healthy animals, proper maintenance of hygienic conditions in and around the kennel, adequate post operative cares should be followed up. It is advisable to use Elizabethan collar to prevent the dog licking of the incision site.

Conclusion

Orchitis and epididymitis are occasionally occurring disease conditions of dogs. There are multiple causes but concerning about bacterial causes one of the zoonotic organisms is involved. Early and proper diagnosis should be carried out to save the fertility of the animal. Besides these, to prevent from orchitis castration at an early age is the only option.

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PET BIRDS: MANAGEMENT AND COMMON DISEASES

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Introduction :

There is increasing trend of having exotic animals as pet and birds are the most popular among them. However, the history of keeping birds dates back to Rig Veda, approx. 3000 years ago; the text contains the first record of a pet parrot. Birds are becoming popular over dogs and cats as they are more suited for small spaces, have low maintenance requirement, relative low cost of maintenance and live longer life.

Common types of pet birds:

There are many bird species that are domesticated, most common among them are Parakeets, Budgerigars, Cockatoos, Mynah, Mannikins, Pigeons and Doves. However caging the birds native of India is considered as illegal as per Indian wildlife act, 1972. Exotic birds are exempted from this regulation. Pscittacine and Passerine are most commonly used as pet. Some common pet birds are listed below:

- a. **Passerines (Song birds/ Perching birds):** They are known for their beauty and singing ability. These birds have four toes, out of which three are directed forward and one backward. They include finches, canaries and mynah.
1. **Canaries:** They are small birds known for their singing abilities. Mostly, they have yellow plumage, but other colours may also be seen. They are 5-6 inches long from head to toe. They are either kept in pair or alone if daily human interaction is given. They have life span of 10-15 years.
2. **Finches:** They are easy to maintain as compared to other pet birds. They delight their owners with their aerial antics and social interactions with one another. They are suited for either indoors or garden aviaries.
- b. **Pscitacines:** These birds are known for their beauty and companionship. They are characterized by curved bill, vibrant colours, upright stance, and during perching two toes directed forward while other two in backward direction. They show very little or no sexual dimorphism. Birds in this order includes Budgerigars, Love birds, Cockatoo and Cockatiel.
 1. **Budgerigars:** They are small, about 8 inches in length and have variety of colours. They show sexual dimorphism, the colour of ceres in adult female is brown while in adult male, it is bluish-purple. They have lifespan of 5-10 years.
 2. **Cockatiels:** They have good companionship qualities and are good for novice owners. They are small grey birds with yellow face and orange cheek patches. They have lifespan of 16-25 years.
 3. **Love birds:** There are many types of love birds, but most popular are peach faced and black masked. They are aggressive in nature and required to be handled daily for retaining its companionship qualities. It is better to keep a single bird. They have life span of 20 years.
 4. **Cockatoo:** They are known for their capability to mimic voice of humans and other voices. They are generally white or black in colour with coloured features in the crest, cheeks or tail and have curved bill.
 5. **Macaw:** They are large sized, intelligent birds and have loud vocalization. Macaws can be distinguished from other parrots by their larger beaks, long tails, and lightly feathered pale colored medial facial patch. They have lifespan upto 50 years.
 6. **Other birds:** Conure, African grey parrot, Parrotlets, Eclectus parrots.

Care and management:

1. **Housing:** An appropriate housing will lead to physiological and psychological well-being. Birds should have proper cage size according to their body size in which they can turn and move around freely. Aviaries are also good option as it gives space needed for flight and reduces territorial stress. The cage should provide protection from extreme environment and predators. Cage should not be made up of galvanized metal as it may cause zinc poisoning. In case of small birds like budgerigars more than one bird can be placed in one cage but stocking density should be appropriate.
2. The cages should be such that they are easy to clean. Solid floors are generally preferred as they are easy to clean. Floor must be covered with any absorbent litter like newspaper, sand etc. Litter must be changed frequently as it may develop bacteria and fungi in unhygienic condition.
3. Cages should have perches or roosting site. Generally tree twig or any hardwood perch are better.
4. Cages should also include some toys especially for psittacine birds for behavioral enrichment. If breeding is required then nest boxes must be installed in aviary.
5. Feeding and watering bowls must be freely accessible and placed so that there is minimum contamination by faeces. Steel or ceramic feeder and waterer are preferred. They should be easily cleaned and refilled.
6. Cage must be located at a place where there is natural light, away from predators approach, in well ventilated areas as birds are susceptible to fumes and smoke.

The approximate size of cages of different bird is given as under:

Bird	Cage dimension (inches)	Bar spacing
Finches	18" x 30" x 18"	1/4" to 1/2"
Canaries	18" x 24" x 18"	1/4" to 1/2"
Budgerigars	18" x 18" x 24"	1/2"
Cockatiels	20" x 20" x 24"	1/2" to 5/8"
Lovebirds	24" x 24" x 24"	1/2"
Conures	24" x 24" x 24"	5/8" to 3/4"
Cockatoos	36" x 48" x 48"	1" to 1.5"
Macaws	36" x 48" x 60"	1" to 1.5"
African Grey Parrots	24" x 36" x 48"	3/4" to 1"

7. **Identification:** It is usually done by either leg banding or microchip within pectoral muscle.
8. **Nutrition:** Adequate amount of fresh feed must be available all the times. Feed must be balanced and formulated as per the requirement of particular breed. Generally either seed or pellets are used. Seeds include cereal seeds like canary seeds, corns, millets, and de-husked oat kernels; and oil seeds like sunflower seeds, peanuts, safflower, pine nuts, rape, maw, niger, and linseed. Though some birds have special requirements like nectars like lorikeets. Different types of birds differ in their feed habits.
 - a. **Nutrition of passerines:** Pet passerines (canaries, finches) are mainly granivorous i.e., their main diet are seeds. However seeds particularly cereal seeds are deficient in vitamins (A, D, E, and K), essential amino acids (lysine, methionine) and minerals (Ca). Thus, supplementation with vitamin supplement, fresh fruits, vegetable mainly leafy vegetables is necessary. Calcium can be supplemented through limestone, cuttle fish bone and marble chips. Sprouted seeds can be added to the diet once or twice in week. Plumage colours in canaries partially depend on the pigments in the diet. Thus pigments like b-carotene, lutein and canthaxanthins are fed before breeding season. Small passerine birds can drink nearly 250-300 ml/kg body weight water in a day.
 - b. **Nutrition of psittacines:** Psittacine include granivory (grain or seed-based diet, including budgerigars and

cockatiels), frugivory (fruit-based diet, including many macaws), and nectarivory (nectar-based diet, including lorikeets and lories).

Some dietary recommendations

- (1) Small psittacines (e.g. Budgerigars, cockateils, love birds)
 - ❖ Good quality diet containing mixed variety of seeds should be used as these birds often become fixated on individual seed varieties, leading to malnutrition.
 - ❖ Obesity is very common in these birds due to high-fat diet and lack of exercise, so, balanced nutrition should be provided.
 - ❖ Sprouted seed mixtures should be least twice a week. Carrot, apple, fresh chickweed and vegetables can be included in the diet. Supplement with an avian vitamin supplement.
- (2) Large psittacines (e.g. Amazon, African greys, Macaw, Cockatoos)
 - ❖ As a thumb rule the diet should have approximately 20-25% good quality seed, 40% sprouted seeds or pulses, 40% vegetable and fruits and supplement with multivitamin.
 - ❖ Temperate fruits commonly used in psittacines but they are poor nutrient source, instead of them pigmented vegetables should be preferred.
 - ❖ If commercial pelleted feed is used ensure that they are palatable by the bird.
 - ❖ When kept indoors due to lack of ample sun exposure, these birds may suffer vitamin D3 deficiency. The traditional diet which is commonly used also short on Vitamin D. So, Vitamin D supplement should be given.
 - ❖ African grey parrots must be supplemented with a calcium source.

9. Deworming:

Common deworming drugs used in pet birds (ectoparasiticide and endoparasitocides):

Drugs	Dose and route of administration
Fenbendazole	50-100 mg/kg orally sid or 10-20mg orally daily for 5 days
Livamisole	20 mg/kg orally for 3 days equivalent to 10 ml of 7.5% solution in 4.5 litres of water
Fipronil	One drop to skin on neck and under wings
Ivermectin	0.2 mg/kg orally or percutaneously

10. Clinical examination :

Prior to clinical examination, complete history of the bird is taken including feeding and watering practices, and housing condition. Clinical examination involve following steps:

- i. Examining general body condition, condition of feathers, wings and any external parasites.
- ii. Examine eyes and nose for presence of discharge.
- iii. Examine oral cavity for thrush or any other lesions.
- iv. Examine the choanal slit for signs of discharges and inflammation.
- v. Palapation of crop to check its fullness, impaction or foreign body.
- vi. Abdomen must be palpated for checking any abnormal growth.
- vii. Lungs and heart sounds must be auscultated.

11. Common diseases of pet birds:

- a. Bacterial diseases:
 - i. Tuberculosis: It is a potential zoonotic disease affecting both humans and birds. It is caused by Mycobacterium avium subsp. avium and M.genavense. It most commonly affects Psittacines (grey-cheeked parakeets, budgerigars and pinous parrots) but Passarines(canary, gouldian finch and zebra finch) can also be affected.

It generally affects adult birds and rarely seen in birds less than 1 year of age. Bacteria is shed in faeces of infected birds and transmitted chiefly by ingestion, inhalation and can survive in the environment for years. It is progressive debilitating disease affecting liver and gastrointestinal tract. In chronic cases loss of body weight, diarrhoea, depression, distention of abdomen, difficult breathing and poor feathering. Treatment is usually long requiring 6-12 months.

- ii. Chlamydiosis (psittacosis, ornithosis): It commonly infects cockatiels, budgerigars, and parrots but all types of pet birds are susceptible. It is also zoonotic. It is caused by *Chlamydia psittaci*. The pathogen is present in the faeces, naso-ocular discharge of diseased birds and remain viable in organic debris for months. Clinical signs seen are depression, anorexia, oculo-nasal discharge, conjunctivitis, dyspnoea, dehydration and diarrhea. For treatment doxycycline is given orally for 45 days.

It is zoonotic disease causing flu like symptoms in humans. Owner should wear gloves, masks and protective clothing while handling infected birds as well as exposed birds. Proper disinfection of cages using bleach or 1% Lysol is recommended.

- iii. Salmonellosis: Two main salmonella species that affect pet birds include genus *Salmonella* are *S. enterica* and *S. bongori*. *S. typhimurium* is also commonly isolated from psittacine birds in outbreaks. Salmonellosis affects all types of birds but among pet birds finches and sparrows are more susceptible. High mortality is reported in psittacine birds such as lorries and lorikeets, budgerigars, parakeets, and sulphur crested cockatoo. Infected pet birds, rodents, reptiles, wild birds, contaminated water, feed and eggs act as source of *Salmonella* spp. Infection occur by food and infected drinking water. It is common when birds visit any exhibiton or in open air aviaries. In acute cases there is mortality especially in canaries. Other birds shows depression, anorexia, delay in the emptying of crops, laboured breathing and diarrhoea for 3-4 days before death. Greenish-yellow diarrhoea is observed in adult budgerigers in *S. typhimurium* infection. In chronic cases general symptoms such as anorexia, diarrhoea, dyspnoea, lethargy, cachexia, ruffled feathers, subcutaneous granuloma, crop stasis, conjunctivitis, arthritis and panophthalmitis are seen.
- iv. Other common bacterial infection: *Staphylococcus* and *streptococcus* are common bacteria, generally associated with dermatitis. *Staphylococcus* causes commonly pododermatitis (bumble foot).

b. Viral infections:

- i. Avian polyoma virus (Budgerigar fledgling disease, Psittacine polyomavirus):
Young budgerigars are most susceptible but other pet birds can also be infected. Infection spread by direct contact with infected bird or infected nest boxes, cages and other inanimate objects. Infection is fatal in chicks below 16 week of age while adults are resistant. Common clinical signs are depression, anorexia, crop stasis, regurgitation, ecchymosis in subcutaneous tissues and feather deformities. No specific treatment is available. Vaccination can be done to prevent the disease. Primary vaccination is done at 5 weeks of age followed by a booster after 2-3 weeks, then annual revaccination.
- ii. Psittacine beak and feather disease (PBFD) :It affects psittacines as well as Passerines and Columbiformes (pigeons and doves). The virus is shed in faeces, crop secretions and feather dust. Transmission occurs by inhalation and ingestion of the virus. There are two forms of disease: acute and chronic. Acute form occurs in young birds which appear dull and lethargic. Generally death occurs in acute form before the lesions of feather appear. Chronic form is seen in adult birds and characterized by feather dystrophy, immunosuppression, lack of powder down on beak and overgrowth and underrunning of the rhamphotheca (cacktoo). Feathers appear clubbed at their base and may have hemorrhage within the developing shaft. The feathers fall out easily and grow back slowly or not at all. There is no specific treatment.
- iii. West Nile virus fever: It is mosquito borne viral disease caused by flavivirus and mainly affect crows but canaries, psittacines, and raptors can also be affected. Clinical signs include depression, anorexia, weight loss and nervous signs like head tremors, ataxia, blindness, seizures, and death.

- iv. Avian influenza: It is highly zoonotic disease caused by Infulenza A virus of family Orthomyxoviridae. Commercial and domestic poultry, water fowls and sea birds are considered as its reservoir. It is important disease of poultry but pet birds like budgerigers, parrots, lorikeets, passerines are also affected. Infection can be transmitted through wild birds especially in open aviaries. This virus could also spread from endemic countries to other locations through international trade of exotic birds. Non-specific clinical symptoms such as neurological signs (head between legs), depression, ruffled feathers, and standing at the bottom of the cage are observed. In infection with low pathogenic strains diarrhoea and dehydration is noticed.
- v. Avian Pox: It can affect almost every species of pet birds specially Amazon and pionus parrots, lovebirds and canaries. It is caused by Avipoxvirus of family Poxviridae. It is transmitted by direct contact with infected birds, scabs or through mosquitoes. It has two forms : cutaneous form and wet or diphtheritic form. In cutaneous form, clinical signs are ocular discharge, rhinitis, conjunctivitis, typical crusty lesions around eyelid margins, on face, feet and feather less areas. Diphtheritic form mortality is usually high. Clinical signs of Diphtheritic form are dyspnoea, necrotic lesions in mouth, pharynx and trachea. No specific treatment and vaccine is available. Infected birds should be separated from the healthy birds. Cages and utensils should be properly disinfected as the virus persists for long period in the environment.

c. Fungal Diseases:

- i. Candidiasis: It is caused by yeast *Candida albicans*, which commonly affects the gastrointestinal tract. It mainly occurs in immunocompromised birds or in neonates. In adult birds, there is dullness, weight loss, lethargy, and immunosuppression. Clinical signs in juvenile birds include anorexia, crop stasis, white plaques in the oral cavity, regurgitation, and weight loss.
- ii. Aspergillosis: It is caused by members of genus *Aspergillus*. Most common of them is *Aspergillus fumigatus* followed by *A. flavus* and *A. niger* are also found. There are many predisposing factors like species predilection (African grey parrots, Amazon parrots, cockatiels, and macaws), aspiration of food or medications, immunosuppression (underlying disease), moldy bedding or feed, and use of corticosteroids. Poor hygiene and inadequate ventilation, especially in warm, humid climates, can also increase the incidence of disease. The main clinical signs are anorexia and weight loss, respiratory signs i.e., dyspnea, tail bobbing, exercise intolerance, and voice change. Extension of infection to the brain can cause CNS signs.

d. Parasitic diseases:

- i. Giardiasis: It is caused by *Giardia* spp. Which is present in faeces of infected or carrier bird. Infection occurs by ingestion of infected cyst. Cockatiel are most commonly affected and main clinical sign is voluminous and aerated droppings, also called "Popcorn poop". It is diagnosed by demonstration of cyst in faeces either by direct smear examination or PCR or ELISA. Treatment is done by Metronidazole (50 mg/kg/day, for 5-7 days).
- ii. Trichomoniasis: It infects almost all pet birds, most commonly budgerigars. It is caused by *Trichomonas gallinae*. Main clinical signs are anorexia or dysphagia, dyspnoea, whitish yellow, caseous lesions on mucosa of the oropharynx, crop, and oesophagus. Treatment is same as for giardiasis.
- iii. Scaly face/leg mite: It is caused by *Knemidocoptes pilae*. It is common in budgerigars. Clinical signs are white encrustations around the corners of the mouth, beak, eyes, legs and vent. Mites can be seen in microscopic examination of scrapings of lesions. Treatment is done by Ivermectin (0.2 mg/kg, PO or IM) or moxidectin (0.2 mg/kg, PO or topically).

e. Air sac mites (*Sternostoma tracheacolum*):

It is a parasite affecting whole respiratory tract and can be found in lungs and air sacs. It most commonly affects canaries and finches. Clinical signs include dyspnoea with high-pitched noises, sneezing, tail bobbing, and open-mouthed breathing. Treatment is generally done by administering two doses of Ivermectin (0.2-0.4 mg/kg, PO or IM) two weeks apart.

f. Behavioral problems:

Most common in psittacines. Common problems include biting, excessive vocalization, feather plucking, phobia, one person bird, territorial behavior. These problems can be avoided by giving some basic training like teaching simple commands like yes, no, step up, step down etc. Owner should be able to dominate the bird behavior

Conclusions:

There is increase in popularity of birds as pets. These pet birds mainly include passerines and psittacines. Proper diet, housing and health management ensure good quality life of these birds.

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HIND PUBLICATIONS

PLASTINATION-A FAVOURABLE APPROACH TO PRESERVE BIOLOGICAL SPECIMENS

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Abstract:

The fixation and preservation are the integral parts to prevent the biological tissues from decomposition and deterioration. Also these are essential to make the specimens firm and in a specific life like state. The formalin is a most common preservative used since decades due to its properties. But still it bears some drawbacks which leads to need of other alternatives for preservation of specimens. Plastination is a novel method to preserve the specimens in dry and odourless state invented by Dr. Gunther Von Hagens in 1977. This process has been proved to be very beneficial in anatomy both for educational and research purpose.

Introduction :

The organ preservation is an important aspect of Anatomy laboratory because organs have tendency to get degenerate if left without any preservative. This can be achieved by the fixation of specimen which aims to stop autolysis and preserve tissue in its original state. 10% formalin has been used as most common preservative since decades and it is a very effective preservative. Despite of its preservative qualities, it has lots of harmful side effects on human body like it causes irritation in eyes, tears, nose burning and hypersensitivity reaction. It is harsh to smell and in worst cases can lead to nasopharyngeal cancer. Also the preservation of specimens in formalin made them brittle and difficult to transport due to its spillage. To overcome these drawbacks a technique known as Plastination has been discovered by Dr. Gunther Von Hagens in 1977 in Germany. He developed the Silicone (S10) technique and it has been considered as the gold standard for plastination. Thus plastination is defined as a method for the preservation of biological specimens for long term by using specific polymers. This technique produces dry, clean, non smelly, durable and non toxic specimens. The specimens like whole organs, whole body or sections of organs like brain can be preserved with minimum aftercare.

Principle of Plastination:

This technique is based on the principle that the molecules of polymer replaces the molecules of biological fluid in a specimen. Here a curable polymer penetrate inside the tissue of a specimen under the vacuum conditions. The forceful impregnation of polymer in tissues makes them stable and less prone for degeneration.

Types:

Basically this technique has been categorized mainly into two types. i.e Siliconeplastination and Sheet plastination. The basic steps involve in the process are common in both methods and the difference exists in the type of polymer used.

1. Silicone plastination: This method is used when we have to make plastinate of whole specimen or thick sections of specimens. The specimen resulted will be more flexible. e.g. S10
2. Sheet palstination: This method is used for usually thin organ slices usually of 2-5mm in thickness. Epoxy and polyester resins are particularly used in this method. Plastinates resulted through epoxy resins are transparent and generally used for research purpose e.g. E12. The opaque brain slices can be prepared by using polyester resin. e.g. P35

Procedure:

It involves the following steps:

1. **Fixation:** It is usually done in 10% formalin to stabilize the tissue in its original state as much as possible. However formalin can be used in concentration varying 5% to 20%. Old specimens that have been kept

since many years in the laboratory can also be plastinate.

2. **Dehydration:** It is usually done in Ethanol or acetone after rinsing the specimens in running tap water. Ethanol is least preferred because it takes longer time and leads to more shrinkage of tissue. Acetone has been considered as best solvent for plastination as it readily mix with different types of resins. It also acts as defatting solvent. The volume of acetone used is about 5-10 times more than that of specimen and the specimen should immersed in it at least for 3 weeks at room temperature. The cost of acetone is an important factor in this process. Thus the acetone distillation plant installation for this process is of much importance so that acetone can be reused.
3. **Force Impregnation :** In this process, the space occupied by water and lipids has been filled with curable polymers. The dehydrated specimen has been put in liquid resin solution under vacuum condition that draws out acetone and infiltrate polymer inside. Generally the polymers used are silicone and Epoxy resins. To overcome the cost of resins, some indigenous methods also have been developed e.g. the use of quick fix along with amyacetate in equal parts prove to be ideal to preserve whole visceral organ. The technique develops by them proved to be very simple and cost effective.
4. **Hardening :** It is also known as curing. The specimens can be cured by using gas, heat, UV light, or resins. Once the specimens get hardened, they will be ready to use.
An alternate indigenous plastination technique has been developed by Ramakrishna and Prasad in 2007 using environmental pollutants like plastic tea cups and thermocol. In this technique the need of expensive equipments has been minimized as all steps have been carried under room temperature. Thus this technique proved to be low cost technique in which the whole process took around 8-10 weeks to complete. The plastinate resulted by this indigenous plastination technique were very economically affordable and serve as a good teaching aid.
5. **Finishing and Storage :** The unwanted area and the polymer can be trimmed out with scalpel. The specimens can be easily clean with a lubricant and store in plastic bags or Perspex stand at room temperature.

Advantages :

The foremost advantage is that plastinated specimens are easy to store and require low maintenance. These specimens are more durable and can be store for a longer period. These specimens are resistant to fungal growth and decay. These specimens have been accepted as best for teaching in comparison to formalin preserved specimens. Also they served as great synthetic models because of their better vision of anatomical variations. They may be easily handled by those are allergic to formaldehyde. The process of fixation with formalin leads to inhalation of toxic compound which produce significant health hazard and the use of plastinated specimens solve this issue by preventing excessive exposure to staff and students to this toxic substance. These specimens can be examined from all angles and make detailed study more appropriate. Further the palatinate specimens can be used for histology purpose. They served as a great tool for gross anatomy and cross sectional anatomy.

Disadvantages :

This technique is comparatively more expansive than other conventional preservative methods. The main cost is for purchasing the instruments but the further cost can be reduced by establishing the acetone distillation plant through which the acetone can be reused again and again. The resins used in this process are also expansive. It is also quite time consuming process and required much more technical skills. To achieve perfectly displayed specimens, it requires lot of work even after the completion of curing process. The superficial structures cannot be manipulated to see the deep structures. Also it involves little shrinkage of specimen and thus specimens appears to be little smaller than usual.

Conclusion:

Plastinated specimens are proving more beneficial for preservation of biological specimens in laboratory. They serve as excellent tools in teaching anatomy as compared to formalin preserved specimens. Also they proved to

be wonderful artistic museum specimens. Generally students face lot of difficulty in handling the formalin preserved specimens during practical class and self learning. Also due to ethical issue, animal sacrifice has become very difficult and thus there is scarcity of animal samples in laboratory for anatomy teaching. These drawbacks can be overcome by using this technique for preservation as the resulted plastinates appears more lifelike and without surface morphological modifications. The indigenoustrials to modify this technique make it comparatively cheaper and affordable in India. Due to its advantages, it is gaining popularity and thus it is a recommended method of preservation of specimens especially for teaching and research purpose.

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SIGNIFICANCE OF VITAMINS IN ANIMAL HUSBANDRY

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Introduction

Proper animal nutrition is key to successful livestock production. Good nutrition can increase feed efficiency and the rate of gain in animals. Animals must be fed diets that meet their needs. If their needs are not properly met, the animals won't grow, reproduce, or produce milk, and they could possibly die.

Vitamins are organic compounds required in tiny amounts for essential metabolic reactions in a living organism. Absence or deficiency of vitamins causes deficiency disorder. Vitamins may be classified based on their solubility as fat soluble vitamins and water soluble vitamins.

- ❖ Fat-soluble vitamins include vitamin A, D, E and K.
- ❖ Water-soluble vitamins include vitamin B complex group and vitamin C.
- ❖ The B complex group of vitamins includes the following:
- ❖ Vitamin B1 (thiamin)
- ❖ Vitamin B2 (Riboflavin)
- ❖ Vitamin B3 (Niacin/Nicotinamide/Nicotinic acid)
- ❖ Vitamin B6 (Pyridoxine)
- ❖ Panthothenic acid
- ❖ Folic acid
- ❖ Vitamin B12 (Cyano cobalamine)
- ❖ Biotin
- ❖ Choline

Vitamin Reserves

The body's stores of vitamins from previous food intake will affect the daily requirements for these nutrients. This is true for the fat-soluble vitamins A, D and E and for vitamin B12 than for the other water-soluble vitamins and vitamin K. Vitamin A may be stored by an animal in its liver and fatty tissue in sufficient quantities to meet requirements for periods of up to 6 months or even longer.

Vitamin Antagonists and Other Nutrients

Vitamin antagonists (antimetabolites) interfere with the activity of various vitamins. The antagonist may cleave the metabolite molecule and render it inactive, which is the effect of thiaminase on thiamin; it may complex with the metabolite, with similar results, as illustrated by avidin and biotin; or its structural similarity may allow it to occupy reaction sites and block the metabolite's access to them, as is the case with dicumarol and vitamin K. Rancid fats inactivate biotin and destroy vitamins A, D and E, and possibly others. Some antimicrobial drugs will increase animals' vitamin needs by altering their intestinal microflora and inhibiting the synthesis of certain vitamins. Certain sulfonamides may increase the requirements for biotin, folacin, vitamin K and possibly other vitamins when intestinal synthesis is reduced. The presence of vitamin antagonists in animal and human diets should be considered in adjusting vitamin allowances, as most vitamins have antagonists that reduce their utilization. The level of fat in the diet may affect the absorption of the fat-soluble vitamins A, D, E and K, as well as the requirement for vitamin E and possibly other vitamins. Fat-soluble vitamins may fail to be absorbed if the digestion of fat is impaired. Many relationships exist between vitamins and other nutrients and they affect requirements. For example, important relationships exist between

vitamin E and selenium, between vitamin D and calcium and phosphorus, between choline and methionine and between niacin and tryptophan.

Vitamin Supplementation

Livestock -

- ❖ Vitamin requirements, as previously noted, are highly variable among the various species and classes of animals.
- ❖ Supplementation allowances need to be set at levels that reflect different management systems and that are high enough to take care of fluctuations in environmental temperatures, energy content of feed, or other factors that might influence feed consumption or vitamin requirements in other ways.

Ruminants-

- ❖ Grazing ruminants generally only need supplemental vitamin A if pastures are low in carotene and possibly vitamin E (influenced by selenium status).
- ❖ Vitamin D is provided by ultraviolet light activity on the skin, while all other vitamins are provided by ruminal or intestinal microbial synthesis.
- ❖ Ruminants housed under more strict confinement conditions generally require vitamins A and E and may require vitamin D if deprived of sunlight. Additional supplemental vitamin E is needed to stabilize the meat color of finishing animals.
- ❖ Under specific conditions relating to stress and high productivity, ruminants may benefit from supplemental B vitamins.
- ❖ Particularly thiamin and niacin. Biotin deficiency has been linked to lameness in cattle. Increased plasma biotin levels have been associated with hardness and positive conformational changes in bovine hooves as well as increased milk production. Future research may identify a need for folacin and carnitine supplementation. Adding a complete B-vitamin mixture for cattle entering the feedlot during the first month can reduce stress and increase gains. Under the stressful conditions of feedlots, the microbial population in the rumen apparently does not synthesize certain B vitamins at adequate levels.

Poultry-

- ❖ Poultry under intensive production systems are particularly susceptible to vitamin deficiencies. The reasons for this susceptibility are as follows:
 - (1) poultry derive little or no benefit from microbial synthesis of vitamins in the gastrointestinal tract;
 - (2) poultry have high requirements for vitamins; and
 - (3) the high density concentration of modern poultry operations places many stresses on the birds that may increase their vitamin requirements.
- ❖ Typical grain oilseed meal (e.g., corn-soybean meal) poultry diets are generally supplemented with vitamins A, D (D), E, K, riboflavin, niacin, pantothenic acid, B₁₂ and choline.
- ❖ Thiamin, vitamin B₆, biotin and folacin are usually, but not always, present in adequate quantities in the major ingredients such as corn-soybean meal-based diets. Carnitine may be found to be of value in future studies.
- ❖ Vitamins A, D, riboflavin and B₁₂ are usually present at low levels in poultry diets. However, adding other vitamins to poultry diets is good insurance. Vitamins D and B₁₂ are almost completely absent from diets based on corn and soy bean meal.
- ❖ Vitamin K is generally added to poultry diets more than to the diets for other species because of the lower level of intestinal synthesis that occurs in birds owing to their shorter intestinal tract and the faster rate of food passage. Birds in cages require more dietary K and B vitamins than those in floor housing because of the more limited opportunity for coprophagy.

Swine-

- ❖ Vitamin supplementation of swine diets is obviously necessary with vitamin needs having become more critical in recent years as complete confinement feeding has increased.
- ❖ Swine in confinement, without access to vitamin-rich pasture, and housed on slatted floors, which limits vitamins available from feces consumption, have greater needs for supplemental vitamins.
- ❖ For swine, the vitamins most likely to be marginal or deficient in corn-soybean diets are vitamins A, D, E, riboflavin, niacin, pantothenic acid and B12 and occasionally also vitamin K and choline.
- ❖ Almost all swine diets in the United States are now fortified with vitamins A, D, E, B, riboflavin, niacin, pantothenic acid and choline.
- ❖ An increasing number of feed manufacturers are also adding vitamins K, biotin, folacin and B to diets. Diets are fortified with these vitamins even though not all experiments indicate a need for every one of them.
- ❖ Most feed manufacturers add them as a precaution to take care of stress factors, subclinical disease level and other conditions on the average farm that may increase vitamin needs. It appears that carnitine supplementation of weaning pigs may have potential.

Horses-

- ❖ There is a lack of experimental information on the level of vitamins required in well-balanced horse diets, as well as on which vitamins need to be added.
- ❖ The vitamins most likely deficient for all classes of horses are vitamins A and E, with vitamin D also being deficient for horses in confinement.
- ❖ Inadequate vitamin D may be provided to racehorses that are exercised only briefly in the early morning, when sunlight provides less antirachitic protection. Requirements for vitamins A, D, and E can be met with a high-quality (e.g., green color) sun-cured hay.
- ❖ Deficiencies of vitamin K and the B vitamins appear to be less likely in the mature horse than in other monogastric species because many vitamins are synthesized in the caecum of the horse.
- ❖ It is not known, however, what quantities of the vitamins synthesized in the cecum are absorbed in the large intestine. Since it is difficult to depend on intestinal synthesis, many horse owners use B-vitamin supplementation of diets for young horses and for horses being developed for racing or performance purposes.



ANTIBIOTIC RESISTANCE : A GLOBAL CONCERN**K. Merina Devi^{1*}, T. Gyaneshori Devi² and N. Bhumapati³**^{1*}Assistant Professor, Department of Livestock Farm Complex, COVSC & AH, Jalukie, Nagaland, India;²Assistant Professor, Department of Livestock Production Management, COVSC & AH, Jalukie, Nagaland, India³Assistant Professor, Department of Veterinary Gynecology & Obstetrics, COVSC & AH, Jalukie, Nagaland, India**Abstract:**

Orf, is an acute highly contagious, skin disease primarily observed in sheep, goat and other wild ruminants. It is a viral zoonotic disease affecting all age groups of animals; however, young or immunocompromised animals are more susceptible. The disease is transmitted either by direct/indirect contact with contaminated materials or exposure to contaminated environment, inanimate objects, equipment and fomites carrying the virus. Lesions are mostly concentrated in and around the lips, mouth, tongue, hard palate, oral mucosa, muzzle, on the teats of nursing ewe and does. It is a self-limiting disease which can completely be recovered within 1-2 months, however, in an unattended case, there may be maggot wound, fungal infestations and secondary bacterial infections which adds complication to the disease. The mobility rate of the disease may reach up to 100% while mortality is generally less. Being a viral disease, there is no specific treatment against orf, therefore, treatment is towards the control of secondary infections which may include administration of antibiotics, antiallergic, supportive treatment and application of ointment to the lesions. Adequate determination of pathophysiology, risk factors associated with the occurrence of the disease, early detection and isolation of infected animal from the herd may help to minimize the incidence.

Introduction:

Orf, is an acute highly contagious and economically importance non-systemic viral skin disease primarily observed in sheep, goat, domesticated animals (camel, alpaca) and wild ruminants (reindeer, black buck, antelope). It is a zoonotic disease which means it can easily be transmitted to animals to men and is caused by Parapoxvirus (Murphy et al., 2012). It is a self-limiting disease and affects all age groups of animals; however, young or immunocompromised animals are more susceptible. The disease is more severe in goats than in sheep (Nandi et al., 2011). The disease is known with 80 medical names and more oftenly known as contagious pustular dermatitis, contagious ecthyma, sore mouth, scabby mouth, infectious labial dermatitis, thistle disease etc. The word Orf in old English means Rough and Tough (Maclachlan and Dubovi, 2010) and when the disease occurs in human, it is more popularly known as Orf (Nourani and Maleki, 2006). The economic importance of the disease is that there is risk of lower productivity and body weight gain of animals due to stress, reduces the market weight of meat, wool, leather etc.

Transmission:

The disease is commonly found in pasture or manual feeding under drought conditions. It is transmitted to animals or human through broken/damaged/infected areas either by direct/indirect contact with contaminated materials or exposure to contaminated environment, inanimate objects, equipment and fomites carrying the virus. The virus can remain on the wool and hides for approximately one month even after the wound have healed.

Signs and symptoms of disease:

The lesions are normally benign (Kassa, 2021) and appears after an incubation period of 3 to 7 days. Lesions are mostly concentrated in and around the lips, mouth, tongue, hard palate, oral mucosa, muzzle, on the teats of nursing ewe and does. The lesions usually resolved within 1-2 months (Nandi et al., 2011), however, in an unattended case, there may be maggot wound, fungal infestations and secondary bacterial infections which adds complication to the disease. The mobility rate of the disease may reach up to 100% while mortality is generally less than 1%. Although, mortality rate in small ruminants due to secondary infections may reach as high as 20-50 % (Haig and Mercer, 1998) stress, immunosuppression or concurrent disease (Hosamani et al., 2009). Mortality in young animals may be inability of the kids to feed due to pain leading to anorexia; associated with maggot infestations and secondary bacterial infections



Contagious Ecthyma lesion in goat

Diagnosis:

Contagious Ecthyma can be diagnosed based on the characteristics and location of the lesions. However, confirmatory diagnosis can be done on isolation of virus and immunological test.

Treatment:

As there is no specific treatment against orf due to the fact that it is a viral disease, therefore, treatment is towards the control of secondary infections with antibiotics, supportive treatment to enhance immunity of the hosts (CertAHet. al.,2014). Topical application of specific ointment having wound healing property in affected areas will enhance the healing process by combating secondary infections. At present, there is no vaccine available for orf.

Prevention and control:

- ❖ Sick animals should be isolated from the herd.
- ❖ Frequent cleaning and disinfection of the animal shed should be done.
- ❖ Always wear gloves while handling the infected animals
- ❖ Contaminated materials and all tissues should be incinerated to prevent infection to other animals.
- ❖ When the lesion is in nipple, the young ones should be isolated from mother and fed artificially.
- ❖ Strict biosecurity measures in and around the farm area should be done.

Conclusion:

The orf infection can persist in a herd and may create economic loss to the farmers. The disease has gained popularity across the globe due to its zoonotic importance affecting mainly the stressed, weak and immunocompromised hosts. Adequate determination of pathophysiology, risk factors associated with the occurrence of the disease, early detection and isolation of infected animal from the herd may help to minimize the incidence.

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HYDROGEN SULPHIDE PRODUCTION BY FERMENTATION IN RUMEN AND ITS IMPACT ON PRODUCTION AND HEALTH OF RUMINANTS

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Introduction

Hydrogen sulphide has many beneficial and toxic effects on health of the animals. Rumen fermentation plays a vital role in digestion and absorption of nutrients in ruminants. Dietary sulphur can be reduced into hydrogen sulphide (H₂S) in the rumen during ruminal fermentation. H₂S produced during fermentation is absorbed rapidly in to body of animals through intestinal wall. H₂S may be toxic to the ruminants if produced in excess, can cause poliomyelitis. The production of H₂S depends upon the population of sulphate reducing bacteria (SRB). H₂S plays a role in physiological function and maintenance of gastrointestinal tract. H₂S is oxidized successively in mitochondria to thiosulphate and afterwards to sulphite with sulphate as end product under physiological conditions. H₂S accumulation in ruminants lead to toxic effects on the animals, may cause disorders like poliomyelitis.

Hydrogen sulphide toxicity in ruminants

Sulphur in the diet of ruminants can be reduced to hydrogen sulphide (H₂S) during rumen fermentation. H₂S is a toxic gas and its production in rumen may have certain detrimental effect on ruminants and may even induce poliomyelitis (PEM). PEM is a neuropathological condition of ruminants induced by a variety of neural metabolic disruptions such as altered thiamine status, water deprivation, sodium ion toxicosis, excess intake of sulphur and lead poisoning. H₂S and its ionic forms are highly toxic having important effect on biological system and H₂S interfere with cellular respiration in the similar way as hydrogen cyanide. H₂S produced during rumen fermentation rapidly absorbed into the rumen wall and its rate of production depends upon sulphur level in the diet. Dietary sulphur in the form of sulphate given in ruminant's diet is utilized by rumen micro-organisms to produce sulphides, lead to an increased concentration of H₂S in the rumen. Episodes of excessive production and absorption of sulphides in rumen are a toxicological hazard in ruminants and high enough H₂S ration can cause PEM and if not treated quickly the animal may die. H₂S in brain may act as a neuromodulator. H₂S levels in rumen above 2000 mg/L can precede the development of PEM and sometimes known as sulphur induced poliomyelitis (S-PEM). H₂S concentration below 471.2 mg/L in rumen caused no toxic effect on animal health.

Rumen hydrogen sulphide production

Sulphate reducing anaerobic bacteria (SRB), reduce sulphate into H₂S in rumen. SRB can also reduce thiosulphate and sulphite to H₂S and utilize gaseous hydrogen ions.

Relationship between SRB and methanogens in rumen

There is a competitive and interactive relationship between SRB and methanogens. Methanogens and SRB compete for hydrogen for their metabolism, SRB reduces sulphate to sulphide and methanogens reduce CO₂ to methane (CH₄). The competitiveness of SRB and methanogens depends largely on the concentration of sulphate in rumen. If the concentration of sulphate in rumen reach a certain level, methane production can be suppressed. However, when sulphate concentration in rumen was very low, a symbiotic and mutually beneficial relationship formed between SRB and methanogens through hydrogen generation and interspecific hydrogen transfer. Thereby, decreasing sulphate may make SRB a hydrogen producer in rumen. Thermodynamically, affinity of matrix shown an advantage to SRB over methanogens in the hydrogen competition. Methanogens are unable to compete with SRB for hydrogen even though methanogens and SRB coexist. Hydrogen utilization of SRB is due to potential difference as hydrogen ions are more inclined to SRB as energy produced by sulphate reduction is more.

Factors influencing hydrogen sulphide production in rumen**1. Dietary level of sulphur on rumen hydrogen sulphide production**

The dietary level of sulphur and its utilization in rumen are positively correlated with the rate of H₂S produced in rumen. Therefore, the level of sulphur in diet of ruminants is closely related to H₂S production in rumen. A large amount of H₂S was produced in rumen when ruminants were fed high sulphur diets by the action of SRB. Excessive sulphate in rumen (576 mg/L) affect the reducing ability of SRB. It may be indicated that dietary sulphur level affect H₂S production in rumen by regulating SRB.

2. Effect of ruminal pH on hydrogen sulphide production

High sulphur content in the diet lowers rumen pH in ruminants. H₂S production from sulphide is a pH dependent process. The average pH of rumen account only 12% of H₂S concentration changes in rumen, whereas, rumen protein sulphur intake account for 58% of rumen H₂S concentration changes.

3. Effect of dietary neutral detergent fibre (NDF) on rumen H₂S production

Rumen pH is also affected by the factors other than dietary sulphur level, such as dietary NDF which may affect H₂S production in rumen. H₂S concentration in rumen decreased linearly with an increase in dietary content of roughage NDF. Higher dietary NDF can reduce H₂S production in rumen. Although the exact mechanism of S-PEM are still unknown. It has been known that cattle fed a concentrate rich ration face a greater risk of S-PEM than those fed a high forage diet. This may suggest that increased dietary sulphur content in cattle consuming high forage diet could lower the potential risk of sulphur toxicity by adjusting SRB population in rumen.

Effect of ruminal hydrogen sulphide on ruminant's health and production

Diets containing excess sulphur can be detrimental to animal health as it triggers production of H₂S during rumen fermentation, resulting in to toxicity. Although, sulphur is regarded as an essential element in ruminants nutrition. However, excessive sulphur intake can reduce animal production and can cause respiratory, encephalic and enteric problems. Ruminal H₂S overproduction directly results in to the development of polioencephalomalacia. Cattle growth is adversely affected by sub-acute intoxication of H₂S production in rumen.

Ethanol based co-products usage in ruminant's nutrition tend to increase sulphur concentration in the diet and is one of the main challenge. Therefore, inclusion of greater proportions ethanol based co-products in ruminant's finishing rations has been prohibited. Supplementation of thiamine in diet helps to alleviate or prevent poliomyelitis in ruminants.

H₂S also plays an essential role in physiological functions and maintenance of the gastrointestinal tract.

Summary

Currently there are few studies on rumen H₂S production. H₂S is produced by reduction of sulphate in rumen by SRB and there is competitive relationship between SRB and methanogens. However, this is necessary to verify that H₂S production in rumen is inhibited by increasing methanogens in the rumen. There are no evidences of increase in H₂S concentration after reaching a critical value on increasing sulphur content in diet. The relationship between ruminal pH and H₂S production and effect of NDF on H₂S production further need experimental verification. In addition, endogenous production of H₂S in rodents improved the normal physiology of gastrointestinal tract. Therefore, it is important to accentuate the vital role of GIT micro-flora for the normal physiological functioning of the host.

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POULTRY PRODUCTION IN ENVIRONMENTALLY CONTROLLED (EC) HOUSE

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The environment provided to poultry flocks has a great bearing on flock performance and profitability. Basic environment consists of feed, lighting, air (temperature, humidity, pathogen concentration and ammonia), water and litter quality. Birds are homoeothermic. The internal body temperature in the adult chicken is 105°F-107°F (40.6°C and 41.7°C). Newly hatched chick- 103.5°F (39.7°C) and increases daily until it reaches a stable level at about three weeks of age. The poultry thermal comfort zone, or thermoneutrality, depends on species and age, with younger birds responding better to warmer temperatures. Poultry feed conversion deteriorates when temperatures are outside the recommended comfort zone. Bird produces heat that must be lost to the environment to maintain constant body temperatures.

Disadvantages of free-range system of housing

- ❖ Loss of egg may be a big problem; hens lay eggs everywhere.
- ❖ Predatory animals cause loss of poultry birds.
- ❖ Infectious diseases and parasites problem may occur.

Disadvantages of semi-intensive system of housing:

- ❖ High cost for fencing.
- ❖ Need for routine cleaning and removal of litter material from the pen.

Environmentally controlled house (EC house)

It is one in which inside conditions are maintained as near as to the bird's optimum requirements. A closed building, longitudinally preferably east to west, big exhaust fans on west side, evaporative cooling pads on east side along with automatic feeding and drinking systems inside, in order to maintain proper ventilation, temperature, relative humidity and lighting program.



Control over microenvironment

1. Ventilation:

Negative pressure ventilation:

Types of Negative-Pressure Ventilation Operations

- ❖ Minimum ventilation - (also called just "power ventilation" or even "power vent")- operated on a timer and used for cooler weather and/or smaller birds.
- ❖ Transitional ventilation - operated on thermostat or temperature sensor and used for heat removal when wind-chill (tunnel) cooling is not needed or desirable.
- ❖ Tunnel ventilation.

Components of mechanical ventilation

Fans, openings, heaters (radiant, space and make-up air heaters) and controls. Controls are needed to adjust ventilating rates (fan controls), supplemental heating rates, and the air velocity rates (fan controls), supplemental heating rates, and the air velocity through openings as weather, bird age and size change.

2. Cooling the house

- ❖ Low pressure fogging system:
- ❖ Pad -and- fan system:
- ❖ Pressurized system
- ❖ Vacuum system
- ❖ Fog -and- fan system
- ❖ High pressure nozzle system

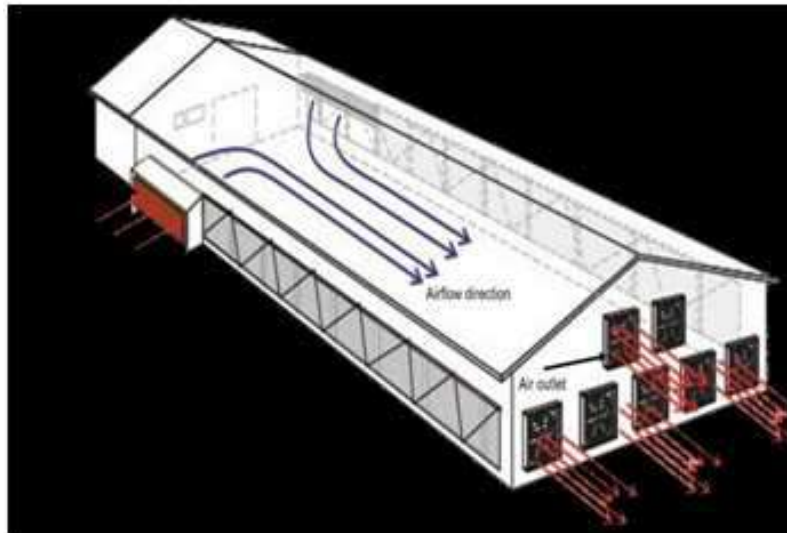
3. Temperature control in environmentally controlled house

Different types of heaters are used for supplemental heating in poultry houses including radiant, space, and make-up air heaters.



4. Feeding in environmentally controlled house

Feed monitoring systems are available to measure the amount of feed consumed by bird. Normally 7- 8 times per day feeding occur in environmentally controlled houses.



5. Lighting management in environmentally controlled house

Environmentally controlled house must be lightproof; that is, no outside light should be allowed to enter the building. A monitoring and control system should provide scheduling of lights that is easy to use. It is especially important breeding facilities for precise lighting schedules to be followed. A system that can pre-program lighting schedules over the life of the flock is very useful for management. It is also important to provide the desired intensity of light.

EC houses in broiler production

Modern climate-controlled housing and equipment make it possible to control the microclimate provided in technologically advanced commercial broiler production. But such houses are expensive to build and operate and require a large turnover of birds to make them viable (Glatz and Pym, 2013). Because of the lower investment costs, the conventional open-side-elevated housing for broilers still persists.

Tunnel Ventilation Properly ventilated housing is essential for profitable poultry production. There are basically five reasons why we must ventilate poultry houses: 1) remove heat 2) remove excess moisture 3) minimize dust and odors 4) limit the build up of harmful gases such as ammonia and carbon dioxide and 5) provide oxygen for respiration. Of these five, the most important are removing built up heat and moisture. The time of the year determines which of these is of primary concern (Bucklin et al., 2012). All poultry houses need some form of ventilation to ensure an adequate supply of oxygen, while removing carbon dioxide, other waste gases and dust (Glatz and Bolla, 2004). Farhadi and Hosseini (2014) noticed that bird performance including live body weight, feed intake, feed conversion ratio, mortality rate, production efficiency index and litter pH, moisture content and air ammonia levels were not significantly affected by types of the houses. Chickens grown in the EC house, although raised at higher stocking density (20 vs 16 birds/m²) than conventional house, had numerically lower mortality rate and greater production efficiency index. This may be probably due to improved environmental conditions through proper ventilation applied in environmentally controlled condition modern house than conventional house.

Tunnel ventilation is the best accessible management tool to prevent heat stress and mortality in broilers during hot periods of year (Lacy and Czarick, 1992). Lott et al., (1998) showed that broilers were raised in a tunnel ventilation system (higher air velocity on the birds) presented better weight gain and feed conversion ratio than the birds raised in a conventional system. In some studies, subsequent decline in air quality within poultry house have been reported by increasing stocking density (Zuidhof et al., 1995; Dawkins et al., 2004). Zuidhof et al., (1995) reported that subsequent decreased air quality due to stocking density increases; negatively affected turkey performance and increasing ventilation rate reduced the negative effects of increasing stocking density on birds. Bilal et al. (2014) compared the growth performance of broilers housed under two different rearing systems (cage and floor) placed in three housing zones (near

vent, middle and near variable speed fans). The body weight ($2266.81 \pm 53.4g$) feed intake ($4218.50 \pm 94.98g$), performance efficiency factor (284.76 ± 7.16), FCR (1.90 ± 0.00) were found to be best near vents followed by middle and fan area.

EC houses in layer production

For controlled-environment housing of layers, multi-tier cage systems are common. Most large-scale commercial farms use controlled-environment systems to provide the ideal thermal environment for the birds (Glatz and Bolla, 2004). Birds' performance in controlled-environment sheds is generally superior to that in naturally ventilated houses, as the conditions can be maintained in the birds' thermal comfort zone. Achieving the ideal environment for birds depends on appropriate management of the poultry house. Bharathi and Senthazai (2020) reported that investment cost per bird is higher in EC housing system whereas the returns are significantly higher due to higher standards of production and lower mortality.

Conclusion

Climate controlled condition improves the performance of birds with better FCR and livability that translates to higher income than in conventional type. Broilers reared on floor near vent area exhibited better growth performance with optimum feed intake leading to best FCR as compared to those of cages placed in the middle and fan area. Power cost is the most expensive component in operating a climate-controlled broiler house. The investment cost per bird though higher in EC housing system the returns are significantly higher on a long run due to higher standards of production and lower mortality. In tropical climatic conditions EC will be future trend in due to unpredictable climatic changes.

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SNAKE BITES AND IT'S MANAGEMENT : A CONCISE STUDY

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Introduction

Since the dawn of time, man has been fascinated by snakes. They have sparked the imaginations of people from many racial, cultural and religious origins around the world. Since the beginning of written history, they have been mentioned in several sources. Since they have long been associated with awe and horror in human minds, snake worship has been practiced throughout history, dating back to the Egyptian civilization more than 5,000 years ago. Snakes are still revered in some regions of India today. Numerous mythological stories and legends have been centered on snakes. Snakes are misunderstood and feared by the general public since they are not well-known to them. With the exception of four species that cause thousands of fatalities each year, most snakes in India are harmless. Snakes can range in size from a few centimeters to up to ten meters in length. Snakes may dwell in a broad range of environments, including sweltering deserts, muggy tropical jungles, chilly Himalayan climates and even the deepest oceans. Additionally, snakes have an array of intriguing skin tones that are perhaps only surpassed by the elaborate and vibrant butterfly wings. Snakes continue to be the most elegant creatures in nature due to their graceful motions and overall beauty. When Alexander the Great visited India in 326 BC, according to historical records, he was deeply impressed by the Indian doctors' skill in treating snakebite patients. Since then, India has gained a reputation for having venomous snakes and the death and illness brought on by their bites [1].

Classification of Indian venomous snakes

In India, there are about 270 different species of snakes, 60 of which are poisonous. Some of species are widespread and have quite potent venom. Venomous snakes are divided into two groups according to their fang and venom types: Solenoglypha (retractable fangs and hemotoxic venom) and Proteroglypha (fixed fangs and neurotoxic venom). The following five families make up the grouping of venomous snakes:

Elapidae

This family include kraits and cobras. These elapids have fixed fangs and extremely neurotoxic venom that affects the nerve system and causes respiratory paralysis.

Viperidae

The "genuine vipers" are members of the family Viperidae. Their heads are substantially wider than their necks and their bodies are thick. They are available in a wide range of sizes, markings and colors. They have movable, hollow, long fangs that are similar to hypodermic needles in function. They assault the blood cells with their highly hemotoxic venom. The Russell's viper is the most typical illustration.

Colubridae

The majority of snakes in the world are members of the Colubridae family. Since their fangs point backward, these snakes, which are generally safe for humans, are referred to as "back-fanged" snakes. The most prevalent illustration is the sub-Saharan African boomslang.

Crotalidae

The so-called "pit vipers" belong to the Crotalidae family and have a heat-sensitive pit between each of its nostrils on either side of the skull. The bamboo pit viper, Himalayan pit viper and hump-nosed pit viper are a few examples of crotalids.

Hydrophidae

The family Hydrophidae, as the name suggests, is made up of all known species of sea snakes, which come in a wide

range of hues and forms. More poisonous than cobra venom, the venom from these snakes is particularly neurotoxic.

Important venomous snakes

In India, the four snakes that are most significant medically are also the ones that cause the most fatalities. These include the Russell's viper, the spectacled/biocellate cobra and the Indian cobra (Najanaja).

Saw-scaled viper

Collectively known as carpet viper (*Echiscarinatus*). All of India is covered by it, with the exception of Jammu & Kashmir, West Bengal and the northeast. It is particularly deadly since it frequently comes into touch with people and is the leading cause of snakebite fatalities in India. Highly hemotoxic with average length of 80 cm, prefers the night and glides quickly in a side-to-side motion. It consumes insects, lizards, frogs, scorpions, mice and lizards.

Common krait

The most potent venom of all Indian land snakes is produced by the Common Krait, also known as *Bungaruscaeruleus*. Except for Arunachal Pradesh, Uttarakhand, Himachal Pradesh and Jammu & Kashmir, it is dispersed throughout all of India. The venom is 15 times more deadly than cobra venom and is highly neurotoxic. It kills by paralyzing breathing muscle. It is about 1.7 m long and typically active at night. It consumes frogs, lizards and rodents for food.

Russell's viper

The scientific name of this viper, *Daboiarusselii*, honors Dr. Patrick Russell, who found it in 1796 while exploring the Coromandel Coast. It is distributed all of India, with the exception of Jammu and Kashmir. Highly hemotoxic and measures about 1.8 meters in length. The snake prefers to hunt at night, is typically slow but may strike quickly and prefers to ambush its prey. It hisses loudly when startled and only bites when absolutely necessary. It eats rodents as food.

King cobra

The longest venomous snake in the world, the King Cobra (*Ophiophagushannah*), can reach lengths of up to 19 feet. It is found in eastern India, which includes West Bengal, Odisha, Bihar, Chhattisgarh and Jharkhand, as well as northern India. Additionally, it exists in every state in the northeast. In addition to these states, the Western Ghats' tangled jungles are another place where King Cobras can be found in great numbers. King Cobras are incredibly swift, acutely aware and aggressive. It might be the only snake with any level of intellect. In a single bite, it has the capacity to inject up to 7 ml of extremely neurotoxic venom, which kills by assaulting the nervous system. This much venom can kill up to 20 adult humans or even an adult elephant because it is so poisonous and within ten minutes, death happens. Additionally, since the King Cobra has no antivenom so death is unavoidable. However, because it primarily inhabits impenetrable jungles, it hardly ever interacts with people. King Cobra fatalities are therefore uncommon. It should be mentioned that this snake has a peculiar trait in that it consumes other snakes. Because of this, it is known as a "Ophiophagus," which is Greek for "snake-eating" [2].

Sea snakes

Along the Indian coastline and in the Indian Ocean, there are two significant venomous sea snakes. Sea snake with a hook-nose: Its scientific name is *Enhydrinaschistosa* and it is the most prevalent sea snake in India. It can be found in the waters surrounding the Andaman & Nicobar Islands as well as all of India's coastline. It has a maximum length of 5.2 feet. Its venom is four to ten times as poisonous as cobra venom. Particularly vulnerable to getting bitten by this snake are fishermen. This snake mostly consumes fish for food.

Yellow-lipped seakrait

Laticaudacolubrina is the scientific name for this, which is also known as the banded sea snake. It can be found all throughout the Indian Ocean. It has a maximum length of 4.9 feet. It prefers the night, and its victims are typically fisherman. It consumes other fish as well as eels.

Other poisonous species that are found in certain geographical regions can also result in a sizable number of fatal snakebite incidents. These include wall's krait, banded krait, Sindh krait, and hump-nosed pit-viper in the Western

Ghats, as well as the monocled/monocellate cobra in the north-east [3].

Non-venomous snakes

In India, there are hundreds of different species of nonvenomous snakes that fall into roughly 31 different categories. Six of the most significant species are briefly described below:

Checkered keelback

These snakes, formally known as *Xenochrophis piscator*, are so named because of their distinctive keel (fold) and checkered pattern. They are typically found in or around ponds and are small to medium-sized, nocturnal/diurnal snakes. They consume fish, frogs, rodents, birds and fish.

Indian rat snake

These snakes are reported to consume mice, frogs, toads, birds and lizards in addition to rats, as their name would imply. The most prevalent and well-known snakes in India are rat snakes, scientifically known as *Ptyas mucosa*. They are swift, fast-growing terrestrial snakes that may grow up to 11.5 feet in length. They are active during the day and are good climbers. They become calm when softly handled after being hyperactive and ready to bite if picked up.

Common vine snake

These snakes are brilliant green, as the name would imply and resemble vines. These medium-to-large (up to 6.6 feet in length; females larger than males) and slow, slender, diurnal snakes have pointed snouts and are known scientifically as *Ahaetullanusuta*. Binocular vision and horizontally elliptical pupils are features of the eyes of vine snakes. They consume tiny birds, frogs, mice, and lizards.

Ornate flying snake

They are medium-sized (up to 5.7 feet in length), thin, energetic, diurnal tree snakes known scientifically as *Chrysopeleornata*, which glide rather than really fly through the air. They can climb very well. They are constrictors like pythons and eat geckos, rodents, bats and birds.

Red sand boa

Because their head and tail are similar, they are commonly referred to as "two headed snakes," even though their scientific name is *Eryx johnii*. They are nocturnal, medium-sized (3.3 feet in length; females are larger than males), sluggish, stocky burrowers that inhabit sandy soil. They are distantly related to South American boa constrictors. They prey on rodents, birds, amphibians and reptiles, making them strong constrictors.

Indian rock python

They are huge (up to 25 feet in length; females are larger than males), slow, mostly nocturnal snakes that can climb and swim well. Their scientific name is *Python molurus molurus*. They prey primarily on mammals and birds, occasionally on reptiles and amphibians, and are constrictors (kill through constriction by wrapping around the target) [4].

Snake venom

The toxic substance known as snake venom is kept in the venom glands, which are actually modified salivary glands and are found near the rear of the head. Through the teeth and venom channel, the snake releases its poison into its prey. There are two different kinds of fangs: fixed and retractable. The elapids, including cobras and kraits, often have the fixed fangs, which are immobile. The vipers, including the Russell's viper and saw-scaled viper, have retractable fangs that can move back and forth.

The unique mixture of poisons that make up snake venom is what causes the vast range of reactions that result from snakebites. The two main categories of snake venom toxins are hemotoxins, which assault the blood and neurotoxins, which attack the nervous system. The former is found in vipers, whilst the latter is found in elapids. Other toxins include cytotoxins, which are harmful to cells, and cardiotoxins, which are harmful to the heart. The majority of the toxins, roughly 90% are composed of proteins and peptides. Some of these have distinct impacts on a variety of biological processes, including blood coagulation, nerve impulse conduction and blood pressure regulation, among others. Enzymes, particularly hydrolytic enzymes, are abundant in snake venom.

About 80-90% of viper venom and 25-70% of elapid venom are made up of enzymes in snake venom. These include nuclease, protease, peptidase, metalloprotease, phospholipase and phosphodiesterase. These defense-enhancing enzymes in snake venom assist in immobilizing and digesting the prey as well as defending against dangers [5].

Medical uses of snake venom

Antivenom, which is used to cure snake envenomation, is made from venom. Snake venom has also been used to make several medications. Hemotoxins, for instance, have been utilized to create medications for the treatment of blood problems, heart attacks and excessive blood pressure. Drugs to treat stroke and brain problems have been created using neurotoxins as a starting point. Captopril, which is extracted from the Brazilian pit viper and used to treat high blood pressure, was the first venom-based medication to be created. Eptifibatide from the rattlesnake and Tirofiban from the African saw scaled viper are two other medicines made from snake venom that are used to treat heart attacks and chest pain.

Snakebite problem in India

In India, snakebites are a very serious medical issue. Around 100,000 people are thought to die each year from snakebites worldwide, compared to 49,900 deaths from snakebites each year in India. Therefore, around half of all snakebite deaths worldwide are caused by India alone! These numbers unequivocally demonstrate the scope of the snakebite issue in India. Furthermore, since most snakebite fatalities are not reported, especially in isolated rural areas, these statistics may be significantly understated because they are mostly dependent on hospital records.

The issue is made worse by traditional "Ojhas" snakebite healers who are incapable of handling deadly snakebites, thus raising the mortality toll. Snakebite deaths predominately (97%) occur in rural parts of India, are more common in men (59%) than in women (41%) and peak from June to September during the monsoon season. The majority of snakebite deaths occur in people between the ages of 15 and 29. The most snakebite fatalities occur in the states of Uttar Pradesh (8,700), Andhra Pradesh (5,200), and Bihar (4,500) [6].

Symptoms and signs of venomous snakebites

The injected venom's primary hemotoxic or neurotoxic properties will determine the signs and symptoms of envenoming. Local symptoms include: pain at bite site, ecchymosis (bruising), swelling, blister formation and necrosis (Russell's viper), bleeding from bite site (saw-scaled viper), rapid discoloration at bite site whereas systemic symptom shows epistaxis (bleeding nose), hematemesis (blood in vomit), hemoptysis (blood in sputum) and hematuria (blood in urine)

Management of snakebite

Both psychological and medicinal methods are used to treat snakebites.

Psychological management

This is crucial because anxiety or panic can contribute to many snakebite deaths. The patient needs to be comforted. Panicking must be avoided at all costs since it impairs judgement and increases the likelihood that mistakes will be made when caring for the patient. It should be remembered that even from non-venomous snakebites, a patient's excessive panicking might prove lethal.

Medical management

This entails providing care in the form of hospital-based "Antivenom Therapy" and first aid administered in the field. Acute Care First aid procedures should be brief, easy and rapid. It shouldn't take up too much of your time. Assuring the patient, immobilizing the biting limb, and making transfer arrangements are all parts of first aid. The mnemonic "Do it R.I.G.H.T." serves as the foundation for the currently advised first aid and includes the following:

R = Reassure the patient, due to the following reasons. Only around half of bites from poisonous snakes result in envenomation, accounting for 65 to 70 percent of all instances of snakebite. I = Immobilize the limb as for a fracture. Between 85 and 90 percent of venomous bites don't result in any envenoming symptoms. Immobilize the limb as if it were fractured. Use fabric to keep the splints in position. Avoid applying too much pressure as this could stop the blood flow. Don't exert too much pressure because doing so could cut off the blood supply. Applying compression in the form of tight ligatures is not recommended because they are harmful and ineffectual. G.H. stands for go to the hospital

right away. Don't waste time seeing "Ojhas," or other traditional healers. There is no evidence that using conventional treatments can prevent poisonous snakebites. T = Inform the physician of any systemic signs you may have seen [7].

Things to Do and avoid

It is crucial that some actions be taken while others should be avoided. The following is a brief summary of these so-called dos and don'ts: Reassure the patient that medical care is available and that death is uncommon because the majority of bites are not venomous.

Remain composed and manage your anxiety. Encourage the sufferer to unwind. Excitation can raise blood pressure and boost circulation, which can hasten the distribution of the venom throughout the body. Keep the bitten limb below the level of the heart when you lay the patient flat on their back. Take off your shoes, watches, tight clothing, rings, bracelets and amulets since they could block your breathing if you have swelling. Have the equipment available to perform cardiopulmonary resuscitation (CPR) on the patient.

Don't use a tourniquet since it will cut off the blood supply to the bitten limb. This may necessitate an amputation and may result in gangrene and necrosis. Applying chemicals to the bite site, such as potassium permanganate, is not advised. Don't cut the bite to extract the venom because doing so could result in the patient bleeding to death because viper bites can cause uncontrollable bleeding owing to non-clotting blood. Electric shock therapy shouldn't be used because it is ineffective. Avoid freezing the bite site or applying severe cold there.

There is no scientific evidence to support the effectiveness of herbal or folk therapies, including applying snake stones to the place that has been bitten. If you have an ulcer, you risk the venom spreading throughout your body if you try to suck it out with your mouth. The bacteria in your mouth might potentially spread infection to the bite site. Use of suction devices to extract the venom is not advised because they are ineffective and may injure the patient. Don't administer any alcohol or medications to the patient. Only water in moderation and paracetamol can be administered to treat pain. Avoid attempting to kill, handle or capture the accusatory snake to bring it to the hospital for identification. If the snake is still around, take a picture with your smartphone instead. Traditional healers, Ojhas, and quacks are useless for treating deadly snakebites, so don't spend your time going to them. Since the majority of bites are not venomous, they merely seem to be successful. When a venomous snake bites a person, only antivenom therapy can save their life.

Antivenom treatment

The only remedy for venomous snakebites that has been established by science is antivenom therapy. Dr. Albert Calmette, a French physician, bacteriologist and immunologist who was affiliated with the Pasteur Institute in Paris, created snake antivenom. At the Pasteur Institute in 1894, Calmette, a personal friend of Louis Pasteur, invented snake antivenom. He showed that an animal might be "hyperimmunized" by administering progressively higher quantities of venom. The serum from the immunized animal can help a second envenomated animal survive. Calmette's serum was the commonly used name for this antivenom. Calmette gave horses an immunization to make the antivenom. Modern antivenoms are still made using the principles of this discovery [8].

Antivenom manufacturing

Extraction of the venom from snakes is the first stage in the creation of snake antivenin. To "milk" the snake, its head is tightly gripped, its fangs are fastened to the edge of a petri dish, and the venom glands are gently squeezed. In the petri dish, the poison gathers. After the venom is dried, solutions in saline or double-distilled water are created with varying quantities. Then, over the course of one to two months, horses are given escalating dosages of the venom to immunize them. In response, the immune system produces antibodies that are resistant to the venom. The horses are bled from the jugular vein in the neck once the vaccination regimen is complete. The serum is separated when the blood is allowed to clot. The active ingredients of the antivenom are the purified antibodies found in the serum. Both liquid and lyophilized (freeze-dried) versions of the antivenom are offered. The shelf life of the liquid form is two years, although it is less stable and needs to be stored in a cold chain. The more stable lyophilized antivenom is offered as a powder. It has a 5-year shelf life and needs just to be kept cool while in storage. Antivenom can be polyvalent or monovalent (developed against a specific species of snake). Indian antivenin is polyvalent, which means it is generated using venoms from various snake species. The "Big Four" snake venoms-viper, Russell's Indian cobra, common krait and

saw-scaled viper are used in India to make the antivenom. Indian antivenom is therefore effective against all four of the aforementioned snakes that are significant medically.

Treatment

Antivenom is extremely expensive and in short supply. As a result, it should only be given once envenomation has been determined. Depending on how envenomated a creature is mild or severe envenomation, the antivenom dose may change. There are 10 ml of antivenom in each vial. An envenomated patient usually needs 8-10 vials of antivenom to be treated. In extremely severe situations, greater doses (20 vials or more) can be necessary. Children should receive the same dosage of antivenom as adults, it should be underlined. Since antivenom is produced in horses, human bodies cannot recognize the antibodies. Negative reactions to serum may result from this.

Antivenom reactions can result in anaphylaxis, a condition that can be fatal. The antivenom must be stopped right away in this case, and epinephrine (adrenaline) must be given to control the anaphylaxis [8]. Manufacturers of antivenom in India, there is "Big Four"-specific polyvalent snake antivenom available. There are now seven snake venom producers in India. They are as follows :

- ❖ Mumbai-based Haffkine Bio-Pharmaceutical Corporation Ltd.
- ❖ Mumbai-based Bharat Serums and Vaccines Ltd.
- ❖ Pune-based Serum Institute of India Ltd.
- ❖ Kolkata-based Bengal Chemicals and Pharmaceuticals Ltd.
- ❖ Kasauli-based Central Research Institute of India
- ❖ Hyderabad's Biological E. Ltd.
- ❖ Hyderabad's VINS Bioproducts Ltd.

Prevention of snake bites

According to the saying "An ounce of prevention is worth a pound of cure," prevention is always preferable to treatment. As a result, it is advised to take the following precautions to avoid being bitten by a snake:

- Steer clear of areas where snakes may reside. Snakes can conceal themselves amid mounds of leaves, firewood, coal or cow dung cakes used for cooking in rural regions.
- Always wear sturdy boots and long pants when out on foot at night. To view the path in front of you, use a flashlight. Tread carefully because doing so will cause the ground to vibrate, which snakes can sense and cause them to flee.
- When walking on unlevel ground, use a stick to prod the ground in front of you. Any snakes will flee if this happens.
- Avoid sleeping on the floor, especially if you live in a remote location, as kraits, which penetrate homes at night in quest of food, may bite you.
- Avoid taking a dip in ponds, streams or rivers after sunset to reduce your risk of being bitten by dangerous snakes like cobras, which can be mistaken for harmless checkered keelbacks due to the poor visibility. Cobras are proficient swimmers, like checkered keelbacks.
- Even if a snake is dead, you should never handle it. It has a reflexive ability to bite!

Conclusion

The burden of snakebites in India is still the largest in the world, yet it is still greatly underreported. Since India accounts for the majority of all snakebites worldwide, estimates of this condition may also be too low. In particular in the 13 states with the highest prevalence of snakebites, there is an urgent need for effective community education, awareness initiatives, suitable training of medical staff, and better availability and distribution of antivenom. This may greatly lower the number of snakebite fatalities in India.

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THE CONSEQUENCES OF POLLUTION ON LIVESTOCK AND LIVESTOCK PRODUCTS

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INTRODUCTION

Pollution has become a key adversary of all life forms on earth, from microplastics posing existential threat to marine organisms, to the smoky hue that envelops India's capital Delhi every year, the consequences of pollution is being felt globally. In today's world, pollution is a major talking point among the countries, still there is a paucity of work done on its effect on livestock in specific. Livestock being considered only for economic returns, not much is taken into consideration when it comes to pollution. In terms of the ecosystem, it's important to note that many of these animals are a part of the food chain. If they are inhaling toxins or drinking contaminated water, humans can become exposed by eating their meat and eggs, or drinking their milk. There are many types of pollution - the study of air, water, land, noise and radiation pollution requires special mention in the context of domestic animals.

EFFECTS OF AIR POLLUTION ON LIVESTOCK

The effect of pollution on livestock may be :

- Direct e.g., health hazards, irritation, behavioural changes etc.
- Indirect e.g., climate change which in turn will affect animals.



Direct Effects of Air Pollution

Animals have to battle two kinds of air pollution: - Indoor pollution and Outdoor pollution, Indoor pollution becomes more important in present times with highly intensive rearing systems. Animals in urban areas are at particular risk of smog and exhaust pollutants. Suburban and rural animals can be exposed to the toxins sprayed as insecticides, fungicides and herbicides. The direct effects are particularly manifested in the form of ill health, loss of production efficiency and a decreased life span.

Pollutants may enter the system by inhalation or ingestion. In air pollution, mostly inhalation triggers the health problems, but occasionally deposition of particles from industrial exhaust on pasture land may affect health directly. Eventually, this may result in toxic residues in meat, milk or eggs without obvious clinical symptoms displayed by the animals producing these products. Inhalation of pollutants may result in respiratory problems like emphysema, anthracosis etc: cardiovascular diseases and even digestive system troubles.

The effect of indoor air pollution is much more in case of swine & poultry:

For dairy cattle, goats and sheep these facilities are quite open and air quality is to a certain degree comparable with the outdoor air quality. The quality of this air is still much better than that of the closed facilities for swine and poultry (Koerkamp et al., 1998). The bird's respiratory tracts are challenged by dust coming off the litter. In layer houses larger accumulation of manure is there, usually in pits, due to longer housing duration which are only emptied infrequently (Harry, 1978). Hence, it is not surprising that especially in poultry houses high concentrations of ammonia, airborne dust, endotoxin and microorganisms can be measured (Koerkamp et al., 1998). Ammonia is considered as one of the most important inhaled toxicants in agriculture. Dodd & Gross (1980) reported that 1000ppm for less than 24 hour caused mucosal damage, impaired ciliary activity, and secondary infections in laboratory animals. Since this level is nearly never achieved, it is rather the long-term, low-level exposure to ammonia that seems to be related to its ability to cause mucosal dysfunction with subsequent disrupting of innate immunity to inhaled pathogenic microorganisms (Davis & Foster, 2002). Generally, the toxic effects of chronic ammonia exposure do not extend into the lower respiratory tract (Davis & Foster, 2002).

In pigs this combined effects of ammonia and endotoxin predispose the animals to infections with viruses and bacteria, both primary pathogenic and opportunistic species. Although food producing animals appear to be capable of maintaining a high level of efficient growth in spite of marked degrees of respiratory disease (Wilson et al., 1986), at a certain level of respiratory insufficiency rapid growth can no longer be attained. Workers in pig or poultry facilities are exposed to the same increased levels of carbon monoxide, ammonia, hydrogen sulphide, or the dust particles from feed and manure as the animals (Pickrell, 1991). As a result, workers in swine production tend to have higher rates of asthma and respiratory symptoms than any other occupational group.

Direct Effects of Air Pollution - Some Popular Examples

A well-known smog incident in Donora, PA in 1948 is known to have made 15% of dogs sick and even killed 10 dogs out of the 229 included in survey records. Sicknesses included respiratory and digestive issues as well as refusal to eat. Poultry farmers also reported that their birds got sick, and 40% of those sick birds died.

The sulphur dioxide from the London fog incident of 1952 reportedly affected cattle with bronchiolitis, emphysema and heart failure. Some cattle died or were euthanized.

In 1950 in Poza Rica, Mexico, hydrogen sulphide is reported to have killed 100% of canaries and approximately 50% of other animals who were exposed to the pollution.

In lab tests, ozone has been shown to adversely affect dogs, cats, guinea pigs, rabbits and mice. It impacted their respiratory systems and also led to deaths.

Indirect Effects of Air Pollution

The indirect effects include those processes which result from pollution and in turn will also affect the livestock, the most popular being climate change. Climate change will play a significant role in the spread of vector borne diseases and animal parasites, which will have disproportionately large impacts on the most vulnerable men and women in the livestock sector. With higher temperatures and more variable precipitation, new diseases may emerge or diseases will occur in places where they formerly did not. Higher temperatures tend to reduce animal feed intake and lower feed conversion rates (Rowlinson, 2008)

The effect of climate change on animals can be summarized as:

Can Climate Change Benefit the Livestock sector?

There may be some positive outcomes for the livestock sector from warmer temperatures, but this largely depends on

when and where temperature changes happen. For example, higher winter temperature can reduce the cold stress experienced by livestock raised outside. Furthermore, warmer winter weather may reduce the maintenance energy requirements of animals and reduce the need for heating in animal housing.

EFFECTS OF WATER POLLUTION

The effects of water pollution on animals are varied and depends specifically on the pollutant i.e, present in the water being taken up by animals. Effect of water pollution particularly is of importance in marine animals and wild animals as the pollution of their habitat or water source directly affects them. Effect of water pollution on livestock is important particularly if the contaminants include heavy metals and pathogens as they will directly have their say on human health. Out of various pollutants present in the hydrosphere and lithosphere, heavy metals and pesticides for example are the most toxic to livestock as well as human beings (WHO, 2001). Due to pesticides, river water was found to be more polluted than lakes (Konstantinou et al., 2006) which are source of drinking water for animals and human also. Anthropogenic activities have been augmented due to industrialization and urbanization which contribute to the entry of toxic metals, gases etc. in food chain of animal and human (Kumar et al., 2008).

- Toxicants, natural and synthetic, may impact on animal agriculture in different ways:
 - (1) by directly or indirectly intoxicating animals (toxicoses), resulting in mortality or decreased production of edible food products;
 - (2) by decreasing the availability or usability of nutritious feedstuffs due to the presence of naturally occurring toxins or added toxicants; and
 - (3) by decreasing the wholesomeness of edible food products due to the presence of hazardous residues (Shull and Cheeke, 1983).

The indirect effects may include the effects due to bioaccumulation or biomagnification that in turn increases the amount of pollutants significantly in the animals thus having deleterious health effects.

EFFECTS OF LAND POLLUTION

Land pollution includes anything that leads to deterioration of the land surface directly or indirectly. In developing countries, the main contributor to this is improper garbage dumping and mining operations that are ill managed. Livestock are vulnerable as they are allowed to forage on this garbage dumps. The animals eat various inedible as well as indigestible things that hampers the digestive functions and death in many cases. The effect of heavy metal poisoning and polyethylene abuse by land pollution is particularly well defined. Phytoremediation is the process by which plant uptake heavy metal (Tangahu et al., 2011). Therefore, such plants are major source of heavy metals and causes toxicity in animals who consume these plants.

The Case of Plastic

Every dead cow contains not less than 30 kg of plastic, much more is consumed by cows apart from plastic. Stray cows consume highly toxic vermilion, chunri, copper coins and even iron nails which cause serious injuries to their intestines, esophagus, and lead to their death.

Effects of Plastic in Cattle

Indigestion: The polyethylene and other plastic material do not degrade in rumen/reticulum and remain as such causing hindrance in orifice.

Impaction: Rumen becomes impacted due to presence of large quantities of polythene



bags/plastics in rumen accumulated over a period of time.

Tympany : When polyethene present in rumen and reticulum, they partially or completely occlude the orifice of reticulum and omasum leading to accumulation of gases in rumen.

Polybezoars : The formation of stones in digestive tract and around polyethene is known as polybezoars

Traumatic reticulopericarditis: Many times, nails, wires or other sharp hard objects are also disposed in poly bags as waste and dropped in waste pit

Immunosuppression: It has been observed that cows with polyethene in their stomach also suffer from immunosuppression that leads to increased sensitivity to various infections particularly of haemorrhagic septicaemia (Pasturellosis). Polyethene and plastic contain several chemicals like polyvinyl chloride, cadmium, lead, acrylamide, polyethene, etc., which are known immunosuppressants.

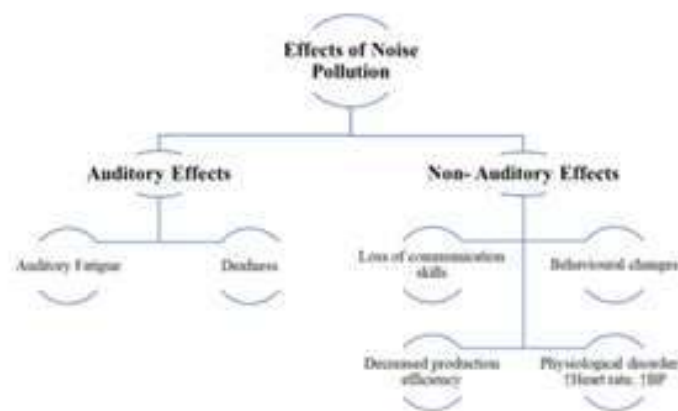
The following excerpt from a Gausihala trustee from Ludhiana (Jagga, 2015) perhaps best sums up the plastic menace :

"When we pick sick cows from roadside, we get them operated on. Apart from more than 15-20 kg of plastic which comes out like stony hard material, we take out vermilion, copper coins which cause injuries to the cow. Vermilion contains lead oxide and it is highly toxic. So much so, intestines of few cows were punctured as they had consumed iron nails as well. We do keep such things separately so as to show devotees what kind of things are consumed by cows which are thrown by human beings as per instructions of astrologers."

EFFECTS OF NOISE POLLUTION

In experimental animals : rats, chinchillas, dogs, pigs and cats - disturbance in - hearing mechanism blood chemistry and stress response have been reported.

In poultry : Adverse effect on egg production



In higher animals : fatigue, irritation, wild nature is enhanced, habit of shouting.

EFFECTS OF RADIATION POLLUTION

- Multifactorial diseases** : Various disease initiation and their progression depends upon multiple factors such as birth defects, and adult-onset diseases which are both chronic as well as acute in nature. The birth defects could range from neural tube defects, cleft lip or genital heart defects while the adult-onset diseases could range from diabetes, hypertension, and coronary problems. These multifactorial diseases are usually influenced by genetic mutations (DNA changes) and any of the mutated genes might be the reason a person might go through these kinds of symptoms.
- Reproductive effects** : Exposure to nuclear radiation by any of the parents could lead to defects at birth as these

causes' mutations at genetic level and lead to variations which usually result in abnormality. Problems like low birth weight, physical impairment or variation and damages in chromosome numbers could result in birth defects.

3. **Genetic effects** : These could lead to chromosomal aberrations and mutations where radiations could cause damage to DNA strands, adverse effects to genetic break up which are either immediate or delayed over a period of time.

EFFECTS OF POLLUTION ON LIVESTOCK PRODUCTS

Anything that affects the livestock will directly or indirectly affect livestock products. Pollution may lead to direct effects such as decreased production due to effect on animals. The environment where products are handled or the water used for their processing if polluted will directly deteriorate their quality. Heavy metals accumulated by animals are directly found in meat. The pathogens introduced as a result of polluted water or indirectly will be shed in the livestock products. Pollution increases the susceptibility of animals to diseases and products from these animals are contaminated with various pathogens.

Indirectly the pollutants may deteriorate product quality in many ways:

- e.g : i) In laying hens, anything that causes hyperventilation, such as heat stress results in parabronchial hyperventilation that causes hypocapnia . The low CO₂ results in less bicarbonate being available to interact with calcium, the final result being thinner eggshells.
- ii) Fish meal made out of fishes exposed to methyl mercury will have high amount of mercury.
- iii) Higher indoor pollution in poultry and swine premises reduces the feed conversion efficiency and deteriorates the quality of meat.

Conclusion

Animals face multifaceted threats from pollution, both as the sufferer and the cause, that adversely impact their lives and in turn their production. The lives of human and animals are significantly intertwined and the factors that influence animal health could not be neglected if humans want a healthy existence. The time is ripe to put forward action plans that mitigate impact of pollution on animals, as well as pollution that results as a result of animals.

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TREATMENT OF MILK FEVER IN DAIRY COW

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Abstract

An indigenous cow presented in TVCC, Bikaner with history of ataxia, poor appetite, sternal recumbency, inhibition of passing urine and dung. After clinical and laboratory examination cow treated with calcium borogluconate intravenously (slow). Cow recovered after infusion of calcium.

Key words - Milk fever, cow, calcium borogluconate

Introduction

Milk fever is one of the most common complex metabolic disease of high producing dairy cattle that occur after and soon parturition. It is characterized by hypocalcaemia, lateral recumbency, inhibition of urination and defecation, low temperature, low respiration, later on lateral recumbency, coma and death. It is economically important disease, it reduce milk yield and fertility. Calcium is the most important macromineral in terms of relative requirement and the diversity in animal body. Circulatory calcium deficit in the plasma pool with sudden excess loss of Ca in milk of high yielder parturient cows is mainly attributed to milk fever (Radostitis et al., 2007)

Case history and Observation

A indigenous cow presented to TVCC, Bikaner with the history of ataxia, poor appetite, sternal recumbency, inhibition of passing urine and dung. Clinical examination revealed low temperature, low respiration, low ruminal motility and laboratory examination revealed hypocalcaemia. (normal serum calcium level is 8-10 mg/dl, lower than 7.5 mg/dl considered as hypocalcaemic).

Treatment and discussion

Milk fever cattle was treated with 25% calcium borogluconate intravenously. Immediately after infusion of calcium the cow was able to stand without any assistance. Cow showed normal behavior.

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POTENTIAL APPLICATIONS OF NANOPARTICLES AND CELL DERIVED NANOVESICLES

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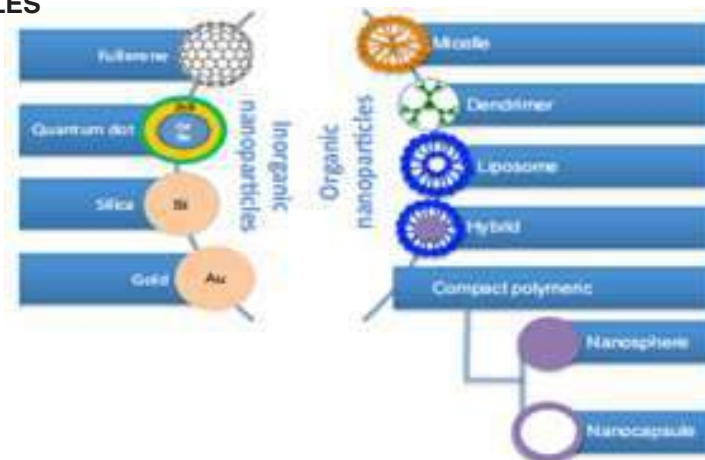
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Introduction

Nanoparticles are nanosized colloidal structures composed of synthetic or semisynthetic polymers whose size ranges about 1 - 100 nm in diameter. The drug is either dissolved, entrapped, encapsulated, or attached to nanoparticle matrix. The first reported nanoparticles were based on non-biodegradable polymeric system that is polyacrylamide, polymethyl methacrylate, polystyrene etc. by Birrenbach and Speiser, 1976. These nanoparticles are increasingly used in different applications, including drug carrier systems and to pass organ barriers such as the blood-brain barrier. Because of their unique properties Nanocrystals and other nanoparticles have been receiving a lot of attention for potential use in Therapeutics, Bioengineering and drug discovery.

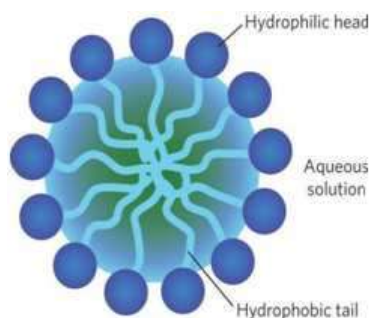
TYPES OF NANOPARTICLES



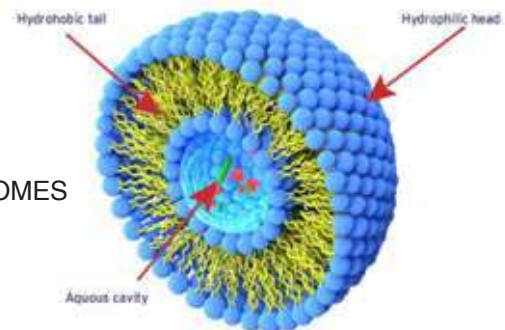
MICELLES

Micelles are nanostructures made of amphiphilic molecules, like polymers or lipids. When exposed to aqueous environments, they hide their hydrophobic groups inside the structure and expose the hydrophilic groups. On the other hand, when in lipid-rich environments, their structure may organize in a reverse way.

MICELLES
LIPOSOMES



LIPOSOMES



Liposomes are concentric bilayered vesicles in which an aqueous volume is entirely enclosed by a membranous lipid bilayer mainly composed of natural or synthetic phospholipids. Liposomes have been used successfully in the field of biology, biochemistry and medicine. Main advantages, they are completely biodegradable, compatible, non-toxic and non-immunogenic.

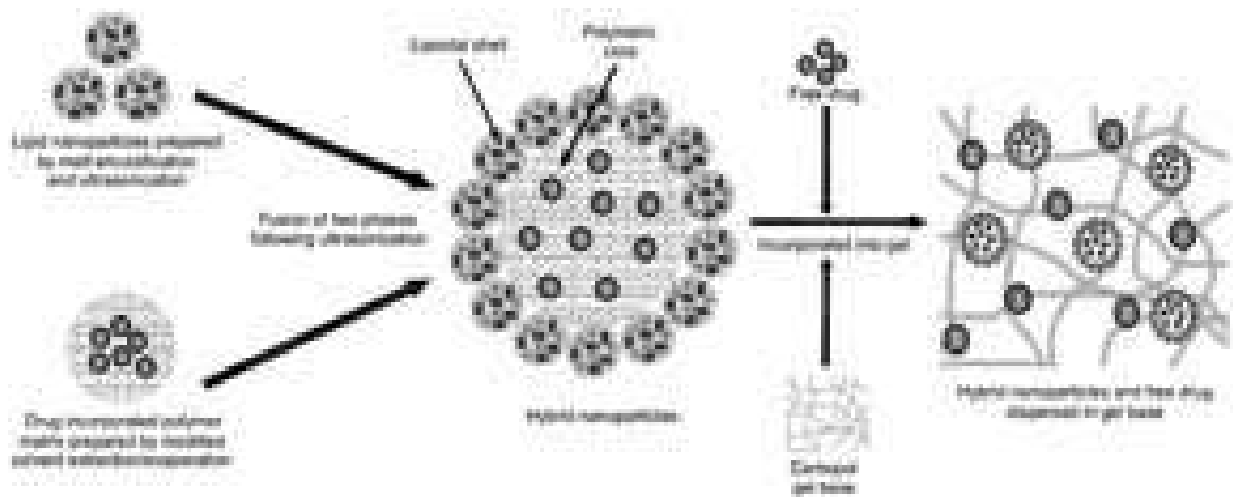
DENDRIMER

Dendrimers, a unique class of polymers, highly branched macromolecules whose size and shape can be precisely controlled. Drug molecules can be incorporated into dendrimers via either complexation or encapsulation. Dendrimers are being investigated for both drug and gene delivery, as carriers for penicillin, and for use in anticancer therapy.



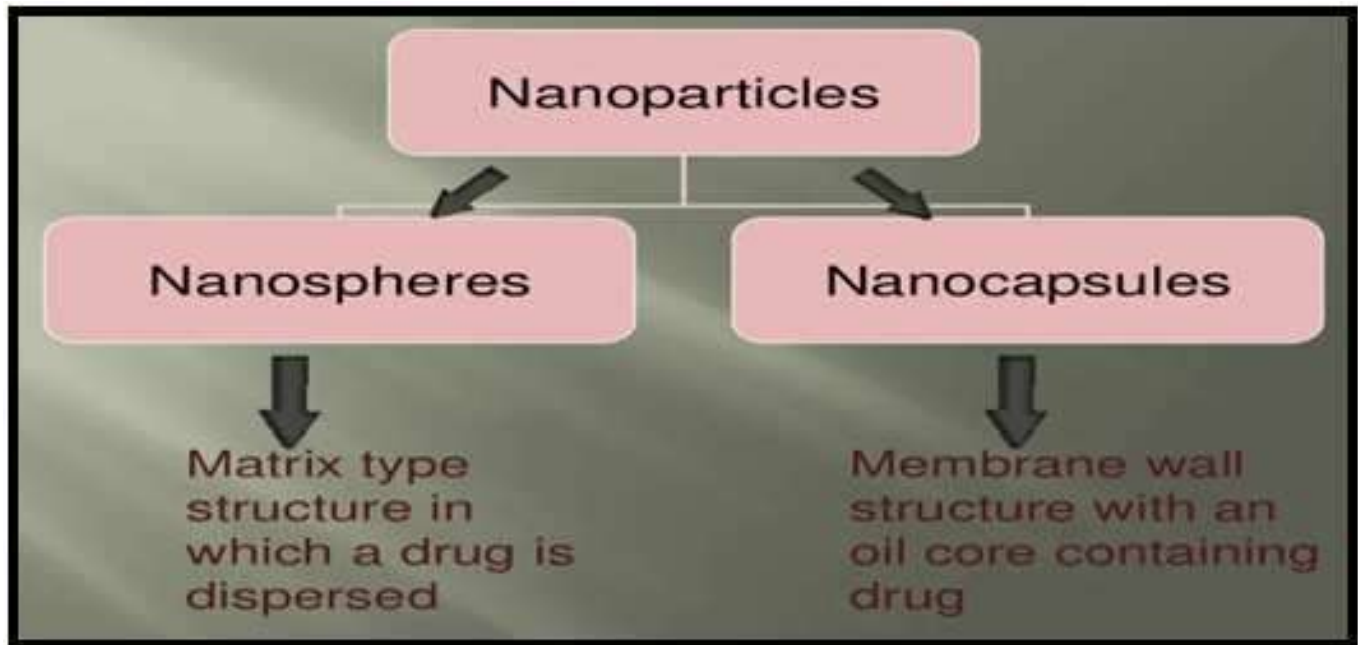
HYBRID NANOPARTICLES

An intermediate type of NPs is the CSPL hybrid NPs. In its structure a biodegradable hydrophobic polymeric core and a lipidic outer monolayer are present. CSPL hybrid NPs bring together complementary characteristics of both structures, namely higher stability, enhanced drug encapsulation yield and superior in vivo cellular delivery efficacy.



COMPACT POLYMERIC NPs

Compact polymeric NPs are nanostructures made entirely of natural or synthetic polymers. They are usually more stable than liposomes allowing sustained localized drug delivery for weeks, with reduced drug leakage.



CARBON STRUCTURES

NPs can also be simply made of carbon molecules with various highly symmetric and stable forms, called fullerenes (allotrope of carbon). C60 the most well-known fullerene, is a rigid icosahedron with 60 carbon atoms. Their unique optic, electric and magnetic properties (such as superconductivity), rendering them important devices in medical diagnosis and imaging.

QUANTUM DOTS

Quantum dots used in imaging, detection and targeting the cells are luminescent semiconductor crystals. Quantum dots present a broad absorption range and narrow emission spectra. quantum dots present high photostability, being remarkably resistant to photobleaching. The use of quantum dots is based on their unique chemical and physical properties, achieved due to their size and highly compact structure.

SILICONS

The most commonly investigated silicon-based materials for drug delivery are porous silicon and silica, or silicon dioxide. Examples of therapies with silicon-based delivery systems include porous silicon embedded with platinum as an antitumor agent. CPS designed as an artificial growth factor. Silicon nanopores for antibody delivery. Porous silica nanoparticles containing antibiotics, enzymes, and DNA.

APPLICATIONS OF NPs

TARGETED DRUG DELIVERY

A key area in drug delivery is the accurately targeting of the drug to cells or tissue of choice. Nanoparticles can be used in targeted drug delivery at the site of disease to improve the uptake of poorly soluble drugs the targeting of drugs to a specific site, and drug bioavailability. Several anti-cancer drugs including paclitaxel, Dox, 5fU and dexamethasone have been successfully formulated using nanomaterials. PLGA and PLA based nanoparticles have been formulated to encapsulate dexamethasone. Being a glucocorticoid, dexamethasone is a chemotherapeutic agent that has anti-proliferative and anti-inflammatory effects.

Gold NPs (Detect cancer)

Gold nanoparticles used as ultrasensitive fluorescent probes to detect cancer biomarkers in human blood. Gold

nanoparticles are promising probes for biomedical applications because they can be easily prepared and, unlike other fluorescent probes such as quantum dots or organic dyes, don't burn out after long exposure to light.

Stem cell Therapy and Imaging

Nanoparticles may prove effective tools for improving stem cell therapy. Chemical engineers have successfully used nanoparticles to enhance stem cells' ability to stimulate regeneration of damaged vascular tissue and reduce muscle degeneration in mice. Nanoparticles can be designed to enhance fluorescent imaging or to enhance images from PET or ultrasound. Nanoparticles and nanofibres play an important part in the design and manufacture of novel scaffold structures for tissue and bone repair. The nanomaterials used in such scaffolds are biocompatible. For example, nanoparticles of CHA, a natural component of bone, used in combination with collagen or collagen substitutes could be used in future tissue-repair therapies.

Other applications

- ❖ Nanoparticles can act as controlled release system depending on their polymeric composition.
- ❖ less amount of dose is required.
- ❖ Reduce side effects & reduce drug toxicity.
- ❖ Can be administered by various routes - oral, nasal, intra ocular etc.
- ❖ Particle size and surface characteristics of nanoparticles can be easily manipulated to achieve both passive and active drug targeting after parenteral administration.
- ❖ Nanoparticles aid in efficient drug delivery to improve aqueous solubility of poorly soluble drugs.
- ❖ Nanoparticles overcome the resistance offered by the physiological barriers in the body.

CELL MEMBRANE DERIVED NANOVESICLES

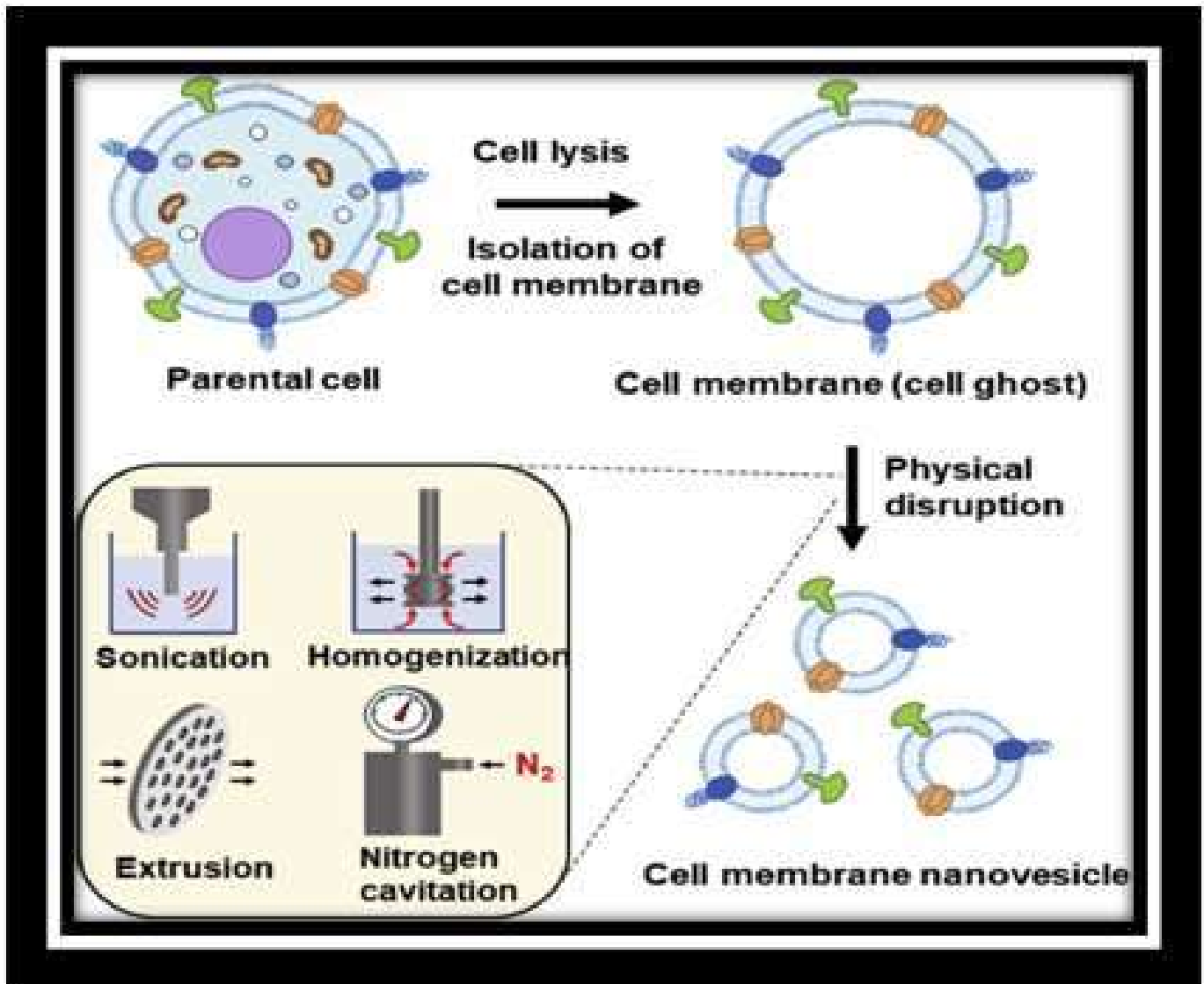
Unlike synthetic lipid or polymeric nanoparticles, cell membrane-derived vesicles have a unique multicomponent feature, comprising lipids, proteins, and carbohydrates. Cell membrane-derived vesicles can carry therapeutic agents within their interior or can coat the surfaces of drug-loaded core nanoparticles. Cell membranes typically come from single cell sources, including red blood cells, platelets, immune cells, stem cells, and cancer cells.

PREPARATIONS OF CMDVs

- o Cell membrane-derived vesicles are prepared through a multistep process that includes digestion of parent cells, purification of cell membranes, and formation of vesicles.
- o First, the parental cells are broken down by lysing with a hypotonic buffer.
- o Second, the mixture of cell membranes and other cellular components, such as cell nucleus and cytoplasmic organelles, are separated by centrifugation.
- o Third the collected cell membrane is physically broken (by homogenization, sonication, extrusion, and nitrogen cavitation) to yield cell membrane nanovesicles of the size of interest.
- o Functions of CMDVs can be modified using two basic strategies: pre-modification and post modification.
- o With pre-modification changes made before disruption of parent cells, and post-modification corresponding to introduction of new components into membranes after isolation.
- o Post modification of CMDVs were modified with various materials to modulate their chemical and biological behaviors.
 - (A) lipid compositions of membranes were modified to increase the stability of vesicles.
 - (B) Enzymes or other proteins were grafted onto the surface of cell membrane vesicles to provide functionality.
 - (C) Nucleic acids, such as aptamers, were conjugated to cell membrane vesicles for targeted delivery.
 - (D) Synthetic polymers (such as PEG) were grafted into cell membrane vesicles to prolong their circulation time in blood.

APPLICATIONS OF CMDVs

RBCs membrane derived vesicles-RBC membranes have received considerable attention as a nanoparticle-coating biomaterial. Dox loaded MPPB nanoparticles have been coated with RBC membranes for photo-chemotherapy applications. Plain MPPB nanoparticles suffer from physical instability, short half-life, and nonspecific uptake by macrophages. The RBC membrane coating improves these pharmacokinetic properties, increasing blood circulation time and decreasing non-specific uptake; it also provides synergistic anticancer effects through combined chemotherapeutic and photo therapeutic actions.

**PLATELETS MEMBRANE DERIVED NVS**

Researchers in the drug-delivery field have developed an interest in platelets because of their ability to target specific sites and evade the immune system. Platelet membranes were used to coat PLGA nanoparticles with imaging agents. For diagnostic imaging, a fluorescent dye was loaded into PLGA nanoparticles, with concurrent incorporation of lipid-chelated gadolinium into the lipid bilayer of the platelet membrane. The resulting membrane-coated nanoparticles provided magnetic resonance imaging capability that was localized to regions of arteries that are prone to plaque formation.

STEM CELL DERIVED VESICLES

Stem cell membranes have been used to coat drug-loaded nanoparticles. PLGA nanoparticles have been coated with cardiac stem cell membranes for use in tissue-repair applications. In this application, direct intramuscular injection of cardiac stem cell membrane-coated nanoparticles carrying stem cell-secreted proteins was found to alleviate symptoms in a mouse model of myocardial infarction

CANCER CELL DERIVED VESICLES

Cancer cell membrane-coated nanoparticles have been studied for a variety of cancer therapy applications as cancer cell membrane's have ability to penetrate the blood-brain barrier. Coated polycaprolactone/F68 nanoparticles with brain metastatic tumor cell membranes and loaded the resulting nanoparticles with indocyanine green, used as an imaging and photothermal agent. Intravenously injected nanoparticles were shown to distribute to the brain in glioma cell-bearing mice. Cancer cell membrane-coated nanoparticles showed greater accumulation in the brain compared with uncoated nanoparticles.

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NEONATAL CARE OF FRENCH BULLDOG PUPPIES - A Personal Account

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Introduction

The bat ears, large bright eyes, stubby tail, compact and muscular body, playful nature and remarkably docile demeanour; some of the innumerable qualities that make the French bulldogs an excellent companion animal. Due to their smaller body size, these dogs make good travel companions as well. Additionally, their intelligence and quick adaptability ensure that they are safe to be let about around infants and older members of the family as well (Packer et al., 2020). It is no wonder that they have taken the world by storm (Mills, 2018) and now most dog lovers around the globe want a 'Frenchie' of their own. To these statements, I can attest myself for I have a 4 years old female French bulldog - one of the most brilliant dogs that my family has ever had the privilege to own. She has incorporated herself into the typical Indian family hierarchy quite efficiently and has her own distinctive place as the 'granddaughter' of my parents.

However, during these past four years, one major concern surfaced itself time and again to my veterinarian parents: Pyometra. Throughout his clinical experience of beyond 30 years as a veterinary surgeon, my father has observed numerous cases of 'unmated' bitches ending up with a serious and life-threatening condition called Pyometra (Rootwelt-Andersen and Farstad, 2006 and Smith, 2006).

Pyometra is defined as an intrauterine accumulation of pus accompanied by a persistent corpus luteum and failure of oestrus. Apparent failure of the endometrial luteolytic factor or endogenous prostaglandin to cause luteolysis makes bitches appear and behave as though they were gestating. Risk factors for pyometra include increasing age, nulliparity, breed, and exogenous oestrogen or progesterone administration (Salgado, 2007 and Shekhar, 2008).

Spaying (Ovariohysterectomy) completely and promptly removes the infection, prevents uterine rupture and peritonitis, and prevents recurrence, in most cases. Spayed animals do very rarely develop pyometra in the uterine stump. Even so, ovariohysterectomy is currently considered the most effective and safest treatment (Rootwelt-Andersen and Farstad, 2006 and Smith, 2006).

It is thus, a very important disease to be aware of for any dog or cat owner because of the sudden nature of the disease and the deadly consequences if left untreated. While it is observed that this condition may occur in any dog regardless of age and mating history, it is more common in bitches that have not whelped even once throughout their life (nulliparous) (Pretzer, 2008).

Therefore, after a proper discussion and consultation with scientific literature, we decided to allow our French bulldog to mate with a healthy adult male of the same breed.

Little did we know what was in store for us in the next few months to come. Our dog conceived successfully and started showing some symptoms of gestation such as gradual enlargement of abdomen, quick exhaustion, reluctance to run or play, enlargement of mammary glands, etc (Johnson, 2008). However, she lost her appetite abruptly and refused to eat her meals about two weeks into her pregnancy. As her abdomen rapidly grew in size, her appetite reduced alarmingly (Ivanova, 2018). To manage the issue, she was given appetite inducers, liver supplements and shifting of meal ingredients from fish, to egg, to chicken, to pork alternatively, in an attempt to spark her interest. She ate almost nothing. There was gradual loss of condition as her abdomen distended significantly. At merely 30 days of gestation, her general appearance was of a bitch at full term. A general abdominal ultrasound was conducted on the 40th day of gestation and roughly 7 puppies were observed (Kustritz, 2005 and Cartee, 1984) even though the number could be greater since unlike X-ray, the number of foetuses cannot accurately be determined using ultrasonography (Forsberg et al., 2010) and we were unwilling to conduct radiography due to radiation hazard (Storr, 1962).

As she entered the end of her term, Paris was visibly distressed due to the significant enlargement of her uterus and its extension cranially rendering her unable to rest in dorso-ventral or lateral recumbency due to the increased pressure on her diaphragm restricting sufficient inflation of her lungs during respiration. She instead preferred to sit close to walls and furniture and lean for support, thus keeping her thorax elevated than her abdomen to reduce pressure on her diaphragm while breathing.

There were a couple of concerns we were ailed with. Since French bulldogs are known to have a narrow pelvic girdle (Markovics, 2010 and Lehmann, et al., 2021) and foetal head size is typically large, normal parturition could lead to lodgement of the head of the foetus in her birth canal leading to dystocia (O'Neill et al., 2019 and Runcanet al., 2018). This is why being a veterinary surgeon; I had made all preparations for a caesarean section.

Additionally, on an average, French bulldogs have no more than 5 puppies per litter (Goleman, 2015) but in the case of my dog Paris, her litter size appeared considerably larger upon ultrasonography, which could be correlated with her abnormally distended abdomen.

On the 58th day of gestation, she displayed vivid signs of labour such as nesting, restlessness, panting and straining. We were alarmed due to her pre-term parturition since there were still 3-5 days of pregnancy remaining. At 6:30 pm in the winter evening she delivered her first puppy via normal parturition without incident and continued to deliver 8 more over the next 7 hours and delivered a total of 9 puppies of which one was still-born. The pups had lower body weight and were visibly smaller in size compared to normal French bulldog neonates and that perhaps could be the reason why they were delivered naturally through her narrow pelvis (Groppettiet al., 2015 and Borgeet al., 2011). It was severely cold and raining outside.

She displayed admirable maternal instinct and licked away the foetal membranes from all the puppies enabling them to breathe and stimulated them by licking their faces and bodies until the pups let out their first cries (Lezama-García et al., 2019).

The umbilical cords were ligated firmly using Polyglactin 910 (size 2/0) suture at a distance of 1.5 inches from the umbilicus, then snipped distal to the ligation with a pair of sterile scissors. The puppies were cleaned and stimulated further by rubbing gently with sterile absorbent cotton. Unlike most other breeds of dogs, Paris readily allowed us to handle and care for her pups, trusting us completely to keep them safe.

Considering the chilly weather, the pups were provided with sufficient baby blankets and an electric heater placed 1.5 metres away to stay warm without overheating. On the first two nights, the puppies were allowed to remain with the mother however; we lost another pup as a result of crushing injury inflicted due to her lack of experience (Cline, 2012).

It was then decided to undertake human intervention so as to ensure the safety of the remaining 7 puppies and avoid such accidents in the future (Czerwinski et al., 2016). On the 4th night however, the mother managed to get into the basket housing her puppies, reached in with her mouth and carried out one puppy then took her to her bed. The puppy was licked thoroughly by the mother and was only discovered approximately 4 hours after the incident. By then the puppy was hypothermic and dehydrated. Due to severe dehydration and subsequent hypoglycaemia, she was very weak, unable to suckle milk and twitched in frequent intervals. Intensive care was initiated immediately and the puppy was separated from the rest, kept constantly warm at 39 degrees Celsius, fed artificial milk in intervals of 1 hour. However, not much improvement could be observed. 33 hours later, I decided to dip my small finger in honey and allow the puppy to taste it. After repeating the procedure thrice, she visibly regained strength and began suckling on the finger showing intent. I continued to feed her the milk replacer at 1 hour intervals and 0.5-1.0 ml of honey twice daily (Ranjan, 2010). This was continued until she regained vigour and could suckle her mother's milk without assistance and was then released back to her litter.

The puppies were closely monitored and allowed access to the mother only during the nursing times maintained for the first 3 weeks at 3 hour intervals where the puppies were given mother's milk and supplemented with 'Babydog Milk' by Royal Canin. Cotton balls dipped in warm water were used to gently rub the anal orifice and penis/vulva to stimulate defecation and urination, respectively. This is an essential step since most puppies at neonatal stage are unable to void faeces and urine independently and require stimulation from the mother by licking or artificially using soaked cotton balls

(Connolly, 2012). In the case of Paris, she would tend to lick using excessive pressure perhaps due to her overwhelming maternal instinct, which is why we had to deter her from doing so and took charge of the issue ourselves.

From the 4th week, feeding was repeated at 4 hour intervals and subsequently increased to 6 hours at the age of 6 weeks.

The pups were shifted from milk to mini starter ration by Royal Canin at 4 weeks age, to be continued until 16 weeks. They are currently 12 weeks old and in the past couple of months, I have put my theoretical knowledge on neonatal care of puppies into practical application.

General status of health could be assessed by observing faecal consistency and frequency. Neonates void yellow or brown semi-solid faeces with a seedy appearance at intervals of 2 to 3 hours. Faeces solidify gradually and take the form of small boli in healthy puppies without gastrointestinal ailments and having sufficient hydration (Lawler, 2008).

Anaemia was assessed by colour and dryness of the oral mucous membranes, dehydration could be assessed by pulling the skin on the back using thumb and index finger as well as the colour of urine. Healthy puppies void clear, colourless to slightly yellow urine, and dehydrated puppies have dark yellow urine voided in scanty quantities. Health assessment at birth was made using Apgar scoring and later by detailed physical evaluation (Veronesi, et al., 2009).

The first two weeks are very crucial since the puppies were prone to hypothermia and hypoglycaemia if optimal room temperature and feeding schedule is not carefully maintained. Thermoregulatory mechanism is not active in puppies until 3 weeks of age rendering them prone to rapid decline in body temperature, which needs to be controlled using external heating system, maternal body heat and consumption of mother's milk (Reyes-Sotelo, et al., 2020).

The puppies' eyes opened at 9 days age. Methylcellulose eye drops were instilled at 6 hour intervals for one week to prevent corneal desiccation.

The mother resumed feed consumption the morning after her delivery. Her diet was supplemented with multi-mineral and multivitamin syrup (Multistar Pet) and calcium chew tablets (Drools), help her regain optimal health as well as to sustain the high nutritional requirements during lactation (Greco, 2008).

All puppies were vaccinated with Puppy-DP (Distemper and Parvovirus) at 30 days age considering the facts that Paris missed her vaccination during her pregnancy and a Parvoviral infection was on-going as an epidemic in the city. Additionally, the puppies were kept under complete isolation and I had to place myself under home-isolation since I would encounter multiple Parvo and Distemper cases at my workplace. No visitors were allowed until 60 days age when they were administered with vaccination against DHPPiL (Canine Distemper, Infectious Canine Hepatitis, Parvovirus, Parainfluenza and Leptospirosis).

It is with great pride that I can say that all seven puppies have shown remarkable growth and development, are healthy, happy and playful.

FIGURES :



A healthy female French bulldog (Paris), 4 years age.



A photograph of Paris at 30 days of gestation, with distended abdomen and mildly enlarged mammary glands.



A photograph of Paris resting with her fully-fed neonate puppies after nursing.



Six French bulldog puppies of 60 days age, sitting attentively for a photograph.

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USE OF ANTIBIOTICS AS GROWTH PROMOTOR IN POULTRY FARMING : THREAT TO HUMAN

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Introduction

India is one of the leading producers of poultry meat in the world. Poultry meat consumption has increased in recent years as consumers are attracted not only to lower prices but also product consistency and adaptability as well as higher protein/lower fat content. In 2021, the consumption of poultry meat in India was found to be over four million metric tons. By the end of this decade, globally, poultry meat is expected to represent 41 per cent of all the protein from meat sources, according to the OECD-FAO Agricultural Outlook 2030. According to government data, poultry meat production has been expanding from 3.7 ml t in 2017-18 to 4.3 ml t in 2019-20. Although ambitious, some projections suggest, by 2023, the country may produce 6.2 ml t poultry meat. (Business line Indian poultry industry poised for growth 15 Aug 2021)

The use of antibiotics as feed additives has been a hallmark of modern animal husbandry. The poultry industry uses antibiotics to improve meat production through increased feed conversion, growth rate promotion and disease prevention. Antibiotics can be used successfully at sub-therapeutic doses in poultry production to promote growth (Chattopadhyay, 2014) and protect the health of birds by modifying the immune status of broiler chickens (Lee et al., 2012). This is mainly due to the control of gastrointestinal infections and micro biota modification in the intestine (Singh et al., 2013). Organization for Economic Cooperation and Development (OECD) estimates that the amount of antimicrobials used in food animals will escalate globally from 63,151 tons in 2010 to 105, 596 tons by 2030- an increase of 67%. More than 26% of the antibiotics used in veterinary practice were intended for poultry, mainly for broilers, resulting in a yearly exposure of 430 mg of antibiotic/kg/year of poultry (Van den Bogaard, 2000). This was considerably higher than the antibiotic usage in other food animal populations (Van den Bogaard, 2000).

Uncontrolled usage of antimicrobials in food animals as poultry has created selection pressure and fostered the emergence and spread of antimicrobial resistant pathogens worldwide. Resistant microbes and resistance genes can circulate between human, animals, food, water and the environment. Since many antimicrobials commonly used in livestock and poultry are the same as or similar to antimicrobials used in human medicine, there is global concern that drug-resistant organisms may pass from animals to humans and present a serious threat to public health. Non-therapeutic usage of antibiotics has been especially common in poultry production. Scientific evidence suggests that the massive use of these compounds has led to increased problem of antibiotic resistance (Forgetta et al., 2012,) and presence of antibiotics residues in feed and environment (Gonzalez Ronquillo et al., 2017) compromises human and animal health (Diarra et al., 2010). Resistance in commensal bacteria often is high to broad spectrum of antimicrobials (Goldstein et al., 2001). Antibiotic selection pressure for resistance in bacteria in poultry is high and consequently their fecal flora contains a relatively high proportion of resistant bacteria (Van den Bogaard et al, 2002). The presence of antimicrobial resistant micro-organisms in fecal material of animals is becoming a matter of great concern because these microorganisms could be transmitted to humans through a contaminated food and water supply.

The increase in antibiotic resistance is a global concern for human and animal health. Resistant microorganisms can spread between food-producing animals and humans antibiotics are also widely applied in food-producing animals, which can serve as a reservoir of antibiotic-resistant bacteria and AR determinants that may be transferred to humans (Marshall and Levy, 2011). Subsequently, the effectiveness of antibiotics in humans decreases, resulting in treatment failures (Mellata, 2013; European Food Safety Authority and European Centre for Disease Prevention and Control, 2016).

Antibiogram test revealed multi-pharmacological resistance in Enterobacteriaceae isolates from eggs and broiler meat (Diarra et al., 2010, Yulistianiet al., 2017). Eggs are frequently implicated in Salmonella transmission (Singh et al., 2010).

This contamination is due mainly to the proliferation of pathogens in the intestines. There are secondary contaminations along the production line by resistant bacteria in foods of animal origin. Schwaiger et al. (2012) reported that the prevalence of multi-resistant of Salmonella was higher in retail samples compared to slaughterhouse samples. The animal intestinal tract can act as a reservoir for vancomycin resistant Enterococcus (VRE) and food-producing animals can directly transfer VRE to humans via the food chain (Kuhn et al., 2005). Animals, especially livestock, such as chickens and pigs, have consistently been reported as the reservoirs for VRE (Vignaroliet al., 2011). Several studies suggest that poultry products could be a source of vancomycin resistant Enterococcus (VRE) in humans through the food chain (Roberdoet al., 2000). The results of previous studies have indicated that the use of avoparcin, gentamicin (GEN), and virginiamycin for growth promotion and therapy in food animals has led to the emergence of VAN- and GEN- resistant enterococci and Quinupristin-Dalfopristin-resistant *E. faecium* in animals and meat (Hammerum et al., 2010). Avoparcin, an antibiotic used only for growth promotion in animals, shows full cross-resistance with the human hospital drug vancomycin and partial cross-resistance with teicoplanin. All these antibiotics are glycopeptides. This is causing great concern because, following the first description of human infections with GRE in 1986 (Uttley et al., 1988), these infections have become a serious problem in the hospital environment, especially in the United States (Huyke et al., 1998). The occurrence of GRE in food animals was associated with the use of the glycopeptide antibiotic avoparcin in Europe (Bates, 1997, Butaye, et al., 1999).

Not only the antibiotic resistance has negative consequences, but residues in livestock products can actually have adverse impact on human health; this is the case for tetracyclines, which interfere with teeth development in young children (Kummerer, 2009). This is also the case with beta-agonists, such as clenbuterol, leading sometimes to food poisoning and muscle tremors, palpitations and tachycardia (Chan, 1999). Further, chloramphenicol illustrates both potential problems (Gassner and Wuethrich, 1994). Gassner and Wuethrich (1994) have demonstrated the presence of chloramphenicol metabolites in meat products. These authors concluded a possibility link between the presence of these antibiotic residues in meat and the occurrence of aplastic anemia in humans.

The transfer of drug resistance from animals to humans is like an uncontrollable nuclear chain reaction. Additionally, eating small doses of antibiotics in food also leads to the development of antibiotic-resistant bacteria in humans. There is very limited surveillance for the ABR in animals and food. There are isolated studies, which have indicated high levels of ABR across animal commodities and systems, but they are yet to be unified under a nationally scaled program. There are few laws governing the use of antimicrobials for cattle, chicken, and pigs raised for domestic consumption in India, with no stringent implementation protocols even when there are regulations. . If there is no immediate and radical actions taken collectively against this trend, soon humans will be running out of options to save lives and the world will go backward to a pre-antibiotic era.

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BEHAVIOURAL PATTERNS IN POULTRY AND THEIR WELFARE

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Abstract-

Poultry production for decades has had the status of the fast-growing agricultural sector, and it is expected to continue to grow along with demand for poultry meat and eggs. The progress has been made by changes in technology which increased the number of birds per farmer and labor productivity, and also by selective breeding directed to improving the size, fecundity and growth rate of birds. However, intensification of the production has also resulted in many welfare problems manifested as damaging behaviour, injuries of specific body parts, various kinds of diseases, and the increased mortality rate of poultry. Welfare problems are usually multifactorial but basically, they arise when animals cannot realize their natural behavioural needs. Certain species-specific behaviour patterns in poultry species are very strongly motivated, such as nesting, perching, dust bathing, and scratching; if the birds are not allowed their expression that leads to frustration, abnormal behaviour manifesting and/or to injury. The wounds cause physical pain to the birds and may also be a source of infection and disease. Thus the present review aims at discussing, on scientific research studies of the behaviour of poultry and its relationship to welfare.

INTRODUCTION

This objective of this review is to present scientific research studies that relate different behaviors to chicken welfare. Poultry behavior is a reflex of their welfare status at a particular moment, and it is related to internal (physiological) and external (environmental) factors. Several natural behaviors that favor welfare, as well as undesirable behaviors, may be stimulated by environmental enrichment. The correct interpretation of the behaviors expressed by poultry, including their frequency, duration, and sequence, may be used to estimate their welfare.

One of our key principles is based around providing conditions that enable birds to perform their natural behaviours. In this section we consider current knowledge on a number of different behavioural aspects and how these impact on the way we should manage poultry.

The following behaviors are reviewed: feather pecking, scratching, dust bathing, nesting, locomotion activities, and aggressive behaviors. These behaviors are the most frequently observed in commercial broiler, broiler breeder, and layer farming, and therefore, monitoring their incidence may contribute to measure poultry welfare.

Another major welfare indicator is animal locomotion. According to Garcia et al., (2012) many behavioural patterns depend on locomotion, such as exploring the environment, seeking food, water, and shelter, and escaping predators. However, easy access to resources such as water, food, and shelter, associated with monotonous environments, high body weight, and high stocking density, interfere in walking ability and reduce the exploratory behaviour.

The most frequently observed behaviors in commercial broiler, broiler breeder, and layer farming could be catalogued into following headings -

Natural Behaviour - Those behaviors shown by the species under wild conditions and at the same frequency, duration or intensity. It does not include those behaviors that are shown only in captivity but not seen in the wild or those shown at a level that differs from the wild.

Abnormal Behaviour - Abnormal behaviour is that which deviates from behaviour in the wild and causes problems to humans, the animal or its group members. Many forms of abnormal behaviour exist but all are caused by a mismatch in what the animal needs from what the environment provides or an inability to control the environment.

NATURAL BEHAVIOUR

DUST BATHING includes a sequence of behavioral components. Firstly, the bird pecks and scratches the potential dust bathing place, and then sits on a spot and starts to gather loose substrate (commonly sand/sawdust/paper scrapping set) particles around its body. Still sitting, the bird flaps its wings to spread the particles in the air and to allow them to settle

on its feathers. It then lies down, rubbing its neck and the sides of body on the substrate, and finally shakes itself to remove the particles.

Dust bathing removes external parasites and improves feather conditions, to cleanse the skin and feathers from external parasites, dead skin, and other skin irritants, helps to prevent the buildup of the oil from preening, to balance lipid levels in the feathers.

According to Pereira et al. (2007), it is a mechanism of heat loss by conduction. This sequence of movements, which involves body rotation and leg stretching, may also be considered an exercise, as it makes leg muscles stronger, thereby preventing leg deformities and walking incapacity (Shields et al., 2004).

It is also a social behavior, because birds commonly express this behavior in groups (Olsson et al., 2002).

Abnormal behaviour - When chickens do not have access to dust baths, they will nonetheless go through the motions of dust bathing. In behavioral studies, hens have shown a willingness to work; to gain access to material; for dust bathing.

SCRATCHING

The behavior of scratching is expressed when the bird scratches the litter with its feet in a backward movement, and pecks the litter in search of food.

According to Bracke&Hopster (2006), this behavior is very important to the bird because, its higher intensity, duration, and incidence indicate better bird welfare. Wiepkema (1987) developed a model relating the expression of a behavior that results in welfare (Sollwert) with how its expression is cognitively perceived by a bird (Istwert); the difference between these two parameters would determine how the bird responds to the environment.

When layers are housed in battery cages in commercial farms, there are large differences between Sollwert and Istwert because, among other deprivations, there is no litter available for scratching.

Abnormal behaviour /Consequences of the frustration of scratching behavior is the negative behavior of feather pecking. Haas et al. (2010) observed that poultry may redirect their scratching behavior to pecking the feathers of other birds when their foraging possibilities are limited.

PREENING is a chicken's way of grooming herself. Feathers are meant to insulate and provide waterproofing, which they can't do if they are dishevelled. Purpose- to reapply oils to the feathers. Chickens have an oil gland at the base of their tail, and they pinch this with their beaks before preening.

ROAMING - Wild poultry are active, daily moving long distances within their home range to forage, while at night they roost. Except in waterfowl, flight is infrequent.

Purpose- stretching their legs and getting some fresh air, chickens enjoy foraging for food while they roam, trying to find a place to take a dust bath, or a place to make a nest

Abnormal behaviour - Constantly being in close quarters with other chickens can cause stress, aggressive behavior, and even illness. Roaming around helps the chickens stay care-free.

FORAGING - In the wild, jungle fowl spend 61% of their time foraging. Foraging behaviors include pecking and scratching at potential food sources, as well as looking for and sampling possible food sources. Providing chickens with a complete feed eliminates the need for foraging in order to obtain nutrients, but the hens will continue performing this behavior.

Although finding food is not the ultimate goal of the foraging behavior in domesticated fowl, researchers have not yet been able to determine the motivation for this behavior. There are a number of theories, but little evidence to support them.

PERCHING- Chickens have a desire to roost. At about three weeks of age, chicks start to jump up to higher surfaces. The structure of a chicken's claws ensures a firm grip while the chicken is perching and will prevent the chicken from falling off a tree branch, even when the bird is asleep.

They seem to perch when the light is about 1.25 foot-candles. The "flying down" time in the morning is typically 30 minutes before dawn, at around 0.003 foot-candles of light. Again, the actual timing of this activity varies depending on the weather conditions. Chickens snuggle together during the night and start spreading out about two hours before the

lights come on.

Dust bathing, together with preening, is a common strategy for feather and skincare . Birds that cannot perform either of these two behaviors (e.g. due to the lack of a dustbathing substrate or shortened beak) may have a severe problem with ectoparasites such as red mite (*Dermanyssusgallinae*) . A form of preening behavior which domestic fowl may show after mild or short-term frustration is "displacement preening" .Displacement behavior usually occurs when an animal is torn between two conflicting drives, such as fear and aggression .

LOCOMOTION ACTIVITIES

Bracke&Hopster (2006) mention that some species-unspecific behaviors i.e. behavior that are expressed by several species, such as playing, walking, stretching the limbs, turning, standing up and lying down normally, are highly beneficial to welfare.

Buijset al. (2010) observed that the duration of the expression of the behaviors of standing, lying, scratching the litter or feeding were not influenced by stocking density in broiler flocks; however, the duration of sitting and preening was shorter at higher stocking densities, as well as walking, which was increasingly reduced during the last weeks of the flock.

Maríaet al. (2004) associated reduced locomotion activity with increased stress caused by the frustration of the expression of some behaviors, such as lack of access to nests (Duncan,1998), or by high environmental temperatures, in an attempt to exchange heat with the litter.

According to Leone &Estévez (2008), there are several benefits of environmental enrichment topoultry, including more even distribution of birds in the space available, which allows more activity and locomotion and reduces disturbances and aggression, as well as fear and stress.

FEEDING BEHAVIOUR

Food requirements are affected by energy needs, nutrient density and diet palatability. Chickens have the ability to choose a nutritionally adequate diet from a range of different foods, and they have specific appetites for key nutrients. Birds tend to feed as a group, in large flocks, enough space should be provided to allow most birds to feed simultaneously, otherwise they could be frustrated and production may decrease.

Under natural conditions, wild birds are faced with an array of different food items that vary widely in nutritional composition; from these, they are capable of selecting a diet that is adequate for all their requirements.

Domestic birds can similarly choose a diet that provides them with all needed nutrients; if they are offered a range of different foodstuffs. For example, domestic fowls that are deficient in a particular nutrient such as Ca or Na show an increase in generalized searching behaviour, pecking at objects that they would not normally investigate. They continue to consume those items that are palatable and nutritious. Even when fed concentrated feeds, poultry will still consume herbage if it is available.

Consequences of the frustration of Feeding behaviors are -

Food intake varies between housing systems, being lower in cages than in non-cage systems (Due to lowered physical activities). Illumination levels, also influence feed consumption. Hens show a preference for feeding in bright (200 lux) as opposed to dim (< 1 lux) light since poultry are often kept in dim lighting to reduce feather pecking or activity, so this lack of illumination may depress feeding activity.No possibilities of choosing desired feed and completely depended on the provided feed in the feeder.

DRINKING BEHAVIOUR

Young chicks are initially unable to recognize water. They have, however, a tendency to peck at shiny surfaces. This results in them pecking at a pool of water, and once their beaks are immersed they begin to learn to drink; the characteristic movement during which the head is raised and swallowing occurs is innate. Chicks under commercial conditions have some difficulty in learning to peck at nipple drinkers; this movement has to be learnt. For this reason, the pressure in the system is often increased for the first few days, so that water drips slowly from the drinkers, thus encouraging the chicks to peck at the shiny drops. Drinking is closely associated with feeding.

PROBLEMS ASSOCIATED WITH DRINKING BEHAVIOUR -

In broilers, problems can arise with wet litter. This may be due to inadequate ventilation or poorly designed drinkers where, at high stocking densities, pushing and jostling between birds causes the drinkers to be tipped and water to spill. Other possible causes are nutritional: a diet that is too high in minerals, especially sodium or potassium, can lead to overdrinking, while high-fat diets have also been implicated. The wet litter can result in high concentrations of atmospheric ammonia, hockburn, necrosis of the feet and breast blisters. Overdrinking can also cause wet droppings and wet litter in floor systems, and there is evidence that overdrinking can be a stress-related behaviour.

Since, water in the crop softens feed so that digestion can occur. Without water, dry feed forms clumps in the crop. The clumped feed can press on the bird's carotid artery, decreasing blood flow to the brain. This can cause paralysis and possible death.

MATERNAL BEHAVIOUR**NESTING**

A behavior which precedes ovi-position i.e. a pre-laying behavior, and involves searching of an adequate place to lay the egg. Hens rapidly get in and out of the nest boxes, or build their nest on the litter. At the time of lay, the hen enters the nest and remains there.

It occurs predominantly as an internal motivation, that is, it does not depend on the external environment. This behavior is expressed 1h to 1hr. 30 min. before lay. If the bird is not able to build the nest, this need is frustrated and the hen demonstrates its frustration sitting and not performing any activity (Duncan, 1998)

In addition, frustration may be physiologically expressed by egg retention in the eggshell gland, resulting in an extra calcium layer on the eggshell (Reynard & Savory, 1999)

Pre-laying behavior is triggered by hormones associated with the last ovulation and not by the presence of an egg in the shell gland. If egg laying is delayed for some reason, the period for pre-laying behavior will pass, and the hen will no longer be motivated to search for a nest. In these cases, the egg may be laid outside the nest while the hen goes about other activities.

OVIPOSITION

Oviposition is the act of egg laying. Ovulation occurs soon after dawn and starts a sequence that triggers pre-laying behaviour and oviposition 24 h later. Disturbance around this time can disrupt the process, so in floor systems it is important to provide sufficient and adequate nest sites.

Pre-laying behaviour i.e. nesting is normal behaviour in poultry, but is often abnormal in cages or where nests are wire-rolled.

Disturbance during shell formation can cause mis-shapen eggs and just prior to oviposition can lead to egg retention and calcium dusting. Abnormal behaviour during oviposition can result in cracked eggs and egg eating.

BROODINESS

Broodiness is a normal behaviour but is undesirable under commercial conditions; its incidence is low because of selection and because eggs are removed from nest boxes. Before a broody hen lays eggs, hen will ensure the nest is perfect by plucking out her own feathers for bedding. Broody hens fluff out their feathers to appear bigger, and therefore more threatening. They may also hiss, growl, or peck. This is a behavior that won't be mistaken for anything else.

Reproductive Behaviour**MATING BEHAVIOUR**

Males show courting behaviour while females select males based on displays and physical features. Nests are usually simple hollows and females generally incubate, though in some species both parents take part. Where natural mating is required, mixed-sex rearing is important for sexual imprinting. The presence of males may also stimulate female body development. In small mixed flocks, high-ranking males mate most frequently, but rank has less effect in large flocks. Males mate about five times per day, while females mate 0.5 times. Fertility is high even with infrequent mating,

because viable sperm are stored in the oviduct. Artificial insemination (AI) is the rule in turkeys, because broad-breasted strains cannot mate naturally.

In many broiler breeder flocks, fertility and hatchability decline with age, because of male obesity and male aggression towards females. This may be because of a breakdown in normal courting behaviour, perhaps because of inappropriate genetic selection.

SOCIAL BEHAVIOUR

Under natural conditions, poultry typically form social groups; one male with several females in chickens, same-sex or mixed-sex groups in turkeys, and mixed-sex groups in ostriches. Quails, ducks and geese tend to form larger aggregations, though pairing may occur during breeding. Communication can take place visually through postures and displays, or by calling. Calls serve many functions, including warning, threatening, attracting or signalling food. Physical features on the head and neck can also have signal value.

Socialization begins in the egg and continues during rearing through imprinting and maternal influence for eg. Chicks are able to identify their mother hen by various means, but hearing seems to be an important one. Embryos and hens begin to vocalize the day before hatching and do so more and more often as hatching approaches.

In a study, when a sitting hen was removed in the dark from her chicks and another broody hen put in her place, the chicks still found their mother hen. When the hen was disguised by various means, her chicks came to her anyway. Vision does; however, appear to play an important role in helping chicks recognize their mother hen.

Chicks can also learn some behaviors from one another. Individuals also tend to act synchronously, performing the same behavior at the same time as other birds, feeding, drinking, resting and dust bathing together. Aggression is generally low in small stable groups, partly because the top-ranking bird inhibits it in subordinates, higher in medium sized groups and lower again in very large groups. In small groups, introduction of a stranger results in stress, but in large flocks, unless there are partial barriers, birds tend to move over the whole house area and there is probably no individual recognition. Any tendency to maintain a personal space is weak and, in some contexts, such as roosting, totally lacking.

AGGRESSIVE BEHAVIOUR

FEAR

Chickens may also express negative behaviors, detrimental to their welfare, when frustrated or frightened.

Fear is associated with freezing behavior, tonic immobility, escape attempts, aggression, adrenal cortex activity, heart-rate elevation, and effects on meat quality. Fear reactions range from a mild state of alert to extreme panic, with behaviors indicating suffering and welfare impairment. When fear is extremely high, there may panic, high mortality, and hindering of human-animal relationships, whereas excessively low levels are detrimental to the animal, because fear is a natural response that allows animals to react to danger.

CANNIBALISM

Cannibalism is a behavior; detrimental to bird welfare, particularly because it causes pain and injuries. It is related to severe feather pecking and may be as a result of the genetic selection for the improvement of individual performance as opposed to social and natural behaviors. (Merir & Aggrey, 2003). Most common causes of cannibalism are Overcrowded & overheated brooder area, lack of feed nutrients (mainly fibre), excessive light in poultry house, dead birds left in the flock, flock of different ages and colors etc.

Controlling Strategies to Isolate & treat the injured / wounded hen, try to isolate the culprits, reduce the brightness of chicken house (ensure total darkness for at least 8-10 hours), provide extra fiber in their diet.

FEATHER PECKING

This behavior involves pecking and possible removal of the feathers of one bird by another and it is considered a symptom of negative welfare status.

According to McAdie & Keeling (2002), feather pecking may be classified as:

i) Gentle, in which feathers are nibbled and not pulled out, and the recipient bird does not react; and it may be considered as a normal exploratory behaviour.

ii) Severe, in which feather are vigorously pulled and some may be removed, and the recipient bird often reacts. It impairs bird welfare because it causes pain and the blood from the injuries may lead to cannibalism. (Hughes & Duncan, 1972)

In addition of a welfare problem, feather pecking economically affects the egg production industry, and therefore, measures to prevent such behaviour are needed. (Brumberg et al., 2011)

Feather pecking may lead to feather ingestion, stimulating feed passage through the digestive system in the same manner as insoluble fiber. Also, feather pecking is usually considered a result of the frustration in expressing scratching behavior, depending on litter material or dust bathing; as both behaviors have a component associated to pecking movements.

When there are no natural substrates for pecking, the bird replaces them by feathers. Lighter and younger hens tend to be more affected by this aggressive behaviour.

Layers fed coarser diets, independently of dietary energy and non-starch polysaccharide levels, remained longer at the feeders and engaged less in feather pecking behavior than those fed finer diets. (Van Krimpen et al., 2007) Feather pecking is more frequent in the afternoon, and that the wings and tail were the most affected body areas.

Other behaviours that harm other animals appear more frequent and include injurious pecking (gentle and severe feather pecking, cloaca i.e. vent pecking, and cannibalistic pecking), toe pecking, aggressiveness, and bullying.

HOUSING & MANAGERIAL BEHAVIOUR

Many cages for laying hens provide space less than or equal to their body area. Movement is severely restricted, wing flaps (seen regularly on deep litter) are absent and bone strength is reduced.

The incidence of behaviours like preening, dust and water bathing, wing flapping requires comfort movement and therefore influenced by availability of space, stocking density, type of housing system and litter material. They decrease with crowding and are much less frequent in cages.

Air temperature and humidity are affected by stocking density, season and ventilation rate. Air humidity also depends on indoor temperature, type of drinkers, water spillage, litter type, and other factors (Dinev et al (2019) . Mutual action of both parameters influences the thermal comfort of the birds. Elevated values of these two parameters may cause thermal stress and death.

Litter quality affects the occurrence of respiratory diseases and has a direct influence on the skin. Wet litter is a major risk factor for contact dermatitis lesions i.e. footpad dermatitis, hock burns and breast dermatitis in broiler chickens . The lesions are common in heavy birds that spend most of the day time sitting, e.g. due to leg weakness . Moisture content in the litter is associated with litter material, high stocking density, diarrhea in birds, water consumption and diet composition which affects the amount, water contents and viscosity of feces

Light management (which includes photoperiod, light intensity, source and wavelength of light) is an important tool in regulating broiler and laying hens' production and behavior. Broilers provided with sufficient dark periods have fewer health-related problems, including sudden death syndrome ("flip-over disease"), ascites syndrome associated with pulmonary hypertension, spiking mortality syndrome, eye enlargement, tibial dyschondroplasia, and other skeletal disorders Dimming the light is one of the effective measures in the case of problems with feather pecking during the laying period

Stocking density - Some systems provide lower density (i.e. organic and free-range systems) and the cage density is higher than in most floor systems. High density reduces locomotion and ground pecking, final body weight, feed intake, and feathering . It increases the time that birds spend sitting and behavioral disturbances in the last week of broilers rearing, and there are more scratches and bruising on the body surface. The effects may be magnified or caused by increased temperature, humidity or litter moisture .

Conclusion

Each of the existing systems and the technological solutions for laying hens or broiler chicken is associated with certain welfare problems. The ideal system has not been created yet and in all of them some of the behavioral needs are deprived; the natural behavior and the needs of animals are principally incompatible with the production goals.

Abnormal behaviour may cause damage to the animal itself or its conspecifics. Behaviors harmful for the animal are feather-plucking (self-removal of feathers), hysteria or "fright disease", and "excessive gregariousness" - which may lead to suffocation (1). Behaviors that harm other animals appear more frequent than previous and include injurious pecking (gentle and severe feather pecking, cloaca i.e. vent pecking, and cannibalistic pecking), toe pecking, aggressiveness, and bullying. Therefore, these behavioural measures of bird welfare may not only precede more clinical or difficult to assess signs of poor health outcomes, but they additionally represent motivational and affective aspects of welfare not currently incorporated into standard welfare assessments for poultry and should be considered in future poultry welfare standards.

The goal is something else, to find the best solution that will strike a balance between producer goals, the right of consumers to get a quality product they can afford and the right of production animals to live according to their needs and to end their lives humanely.

The results of this study reflect the diversity of behaviors and provide a good basement for further characterization of different strains to improve animal welfare, support future breeding and preserve local breeds.

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METABOLIC DISORDERS OF ANIMALS

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Introduction

The term "metabolism" refers to the collection of all physical, chemical, and metabolic activities that take place within a live cell or organism in relation to the absorption, disintegration, or synthesis of essential organic components. Numerous metabolites that are either utilised as building blocks or destroyed and expelled from the body as waste are released as a result of metabolic activities. During metabolism, nutrients are converted into energy that is used by cells, organs, systems, or the entire organism for healthy bodily function. Therefore, all metabolic activities that enable life and regular organ function are included in metabolism. When one or more metabolic pathways are dysfunctional, other organ systems or the entire body may also be affected. Metabolic disease or disorder is characterised by disruption of one or more metabolic processes that are connected to the control of a specific metabolite in body fluids.

Fig-metabolic disorders often occurs in predictable sequence or cascade

(Source - <https://slideplayer.com/slide/16653943/>)

A series of ailments known as metabolic disorders of cattle affect dairy cows right after giving birth. The following metabolic abnormalities are the most frequently found in dairy cows within the first month following parturition: (1) subacute and acute ruminal acidosis, (2) laminitis, (3) ketosis, (4) fatty liver, (5) left displaced abomasum (LDA), (6) milk fever, (7) downer cow, (8) retained placenta, (9) liver abscesses, (10) metritis, (11) mastitis, and (12) bloat. These illnesses are referred to as metabolic disorders because they are linked to the disruption of one or more blood metabolites in ill cows. For instance, fatty liver is linked to increased non-esterified fatty acids (NEFA) and their accumulation in the liver, while acidosis is linked to increased production of organic acids (such as acetic, propionic, and butyric acids). Ketosis is also linked to increased levels of ketone bodies (i.e. beta-hydroxybutyric acid - BHBA) in the blood. Metabolic disorders in dairy cattle, which are illnesses involving disruption of one or more metabolic processes in the body. For dairy cows, the transition period-which lasts for three weeks before and three weeks after parturition-is extremely important. The transition from a non-lactating to lactating state, hormonal changes, a significant decrease in feed consumption, and a change in diet from a roughage-based diet (such as hay and grass) to one high in fast fermentable carbohydrates are all connected with this time period (i.e. high-grain diets). One or more metabolic diseases affect one out of every two dairy cows in a herd. Although the pathogenesis and aetiology of the majority of metabolic illnesses are not fully understood, numerous preventive and therapeutic approaches have been developed over time.

Low rumen pH, rumen metabolism, and milk fever are all linked to lower blood calcium levels. Some metabolic illnesses, like downer cow, LDA, metritis, mastitis, laminitis, retained placenta, and bloat, still lack a blood metabolite. The most intriguing finding in relation to the prevalence of metabolic disorders is how closely they are related to each other. For instance, milk fever-affected cows are more likely to develop mastitis, retained placenta, metritis, LDA, distocia, udder edoema, and ketosis, while acidosis-affected cows are more likely to develop laminitis, LDA, milk fever, mastitis, and fatty liver. Metritis, LDA, and ketosis are more common in animals with retained placenta. In cows with milk fever, mastitis, laminitis, LDA, metritis, retained placenta, and udder edoema, ketosis and fatty liver are frequent findings.

What is Transition Period

- According to custom, it lasts from dry off through parturition.
- more accurately known as these 4 distinct physiological states that the cow experiences:
 - ❖ Late lactation
 - ❖ Dry period
 - ❖ Parturition
 - ❖ Early lactation

Why A Transition Period

- Diets for dry cows are frequently hefty and lacking in nutrients.
- When cows freshen (milk production begins), they introduced immediately to very dense (energy rich) ration
- This could cause a lot of issues if not handled appropriately.

Milk fever

Milk fever (Parturient Paresis), also known as hypocalcaemia, is a condition that can be avoided in lactating dairy and beef cows. Milk fever affects five to eight percent of cows. It is a metabolic disease known as milk fever or hypocalcaemia is brought on by a lack of calcium.

(Source- <https://www.facebook.com/102583428197586/posts/milk-fever-milk-fever-postparturient-hypocalcemia-or-parturient-paresis-is-a-dis/218674156588512/>)

Therefore, milk fever-affected cows will have reduced calcium levels in their blood.

Usually, this disease shows up within the first 24 hours after calving. In some circumstances, it may even happen up to three days after calving. Both the immune system of the cow and muscular function are significantly influenced by calcium. Therefore, if blood calcium levels are too low, they won't be sufficient to maintain nerve cell function or muscle contractions.

The clinical signs of milk fever can be classified into three stages:

- Stage 1: The cow may appear agitated and tremble and tense her muscles (may go unnoticed). - reluctance to move or eat; the animal may stagger and/or develop stiff hind limbs.
- Stage 2: The cow will typically have a "kink" in her neck or her head curled along her flank and will be discovered lying down or sitting down and unable to get up. Poor body temperature, low body lustre, hard breathing, rapid heartbeat
- Stage 3: Cows frequently appear to be unconscious and unresponsive. The animal will extend its legs out and lie on its side; bloat frequently occurs and regurgitation is likely:- The majority of animals in this stage will perish if untreated.

Common observable symptoms in milk fever

1. An uneven walk is the first sign of the condition. It might be apparent during the day. When the cow eventually settles down, you will notice that her ears are cold and typically droopy.
2. Early signs include paddling with the back feet and swaying as if about to fall over if the cow is on her feet. Once she is on the ground, she will turn her head and neck to the side as if she had a kink. Her nose starts to dry up.
3. Another warning signal is if your cow suddenly loses her energy and attention after being alert and attentive while tending to her new calf. Although this could be a sign of any illness, at this point in your cow's life, you should suspect milk fever.
4. If not treated, the symptoms get worse until the cow passes out, her pulse slows down, and she starts to go cold (you can feel this initially in her legs, ears, and other extremities). She doesn't recognise you anymore. There is no more rumen activity. She will eventually lose the ability to support her head and collapse, gasping for air, after a period of time.

Nutritional precautions against milk fever

The feeding practises used both during pregnancy and right after calving directly affect the incidence of milk fever. By using the proper feeding techniques throughout the aforementioned times, milk fever can be avoided. The following feeding techniques are advised for dairy cows that produce a lot of milk in order to avoid milk fever.

Calcium restriction during the prepartum (before giving birth) period

Animal life depends on calcium for a number of processes. Calcium is an essential mineral. Calcium shouldn't ever be added before calving as a milk fever preventative measure. Dietary calcium intake should be low as well (about 20 g per day). When taken a week or so prior to calving, vitamin D considerably reduces the risk of milk fever and aids in the absorption of calcium from the digestive tract. However, because the often offered forages and concentrates include considerable amounts of calcium, it might be challenging to manipulate the ration to ensure low calcium intake. Zeolite and vegetable oils can be added as supplements in this case because both are proven to sufficiently inhibit calcium absorption.

Magnesium supplementation

Another vital mineral is magnesium, which makes up 70% of the body and is primarily found in bones. Magnesium is important to the health of the heart, skeletal muscles, and brain system because it helps keep membranes stable. It is connected to a number of enzymes needed for body metabolism and, most significantly, it is crucial for calcium metabolism. Magnesium is crucial for keeping the level of calcium in an animal's blood, which makes it indirectly responsible for the development of milk fever. Milk fever in dairy animals can be avoided by supplementing with magnesium at a rate of 15 to 20 g/day coupled with a source of readily digested carbohydrate. Magnesium should be given throughout pregnancy at a rate of 0.4% of dry matter of the diet.

Supplementation of calcium to susceptible animal after calving

Using this approach as your first line of defence against something is not advised. Given that there is a potential that calcium homeostatic pathways would be disrupted, supplementation should be done based on the calibre and calcium content of the food being delivered.

Down Cow Syndrome

When a cow is unable to stand, it becomes recumbent. When a cow is lying down, it is frequently referred to as being "down," and when it has been down for a while, it is referred to as a "downer cow."

(Source- <https://www.pashudhanpraharee.com/downer-cow-syndrome-treatment-and-management/>)

There are many causes of a downer cow, including:

1. Injury at or immediately following calving: Bone fracture or paralysis
2. Metabolic: hypomagnesaemia or milk fever (hypomag or grass staggers)
3. Mastitis or metritis are toxic diseases.

When the primary cause is eliminated but the cow still doesn't rise, it becomes a downer cow. Due to muscular and nerve injury, this failure to rise is typically noticed within 24 hours of the cow falling off her feet. Damage happens from a cow falling off its feet, which puts a lot of pressure on its muscles and nerves. Many conditions make this worse since the cow is unable to change positions to stop continuous carrying of weight. The primary causes of recumbency can be divided into 4 categories, and remembered with the mnemonic MINT:

Metabolic

- hypocalcaemia
- hypokalaemia
- nutritional acidosis
- ketosis
- fatty liver disease

Inflammatory

- Acute septic metritis
- Acute mastitis
- Acute peritonitis (eg. traumatic reticulitis/ruptured uterus)
- Neurological
- Obturator, sciatic or femoral nerve paralysis (eg calving paralysis is damage to L5/L6 outflow of obturator and sciatic)

Traumatic

- fractured femur
- dislocated hip
- muscle, tendon or ligament rupture

Timings and impact (6 hours down)

- The weight of the cow causes damage to its muscles, nerves, and joints.
- It has been shown that just 2% of dairy cows treated for milk fever within six hours developed a downer cow. Seven to twelve hours without treatment:
- More than 25% developed depressive tendencies. Not treated till 18+ hours.
- Almost 50% of cows that weren't treated until after 18 hours couldn't get up.

Clinical Signs

- A cow that just had calves (usually less than 48 hours)
- Unable to stand up for some unknown reason
- Lie with your back straight (on the breast bone)
- Alert, frequently eating, drinking, and peeing and pooping
- Few attempt to stand up, but few move around on their forelimbs (creeper cows)

Diagnosis

- Based on the above-mentioned clinical symptoms
- Because the downer cow is an exclusionary diagnosis, a vet visit is necessary to rule out conditions like metritis, broken bones, nerve paralysis, and peculiar milk fevers.
- Blood tests and the presence of reflexes can both be highly helpful in determining the prognosis.

Treatment

- If you're housed, move to a well-bedded yard or loose-box
- The secret to success is quality nursing care. Give the cow access to food and water in convenient, wide-based containers, shelter, and a soft surface. If the cow isn't shifting its weight, be sure you force it to do so at least twice a day.
- Raising the cow mechanically, like using a sling, can be helpful for treatment and diagnostics. To increase support if there is nerve injury, hobbling could be useful.
- Keep a watchful eye out for toxic mastitis because it can develop in cows with no history of mastitis.
- Supplement with calcium, phosphorus, and magnesium as needed
- In cases that are more serious, local disinfection and treatment are required.

Prevention

1. A challenging calving was the main issue in 46% of downer cows. Good calving management is therefore essential. Although there are many elements that affect good calving management, the following four are perhaps the most

crucial ones:

- " Create a healthy habitat that is clean, dry, and has low stocking densities.
 - " Verify that the cows' BCS values at calving are between 2 and 3.5.
 - " Keep a safe distance and avoid getting too involved.
 - " Recognize when to ask for and accept support.
 - " Pick a bull with a high grade for calving ease.
2. Milk fever was the main reason for 38% of the downer cows. The quantity of downer cows will be drastically decreased if milk fever is prevented (see NADIS fact sheet on milk fever)

Grass Tetany

Hyperexcitability, muscular spasms, convulsions, respiratory distress, collapse, and death are all symptoms of hypomagnesemic tetany, a complex metabolic disturbance characterised by hypomagnesemia (plasma tMg 1.5 mg/dL [0.65 mmol/L]) and a reduced concentration of tMg in the CSF (1.0 mg/dL [0.4 mmol/L]). The loss of Mg in milk makes adult lactating animals the most vulnerable. Hypomagnesemic tetany can affect breastfeeding beef cows fed silage indoors, but most typically affects animals grazing on lush grass pastures or green cereal crops. Although it rarely happens in cattle that aren't breastfeeding, it has happened when undernourished animals were given access to green cereal crops.

(Source - <https://www.agridirect.ie/article/silent-killer-grass-tetany-and-how-to-prevent-it>)

Cause: The grass tetany season lasts from February to April, and it is characterised by low levels of magnesium or calcium in cattle eating ryegrass, small grains (such as oats, rye, and wheat), and cool-season perennial grasses (such as tall fescue, orchardgrass). This time of year typically sees a burst of new forage growth. Forages cultivated on soils that are low in magnesium, moist, or that are high in potassium and nitrogen but low in phosphorus may have very low levels of magnesium and calcium. Additionally, a lot of spring calves are born and nursing during this time of year. Cattle that are lactating, especially those in the herd that produce the most milk, are most frequently afflicted by grass tetany. The needs of breastfeeding cattle in terms of magnesium and calcium are significantly higher than those of dry cattle. This makes cattle more susceptible to grass tetany while lactating. When the amounts of magnesium and calcium in forages are insufficient to meet the needs of cattle and cattle are not given enough magnesium and calcium supplements, grass tetany develops. Nervousness, muscle twitching, and stumbling while walking are clinical indications of grass tetany. If untreated, an infected animal may collapse on its side, go into convulsions, and endure muscle spasms.

Prevention: Dolomitic lime, which includes magnesium, should be applied to pastures lacking in magnesium. Since plants might not be able to absorb enough magnesium in wet conditions, this might not be useful in avoiding grass tetany on waterlogged soils. Magnesium levels in pasture may benefit from phosphorus fertilization as well. However, it is important to take into account the environmental issues related to high soil phosphorus levels. When included in the fodder regimen, legumes (such as clovers, alfalfa, and lespedezas) are frequently high in magnesium and may help lower the risk of grass tetany. The best way to prevent grass tetany is to boost your diet with extra calcium and magnesium throughout the grass tetany season. Both can be a part of a mineral supplementation regimen by being incorporated into a mineral mix. One month before grass tetany season, start feeding a high magnesium mineral.

Hypomagnesemic Tetany in Calves

When calves are fed milk, the efficiency of magnesium absorption decreases, going from 87 percent at 2-3 weeks to 32 percent at 7-8 weeks. In 2- to 4-month-old calves being fed just milk or in younger calves with persistent scours being fed milk substitute, hypomagnesemic tetany can develop. Clinical symptoms include hyperexcitability, muscle spasms, convulsions, and death and are comparable to those of hypomagnesemic tetany in adult cattle (see above). Acute lead poisoning, tetanus, strychnine poisoning, polioencephalomalacia, and enterotoxemia brought on by the *Clostridium perfringens* toxin must be distinguished from hypomagnesemic tetany in calves. Bone analysis helps with diagnosis; in calves with hypomagnesemia, the Ca:Mg ratio may be as high as 90:1 from normal bone's 70:1 ratio. A 10 percent

solution of magnesium sulphate (100 mL, SC) must be administered right away to affected calves, followed by 10 g of magnesium oxide each day, orally. The condition can be avoided by giving animals high-quality legume hay and a beginning diet starting at two weeks of age.

(Source- https://en.wikipedia.org/wiki/Grass_tetany)

Ketosis in Dairy Cows

The first six weeks of lactation are the most frequent time that dairy cows experience the metabolic illness ketosis. There are no regional names for ketosis in East Africa; it is also known as acetonemia or ketonemia in English. Adult cattle commonly suffer from ketosis. Early lactation is when it generally affects dairy cows and is most frequently characterised by partial anorexia and sadness. Rarely, it affects cattle in the late stages of pregnancy, when it resembles pregnancy toxemia in ewes. Along with lack of appetite, occasionally people will notice indicators of nerve dysfunction such pica, abnormal licking, unsteadiness and strange walking, bellowing, and hostility. Despite having a global distribution, the illness is particularly prevalent in areas where dairy cows are bred and raised for high production.

Cause

The primary culprit is a confluence of high energy requirements at the start of lactation and insufficient energy in the feed (e.g. poor quality silage, very coarse hay). A cow is only able to consume a certain amount of fodder each day. The animal has a net energy loss that worsens over time and lowers blood sugar levels if the energy provided by the ingested feed is less than what the cow needs. The liver transforms body tissue (protein, fat) into more glucose to supply more energy (sugar). Ketone bodies, which are harmful byproducts of this process and must be eliminated, are produced. The cow becomes ill if the blood's ketone concentration is too high.

Signs and Symptoms

The highest productive dairy cows are impacted by ketosis, which starts with extremely subtle symptoms that are first simple to ignore. Animals that are affected eat less and produce less milk. The cow seems to be dozing off and often excretes solid waste that is mucous-covered. The animal loses weight quickly (using its energy reserves) if the condition gets worse. Cattle that are ill may try to eat odd feed in addition to refusing to eat grain, concentrate, or dairy flour (coarse straw, twigs, soil, abnormal objects). Due to the increased ketone levels, the animal stands with a humpback and some exhibit a peculiar fruity to musty odour in their breath and urine. Untreated cows may exhibit strange behaviour (such as staggering, circling, head pressing, continuous licking, bellowing - like Rabies!), lose their ability to stand, and have other health issues.

Type II ketosis is occasionally used to define ketosis during the first few weeks after giving birth. Such instances of very early lactational ketosis are typically accompanied by fatty liver. Ketosis and fatty liver are likely two of a range of ailments connected to excessive fat mobilisation in cattle. Ketosis cases that appear closer to the time when milk production peaks, which is typically between 4-6 weeks after delivery, may have less to do with excessive fat mobilisation and more to do with underfed cattle who are experiencing a metabolic deficit of gluconeogenic precursors. This stage of ketosis is sometimes referred to as type I ketosis.

Clinical Findings:

Reduced feed intake is typically the first indication of ketosis in cows kept in stalls. When given meals in parts, cows in ketosis frequently prefer grass to grain. The earliest indicators of ketosis in group-fed herds are typically reduced milk output, lethargy, and an abdomen that seems "empty." Physical examination reveals that cows are febrile and possibly mildly dehydrated. Rumen motility varies, sometimes being hyperactive and other times hypoactive. There are frequently no additional physical problems. In a small percentage of instances, CNS abnormalities are detected. These include unusual licking and chewing, with cows occasionally gnawing unceasingly on pipes and other nearby things.

(Source - <https://www.farmhealthonline.com/disease-management/cattle-diseases/ketosis/>)

Prevention and Control:

Nutritional management is a way to avoid ketosis. Late in the lactation period, when cows typically grow overweight, body condition should be controlled. It may be possible to help allocate dietary energy toward milk production and away

from body fattening by modifying the diets of late lactation cows to boost the energy supply from digestible fibre and decrease the energy supply from starch.

Typically, it is too late to lower the bodily condition score after the dry season. Reducing body condition throughout the dry period, especially in the late dry period, may even be harmful since it causes an excessive mobilisation of adipose tissue prior to delivery. Maintaining and encouraging feed intake is a crucial component of ketosis avoidance. In the latter three weeks of gestation, cows typically consume less feed. Aiming to reduce this decline should be the goal of nutritional management. Regarding the ideal dietary qualities during this time, there is debate. It's possible that the ideal amounts of energy and fibre for cows in the final three weeks of pregnancy differ from farm to farm.

Throughout the whole dry period, feed intake should be monitored and diets should be modified to meet but not significantly exceed energy requirements. The average daily energy requirement during the dry period for Holstein cows with typical adult body sizes is between 12 and 15 Mcal expressed as net energy for lactation (NEL). Diets should encourage quick, persistent increases in feed and energy intake after calving. Early lactation rations should have enough fibre to sustain rumen health and feed intake while still being somewhat high in non-fiber carbohydrate concentration.

Neutral-detergent fibre concentrations should typically be in the 28-30% range, while nonfiber carbohydrate concentrations should be between 38-41%. The ideal ratios of the different carbohydrate components will depend on dietary particle size. Niacin, calcium propionate, sodium propionate, propylene glycol, and rumen protected choline are a few feed additions that may aid in managing and preventing ketosis. These supplements must be given during the last 2-3 weeks of pregnancy as well as during the vulnerable phase to ketosis for them to be effective. Monensin sodium has received approval in several nations for use in avoiding disorders linked to subclinical ketosis and related symptoms. Where authorised, it is advised to administer 200-300 mg per head each day.

Some farms test every cow during the early lactation period using hand-held BHB metres. Propylene glycol is used to treat cows with subclinical ketosis. Although labor-intensive, this method has been shown to decrease the spread of disease in subclinically ketotic animals and increase milk output in those that have received treatment.

Pregnancy Toxaemia in Cow/Sheep

Pregnancy toxaemia, often known as fat cow syndrome, mostly affects cows who were previously well-fed and in good physical condition in late pregnancy when their food intake is reduced. In the latter two months of pregnancy, over-fat pregnant cows given insufficient nutrition may develop a condition similar to pregnancy toxaemia (twin lamb illness) in sheep. In fatty beef cattle, a lack of feed results in the transfer of significant amounts of body fat to the liver. Pregnancy toxaemia is especially contagious in fat pregnant cows, particularly those with weak teeth or those giving birth to twin calves. The condition affects cows who are in their final two months of pregnancy or who have just given birth, and it is more prevalent in first-calf heifers than in older cows. Pregnancy toxaemia is caused when pregnant beef cows' diets are changed from a good quality diet to a poor quality diet in an effort to reduce body weight and improve ease of calving.

(Source-<https://www.semanticscholar.org/paper/Therapeutic-management-of-pregnancy-toxemia-in-a-Chandana-Padmaja/9970f1721e934fc7cf50306dda0dfaac7c448498>)

Cause of the disease

In the form of glucose, pregnant cows need a lot of ready energy to support their growing calves. There are two sources for this. The meal that is ingested through the rumen is first converted to glucose in the liver. Second, fat stores are released and transported in the circulation to the liver where they are converted to glucose by the liver. To make up for the shortfall that usually happens during pregnancy, when energy demands are high, this is a typical process. The issue arises because the liver requires a specific amount of glucose in order to use the incoming fat. When the animal consumes relatively little high-quality feed or when the fat is ingested at a rate that exceeds the liver's capacity to produce glucose, the liver begins to accumulate fat. Ketones build up to high blood levels, the liver enlarges, turns pale and fatty, and they start to have an impact on the brain. The animal quits eating as a result of impaired brain function.

Signs and Symptoms to look out for in Cattle

- Pregnant
- A lesser or nonexistent hunger
- melancholy and depression
- Separate from the herd. 5. Nasal breathing. 6. A sweet, acetone-like odour can be detected on their breath. 7. Neurological symptoms (staggering, aggression, delirium)
- 8. Downer cows become recumbent 2-2 weeks before they pass away.
- 9. Death

Prevention

Nutritional control is key to prevention. At calving, cows should be in good condition (condition score of 3 or higher), and the post-calving feed supply should be of adequate quality and quantity to prevent significant condition loss in the lactating cows. Planning ahead is essential for avoidance of this disease, which in some regions manifests in patterns. For instance, autumn calving in southern New South Wales before the winter rain will result in cows being significantly pregnant when the quality of the feed is low.

The first weather break will upset pregnant cows and severely degrade the quality of the dry grass. Supplemental feeding with high energy feeds (like grain) in these circumstances will stop pregnant toxemia. Simply taking protein meal supplements won't be enough to keep the disease at bay. They do not receive enough food to meet their needs for energy. Feeding late-pregnant cows with high-quality feed is a smart idea. Alternately, select late-gestational cows and provide early supplemental feeding. When there are dry seasons, these cows are the first to suffer, especially if they are part of a mixed mob.

Supplementary feeding practices

The quality and quantity of the feed at hand will determine how much additional feeding is necessary. Breeding cows experience periods where intake is insufficient to meet needs, even on high-quality feed. Cows can typically handle this by utilising their fat reserves, but as the quality of the diet deteriorates, the risk of pregnant toxemia rising. Therefore, supplemental feeding becomes more crucial as pasture quality and quantity deteriorate. Low-quality pastures have a decreased nutrient content and digestibility, reducing their intake.

The following supplements for dry-paddock (more than 1500 kg DM/ha) feeding of late-pregnant and/or lactating cows each provides equivalent energy:

- silage: 10 to 11 kg fresh per head per day
- good hay: 3.5 to 4.5 kg per head per day
- grain: 3.0 kg per head per day
- cottonseed meal: 2.5 kg per head per day
- grain and white cottonseed: 1.25 kg of each per head per day. About 1% calcium should be fed with grain and cottonseed supplements.

Goiter in Animals

It is All domesticated mammals and birds experience thyroid gland enlargements that are not cancerous or inflammatory. Goiter must be distinguished from other causes of swelling in the upper neck, such as enlarged salivary glands or lymph nodes. Although many animals with goitre seem to stay euthyroid, in some cases, particularly in newborns, clinical indications of hypothyroidism may occur.

(Source- <http://www.flockandherd.net.au/sheep/reader/goitre.html>)

Common causes of goiter include:

- enlarged thyroid gland
- idiopathic
- in-utero iodine deficiency or excess
- iodine deficiency
- iodine toxicity
- ingestion of goitrogenic plants
- hereditary familial goiter
- congenital hypothyroidism and dysmaturity syndrome in foals

Iodine Deficiency in Animals

Iodine deficiency may result from inadequate dietary iodine intake or from consuming feeds that contain substances that either prevent the thyroid gland from absorbing iodine or prevent the normal synthesis of thyroid hormones (goitrogens). The thyroid glands normally expand as a result of iodine shortage (goiter). Thyroid hormone, which is crucial for regulating metabolism, is produced by the thyroid glands, which are situated in the upper ventral neck on the trachea. Animals from places with high rainfall who are raised in iodine-deficient soils may develop goitre, with the risk being highest after heavy rains in the autumn or winter. Animals that had recently grazed specific white clover pastures or brassica crops that were strong in goitrogens may also exhibit goitre.

Clinical Signs and diagnosis

Goiter is most likely the cause of a large, hard, non-fluctuant enlargement of the ventral neck in an otherwise healthy animal. Abscesses in the cheesy gland and bottle jaw are other diagnosis. Thyroid glands must be sent for histopathology in buffered formalin for laboratory confirmation.

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ROLE OF VETERINARIANS IN INTEGRATED FARMING SYSTEM

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Agriculture is the primary source of livelihood for about 58% of India's population. The gross value added by agriculture, forestry, and fishing was estimated to be Rs. 19.48 lakh crore (US\$ 276.37 billion) in financial year 2020. Livestock plays an important role in the total GDP of the country and veterinarians contribute a lot in improving the living standards and sustainability of the farmers in India. The farming system in India is basically practiced in integrated forms, wherein benefits are being reaped from both livestock and agriculture. The benefit obtained from one sector is being utilized for the upliftment of the other sector and vice-versa. This type of farming system is known as integrated farming. Mostly backyard farmers/ small stockholders do this type of farming at their own with limited resources and marginal profits. Here comes the role of veterinarians, who by their knowledge can improve the livestock health and thereby benefits the farmers to a greater extent. A Veterinary graduate has comprehensive knowledge on animal health, nutrition, reproduction, selection etc. therefore, he/she can guide the farmer in a better way and can improve their living standards. A veterinarian can also guide and educate the farmers on disease management, biosecurity measures, hygiene practices, selection of breed, healthy production of meat/milk etc. Veterinarians can also update the farmers on ongoing Government policies regarding the livestock development, compensation programmes, thereby help them to get benefited from the concerned departments.

Integrated farming system is very lucrative to farmers but requires more management, manpower, competence and deliberate intensions in comparison to simple farming. Along with this, a good scientific knowledge on either of the components of the farming is utmost necessary. The sustainability of integrated farming basically depends upon the agro-climatic conditions of the area. Additionally, livestock compatibility to the area largely depends upon the choice of breed, farming culture, purpose of the farming etc. Crop and livestock selection needs experience to make the farming fruitful and viable. Choosing a breed which doesn't fit to the agro-climatic conditions and fodder vice-versa will make the farmer lose his money, time, labor and interest to revive it back. Therefore, veterinarian can calculate the total cost incurred and expected profit from the integrated farming system. They can make out the probable reasons for any kind of failure and in turn scientifically support the farmers in minimizing the losses with maximum profit. As we all know that the Government of India is trying hard to double the farmer's income wherein, the role of veterinarians becomes inevitable.

A veterinarian can create an awareness among the farmers on disease that are endemic and also those that needs to be addressed. The disease free farming system will reap more benefit and help the farmers and stakeholders to increase their boundaries and think about other inclusive areas. As disease experts, they can guide the farmers to practice good management and hygienic practices and also follow some prophylactic measures to keep the diseases at bay. A veterinarian can also train the farmers on basic hygienic practices and advice them whenever necessary. They can extend their support to the farmers by arranging trainings on production upliftment, bio-security measures to be adopted before and during disease outbreak, educate them on timely reporting of disease to the concerned authority. In context to this, a veterinarian can also provide the farmers a platform to speak about their challenges and support they want to improve their farming system.

Poultry farming is a very common practice in India. Around 75% of the villagers rear poultry at their own. The poultry farming has gain popularity in livestock business globally because of its high prolificity and profitability. Although, at times poultry business suffer great loss due to occurrence of some disease, inadequate nutrition, poor management

practices, improper vaccination schedule, less/no bio-security measures, relaxations at transboundary check-points, less/no disease surveillance and reporting system etc. In context to this, a veterinarian, having scientific knowledge, can address these points and help the farmers in timely implementation of some crucial measures to reduce the loss and rejuvenating the sector. Proper disease control programmes including-schedule vaccination, disinfection, hygienic practices, good managerial practices, awareness on the current situation will help the farmers to rear the poultry in scientific manner and reap good benefits. Additionally, a veterinarian can advice and organize trainings to adopt a new combination of farming depending upon the geographical location, land area covered, and willingness of the farmer. To say, if poultry farming is integrated with fish farming then the chicken can be raised over or adjacent to the ponds and the poultry excreta recycled to fertilize the fish ponds. Raising chickens over the pond has certain advantages: it maximizes the use of space; saves labour in transporting manure to the ponds and the poultry house is more hygienic.

Veterinarians intervene in different ways in getting farmers household improved through technology injection and innovation in their livestock rearing by providing them technical, financial and moral support.

In conclusion, the aim of doubling the farmer's income cannot be achieved without integration of agriculture with livestock. The government and all state agricultural universities along with Indian Council of Agricultural Research has been developed many models for integrated farming system but till date the integrated farming is not gained desirable popularity due to lack of scientific support, extension and training. In this context, inclusion of veterinarians in a planned way with an exhaustive framework is need of the hour to increase the sustainability of the integrated farming system in India.



STRATEGIES TO REDUCE THE HEAT STRESS IN BUFFALOES

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As we all know among diverse natural condition, In Rajasthan, the period from April to June have extreme temperature reaching up to 48°C that ubiquitously compromises the productive and reproductive performance of livestock species. In such climatic extremes, the owner of buffalos has to keep a few specific attentions in their mind to make their herd comfortable.

What is heat stress?

Heat stress is the very high rise in body temperature from the normal one, which actuates thermoregulatory changes in buffalo. During the extreme hot weather condition, this thermoregulatory capability of buffalo to dissipate heat by sweating and panting is compromised and the condition occurs. Severe heat stress can further lead to rise in body temperature, increased pulse rate, increased peripheral blood flow, reduced feed intake and increased water intake.

Economic importance

All the changes associated with heat stress led to loss of productivity, reduced breeding efficiency and even loss of life in extreme cases. Every year in India severe loss in milk production incurred due to heat stress causing huge financial loss. Heat stress has also detrimental effects on reproduction by decreasing estrus expression, conception rate and by increasing length of service and dry period.

Signs of heat Stress

Common symptoms of heat-stressed animal include

- ❖ Animal attempt to move towards shade.
- ❖ Increase reddening of hide.
- ❖ Water intake enhanced while feed intake reduced.
- ❖ Prefers standing than lying down.
- ❖ Increased respiration rate and body temperature (106.1-108.5°F).
- ❖ Unusual salivation.
- ❖ Open-mouth panting.
- ❖ Dizziness.

Natural defense mechanism towards heat stress

Characteristic black skin that contains numerous melanin granules, which provide protection against UV rays component of sunlight. Buffalo dermis has well-developed sebaceous glands and their oily secretions make skin slippery for water and mud. The oil secretions from skin make it more lustrous during summer to reflect solar radiations more effectively.

Reproductive and Production Challenges: Heat stress challenges the production and reproduction performance of dairy animals. Milk composition like milk fat%, SNF% are also affected. Heat stress negatively affects follicular development and estrous cycle.

Strategies to reduce the negative effects of heat stress

1. Breeding Management

As cows exhibit lesser heat symptoms during heat stress zones as compared to thermal comfort periods, it is necessary to adopt a good heat detection program to detect cows with marginal heat symptoms. It is always advisable to continue AI breeding instead of using bulls because in natural breeding both bull and cows suffers

infertility due to summer stress. Genetic selection of heat tolerant animals and inclusion of heat tolerance as a trait in selection programme will be a boon to the farms.

2. Cooling systems in the farm

Fans in combination with water sprinkling facility provide the best cooling option. Excessive sprinkling should never be practiced as it may end result into wet bedding making animal prone to mastitis and other diseases. The farm should be well ventilated.

3. Feeding Management

Heat stressed animals are more likely to have lower reproductive and productive performance. Feeding high quality forages and balanced rations will lower a number of results of heat stress and will boost performance of the animals. Some dietary control guidelines to manage heat pressure are:

- ❖ Provide high quality feeds.
- ❖ Increase the frequency of feedings.
- ❖ Feed during colder times of the day.
- ❖ Keep feed fresh as much as possible.
- ❖ Provide high-quality forage.
- ❖ Provide adequate fiber.
- ❖ Use of by-pass proteins can enhance the milk yield and protein content.
- ❖ Intake of sufficient cool water is probably the most important strategy for animals to undertake throughout heat stress.

4. Providing natural or artificial shade area

Plantation around the farm will help in assuaging heat load from the animals. But, in today's commercial dairy industry, it is not always practicable. Therefore, provision of artificial shade area by shade cloth or a naturally well-ventilated structure with open sidewalls can keep the animals away from direct solar radiation.

5. Selection of heat tolerant animals Genetic selection of animals based totally on precise molecular genetic markers for heat tolerance will truly be a boon to alleviate heat stress in cattle and buffaloes by figuring out the heat tolerant animals.

Conclusion

Heat stress is a temporary problem and by means of positive management we can hold animal fitness in addition to its productivity. At the end, it can be concluded that nutrients and management are the two very crucial responsibilities by using which we will reduce the loss resulting from heat stress.



IMPACT OF HUMAN-ANIMAL RELATIONSHIP ON PRODUCTIVITY AND WELFARE OF LIVESTOCK & POULTRY

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Introduction

Human-animal relationships (HAR) can be defined as "the degree of relation or distance that exists between an animal and a human being, perceived, developed and expressed through their mutual behaviour".

Farm animals, may perceive interaction with humans as: (Claxton 2011).

- a) Negative - When they fear people, avoiding contact with them
- b) Neutral -When the fear level is low but animals still avoid contact
- c) Positive - When fear is absent, and animals allow physical contact with them

Handling that includes abrupt movements, pushing and the use of rods, shouts and kicks is considered negative, while handling characterised by slow movements, whispers and petting have positive effects on animals (Ellingsen et al 2014).

Non-aggressive controlling interactions, such as gentle stick use, gentle handling and instructive talking, are considered neutral (Waiblinger et al 2002).

The use of positive reinforcements, like feeding or tactile contact, often fosters learning in farm animals (Rochais et al 2014) and may stimulate physiological reactions that can be interpreted as "anti-stress effects" (Lürzel et al 2015). This is one of the means of improving the quality of HAR

Measures of HAR - Evaluating the quality of HAR is an important means of improving animal welfare. This process must consider the behaviour of the animals towards stockpersons as well as the behaviour of the stockpersons towards the animals.

Assessing the quality of HAR requires the gathering of evidence that is: (Roches et al 2014).

- Valid (i.e., reflects what actually occurs);
- Reliable (i.e., the tendency to give consistent results with repeated measurement); and
- Viable (in terms of time, financial resources and safety)

Important human factors to be considered during this assessment are stockperson's attitudes, personality, knowledge, experience and degree of work satisfaction. The attitude towards any kind of animal will affect the quality of interaction and the type of handling.

Attitudes during animal handling have been classified as: (Waiblinger et al 2006).

- Tranquil or friendly;
- Dominant;
- Impatient; and
- Aggressive

Means to assess the HAR

- (i) Use an interview about stockperson practices (Kling-Eveillard et al 2017);
- (ii) Observing stockpersons during common (Ellingsen et al 2014) or less common handling events (Destrez et al 2018);
- (iii) Assess farmer's attitudes through a questionnaire (Fukasawa et al 2017)
- (iv) Use video-recording (Johansson et al 2015).

- (v) The Stationary Person Test, the Avoidance Distance Test and the Touch Test had been validated to effectively measure the human-hen relationship in non-caged systems (Graml et al 2008).
- (vi) However, according to Spooler (2007), it is more relevant to assess the quality of the HAR directly by looking at farmers' attitudes and handling practices than by assessing fear of humans.

Types of Human-Animal Relationships (HAR)

1. Concerned Detachment
2. Concerned Attachment
3. Attached Attachment
4. Detached Detachment

1. Concerned Detachment -

Farmers handle their animals with care; but relate to them in detached manner i.e. seeing them not as individuals, but rather as a function of commercial production.

Relationship is impersonal and indifferent

Example : Farmers who rear livestock for slaughter or with large number of animals.

2. Concerned Attachment -

Relationship is more personal

Farmer appreciate the animal for more than their production utility and sees them as an individuals.

Example : when animals are used for breeding as they stay on farm for longer period of time

3. Attached Attachment -

Farm animals are regarded as outdoor pets and receive preferential treatment.

Uncommon among commercial farmers

Found only among recreational 'hobby' farmers

4. Detached Detachment -

Common among farmers who only deal with their animals from a distance and do not handle them directly

Livestock is purely considered a commodity

Effects on productivity and welfare

The nature of HAR matters as it will modulate not only the welfare of the animal, including its health, but also productivity and product quality (Tallet et al 2018).

Research on HAR and animal production has been mainly focused on its effect on stress, productivity and meat quality (Hemsworth et al 2009).

1. Positive Effects

2. Negative Effects

1. Positive Effects

A positive relationship is notably characterized by absence of fear reactions to humans and animals that are easier to handle (Waiblinger et al 2006).

Positive interactions such as pats, gentle slaps or talking to the animals showed positive effects reducing fear and human avoidance. Also, among the interactions with humans that can be perceived as positive, food provision is an efficient way of attracting animals (Tallet et al 2005).

Stockpersons with positive attitudes towards animals often have animals with increased productivity (Rushen and de Passillé 2015).

Positive Effects in Pigs

Human-animal interactions as short as 4h/sow/reproductive cycle, may influence both the performance and welfare of the animals (Prunier and Tallet 2015).

Janczak et al (2003) found that sows showing less fear of humans had higher reproductive success and more adaptive maternal behaviour.

Intact males, that are commonly raised in stable groups in some countries, when they were positively handled were more socially active, both in their groups and with an unfamiliar human (Tallet et al 2013).

Positive Effects in Poultry

Handling studies on poultry show that regular positive gentle handling can enhance growth performance, feed efficiency, egg production, disease resistance to infection, antibody protection and first-week survival (Edwards et al 2007)

In adult laying hens, reduction in fear of humans and a decrease in plasma corticosterone concentration were shown following additional handling, consisting of walking, talking, feeding and touching single birds (Graml et al 2008).

Similarly, Edwards et al (2010) showed for laying hens that 12 min/day of visual contact with humans during rearing resulted in reduced avoidance behaviour of humans during adulthood and there was a trend for hens receiving positive handling to have a lower corticosterone response to human contact than those receiving negative handling.

Positive Effects in Cattle and Buffaloes

Hemsworth et al (1989) reported that the stockperson's presence and positive handling during calving of heifers led to faster approach to an experimenter in a test situation, lower cortisol concentrations, and less stepping and kicking responses during milking in the first weeks of lactation than heifers that calved without human presence.

According to Ellingsen et al (2014), stockpersons who handle their calves patiently, pet them and calmly talk to them during handling, induce in their animals' higher levels of positive mood.

Gentle stroking in dairy cattle has been shown to reduce heart rate increased during a veterinary procedure (Schmied et al 2010). In addition, in beef cattle, gentle touching at an early age seems to reduce the cortisol release at slaughter (Probst et al 2012).

The HAR is also relevant for udder health. found that positive behaviour of stockpersons during milking was associated with lower somatic cell counts and with lower prevalence of mastitic quarters. (Ivemeyer et al 2018)

As also observed in cattle, in dairy buffaloes the number of positive interactions performed by stock-people was positively correlated with milk production (Napolitano et al 2019).

2. Negative Effects

Negative handling such as shouting and hitting, leads to poor animal welfare, including fear, acute and chronic stress (Hemsworth et al 2000).

Fear responses towards humans may affect the productivity, health and stress physiology of farm animals as in pigs, hens and dairy cows (Adler et al 2019).

Negative Effects in Pigs

Poor handling results in high levels of fearfulness. Negative behaviours displayed by the stockperson (e.g. slapping, hitting and kicking) are strongly associated with a high level of fear in pigs (Hemsworth et al 1989).

Hemsworth et al (1981) subjected gilts to either pleasant or unpleasant human contact for three 2-min periods/week, from 11 to 22 weeks of age. The authors noted that the juvenile females with the pleasant handling treatment had higher weigh gain than those with other treatments.

Lensink et al (2009), observed that the fear response to humans of nulliparous sows was linked with their behaviour towards humans and nervousness around first farrowing, and these negative interactions were mostly related with prophylactic and therapeutic procedures.

Unpleasant physical contact with humans reduced testicle size and delayed coordinated mating response in boars, and reduced pregnancy rate in sows, when compared with those receiving positive human handling (Hemsworth et al 1986).

Negative Effects in Poultry

High fear of humans is associated with reduced egg production, growth, feed efficiency, product quality and sexual

activity whilst increasing aggression, handling difficulties and immuno-suppression (Jones 1996).

Visual or physical contact with humans can elicit behavioural inhibition, withdrawal panic and violent escape reactions in chickens often with associated injury as well as adrenal responses. (Jones 1996)

Fear reactions, like panic or violent escape attempts, not only waste energy and thereby impose a metabolic cost, but they can also result in injury or even death when the birds run into obstacles or pile on top of each other (Waiblinger et al 2006).

Negative Effects in Cattle and Buffaloes

Poor HAR is associated with reduced milk production by cows, aversion to shouts (Pajor et al 2000).

Ellingsen et al (2014) observed that stockpersons with a nervous handling style or who were dominant and aggressive, induced a negative mood in more cows.

Hemsworth et al (2000) found that the use of negative interactions with cattle by stockpersons was not only negatively correlated with milk yield, but also with percent protein and fat, and positively correlated with milk cortisol concentration.

In dairy buffaloes the number of negative interactions performed by stock-people was positively correlated with the number of kicks by buffaloes during milking and with the number of exogenous oxytocin injections used to induce milk let-down (Napolitano et al 2019).

Factors Affecting the Quality of HAR -

- Genetic influence
- Habituation
- Early positive human contact

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STATUS AND PROSPECTS OF INDIGINOUS CATTLE BREED AND MILK IN INDIA

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India is still the world's largest producer of milk. The government has initiated several measures to increase livestock productivity, which has resulted in significantly increased milk production. Milk production in 2019-20 and 2020-21 (provisional) is 198.44 million tonnes and 209.96 million tonnes, respectively, representing a 5.81 percent annual increase. In 2020-21, milk availability per capita is expected to be around 427 grammes per day (Provisional).

Indigenous cattle breed of India

The Livestock Census is the country's primary source of such information. Since 1919, the livestock census has been conducted on a regular basis across the country. The census usually includes all domesticated animals, and head counts are taken. So far, 19 livestock censuses have been carried out in collaboration with state governments and university administrations. During the month of October 2018, the 20th Livestock Census was launched. In the 20th Livestock Census, livestock data were collected online for the first time. Tablet computers have been used to collect data using advanced technology.

- The total livestock population in the country is 535.78 million, a 4.6 percent increase from the Livestock Census 2012.
- The total bovine population (Cattle, Buffalo, Mithun, and Yak) is 302.79 million in 2019, representing a 1.0 percent increase over the previous census.
- The total number of cattle in the country is 192.49 million in 2019, up 0.8 percent from the previous Census.
- The cattle population (Cows) is 145.12 million, up 18.0 percent from the previous census (2012).
- The country's Exotic/Crossbred and Indigenous/Non-descript Cattle populations are 50.42 million and 142.11 million, respectively.
- When compared to the previous census, the Indigenous/Non-descript female cattle population increased by 10% in 2019.
- The total Exotic/Crossbred Cattle population increased by 26.9 percent in 2019 compared to to previous census
- The total Indigenous (both descript and non-descript) Cattle population has decreased by 6% since the previous census. However, the rate of decline in the Indigenous Cattle population from 2012 to 2019 is much slower than it was from 2007 to 2012.
- The total number of buffaloes in the country is 109.85 million, representing a 1.0 percent increase over the previous Census.

The total number of milch animals (in-milk and dry) in cows and buffaloes is 125.34 million, 6.0 percent increase over the previous census.

Breed Group	Category	Population (In million) 2012	Population (In million) 2019	% Change
Exotic/Crossbred	In-milk	14.30	20.00	39.8
	Dry	5.12	5.67	10.8
	Milch	19.42	25.67	32.2
Indigenous/Non-descript	In-milk	29.65	31.98	7.87

Dry	18.48	16.53	-10.53
Milch	48.13	48.51	0.81

Present status of indigenous cattle farming

Highest growth rate in milk production: Andhra Pradesh (12.6%)

maximum milk producer state: Uttar Pradesh 18 followed by Rajasthan (11%), Andhra Pradesh (10%), Gujarat(8%) and Punjab(7%) (MOFPI) Ministry Of Food Processing Industries.

The state with the highest per capita availability of milk - Punjab (1221 grams), NDDB

Highest Cow Population; West Bengal

Maximum Number of Indigenous Cows- Madhya Pradesh

Highest Cross-Breed of Exotic Cow -Tamil Nadu

Highest Number of Livestock-Uttar Pradesh

Highest Cattle Population- Madhya Pradesh

Highest growth rate in milk production: Andhra Pradesh (12.6%)

Breed Improvement

Breeding is an important tool for facilitating production potentials and bringing about long-term genetic improvement in animal production. Between 1968 and 1976, the Government of India established Central Cattle Breeding Farms in various agro-climatic zones of the country under various five-year plans. Their primary goal is to make germplasm with high genetic potential of important indigenous and exotic cattle breeds (Holstein Friesian and Jersey) available within the country in order to serve as the dairy industry's backbone.

Progressive genetic improvement of stock:

These farms are pursuing progressive genetic improvement of stock through a scientific breed improvement programme that employs progeny tested and imported sperm. Animals are chosen for their short calving intervals, open days, and dry days.

Development & conservation of indigenous breeds:

Indigenous breeds such as the Red Sindhi and Tharparkar cattle breeds, as well as the Surti buffalo breed, are being developed and conserved at these farms. HGM bulls of these breeds are being made available to state government and other agencies' sperm stations. CCBF Chiplima is an important source of Red Sindhi germplasm for use in breeding programmes run by states and other organisations across the country.

Production and distribution of elite bull calves:

Disease-free high genetic merit male calves produced at these farms through scientific breeding using progeny tested bull sperm and imported sperm in the case of exotic cattle breeds. High genetic merit disease-free bulls are made available to states and other agencies for sperm production.

Prospects of indigineous cattle farming

Indian history is strongly linked with cattle, particularly cows for their milk, as milk is an elixir for almost every individual, from a child to an elderly person. Furthermore, cattle have become an integral part of the agricultural production system by converting farm waste/byproducts into high value milk for humans and other critical inputs like dung and urine back into the same agricultural production system to rejuvenate soil health. In this regard, the local breed, adapted to the environment, has played a significant role in ensuring the farmers' nutritional and economic security.

Since ancient times, various breeds have been developed in various parts of the subcontinent by selecting the best animals for desired traits such as milking capacity, drought resistance, feeding requirement capacity to adapt to local weather, immunity, and so on. The purity of such breeds was kept with great care and wisdom in each geographical pocket known as a breeding tract. Unfortunately, this social rigour faded over time.

Mating between different breeds and inferior animals within the same breed resulted in a large number of cattle with poor genetic quality. This is because these local breeds were long neglected in terms of characterization, conservation, and planned breeding programmes.

Sustainable livestock production is dependent on the proper utilisation of our local genetic resources, and thus the indigenous cattle development strategy must emphasise the purpose of rearing, its suitability to the agro-eco system, and the affordability of rearers. Apart from milk, indigenous cattle are valued for other byproducts made from cattle dung and urine, and they also serve as a nucleus in organic farming.

The distinct features of indigenous cattle farming that offer enormous potential benefits:

- Increasing demand for indigenous cattle milk and other products like dahi and ghee.
- Importance of organic farming -panchgavya, gobar and gomutra
- Potential enterprises activities through- preparation of various products from cow dung and urine
- Highly sustainable in local agro-climatic conditios
- Environment friendly cow based farming.

Policy implication

Selective breeding of quality indigenous cows in their breeding tracts; using these improved breeds to upgrade the nondescript stock; promotion of farmers' participatory breed conservation programme; assured supply of quality input supplies such as sperm, feed, and fodder resource.

Exclusive market with a premium price for indigenous cattle milk and other byproducts. Specific programs/special schemes/incentives aimed at indigenous cattle farming-free animal scheme, supply of screened bull/credit Insurance and immunisation coverage. Recognize indigenous cattles and nomadic herds. Access to grazing land and forest areas, as well as the creation of CPRs for grazing and water sources.

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UNCONVENTIONAL POULTRY MEAT- AN ALTERNATIVE

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Introduction

The poultry industry in the world has turned to its present position from a mere backyard venture within last few years of time where the maximum contribution lies to entrepreneurs with active research and development in this sector. Since times of its galloping growth, the farmers, entrepreneurs and researchers are in search of alternate poultry species (duck, turkey, quail, ostrich, goose etc.) that has been considered as next to the usual poultry meat (broiler chicken) industry across the globe. Unconventional poultry meat species are reservoirs of valuable genetic resources. Those are traditionally being used as sources of protein since time immemorial. Little has been done to develop their commercial exploitation. The climatic and ecological diversity, different levels of economic development in various parts of the world have led to development in large number of other poultry species which are potentially suitable for domestication and commercial meat production. Justification of commercial exploitation of unconventional poultry meat:

- Unconventional poultry species are adapted to harsh environments.
- Can utilize natural resources that conventional poultry stock (broiler chicken) cannot.
- Suitable for complementary production with conventional species.
- " More efficient recycling of nutrients through integrating them into intensified production systems.
- Unconventional poultry are easy to feed, manage and handle and can therefore be raised by landless and smallholder farmers.

Some alternative poultry meats are given as follows:

1. Duck meat :

Duck or duckling is the meat of several species of bird in the family Anatidae, found in both fresh and salt water. Duck is eaten in many cuisines around the world. One species of freshwater duck, the mallard, has been domesticated and is a common livestock bird in many cultures. The Pekin duck is another livestock species of importance, particularly in North America. Magret refers specifically to the breast of a mulard or Muscovy (or Barbary) duck that has been force fed to produce foie gras.

Generally, duck meat has a higher fat content than other poultry such as chicken and turkey, and the meat is darker in color. Duck meat has a much stronger flavor than both chicken and turkey. Duck meat is tasty due to higher fat content, but the fat is not absorbed in the body, because of its lower melting point (14oC). Hence does not cause obesity and keeps away cardiovascular diseases. It is also very high in protein and iron and is generally nutritious. Duck meat is tender and palatable meat and marketable age of ducks varies from 6-7 weeks of age.

Table 1: Nutrient composition of Duck meat

Calories/Macronutrient	Amount (kcal/grams)
Calories	337 kcal
Carbohydrate	0 g
Fat	28.4 g
- Saturated Fat	9.7 g
- Monounsaturated Fat	12.9 g

- Polyunsaturated Fat	3.6 g
- Omega-3	290 mg
- Omega-6	3360 mg
Protein	19.0 g



However, the majority of this fat comes from the skin, which anyone who wants a lower fat/calorie intake can remove. The fat content is primarily saturated and monounsaturated fatty acids. It is high in B vitamins, selenium, phosphorus, and iron. Presuming we eat the whole duck including skin, then duck skin offers a substantial amount of dietary glycine. The primary mineral in duck meat is selenium, and this mineral is thought to be a kind of antioxidant. Duck meat contains a good range of B vitamins, and it is particularly high in niacin (vitamin B3).

2. Turkey meat

Turkey is a large poultry bird, native from North America. Turkey meat is generally considered healthier as it contains less fat and cholesterol than red meat. It is also rich in high quality protein, a significant amount of vitamins and minerals (particularly rich in Sodium and Selenium), considered as 'white meat' and hence especially recommended for hypertension, obese and heart patients.

Table 2: Nutrient composition of Turkey meat

Nutrients	Per 100 g Turkey Meat
Energy	170 Kcal
Total fat	8g
Total Carbohydrate	0%
Saturated fat	2.5g
Trans Fat	0
Cholesterol	70mg
Protein	24g
Vitamin-A	0
Vitamin-c	0
Sodium	55mg
Selenium	38.45 mcg
Calcium	0
Iron	8%



3. Quail meat :

Quail meat contains a very low amount of cholesterol while other constituents viz. protein, fat, iron, vitamin etc. are comparable with other species meat. Hence it is recommended for people who want to maintain lower cholesterol level. Quail has dark and tasty meat and a dressing% of 67 - 72%. The most commonly available quail is farm raised and can be purchased at selected stores in frozen condition. Quail meat is a sweet and delicate white game meat with extremely low skin fat and low cholesterol value. High quantity of Poly-Unsaturated fatty acids and Omega-3 fatty acids render the quail meat beneficial for consumption for ischemic heart diseases. Quail meat is rich in micronutrients and a wide range of vitamins including the B complex and vitamin E and K. The demand for quail meat is increasing day by day among the meat consumer especially in cities because it contains less cholesterol and saturated fat which is beneficial for heart patients and also recommended for persons on diet. Quail egg contains a very special constituent 'Choline' which helps in brain development in child. Hence it is recommended for children and pregnant woman.



4. Goose meat :

Goose meat refers to the meat of a large bird in the Anatidae family. Although officially classed as 'white meat,' goose has the color of dark meat and looks more similar to beef. Goose is also very popular in the Eastern part of the world, particularly in China and Hong Kong. Goose meat is much more flavorful than other poultry such as chicken. As a direct comparison, goose meat has a stronger flavor than the darkest parts of chicken meat. Goose also contains a higher amount of fat than chicken, which adds to its delicious taste. Goose meat is also a source of vitamin E, which can come in variable amounts.

Table 3: Nutrient composition of goose meat

Calories/Nutrient	Amount
Calories	161 kcal
Carbohydrate	0 g
Fat	7.1 g
Saturated Fat	2.8 g
Monounsaturated Fat	1.9 g
Polyunsaturated Fat	0.9 g
Omega-3	100 mg
Omega-6	800 mg
Protein	22.8 g



5. Ostrich meat :

It is by far the healthiest alternative to our traditional meat (lower fat, calories and cholesterol than beef, chicken, turkey, pork and fish). Huge portion of all the meat from an ostrich comes from the leg, thigh and back. Ostrich meat is a wonderful healthy red meat with all of the flavor and texture of beef. It is rich in protein and high in iron yet is lower in fat, calories and cholesterol than skinless chicken or turkey. Molecules in the oil extracted from the fat of the bird are found to have anti-inflammatory analgesic properties and it is used to treat joint pain, arthritis and skin disorders.



6. Emu meat

The emu (*Dromaius novaehollandiae*) is the second-largest living bird by height, after its ratite relative, the ostrich. It is endemic to Australia where it is the largest native bird. The birds were a food and fuel source for early European settlers, and are now farmed, in Australia and elsewhere, for their meat, oil and leather. Commercial emu farming started in Western Australia around 1970 and now gaining popularity all over the world. Emu meat is like beef in that it contains myoglobin, proteins that hold oxygen and make meat red. Emu meat is the choice for the health conscious person who wants a low fat and cholesterol diet that still contains red meat. Emu is a very lean (97% fat free) red meat, similar to in both taste and appearance. It is higher in iron, protein, vitamins A, C and B12 than and lower in cholesterol than chicken.

**7. Guinea fowl meat**

It is popular in Europe (France, Italy, Poland), Russia, North America and in Africa. The FCR of guinea fowl is 3.1 - 3.5. The guinea fowl has dark and tasty meat, 23% protein and 4% fat (compared to 21% protein and 7% fat in chicken) and has an average dressing percentage of 70-74%. A young guinea fowl, about 11 weeks old has tender meat, while the mature ones have tougher meat. The female fowl meats are usually tender than the males. It is light red and slightly dry with a mild gamey flavor. Moreover, guinea fowl can also be kept for dual-purpose, that is, for meat and egg production. This bird resembles chicken in many ways, but the meat is leaner, somewhat darker and more flavorful.

**8. Pigeon meat**

Pigeon squabs are used for meat. Squab is a young domestic pigeon, typically under four weeks old or its meat. The meat is widely described as tasting like dark chicken. Slaughter is done just before full feather development /flying. Pigeon meat has high flesh: inedible ratio, tender & tasty meat with good flavor. Usually considered a delicacy, squab is tender, moist and richer in taste than many commonly consumed poultry meats, but there is

relatively little meat per bird, the meat being concentrated in the breast. Squab is dark meat and the skin is fatty, like that of duck. The meat is very lean, easily digestible, and "rich in proteins, minerals, and vitamins". It has been described as having a "silky" texture, as it is very tender and fine-grained. It has a milder taste than other game and has been described as having a mild berry flavor.



Potentials of unconventional poultry meat species :

Specific adaptability to ecological niches 2. High reproductive capacity (Short generation interval, Large litter size, Fast juvenile growth) 3. Efficient utilization of nutrients 4. Extended utilization of feed resources (Minute feed -- pigeon, guinea fowl, duck, turkey) 5. Limited competition with humans for feedstuffs (Utilize roughages and edible byproducts of food processing) 6. Flexible adjustment of poultry birds to available resources (are small, prolific and have a fast turnover) 7. Low production risk (Small initial investment, fast returns) 8. Easy to market or consume at home (can be transported alive without difficulty).

Constraints:

1. Insufficient information about genetic resources for specialized production systems 2. Limited genetic progress, due to lack of breeding strategies, small population sizes and multipurpose production 3. Underestimated importance as sources of food and income 4. Low priority given in research and development 5. Lack of management skills and veterinary inputs 6. Limited scope for improving backyard production systems 7. Legislation to protect wild species imposes limitations on the economic utilization of undomesticated birds 8. Insufficient marketing and an unstable consumer base 9. Small amount of meat yield and high cost of meat.

Conclusion

The unconventional poultry meat and its products need innovation to increase market demand. Interventions for the production of low-fat meat and development of new products, such as ready-to-cook and ready-to-eat alternate meat-based products are required. Further processing of meat byproducts can also serve as a profitable business. Efforts for utilization of unconventional and less valued meats like those from duck turkey, quail etc. need to be focused on by researchers and government to popularize the duck meat as a food choice. A persuasive approach and good policies from the government will hopefully attract the society to use unconventional poultry meat in greater quantities.



HERBAL FEED ADDITIVE : ROLE IN LIVESTOCK PRODUCTION

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Introduction

Dairy cow nutrition affects not just milk output but also product quality, animal health, and dairy system environmental implications (NRC, 2001). To address the global demand for dairy products, nutritional solutions that maximise milk production efficiency while also enhancing animal and environmental welfare are required. Low molecular weight secondary metabolites have evolved in a wide spectrum of plant species. Plant-derived compounds having nutraceutical qualities, known as phytogetic feed additives, have been studied in a variety of livestock production systems. To begin with, there is increasing interest in using herbal feed additives in animal production as a result of the rise in microbial resistance to antibiotics and the ramifications for human health. The second is a reaction to consumer pressures to eliminate all non-plant xenobiotic agents from animal diets. Herbal feed additives serve an important function in animal nutrition and health. These molecules, in general, allow plants to interact with their surroundings and may serve as a defence system against physiological and environmental stress, as well as predators and diseases. Apart from hazardous chemicals, numerous of these secondary plant metabolites have been demonstrated to have beneficial impacts in food and animal metabolism. The majority of these active secondary plant metabolites fall into the isoprene derivatives, flavonoides, and glucosinolates groups, and many of them have been proposed as antibiotics or antioxidants. Herbs generate their initial activity as flavour in farm animal feed and can thus alter eating patterns, digestive fluid output, and overall feed intake. Herbs or phytochemicals can alter bacteria selectively through antimicrobial activity or a positive enhancement of microflora eubiosis. The majority of herbal feed additives work against bacteria by denaturing and coagulating proteins in the bacterial cell wall structure. Activation of feed intake and secretion of digestive secretions, immunological stimulation, antibacterial, coccidiostatic, anthelmintic, antiviral or anti-inflammatory activity, and antioxidant qualities may all contribute to the beneficial benefits of herbs or botanicals in farm animals.

The herbal feed additives exert their beneficial effects by:

1. Effect on animal performance

Following the restriction on antibiotics, more herbs are being utilised as feed additives to help animals develop faster. Various herbs and spices have different effects on digestion processes due to the broad diversity of active components. The majority of them increase saliva production. Curcuma, cayenne pepper, ginger, anise, mint, onions, fenugreek, and cumin increase bile acid synthesis in the liver and bile acid excretion, which improves lipid digestion and absorption. Plant herbs including garlic (*Allium sativum*), lemongrass, and peppermint (*Mentha piperita*) are commonly used as antibacterial agents and to maintain the microbial environment of the gastrointestinal tract, particularly in tropical areas. Garlic was found to boost growth rate, digestibility, and carcass characteristics in livestock when used as an alternative growth promoter.

2. Herbal feed additives as antimicrobial supplements

Allium sativum, *Angelica dahurica*, *Anguisorba officinalis*, *Artemisia argyi*, *Coptis chinensis*, *Geranium thunbergii*, *Hydrastis canadensis*, *Phellodenron amurense*, *Polygonum cuspidatum*, *Scutellria baicalensis*, and *Sophora flavescens* have all been researched for their antimicrobial properties. These herbs contain antimicrobial flavonoid components such as baicalin, baicalein, limonene, cinnamaldehyde, carvacrol, or eugenol, as well as other supporting herbs. These herbs are antibacterial against *Salmonella* spp. and *E. coli*, as well as gram-positive bacteria including *Staphylococcus* spp. and *Streptococcus* spp. The active ingredients in herbal feed additives alter the fatty acid composition, which can affect microbe survival by increasing hydrophobicity.

3. Herbal feed additives as anti-inflammatory

Curcuma, red pepper, black pepper, cumin, cloves, nutmeg, cinnamon, mint, and ginger extracts were found to

have anti-inflammatory properties. Phenols, terpenoids, and flavonoids are the main anti-inflammatory active chemicals. Anti-inflammatory, anti-allergic, antiviral, and anti-proliferative properties of flavonoids have long been known. Chamomile, marigold, licorice, and anise are the most well-known plants and spices with anti-inflammatory properties.

4. Herbal feed additives as antioxidants

Antioxidants are substances that assist delay and inhibit lipid oxidation, and when added to meals, they aid to reduce rancidity, prevent hazardous oxidation products from forming, and retain nutritional quality. Several studies have found that antioxidant-rich plants are beneficial to health and disease prevention, and that their consumption reduces the risk of cancer, heart disease, hypertension, and stroke. The content of phenolic compounds (flavonoids, hydrolysable tannins, proanthocyanidins, phenolic acids, phenolic terpenes) and some vitamins in medicinal plants may be connected to their antioxidant activity (E, C and A).

5. Herbal feed additives as immune-stimulant

Herbs and spices high in flavonoids, vitamin C, and carotenoids are generally beneficial to the immune system. Echinacea, liquorice, garlic, and cat's claw are plants that contain chemicals that have immune-stimulatory characteristics. These herbs can boost lymphocyte, macrophage, and NK cell activity, as well as promote phagocytosis and induce interferon production. Essential oils derived from medicinal plants boost the immune system and can alter the mucosa of the duodenum, resulting in positive effects on the animal.

6. Herbal feed additives as coccidiostat

Some plant extracts have been shown to have anti-parasitic effects in chickens, particularly coccidian parasites. Curcumin, a phenolic molecule derived from the rhizome of *Curcuma longa*, acts as an anticoccidial agent by acting as an antioxidant on the immune system.

Advantages of Herbal Feed Additives

Selection and feeding of herbal feed additives over other feed additives is due to:

1. Natural component of feeds
2. Absence of residual effects
3. Eco-friendly
4. Least problem of drug resistance

Limitations of Herbal Feed Additives

- ❖ Due to their complicated makeup, they are difficult to quantify and standardise.
- ❖ Harvesting procedure and storage conditions may affect the composition of plants
- ❖ Some ingredients are thermos- labile, thus less stable
- ❖ Anti-nutritional factors and microbial contamination can have a significant impact on the usage of herbal feed additives.

Conclusion

It is vital to keep farm animals healthy in order to obtain healthy animal products. The use of natural-source additives in animal and human nutrition has been promoted for the past decade. Herbs and spices can be added to feed as dried plants, portions of plants, or extracts to get beneficial effects.

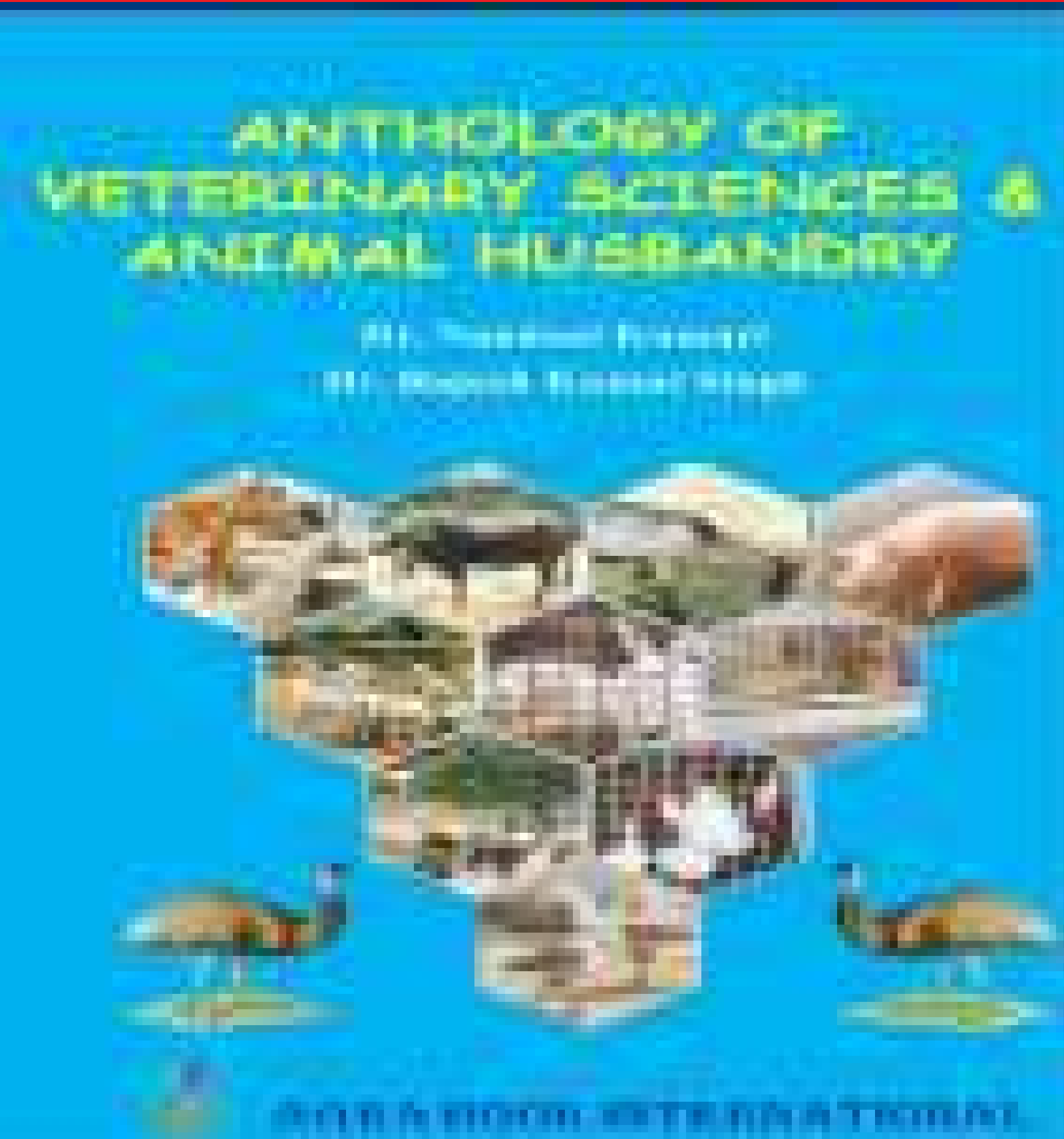


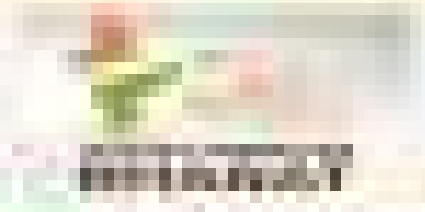
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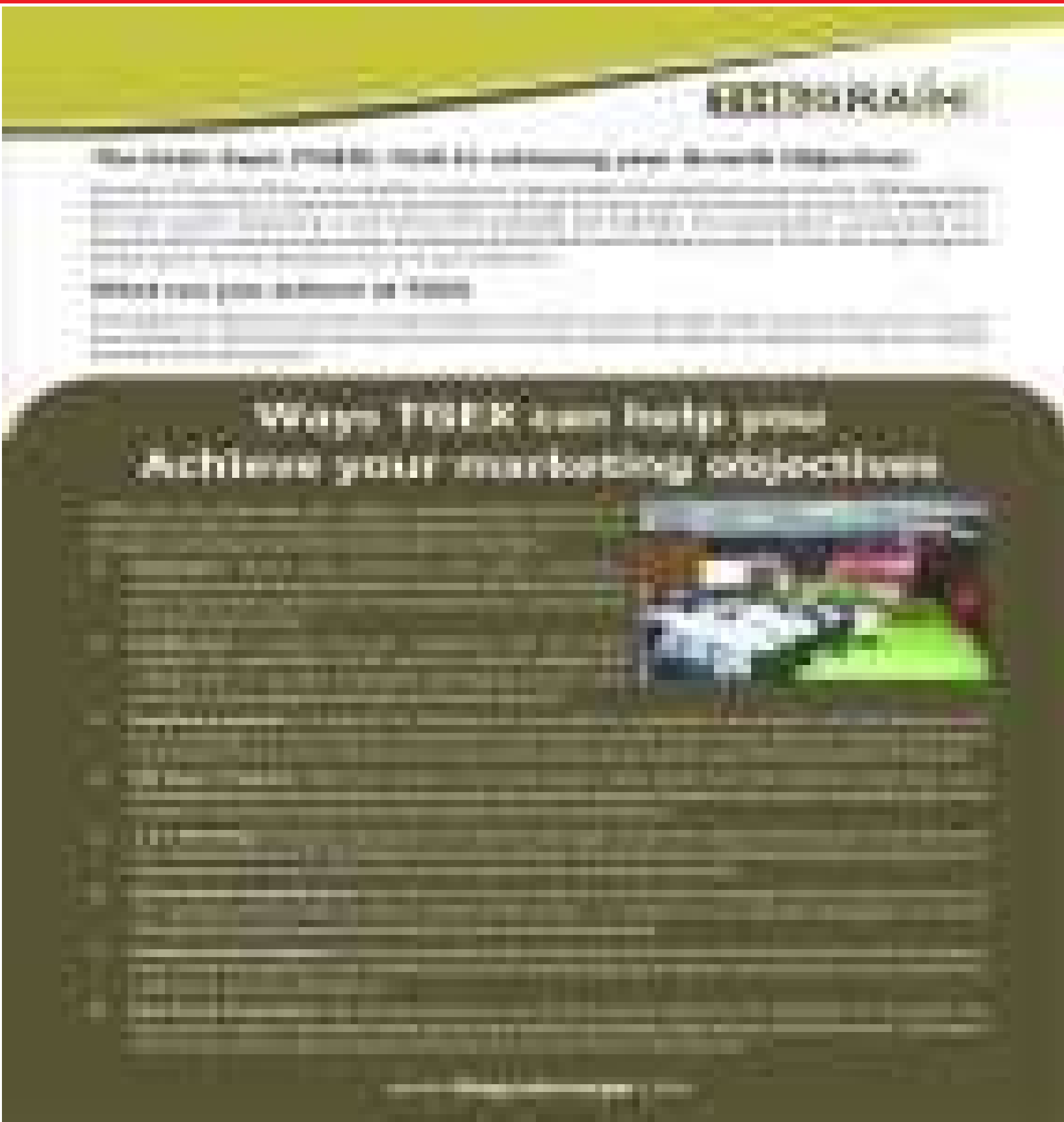
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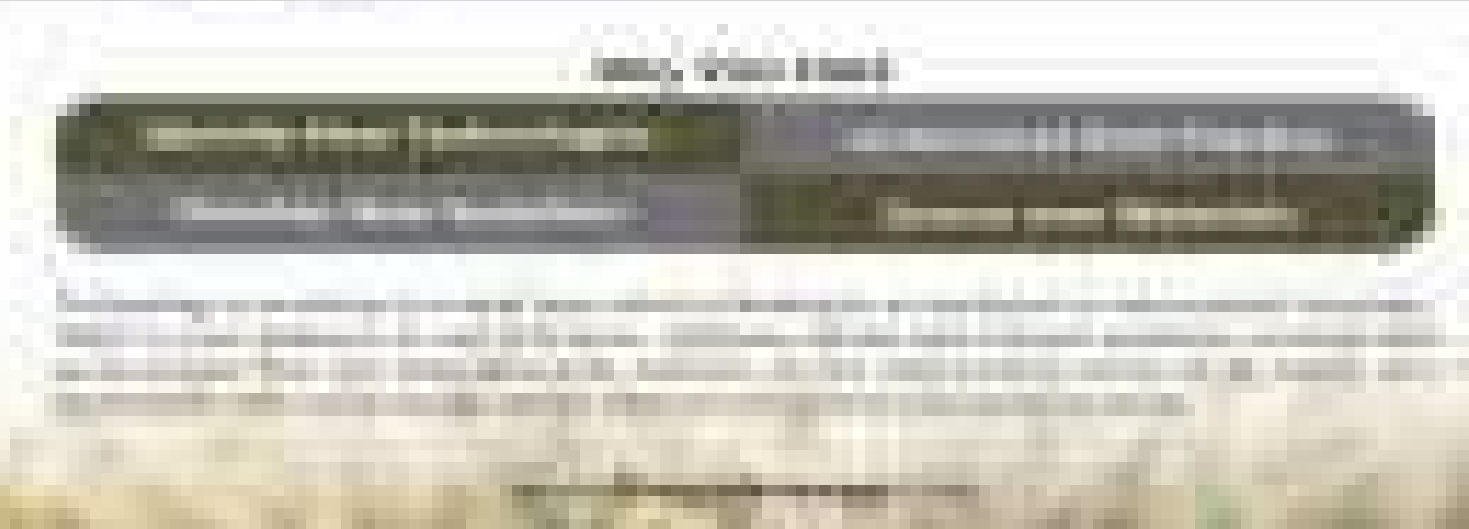












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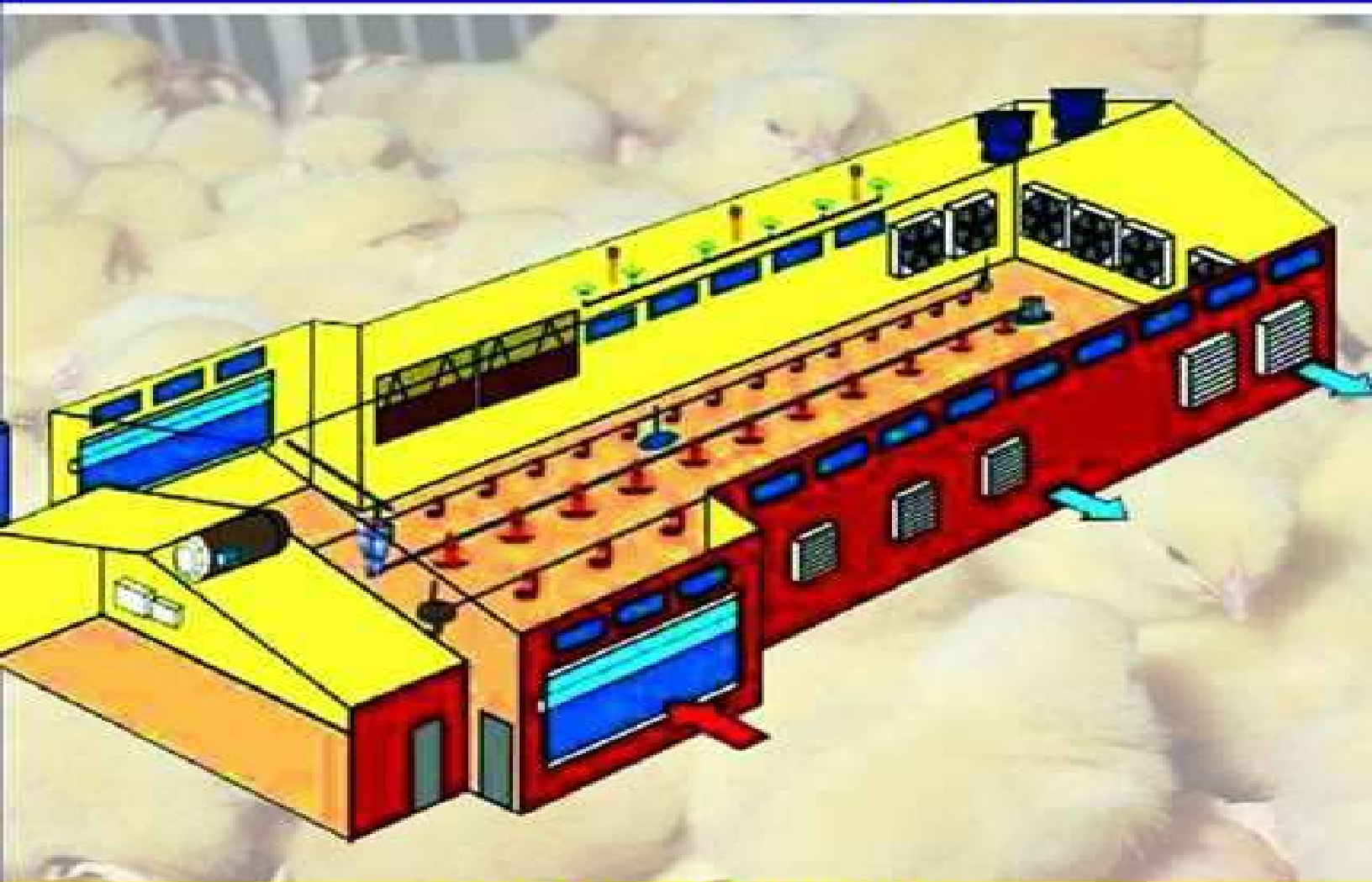
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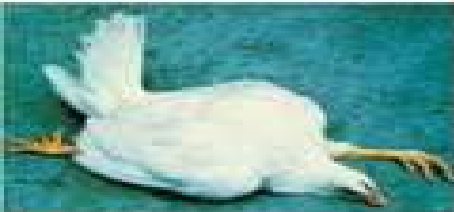
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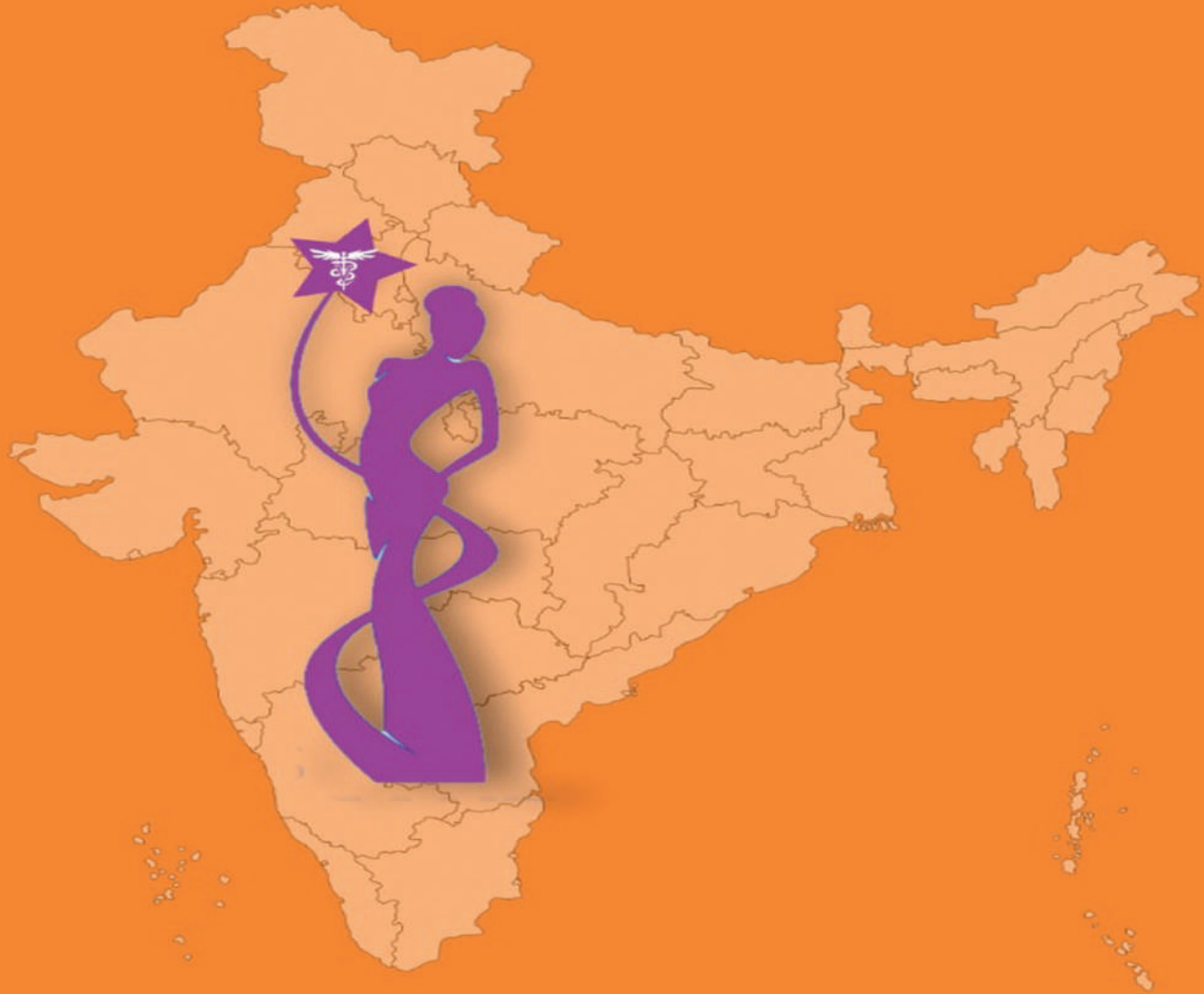
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