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Our customers expect more from us than just medicines, and we continue to deliver the information, technologies and veterinary services to meet their needs around the world. As a multi-species global company operating in more than 150 markets, we respond readily to the demands of our dynamic industry.

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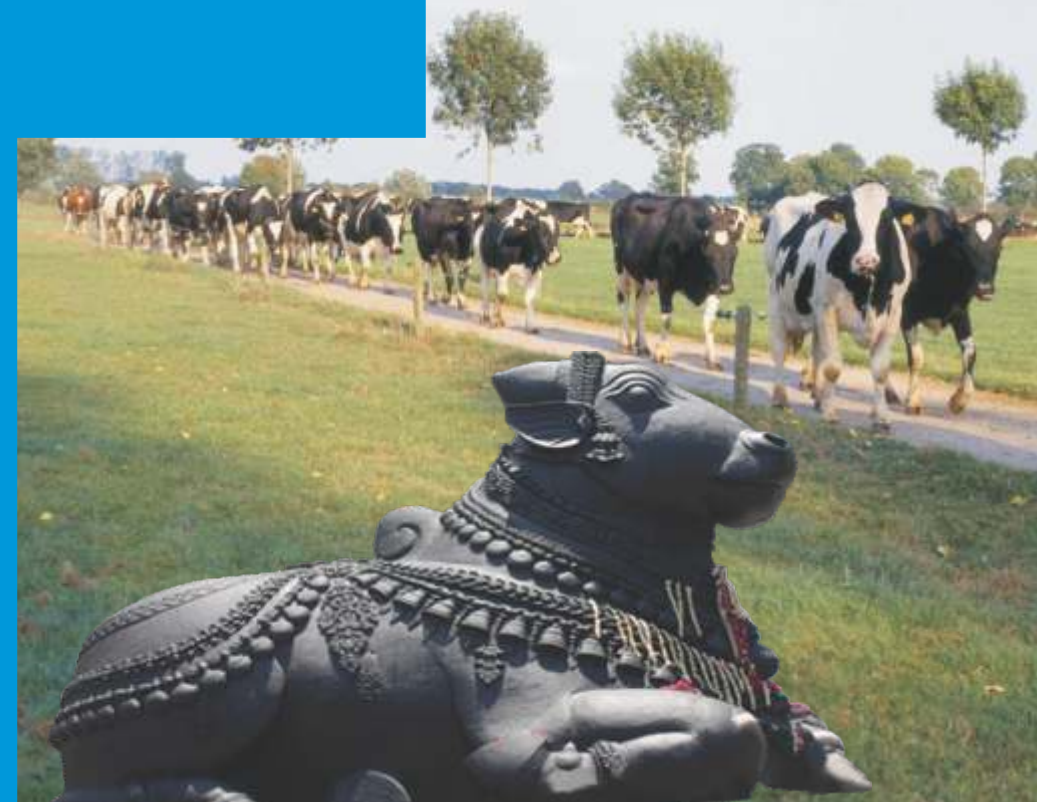


The Blue Cross Book

38

The Blue Cross Book

For the advancement of the veterinary profession



38

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The results/conclusions drawn and recommendations made in the article (s) are of the author (s) and not necessarily of the Editorial Board.

Doubling farmer's income and achieving goals of milk production is a great challenge for professional veterinarians as farm animal productivity is to be enhanced through sustained efforts with animal owners. It is possible to consider regional needs and even efficacy of available alternate livestock species through encouragement of different strategies. Piggery, back yard poultry, small ruminants, yak, camels and many other species are potential yielders and can sizably improve farmer's income.

Regular veterinary clinical practice is far away from diagnosis and treatment of male animals. Andrological investigation of male animals is important consideration to enhance productivity of females. 'Semen straw to milk' concept in dairy business has immense importance in the days of use of sorted semen and conception rate improvement challenge. Factors leading to seasonality restrictions in breeding of farm animals must be understood in depth to provide uniform animal productivity throughout the year.

Emphasis on disease diagnosis, providing diagnostic services and reporting of rare clinical cases at field level is necessary. It is noteworthy to mention that social media groups of field vets now discuss and encourage reporting of clinical case discussion to the larger extent and thus imparts continual educational support. Most typical and unusual cases need to be documented for long term technical support. Birds, wild animals and pets in clinics provide opportunity to handle, treat and follow new experience, in addition to enjoy uniqueness and satisfaction of different approach.

Availability of mobile apps in market to detect milk adulteration and decision of state of Maharashtra regarding lifetime imprisonment penalty to milk adulterants are the recent developments in clean, green, standard and residue free milk marketing. Similar consideration to provide UV disinfected table eggs and improve quality of eggs is necessary. Cleanliness move in 'one health' program is utmost necessary to keep livestock and human life away from diseases.

For years together, we have experienced very harsh and severe effects of environmental adversities. Professional Veterinarian must have training and knowledge to tackle all types of disasters. Preparedness to fight in adverse natural conditions is possible only through preventive strategies and protection of livestock wealth by the field veterinarians. Service to animal world is a novel job and multi pronged approach of veterinarians can save pain and suffering of deaf and dumb creatures through skillful professional techniques.

Editorial board wishes the readers very Happy and Prosperous New Year 2019.



Dr. Yash Goyal
Managing Director,
MSD Animal Health

Dear Veterinarians,

As a continued commitment towards our vision of "Science for Healthier Animals", we are bringing this 38th issue of 'The Blue Cross Book' journal, wherein many health issues and solutions of livestock are discussed by several eminent Veterinarians from different institutes, for the benefit of our readers. MSD-AH conveys sincere thanks for their contribution.

Sharing of information is one of the best ways that can help customers care for and manage their animals better. In the year 1955, MSD published the first edition of the now world-famous MSD Veterinary manual which is available in digital form (www.msdrvvetmanual.com). Similarly, MSD-AH in India has initiated the concept of sharing knowledge by publishing 'The Blue Cross Book' journal in the year 1993 and continuing as a biannual scientific publication which is also available in digital form (www.msd-animal-health.co.in).

Early diagnosis and preventive measures will help the livestock owners to keep their animals healthy and productive. MSD-AH is helping its customers through the diagnostic services both in the form of laboratory diagnosis and field visits by its technical experts. Additionally, several Public Private Partnership surveillance programs are undertaken with the help of government bodies, to understand the disease situations of Poultry and Livestock sector. This has helped a lot in identifying several emerging and re-emerging diseases of animals and made us to combat such situations with introduction of novel vaccines like Vector vaccines and recombinant vaccines.

Reproductive issues in cattle have a negative effect in livestock economy, both with unproductive stock maintenance and their treatment. Early diagnosis and right kind of treatment is the need of hour to bring back the animal into productive environment. MSD-AH has done several veterinary camps with the help of local field Veterinary experts in diagnosing the reproductive problems of livestock and suggesting treatment with great success. These kinds of camps are needed much more in order to cover the larger livestock population of India for successful dairy production.

MSD-AH wishes a Happy New Year 2019 to all our readers.

Best wishes
MSD-AH team

ORIGINS

When MSD and Schering-Plough merged in 2009, we became part of one of the largest health companies in the world.

The animal health expertise of our three original companies: MSD, Intervet and Schering-Plough Animal Health, dates back over 100 years. Each was sparked into being by breakthrough ideas from people with the spirit and intelligence to take on the diseases they saw harming the animals, people, and livelihoods around them.

MSD

In the 1930s, MSD scientists in the US were seeking a drug for human streptococcal infection. Instead they found sulfaquinolaxaline, which proved to be a highly effective treatment for coccidiosis in chickens. MSD wasted no time turning it into a drug, and started a soon-to-be successful animal health division.

Intervet

It was feed manufacturer Wim Hendrix who laid the foundations of Intervet in 1949 in the Netherlands. He observed that sick chickens don't eat, and set about enlisting scientists to create the first ever vaccine for fowl pox. This was one of many firsts Intervet has brought to the animal health market, including many leading vaccines for all types of animals.

Schering-Plough Animal Health

Schering-Plough's animal health division was formally established in 1955 in the US. It was created to supply demand for the corticosteroid prednisone (originally a human drug), to fight ketosis in dairy cattle. The original sales team of three, grew ten-fold in two years, and went on to establish a leading position in the animal health market.

OUR STORY SO FAR

MSD Animal Health has a proud history of improving the lives of animals and the people who care for them. Now our experience is helping us shape the future. So while we cherish our beginnings, we also know we are more than a sum of our parts. Today we're striving to become an even more ambitious, innovative force for progress in science.

1940s



Merck & Co. discovers sulfaquinolaxaline, the first poultry coccidiostat and establishes an animal health division

1949

Feed manufacturer Wim Hendrix lays the foundation for Intervet at Boxmeer in the Netherlands, where the animal health headquarters of today's company remained until 2012

1950s

Schering-Plough Animal Health is established and comes to market with prednisone to treat ketosis in dairy cattle.

Intervet develops first fowl pox vaccine for poultry.

1955

First edition of the Merck Veterinary Manual

1961

Netherlands based Koninklijke Zwanenburg Organon, which later became AKZO NOBEL, acquires Intervet

1970s

Introduction of anti-inflammatory drug flunixin meglumine for horses by Schering-Plough Animal Health

Development of anthelmintic fenbendazole.

1980s

First ever recombinant DNA vaccine developed by Intervet to protect against diarrhea in piglets.

First high-titre, low-passage vaccine against canine parvovirus.

1990s

Schering-Plough Animal Health develops florfenicol, a novel phenicol antibiotic exclusive to veterinary medicine.

Intervet introduces antiparasitic SCALIBOR®, a dog collar to prevent Leishmaniasis from sand fly bites.

Merck & Co. and French pharmaceutical company Rhone-Merieux (later Sanofi) combine their animal health divisions in an equally-owned joint venture named Merial

IDAL®, the first needle-free, intradermal platform to deliver vaccines

2000s

Schering-Plough Animal Health launches fish antiparasitic (emamectin) for the treatment of sea lice in salmon.

Intervet obtains license for the first live bacterial recombinant vaccine against strangles in horses in the EU.

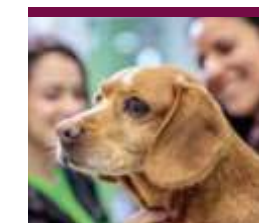
Introduction of the first marker vaccine for classical swine fever by Intervet.

Harrisvaccines, a privately-held company that develops, manufactures and sells vaccines for food production and companion animals founded in Iowa

Schering-Plough acquires Organon Biosciences (Intervet and Organon) from AKZO NOBEL. The animal health division operates as Intervet Schering-Plough Animal Health.

Intervet Schering-Plough Animal Health develops revolutionary freeze-drying technology SPHEREON, for vaccines.

Merck & Co. acquires Schering-Plough. Intervet Schering-Plough Animal Health becomes the animal health division of Merck & Co.



2010s

The operating name of MSDs animal health unit changes to Merck Animal Health in the USA and Canada and MSD Animal Health elsewhere

The 1st transdermal, needle-free application for a non-steroidal anti-inflammatory drug for cattle is introduced

MSD Animal Health receives approval for the first long-lasting chewable tablet for dogs for the treatment and prevention of fleas and ticks.

MSD Animal Health receives approval of Europe's first single-shot vaccine to protect piglets from Porcine Circovirus Type 2 and *Mycoplasma hyopneumoniae* infections.

Full line of fixed-time insemination products for swine are introduced

MSD Animal Health receives a conditional product license for the canine influenza H3N2 vaccine and becomes the first company to receive approval to launch a combination vaccine, providing protection for dogs against both H3N8 and H3N2 strains of canine influenza.

MSD Animal Health acquires Harrisvaccines.

MSD Animal Health releases extended flea and tick protection for cats and dogs as a spot on.

MSD Animal Health acquires Vallée S.A., a Brazilian animal health company.



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Disaster Management- A Challenge for Vets

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Abstract :

Disaster causes serious disruption of society causing damage to human as well as animal lives. India is vulnerable to various types of disasters, which leads to detrimental effect on livestock population. By the means of proper disaster management plan, with preparedness, mitigation, prevention, response and recovery phase, one can effectively deal with any type of disaster and minimize its effect on livestock population.

Keywords : Disaster, Livestock, mitigation, recovery.

Introduction :

The word disaster came from a latin word *désastre* which is derived from Greek dusaster meaning bad star, which comes from an astrological sense of a calamity based on the position of planets that is beyond the imagination of humans. According to the United Nations (UN), disaster is an event that involves the serious disruption of a society and exceeds the ability of the affected communities to cope using their own resources (UNDP). Disaster is an event, natural or man-made, sudden or progressive that leads to sudden disruption of normalcy within the society, causing damage to life and property to such an extent that normal social and economic mechanism available are inadequate to restore normalcy. Disaster may have features like unpredictability, unfamiliarity, speed, urgency, uncertainty and threat.

India is vulnerable, in varying degrees, to a large number of disasters. More than 58.6 per cent of the landmass is prone to earthquakes of moderate to very high intensity; over 40 million

hectares (12%) of its land is prone to floods and river erosion; close to 5,700 kms, out of the 7,516 kms long coastline (8%) is prone to cyclones and tsunamis; 68% of its cultivable area is vulnerable to droughts; and, its hilly areas are at risk from landslides and avalanches (3%). Moreover, India is also vulnerable to Chemical, Biological, Radiological and Nuclear (CBRN) emergencies and other man-made disasters (NDMA, 2018).

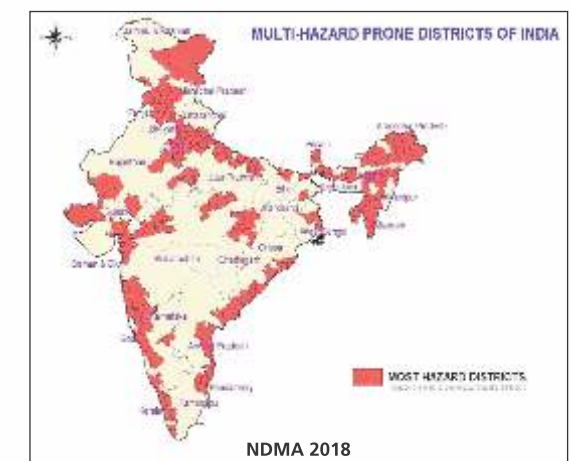




Table details classification of disaster as natural and manmade with its intensity as major or minor.

<p>Major natural disasters:</p> <ul style="list-style-type: none"> • Flood • Cyclone • Drought • Earthquake • Cloud Burst • Tsunami 	<p>Minor natural disasters:</p> <ul style="list-style-type: none"> • Cold wave • Thunderstorms/hailstorm • Heat waves • Land slides • Storm • Pest attack • Avalanches
<p>Major manmade disasters:</p> <ul style="list-style-type: none"> • Setting of fires • Epidemic • Deforestation • Chemical pollution, • Wars 	<p>Minor manmade disasters:</p> <ul style="list-style-type: none"> • Road/train accidents, riots • Industrial disaster/crisis • Environmental pollution

The most common disasters are naturally occurring, but any disaster may either be rapid-onset or slow-onset. Rapid-onset disasters include floods, earthquakes, tornadoes, hurricanes, cyclones, severe storms, wildfires, landslides and tsunamis. They could also include technological events such as a gas explosion. Slow-onset disasters include: drought, unusually harsh winters, freezing weather, insect infestations, disease epidemics and flooding. They could also include events such as oil spills or nuclear leaks.

In the last two decades, it has experienced the few awesome disasters like the Orissa super cyclone, Tsunami, Latur and Gujarat Earthquakes, Kosi flood, Hurricane Aila, flood in Kedarnath and the draught in several States due to delayed/week monsoon. Besides the high population density, compulsive inhabitation of

the risky areas (flood plains, drought-prone areas, cyclone-prone areas, seismic zones) by financially weaker section of society is also responsible for large number of casualties. In the decade 1990-2000, an average of about 4344 people lost their lives and about 30 million people were affected by disasters every year.

India's annual loss due to disasters are recorded in million dollars as earth quakes - 19, Cyclone - 447, Storm surge - 727, Tsunami - 1160, Flood - 7472. (Source: Global assessment report UNISDR 2015).

Disaster gradation is attempted as L-1, L-2, L-3, L-0 indicative of District Level disaster, State Level disaster, National Level disaster and no disaster situation, respectively.

There are several categories of animals and it is important to save all of them during disaster.

Livestock, working animals and companion animals are the commonest ones, (Concept of animal Welfare, 2014).

However, there are also small farm animals, such as backyard poultry, rabbits, etc., Animals in shelters, Animals in zoos and laboratories and animals that are in-patients in our veterinary clinics.

Livestock and Natural Disaster :

Direct effects

- High incidence of livestock mortality
- Tethered animals may pull at the neck ropes and try to get free and injured
- Attacks by poisonous insects, snakes, other rodents, leeches etc.
- Starvation due to inaccessibility to feed and fodder
- Respiratory problems due to exposure to wet and windy condition especially young ones

Indirect effects

- Out break of diseases
- Epidermics like FMD, HS, BQ
- Reduction or total loss of production of milk, work, egg etc

India has suffered 3096 deaths in 1991, 15800 in 1993 and 20000 in 2001 due to earth quake at Uttarkashi, Latur - Osmanabad and Bhuj, respectively.

The main consequences of disaster affected animals are

Spoilage of food and water supply, Zoonoses, Animal bites, Impact on public mental health due to emotional involvement of the owners with the animals, reduced dairy and livestock production,

due to scarcity of feed and water, high livestock mortality rates, etc., The damage to both domestic and wild animal species, due to lack of feed and water and the diseases which spread during and after a disaster. Experience has shown that during disasters, the prime concern of everyone, and the principal objective of every relief measure, is to help people, although animals are also severely affected, people must take priority.

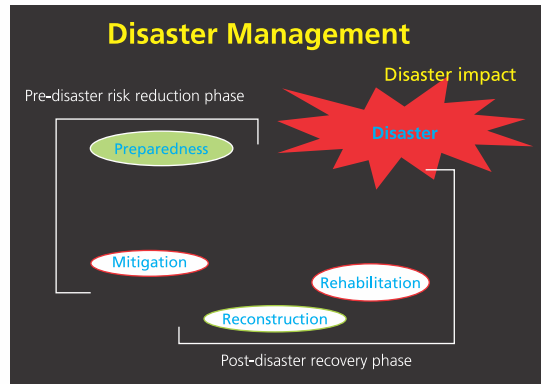
At the global level , there has been considerable concern over natural disasters. Even as substantial scientific and material progress is made, the loss of lives and property due to disasters has not decreased. In fact, the human toll and economic losses have mounted. Though India receives substantial foreign aid for natural disaster relief and rehabilitation, it has to spend enormous amounts as well to handle such disasters.

Disaster Management :

It involves preparing for disaster before it occurs , disaster response and supporting, and rebuilding society after the event. Effective emergency management relies on thorough integration of emergency plans at all levels of government and non-government involvement. Activities at any level affect the other levels. The nature of management depends on local economic and social conditions.

Disaster management is the term used for this protocol. It covers what you should do to prepare for different disasters, and what you should do in response to them, so that you can cope better with it as a community.

Disaster management broadly divided two-point framework, pre disaster risk reduction phase and post disaster recovery phase. Disaster management has four main components:



- Preparedness before disaster strikes by adopting advanced weather forecasting technology and early warning system
- Mitigation and Prevention, i.e. making the effect of the disaster less severe by understanding hazard, vulnerability and risk assessment
- Response response time to a disaster must be as minimum as possible
- Recovery phase takes time

Three major functional areas viz. prevention, response and recovery have been recognized as necessary components of a comprehensive approach.

In the preparedness phase, plans of action to face the disaster strikes need to be developed. Besides, casualty prediction-the study of how many deaths or injuries to expect for a given kind of event is also important. This gives planners an idea of what resources need to be in place to a particular kind of event.

Mitigation efforts attempt to prevent hazards from developing into disasters altogether, or to reduce the effects of disasters when they occur. These measures can be structural or non-structural and are the most cost-efficient

methods for reducing the impact of hazards in certain cases.

The response phase includes the mobilization of the necessary emergency services and first responders in the disaster area. This is likely to include a first wave of core emergency services, such as firefighters, police, NDRF and ambulance crews. They may be supported by a number of secondary emergency services, such as specialist rescue teams and animal husbandry team. A well rehearsed emergency plan developed as part of the preparedness phase enables efficient coordination of rescue.

The aim of the recovery phase is to restore the affected area to its previous state. It differs from the response phase in its focus. Recovery efforts are primarily concerned with actions that involve rebuilding destroyed property, re-employment, and the repair of other essential infrastructure after immediate needs are addressed. In order to deal with the above functional areas, the key responsibilities of agencies include:

Planning: Involves the analysis of requirements and the development of strategies for resource utilization.

Preparedness: Involves the establishment of structures; development of system and testing ; and evaluation by organizations of their capacity to perform their allotted roles.

Co-ordination: Bringing together of organizations and resources to ensure effective disaster management.

Disaster Management in Livestock :

Though the relief manuals come very handy in providing immediate relief and rehabilitation in the eventuality of disaster, these mankind-centric documents give considerably low importance for the livestock which remains the

mainstay of livelihood and food security even in a divested area. This low prioritization and poor preparedness coupled with non-availability of resources makes the situation pathetic in the event of a disaster. This is further compounded with the lack of adequate training of the personnel (Veterinarians and para-veterinarians/subordinate staff) engaged in such activities. In the background of the fact that animal welfare is now a global concern, it is necessary that suitable steps are taken to consider livestock as living beings and attending to them from welfare angle instead of treating them as 'property'.

Majority of the actions in disaster management in livestock greatly vary depending upon the type of disaster. Therefore, disaster-specific relief manuals/guidelines treating the livestock as living beings need to be developed. There is a need to integrate the disaster management initiatives/plans with the existing National / District development plans on animal husbandry and veterinary services with a holistic approach with livestock welfare ingrained in such disaster management plans at all levels. The possible ways of such integration are inclusion of the components in the existing scheme like disaster mapping and disease forecasting, management of disaster caused by outbreak of animal diseases, strengthening and up gradation of the field Veterinary institutions including the diagnostic laboratories, need based research and development of livestock breeds suitable for disaster prone areas, mass vaccination, capacity building for handling livestock related disasters and evolving it as a component of 'all hazard' approach, mass campaign for community sensitization, scheme for development and storage of special feeds, fodder bricks, drinking water and medicines for use in different phases of disaster management cycle.

Preparedness/Pre disaster

1. Disaster mapping- Identification of Geographical area which is prone to specific disaster
2. Strengthening and regular training of the field Veterinary staff to deal with disaster condition
3. Strengthening and up gradation of the field Veterinary institutions including the diagnostic laboratories
4. Adoption of need based breeding policy development of livestock breeds which are suitable for disaster prone areas
5. Creation of feed and fodder bank at district level
7. Development of Pasture land at village/ nyay panchayat level application of fodder conservation techniques training to farmers for conservation of fodder
8. Distribution of quality need based fodder seed to farmers at subsidized cost
9. Regular Vaccination and deworming livestock at disaster prone area

During disaster

1. Treatment of injured/diseased animals.
2. Ensure Regular supply of water and fodder/feed to animals at animal relief camp @ Rs 70/- for large animal and Rs 35/- for small animal. Relief camp will work(default period) for 30 days can be extended for 60 days and 90 days according to situation (NDMA 2015)
3. Feeding technologies to be used during disaster



Different feeding technologies developed earlier have capacity to meet the challenge of feed scarcity or quality improvement to correct malnutrition.

- Fodder block
 - Concentrate mixture supplement
 - Urea treatment of straws
 - Urea treatment of straws is the only chemical treatment with practical potential under field conditions. Urea molasses liquid diet (UMLD), Urea molasses mineral block (UMMB)
 - Compressed complete feed block (CCFB)
 - Silage technology for scarcity period
 - Use of sugarcane crop residual animal feed
 - Tree leaves and vegetable leaves
 - Crop residues
4. Perform Post mortem of the carcasses as soon as possible as it will help in claim settlement
 5. Disinfection of animal sheds by insecticidal spray: This can be done with the compounds like lime powder, alum, 2% formalin, 4% NaOH, 1% KMnO₄, sodium bicarbonate, Bleaching powder, Copper sulphate, phenol gases like HCN, formaldehyde etc. For control of ticks, flies, mosquitoes, lice etc. various insecticides like methrin, melathion, aldrin, etc. may be used for this purpose.
 6. Carcass disposal by Burning or Burial: To control zoonoses and infectious disease to animals.
Euthanasia programmes are intended to prevent animal suffering and the spread of epizootics.
 7. Vaccination: In extreme conditions, animals become more susceptible to diseases due to stress and thus all vaccination schedules should be followed.

8. Deworming: To check the parasitic infestation regular deworming should be followed.

Post disaster:

Distribution of disaster-specific relief as per guideline

Animal husbandry assistance to small and marginal farmers

Replacement of milch animals, drought animals or animal used for haulage as per Ministry of Home Affair letter No-32-7/2014-NDM-1 dated 8/4/2015 listed below reference:-

Relief as per government norms should be distributed to the affected owner in proper coordination with revenue and administrative departments

Programmes for community development must be started soon after relief work is over.

Specific and suitable rehabilitation program/project should be implemented in the affected region for the up liftment of the livelihood of the affected community

Conclusion :

Severe devastating effect of natural calamities on the livestock, poultry and other animals can be minimized by adopting advanced weather forecasting technology under prevention and mitigation, preparedness before disaster strikes and minimum Response and recovery phase after it occurs

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Category	Type of animal	Compensation in Rupee
Milch animals	Buffalo/cow/camel/yak/mithun	30000.00
Small animals	Sheep/goat/swine	3000.00
Drought animals	Camel/Horse/bull buffalo & cow	25000.00
Calf	Calf cow& buffalo/donkey/mule/pony	16000.00
Poultry	Chicken (broiler/layer)/Duck	50.00/bird

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Role of Melatonin on Reproduction in Seasonal Breeding Animals

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Abstract:

Melatonin is one of the key elements in the control of seasonal reproduction. Many mammalian species exhibit seasonal variations in breeding activity, which are controlled by photo-periodic cycles. Melatonin is a neuro-hormone secreted by the pineal gland, whose concentrations in the body are regulated by both the dark-light and seasonal cycles. In long day breeders, such as mare and hamster etc., melatonin show inhibitory effects on GnRH and hypothalamic pituitary-ovarian axis. In short day breeders such as sheep, goat and camel etc. melatonin shows stimulatory effects on GnRH and hypothalamic pituitary-ovarian axis. Melatonin also regulates testosterone synthesis and testicular maturation in male animals.

Key words: Melatonin, seasonal breeding, Neuro-hormone

Introduction :

Melatonin is derived from tryptophan (amino acid) present in vertebrates, invertebrates, bacteria, unicellular organisms and even in plants. (Reiter *et al.*, 2010). Melatonin is soluble in both water and lipids. Therefore, It may move freely through the blood-brain barrier and placenta. It is produced in the pineal gland (principal site), cerebellum, retina, skin, gastrointestinal cells, Harder's gland, thymus, mononuclear peripheral cells, placenta, ovary, testicle, bone marrow, liver, hippocampus and platelets. (Reiter *et al.*, 2010; Cebrian-Perez *et al.*, 2014). Melatonin plays numerous important physiological functions in animal, such as circadian rhythm regulation, seasonal reproduction and temperature regulation (Tamura *et al.*, 2013). Melatonin produced in the pineal gland is not stored but directly

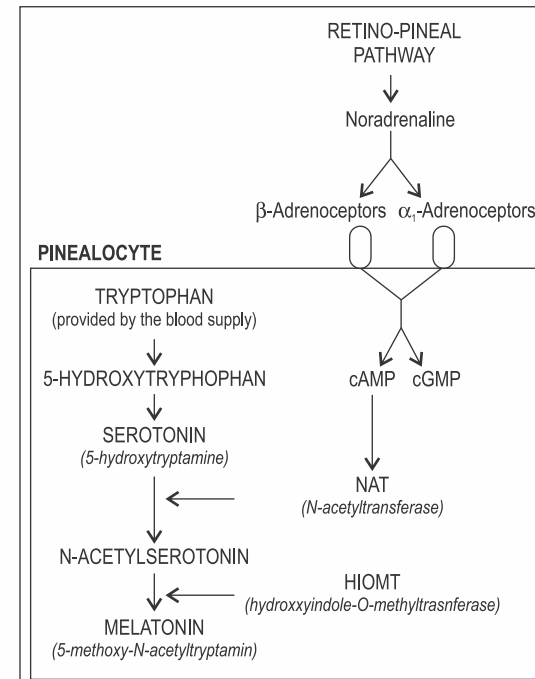
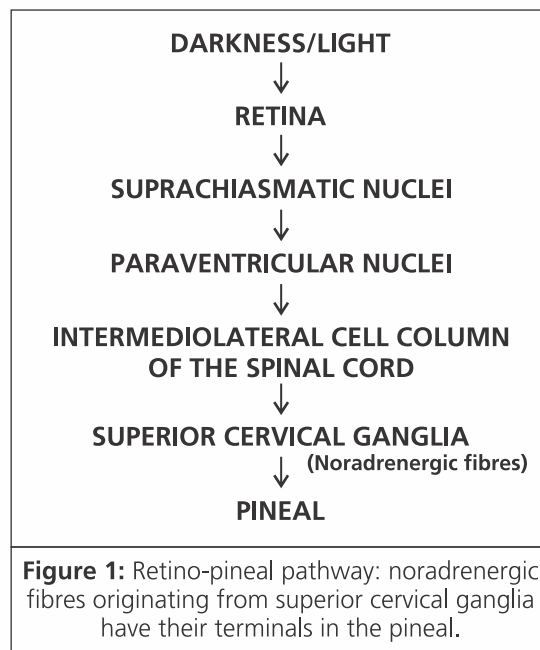


Figure 2: Pathway for secretion of melatonin within the pinealocyte: the N-acetyltransferase (NAT) activity, which is under the control of the retino-pineal pathway (through the release of noradrenaline), represents the rate-limiting factor in the synthesis of melatonin.

secreted to both cerebrospinal fluid and cardiovascular system (Cebrian-Perez *et al.*, 2014). Melatonin regulates the secretion of GnRH and LH. Foods rich in melatonin include cherries, rice, beet, cucumber, tomatoes, yeast and bananas.

Role of melatonin in mare :

Mares are long-day breeder. They are reproductively active during the summer, when the nights are shorter. The reproductive function decreases to a minimum in winter months. In horses, specific melatonin binding sites are found in the pars tuberalis, in the median eminence and in the suprachiasmatic nucleus.

(Stankov *et al.*, 1991). During dark hours, melatonin secretion is stimulated by norepinephrine secreted by the postganglionic synaptic neurons. In the horse, this concept is supported by the observation that isoproterenol, an β -adrenergic agonist, stimulates melatonin secretion. (Sharp *et al.*, 1980). HIOMT-activity (one of the key enzymes in melatonin synthesis) is highest during the anovulatory season and decreases significantly 2–3 months before the beginning of the ovulatory season (Wesson *et al.*, 1979). Pinealectomy prevents gonadal regression in mares exposed to a short photoperiod. This antigonadal action is exerted by inhibition of gonadotrophin-releasing hormone (GnRH).

Role of melatonin in sheep and goat :

In short-day breeders, such as the sheep and goats, reproductive activity is associated with a decrease in the length of the day. The breeding season thus is autumn and winter. Photoperiod appears to be the main environmental factor responsible for seasonality of reproduction in sheep and goats. Malpoux *et al.* (1996) reported that a direct action of melatonin on GnRH neurones appears unlikely because most of the GnRH neurones are located in the preoptic area of the hypothalamus, which does not seem to be a site of action of melatonin and very few are located in the mediobasal hypothalamus (presumed site of action of this hormone). Misztal *et al.* (1997) reported that in lactating ewes, the melatonin concentration decreases, where as prolactin, responsible for the initiation and maintenance of lactation increases. Prolactin may block the hypothalamic mechanism which is responsible for episodic release of LH or inhibit the positive feedback of estrogen on LH secretion and it can affect ovarian steroidogenesis by altering the number of LH receptors.



Role of melatonin in buffalo :

Buffaloes are able to show a seasonal breeding pattern. Seasonal breeding pattern is determined by melatonin secretion in response to short-day length. Buffaloes exhibit estrus more during the period of short-day length compared to the long-day period. The differences between night and day concentrations of plasma melatonin in March were lower in heifers (5.0 times) than in adult (28.3 times) buffaloes (Borghese *et al.*, 1995). Melatonin appears to act at hypothalamic sites to increase the release of GnRH pulses by modulating the negative feedback potency of estradiol (Noel *et al.*, 1999), which acts at hypothalamic and hypophysial loci to reduce luteinizing hormone secretion (Caraty *et al.*, 1989). The restoration of the ovarian activity in summer anestrus buffaloes are achieved by administration of exogenous slow-release melatonin, which provides improvement or boost for follicular growth and ovulation. Treatments with melatonin implants tend to originate an increase in serum melatonin concentration in anestrus buffalo heifers (Ramadan *et al.*, 2014) and in anestrus animal which could be associated with the antiprolactinic action of melatonin (Dholpuria *et al.*, 2012). Melatonin implantation in conjunction with CIDR-eCG protocol successfully induced estrus behavior and enhanced conception rate in anestrus heifers and anestrus lactating buffaloes during out-of-breeding season under tropical conditions.

Role of melatonin in camel :

During daylight hours, the retinal photoreceptor cells are hyperpolarized in camel. At night, the enzyme that regulates the rate of melatonin synthesis (arylalkylamine N-acetyltransferase) is increased, initiating the synthesis and release of melatonin (Thipayang, 1998). Melatonin modulates the discharge frequency of

hypothalamic regulatory factors such as gonadotropin releasing hormone (GnRH). Serum prolactin levels are high during the non-breeding season and decrease significantly in the rutting season. Thus, it was proposed that hyperprolactinemia may cause reduced fertility and libido in the male dromedary during the nonbreeding season probably due to its inhibitory action on the synthesis and secretion of FSH and LH (Azouz *et al.*, 1992).

The role of melatonin in the regulation of male reproduction :

Melatonin secreted by the pineal gland influences male reproduction by binding to specific receptors and thereby inhibiting the production of both GnRH and LH. In the hypothalamus, melatonin can also inhibit GnRH release by increasing GnIH (Inhibitory) production. In the testes, it inhibits testosterone production but may also protect against damage caused by toxic environments or testicular inflammation, and can improve sperm quality due to its antioxidant activity.

Conclusions :

Melatonin is distributed widely in nature. Melatonin is the hormone responsible for the translation of the day length information to the reproductive axis by changing the sensitivity of the GnRH pulse generator with consequent modification on the pulsatile secretion of LH. Melatonin has been widely used as an antioxidant agent against a wide variety of processes and agents that damage tissues via free radical mechanisms. Melatonin also has immune enhancing and oncostatic properties. It acts as a photoperiod messenger molecule, transducing photoperiod changes to reproductive organs and plays a vital role in the seasonal control of reproduction in certain animals.

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Conservation of Livestock Breeds for Sustainable Livestock Production

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Abstract:

Human life all over the world is related with domestic animal husbandry practices and hence, conservation of livestock breeds is the strongest desire. Breeding methods, biotechnologies, genetic engineering advances and collective human efforts can largely preserve endangered and domestic productive animal species. This review highlights need, methods and scope of livestock conservation strategies on scientific lines for sustainable livestock production.

Keywords: Conservation, livestock, breeding and preservation.

Introduction :

India is the seventh largest country in the world and it is recognized as one of the 12 mega biodiversity centers of the world. Due to diverse agro – ecological regions and topographic conditions, India has vast repository of domestic animal biodiversity with a large number of breeds of all livestock and poultry. The diversity of domesticated livestock breeds was developed due to years of evolution adopted to specific ecological niche and local needs. There are thirty seven recognized breeds of cattle in India, in addition to large number of non – descript cattle. The share of India in terms of number of breeds is 7.75 percent of the total world cattle breeds.

Each breed should be regarded as collection of special genes designated to serve specific purposes in particular agro – ecological zones and a valuable genetic resource. The livestock is being endowed with unique qualities like tolerance to high heat and humidity, resistance

to diseases and ability to survive under severe nutritional stress. According to FAO recent statistics, 22 percent of the world's more than 8000 livestock breeds are classified as at risk of extinction.

A number of these breeds are subjected to fast genetic degradation and dilution because of indiscriminate breeding and introduction of exotic germ-plasm. Since last two decades the emphasis on draft ability of cattle has reduced due to mechanization of agriculture and transport. Cross breeding of native cattle for increased milk production has been advocated as a breeding policy across the country. As a result, some indigenous breeds are getting endangered at an alarming rate while others are in the process of replacement by certain high producing strains. The need for parallel conservation of animal genetic resources as a raw material for future animal breeding programmes is also recognized as an important

issue in international, national and regional animal husbandry planning. Conservation of livestock is of particular concern in regions where rapid agricultural change takes place, where indigenous stocks and farming methods are replaced by climatic change and disease.

Different reasons for conservation of animal genetic resources.

1. Economic and biological reasons:

Genetic variation both within and between breeds is the raw material with which the animal breeder works. Therefore, any loss of genetic variation will limit our capacity to respond to changes in economic forces for the exploitation of animal production in future. Breeds with specific qualities like resistance, heat tolerance, ability to survive and produce under stress and low input conditions need to be preserved for future use. Future requirements of type and quality of animal produce (milk, draught power) may change and this requires conservation of animals better performance in specific production traits. Magnitude of heterosis depends upon the breeds crossed. For exploiting the heterosis in animal production, it is necessary to maintain breeds which are complementary to each other and on crossing result in maximum heterosis.

2. Scientific reasons:

Breeds with unique physiological (or) other traits are of great value as they provide missing links in the genetic history of a livestock species by the study of blood groups on polymorphic traits. To identify the DNA sequences causing the distinctive traits, preservation of breeds with unique traits will be essential for long term research in molecular engineering. To evaluate the

magnitude of genetic change due to selection maintenance of a sample as control population is very much essential.

3. Historical and cultural reasons:

Conservation of historically important, culturally interesting and visually unusual and attractive population is very important. Conservation of breeds will be preservation of population with diverse sizes, colours and other morphological features for aesthetic reasons etc.,.

Identifying reasons for the loss of animal genetic diversity

There are several factors that place breeds at risk of extinction and threaten livestock diversity (FAO, 2007; FAO, 2009). In developed countries, the greatest cause of genetic erosion is, by far, the growing trend towards a global reliance on a very limited number of international transboundary breeds suited to the needs of high input – high output industrial agriculture. The effect of this trend is that many breeds have fallen out of use and disappeared without notice. In developing countries, genetic diversity is potentially threatened by a variety of influences. In the literature, there is broad agreement regarding the general trends and factors threatening animal genetic resources in developing countries, viz.

1. Change in production system,
2. Producer preference – consumer demand - lean pork,
3. Socio economic factors,
4. Natural disasters (drought, famine, disease, epidemics and war),
5. Development of technology (Biotechnology),
6. Lack of sustained breeding programme,
7. Increased demand for livestock products,
8. Climate change,
9. Loss of labour force,
10. Migration of livestock keepers to urban area



Conservation Strategies:

(A) Breeding Policy

The States may review their respective breeding policy so as to prioritize conservation of Indigenous breeds in their breeding tract and allowing no cross breeding of recognized indigenous cattle in the home tract of important and recognized indigenous breeds.

(B) Implementation of the Breeding Programme

1. The State may consider region specific and breed specific breeding strategies, programmes and plans to implement the conservation programme.
2. The States may delineate and identify, in their respective breeding policies, the geographical boundaries of the areas where non-descript cattle should be upgraded by crossing with bulls of indigenous breeds. Once such areas are earmarked, no cross-breeding of non-descript cattle, other than with bulls of indigenous breeds, should be permitted.
3. The areas for cross-breeding of non descript cattle with exotic breed may be identified.

(C) Promotion of Breeders organization

1. Breeding Farms

The existing States breeding farms of indigenous breeds should be declared as germplasm repositories and used for production of bulls. Only pure breeding should be practiced at these farms.

2. Gaushala

Conservation efforts have mostly limited to institutional farms with small herd sizes, leaving larger parts of the breeding tract totally neglected. There are large number of

Gaushala have quite sizable populations of purebred animal of Indigenous breeds but do not have the resources for maintaining and improving these animals. Such Gaushala may be supported to maintain indigenous breeds so that they can supply improved quality of germplasm for breeding. They should be provided with scientific and technical inputs and training for genetic evaluation.

(D) Role of voluntary organization

1. Breeder's Association –without involvement and participation of farmer's it is not possible to conserve the breed. Improvement of Indigenous breeds can be taken up in collaboration with Breeders' association through selection of outstanding animals true to their breed types.
2. These Breeders' association can be encouraged to form a Federation at the State/District level to take up issues relating to conservation and development of respective indigenous breeds. States may consider having State level awards for Breeders' associations and for progressive farmers who have contributed to conservation and development of recognized indigenous breeds.

(E) Use of Science and Technology

Since the introduction of cross breeding programme, most of the techniques and methodologies for breed improvement have been used to produce cross bred cattle. The application of such technologies for propagation and improvement of indigenous breeds is a relatively rare phenomenon, one of the reasons for which may be the reluctance of the farmers, owning these breeds to accept new and

established techniques for reproduction.

1. Technologies such as artificial insemination, frozen semen production, progeny testing, embryo transfer technology should be used, after proper evaluation where ever required.
2. National gene bank should maintain the germplasm in the form of semen & embryo. Regional gene banks should meet the requirements of National gene bank.

(F) Data Base

1. A reliable data base should be developed with regard to all the details of Indigenous breeds, including their breeding tracts, numbers, characterization, gene make up, the institutional farm where they are being preserved and / conserved.
2. The national level data base for cattle and buffalo developed by NDDDB may be utilized for this purpose.
3. A breeding network should be set up by computerizing and net working all AI outlets, semen stations, breeding farm and Gaushala.

(G) Creation of Public Awareness

1. Available information on different breeds should be published in the form of pamphlets, books, calendar etc. This will create awareness and motivate farmers to conserve the important breeds.
2. Some farmers are the proud owner of the popular breeds of their area. Such farmers, if encouraged through financial and veterinary help will help in preservation of breeds
3. Breeds shows should be arranged for local breeds and owners should be rewarded for maintaining pure local breeds. Publish

success stories on local breed conservation and innovative utilization.

Mechanism of conserving cattle genetic resources

Once genetic resources have been identified and characterized, two basic conservation activities can be followed, i.e., *in situ* and *ex situ*.

In situ conservation

In situ conservation requires establishment of live animal breeding farms and their maintenance. The generation and loss of alleles is a dynamic process that should be maintained at close equilibrium through sound management. *In situ* conservation strategies emphasize wise use of indigenous cattle genetic resources by establishing and implementing breeding goals and strategies for animal sustainable production systems. In India, such efforts are limited to only six breeds of cattle, in a herd registration program organized by the Central Animal Husbandry Department (Balaine *et al.*, 1987). Similar programs are required for the rest of the breeds and species as well. In any such program, the success depends upon the participation of the farmer for which he needs support and incentive. Therefore, it is difficult to organize the farmers for conserving the breeds which are no more economical to him. In the case of breeds which are no more economically viable, therefore, the only alternative is to bring them under government farms. *In situ* conservation is very costly if the entire population has to be retained for which at least 26 females and 10 males in cattle have to be maintained that would keep the inbreeding coefficient at 0.2 per cent per year (Smith, 1984). Therefore, this approach would have to be limited to those breeds which are highly endangered. Modalities for simplified animal recording, genetic development and dissemination are needed for each species for a range of national livestock structures in developing countries.



Major advantages of *in-situ* conservation:

1. Live animals can be evaluated and improved over the years.
2. Genetic defects can be detected and eliminated.
3. Live animals are always available for immediate use.
4. They are a gene bank for future use.
5. They are a constant reminder that the needs of posterity must be considered.
6. The herd may have some economic advantages (heat tolerance, disease resistance) which can be exploited and so render the enterprise economically viable.
7. The produce from live animals partly compensates the expenditure, if not entirely.
8. From aesthetic point of view, the live animals are, visible, a pleasure to look at, the people are delighted to see variety of animals and have some cultural value.

The major limitation of live animal conservation is the number of animals that could be maintained. While fixing the number for preservation of a breed, the cost of maintenance, availability of animals and rate of inbreeding should be taken into consideration. With small population size, the effective population size decreases and the genetic structure of the population is affected due to inbreeding and random drift.

Many models are now available which reduce inbreeding to a minimum, but random drift over long periods may lead to a population very different in genetic composition from the initial one. *In situ* conservation involves a large infrastructure of land, buildings, feed and fodder resources, water supply, labour, technical and

supervisory man-power, etc. Therefore, new establishments for in-situ conservation of farm cattle genetic resources are quite costly and even the maintenance of existing ones is cumbersome. The costs need to be estimated for each ecosystem.

Smith (1984) recommended that the population size should be such that increase in inbreeding should not be more than 0.2 % per annum for preserving the breed in situ. Turner (1987) recommended a flock/herd of 150 breeding females with 20 breeding males, the males being unrelated as far as possible, for preservation purposes. Brem (1990) considered a maximum inbreeding level of 1 % per generation as tolerable. He suggested that a herd size of 200 breeding animals is necessary to breed and selected successfully for a quantitative trait. Henson (1990) observed that an effective number of 25 animals per generation will be able to preserve about 50 per cent of genetic diversity in a breed over 50 generations, while an effective number of 50 per generation will maintain 75 per cent of the diversity. To maintain 100 per cent genetic diversity an effective number of 500 animals per generation will be needed.

Maijala (1990) reported that heterozygosity starts declining at an accelerating rate after the effective population size falls below 100, while the genetic drift increases rapidly when the effective size is less than 30. In case of preservation of small populations, to prevent undesirable effects of inbreeding and random drift, FAO suggested a mating ratio of 5 males and 25 females, but a ratio of 50- males and 250 females is recommended in case of traits with low heritability (Anon., 1987). When preservation is through cryogenic methods, semen from 25 unrelated males should be frozen and embryos from 35 different matings must be ensured for embryo freezing.

Ex-situ conservation

Ex-situ conservation includes cryogenic preservation. It is the storage of genetic resources, which the farmers are currently not interested in using. *Ex situ* conservation is based on the use of live animals populations wherever practicable, supported by cryopreservation where technology exists or can be developed, combining within-country gene banks with global repositories. Interested governments, non-governmental organizations, research institutions and private enterprises should be encouraged to maintain *in vivo* samples of breeds at risk, with national inventories being established and kept up to date so that the genetic resources are readily available for use and study. *Ex situ* conservation is comparatively more convenient, economical and easy with the application of modern reproductive technologies.

Advantages :

1. If the preservation is to maintain populations without genetic change, it can be best done by cryogenic storage as it is difficult to breed many generations of animals without any change in the genetic structure.
2. The resources requirement for in situ preservation is quite large as compared to cryogenic methods.

Limitations :

1. *Ex situ* preservation using frozen semen delays the restoration of a breed as it can be restored in the future only by upgrading. But this could be overcome through preservation of embryos.
2. Another important factor is the danger faced by a breed restored from cryogenic preservation from important changes in the environment like germs, climate, etc., that have taken place over the years.

3. Variability in cryogenic storage of germplasm, accessibility to their physical location, ownership, behaviour of animal, response of germplasm to freezing and thawing techniques, and poor conception rate.

Ex situ/Cryogenic preservation includes

1. Preservation of frozen semen, 2. Preservation of oocytes, 3. Preservation of embryos, 4. Preservation of ovaries, 5. Use of embryonic stem cells or blastomeres, 6. Production of chimeras, 7. Production of embryos in vitro, 8. Embryo splitting, 9. Transgenesis, 10. DNA libraries (Polge, 1990).

1. Semen preservation

Semen cryopreservation and artificial insemination are important tools of animal improvement with vast scope of genetic improvement, conserving indigenous cattle resources because of their simplicity and relatively cheaper costs. Semen storage and distribution activities are being carried out in a few well-known indigenous milch cattle. Still, many breeds like *Amrithmahal*, *Dangi*, *Gaolao*, and *Punganur* lack such facilities. Spermatozoa may also be collected from the epididymis.

2. Oocyte preservation

This method provides an opportunity for conserving females in the same way as sperm is conserved. The oocyte can be recovered by surgery, laparotomy or slaughtering of donor animals. The frozen thawed oocyte can be used for IVF successfully (Schellander *et al*, 1988). The immature and mature oocyte from slaughtered animals could be useful in near future for cryo-preservation of genetic material of endangered breeds.



3. Embryo preservation

The main advantage of cryo-preservation of embryo over that of sperm or oocyte is that it contains the complete genome. The embryo transfer technique coupled with micro manipulation, embryo sexing and splitting are more useful and economical to carry out *ex situ* conservation of animal genetic resources. This technique is very useful in conservation of genetic resources by rapid multiplication of superior or rare germplasm. MOET can be used in resurrecting the endangered cattle breeds like *Sahiwal*, *Punganur* and *Vechur*.

4. Preserving of ovaries

The preservation of slices of ovaries in liquid nitrogen is a new technology which may be of great use in conservation of animal genetic resources. The ovary slices might be transferable into suitable recipients to obtain oocytes which can be fertilized.

5. Embryonic stem cell and nuclei

Preservation of embryonic stem cells could represent an important method of genome conservation and would be helpful in propagating animals from a single embryo of elite or rare animals belonging to endangered breed/species. Embryonic stem cells represent progressively growing cultures of embryonic cells which retain their pluripotential characteristics. They are derived by culturing blastocysts *in vitro* in such a way that the cells from the inner cell mass proliferate but do not differentiate. Embryonic stem cell lines can be isolated and then multiplied by continued culture. The importance of embryonic stem cell lines is that, if they are incorporated with normally developing embryos, they will participate in the formation of the inner cell mass and

produce chimaeric animals, including germ line chimaeras which are fertile. A more direct route of regenerating animals from embryonic stem cells might be to use the nuclei from these for nuclear transplantation into enucleated oocyte and embryonic multiplication.

6. Chimaeras

Chimaeras mean the animals having body cell population with different karyotypes which have been formed from two or more zygotes with different karyotypes. Chimeric embryos have been frequently made by the aggregation of cells from two individual embryos or by injecting cells from one embryo into the blastocyst cavity of another embryo. So long as cells from both embryos are represented in the inner cell mass, the composite embryo will develop into a chimaeric animal. A more important aspect of chimaerism in genetic conservation is the potential use for inter-species embryo transfer. Using this technology sheep have been born to goat foster mother and vice versa. This would be especially important if it was a species rather than a breed of animal that was on the verge of extinction.

7. Production of embryos *in vitro*

This technology involves salvaging mature oocyte from ovaries of slaughtered animals and developing methods for their maturation, fertilization and *in vitro* culture for normal embryonic development. For conservation of rare breeds, such a method could provide an opportunity to salvage a few oocytes from the ovaries of rare and superior animals even after their normal reproductive life and to produce some blastocysts for conservation by deep freezing.

8. Embryo splitting

Embryo splitting is more advantageous in the circumstances where only few embryos of particular genotype or breed or species are available. This technique of manipulating embryos could be helpful in producing more number of animals from a few stored embryos of rare and endangered animals.

9. Transgenesis

Recent developments in molecular biology have enabled introduction of specific genes in to the animal genome. A small amount of DNA is injected into the nucleus of an egg soon after fertilization. In some instances the DNA becomes integrated into the chromosomes and an embryo and fetus develops in which all the nuclei contain copies of the inserted gene. As any sequence can be spliced with any other (Anderson, 1986), transportation of genes across breeds and species is possible by recombinant DNA techniques. Successful micro injection of genes in mice embryo and their expression (Gordon et al., 1980; Palmiter et al., 1982,1983) has made the creation of transgenic forms a possibility, and for the future a viable technique for improving animal production, and for conservation and capitalize on of important genes across breeds and species.

10. DNA libraries

Theoretically, an animal can be produced from its complete DNA complement. However, at present technical developments are limited to the identification and manipulation of only a few genes. But the direction in which technical advancements are taking place gives an indication that in future breeds/species can be reconstructed from their DNA complements. This gives the

hope that if complete DNA complement is stored either in lyophilised form or as cryopreserved cells, reconstruction can be taken up when techniques are standardised.

Advances in biotechnology are emerging in a big way and could be of great utility in near future for animal improvement and animal genetic resource conservation programmes. Applications to genetic conservation are very justified and future programmes should certainly be evolved in which all the opportunities emerging from new biotechnologies may be exploited. *In situ* and *ex situ* conservation schemes are complementary, not mutually exclusive, with their application for a particular animal genetic resource depending on farmers' current use of it and its comparative uniqueness. Furthermore, frozen germplasm can play an important role in the support of *in situ* breed develop schemes.

Species Specific Recommendations :

General

There is large genetic diversity in livestock as reflected in important domesticated species and a large number of known and lesser known breeds/strains. It is imperative that extensive surveys be undertaken in the home tracts of the known breeds for their description and evaluation and identifying the need and approach to their conservation and improvement. Where the numbers are extremely small, immediate efforts should be made to conserve those breeds, preferably *in situ*.

Species-wise recommendations for breeds, which require priority attention for conservation, are as follows:

Cattle

Cattle breeds such as Red Sindhi and Sahiwal which have their breeding tracts in Pakistan and



Tharparkar, for which we share the breeding tract with Pakistan, are available with a few institutional herds and private breeders. They should be further improved and conserved. Similar attention should be given to Gir, Kankrej and Ongole breeds of Gujarat and Andhra Pradesh. These could be utilized in grading up of non-descript cattle under harsh environments.

Lesser known breeds of cattle such as Punganur, Red Kandhari, Vechur, Bhagnari, Deoani, Lohani, Bengal, Chitagang Red, Nepalese Hill, Kachcha Siri, Tarai, Lulu, Sinhala, Umblacherry and Gangateri need to be studied as genetic resource and steps taken for their conservation and improvement. A number of new breeds such as Frieswal, Karan Swiss, Karan Fries, Sunandini are in various stages of development from a crossbred base. Their further improvement and conservation is necessary.

Buffalo

Murrah and Nili Ravi are two most important breeds of buffaloes. They need to be improved further. Other important buffalo breeds, viz. Surti, Jaffrabadi, Mehsana, Bhadawari, Nagpuri, Pandarpuri, need to be studied and improved through selection's Lesser known breeds such as, Kaziranga, Toda, Marathwadi, Sambalpur, Kalahandi and Paralakhemandi would require extensive survey for their description and evaluation followed by improvement and their conservation if required.

Sheep

Of the 42 breeds of sheep, all the breeds of Jammu & Kashmir and other indigenous breeds like Pugal, Nilgiri and Garole need immediate steps for preservation.

Goat

Of the 20 breeds of goats, Jamnapari, Barbari, Beetal and Surti are threatened by extinction and

would need steps for conservation. These breeds have played an important role in genetic improvement of goats. Other breeds of goats like Black Bengal and Osmanabadi also need to be studied and improved.

Camel

In addition to four important breeds of camel viz. Bikaneri, Jaiselmeri, Kuchchi and Mewati, there are lesser known breeds such as Marwadi, Mewadi, Sindhi, Shekawati. There is a need for proper description, evaluation, conservation and improvement of these breeds.

Horse

Little efforts for description and evaluation of indigenous breeds of horses and donkeys have been made. Breeds like Marwadi, Kathiwadi, Zanskari and Spiti are some important breeds which need immediate attention for conservation and improvement.

Donkey

Nothing is known of genetic variation in donkeys in spite of their large variation in phenotypic characters. There is a need for conducting surveys for description and evaluation of different types of donkeys available in the country.

Pig

There is a large variation in pigs as reflected in size, colour, performance, etc. There is a need for proper description and evaluation of these types and steps need to be taken for their conservation and improvement.

Yak

Little is known about the genetic resources of yaks. There are differences in size and reproduction performance of yaks located in different regions. These differences need to be studied and utilized in conservation.

Future strategies :

The object in conservation and improvement should be considered not only on economic traits but also aimed at the reproductive and survivability in a given eco-system. Policies for genetic conservation and those for genetic improvements (selection programs for commercial exploitation) have opposing objectives. Commercial livestock systems are likely to result in genetic uniformity, wherein further improvement is not possible. These two policies can be made compatible and genetic loss resulting from selection programs can be minimized. Conservation programs are applied in case of farm animals, through the medium of recognized breeds of livestock. The techniques advocated to maintain genetic variability include the use of high ratio of males to females breeding stock, and the application of random breeding system. These are intended to minimize genetic drift and inbreeding, which are the features of small, closed population and to prevent genetic change in populations subject to artificial selection pressures. Maintenance of the breeds in small numbers especially in the Government livestock farms, research institutes and with breeders at field level in the respective breeds tracts could be considered immediately. Since the number of cattle breeds and their variants are high, and the funds available is less, the conservation program should be initially restricted to the more economic and presently used breeds of cattle. As more funds become available, the other breeds can be thought of to be conserved from the historic point as well as for posterity. Immediate strategies would involve the Survey, Conservation of Livestock Genetic Resources, Research on Conservation and Training in Conservation and Management. Serious efforts should be made to organizing conservation and evaluation strategies. Since the major emphasis in any system of conservation is the lack of information in gene resources, it is

absolutely important that evaluation and conservation should go hand in hand and can be achieved by the following: 1. All universities, educational institutions, religious trusts and organizations associated or having interested in historical preservation should be aided by the Government and encourage to maintain small groups of animals in their natural habitat or intended management systems. These groups should be under a uniform recording system, in a computer readable format with the evaluation and documentation being done at the NBAGR. 2. All the developmental programs being taken up by the state governments should have a mandatory pre-requisite that breeds being used for crossbreeding or grading up should be maintained in nuclear herds in their natural habitat and subjected to continuous evaluation as described above.

Conclusion :

The number of indigenous cattle population is decreasing constantly due to the overwhelming influence of mechanization of agriculture and crossbreeding programmes. Conservation of domestic cattle breeds of cattle is essential due to their potentiality for production or draught capability or high resistance to diseases and heat tolerance ability. All the available cattle genetic resources cannot be conserved due to the high cost involved, hence, conservation should be aimed at the those breeds which are immediately useful to the farmer. *In situ* conservation is the method of choice for conservation. However, *ex situ* methods of conservation such as frozen semen preservation can be complementary. Other *ex situ* methods can be utilized once they are standardized and are cost effective. NBAGR (National Bureau of Animal Genetic Resources) will be the national focal point in this programme while the regional focal points will be the state agricultural universities, educational institutions, religious trusts, other non-government



organizations along with the farmers at the field level.

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Efficacy of Herbals in Restoration of Blood Biochemical Homeostasis in Diarrhoeic Goat Kids

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Abstract :

Evidence-based controlled trials revealed that in restoration of blood biochemical homeostasis in clinical cases of colibacillosis in goat kids up to 4 weeks of age, the most effective regimen was Ciprofloxacin reference antibiotic, closely followed by combination herbal preparation: dried extract of *H. antidysenterica* (Kutaj) bark powder + dried extract of *P. granatum* (Anar) fruit rind. Mono-herbal preparation: dried extract of Kutaj bark / Anar fruit rind, was also effective, but to a lesser extent, in that order.

Key words: Herbals, kutaj, pomgranate, ciprofloxacin, colibacillosis

Introduction :

Colibacillosis is an acute, infectious enzootic disease of bacterial aetiology with high morbidity (60.8%) and mortality rate (15-30%) in the goat kids (Rajput *et al.*, 2013). The itinerant gut bacterium *Escherichia coli* induces severe diarrhoea during the first two weeks of life. The affected neonatal kids (1-4 days of age) excrete semi-solid to watery faeces with offensive odour, greenish to yellowish white in colour and occasionally blood stained. Serious imbalances in cellular water-cum-electrolytes homeostasis and deranged acid-base balance often culminate in life-threatening situations (Singh *et al.*, 2014). The present communication reports on the comparative efficacy of the eco-friendly homemade herbal preparations: bark extract of *Holarrhena antidysenterica* and fruit rind extract of *Punica granatum*, singly or in

combination, vs. the proven antimicrobial, Ciprofloxacin in restoration of blood biochemical homeostasis in the diarrhoeic goat kids.

Materials and Methods :

Animals: Total 100 goat kids (up to 4 weeks post-partum) from the Institute's Amanala Goat Farm and the out-patients coming to the Teaching Veterinary Clinical Complex (TVCC) and some representative peri urban house-hold goat rearing units exhibiting typical signs of diarrhoea, poor body condition and dry muzzle were screened systematically. The study was conducted for six months: mid-July 2017 to mid-January, 2018.

Herbal medicaments: *Punica granatum* (pomegranate, Hindi Anar): carefully selected fruits were procured from the local market. The



pooled peeled fruit rind mass was washed thoroughly under running tap water, air dried, homogenized to a fine powder and stored in airtight bottles. Dried powder (10 g) was uniformly dissolved in methanol (100 ml) in a Erlenmeyer flask, securely plugged with cotton wool and gently agitated in a rotary shaker (24 hr). The material was filtered through Whatman filter paper No. 1 cone inside a glass funnel, and centrifuged (5000 rpm, 10 minutes). The clear supernatant was collected, and the solvent was slowly evaporated off till the final volume was reduced to ¼th of the original volume, and cold preserved (4°C) in airtight labeled glass bottles. Nearly 2 g powder was obtained from 150 g of the dried peels of pomegranate.

Holarrhena antidysenterica (Hindi "Kutaj") dry bark powder was purchased from the reputed herbal product suppliers of Jabalpur city. Air dried powder (50 g) was transferred into 300 ml methanol in an Erlenmeyer flask, covered with aluminum foil and allowed to stand for seven days to permit slow extraction of the medicinal ingredients in RT. The extract was filtered through wetted Whatman filter paper No. 1 cone, fitted inside a glass funnel and evaporated

Experimental design

Group	No. of animals	Treatment schedule
T _c	6	Healthy control
T ₁	6	Ciprofloxacin @ 5 mg/ kg body weight, PO for 5 days OD
T ₂	6	Dried methanol extracts of fruit rind of <i>Punica granatum</i> (pomgrenate, Anar) @ 400 mg/ kg body weight PO, for 5 days OD
T ₃	6	Dried methanol extract of dry bark powder, <i>Holarrhena antidysenterica</i> (Kutaj) @ 400 mg/ kg body weight PO, for 5 days OD
T ₄	6	Dried methanol extracts of fruit rind of <i>Punica granatum</i> , and the bark powder of <i>Holarrhena antidysenterica</i> (Kutaj), each @ 200 mg/ kg body weight PO, concurrently for 5 days OD

off (40° C) in a rotary evaporator (Kaundal and Sagar, 2016). The extracts were pooled and labelled.

Biochemical investigation: Total 24 diarrhoeic goat kids up to 4 weeks age, irrespective of sex/breed, were randomized in to four treatment groups, each comprising six animals as shown in experimental design table.

Blood biochemical profile: Five ml samples of blood were collected aseptically from the jugular vein of goat kids under the therapeutic trial on day 0 pre-treatment and on days 3 and 6 post-treatment and stored in clean, dry, sterilized labeled glass vials containing EDTA @ 1 mg/ ml blood. Whole blood samples (3 ml aliquots), without added anti-coagulant, were kept securely in 30° slant at RT, and the unhaemolysed clear serum samples (spinning at 2000 rpm, 15 minutes) were carefully aspirated off, transferred into fresh labelled neutral glass tubes, and stored (4°C).

Circulatory total protein and albumin concentrations (g/ dL) were estimated with the standard diagnostic reagent kits on Blood

Chemistry Auto Analyser (model Erba Mannheim CHEM-5 plus v2). Ten µL aliquots of the clear unhaemolysed serum sample was quantitatively transferred into chemically clean Eppendorf tube and gently mixed with 500 µL total protein reagent. Five µL of clear serum transferred into another tube was gently mixed with 500 µL albumin reagent.

Circulatory sodium (Na⁺), potassium (K⁺), and Chloride (Cl⁻) concentrations (mEq/L) were estimated with Cornley (model ACCULYTE-3P)

electrolytes analyzer Bicarbonate (HCO₃⁻) concentration (mEq/ L) was estimated with semi-biochemistry analyzer (mini CHEM 100). The experimental data were analyzed with One way Analysis of Variance (ANOVA), and the mean values were compared with Duncan's Multiple Range Test (Snedecor and Cochran,1994).

Results :

The experimental data are summarized in Tables 1-6.

Table 1. The mean values of serum total protein concentration (g/dL) of kids in different treatment groups at different intervals.

Groups	Treatment intervals (Day)		
	Pre-treatment	Post-treatment	
	Day 0	Day 3	Day 6
T _c	6.81 ^{aa} ±0.07	6.73 ^{aa} ±0.059	6.79 ^{aaB} ±0.10
T ₁	5.57 ^{cb} ±0.23	6.12 ^{bbB} ±0.10	6.73 ^{aaB} ±0.11
T ₂	5.75 ^b ±0.23	5.93 ^b ±0.21	6.34 ^{bB} ±0.19
T ₃	5.77 ^{bb} ±0.18	6.14 ^{abb} ±0.15	6.46 ^{ab} ±0.18
T ₄	5.63 ^{cb} ±0.16	6.32 ^{bb} ±0.13	6.87 ^{aa} ±0.06

The mean values between treatments (upper case) and between intervals (lower case) with different superscripts vary significantly (P <0.05).

Table 2. The mean values of serum albumin concentration (g/dL) of kids in different treatment groups at different intervals.

Groups	Treatment intervals (Day)		
	Pre-treatment	Post-treatment	
	Day 0	Day 3	Day 6
T _c	3.22 ^{aa} ±0.08	3.21 ^{aa} ±0.04	3.16 ^{aa} ±0.07
T ₁	2.12 ^{cb} ±0.09	2.54 ^{bbC} ±0.07	3.15 ^{aa} ±0.05
T ₂	2.18 ^{cb} ±0.04	2.36 ^{bcD} ±0.04	2.80 ^{ab} ±0.07
T ₃	1.82 ^{cc} ±0.14	2.29 ^{bd} ±0.10	2.79 ^{ab} ±0.15
T ₄	2.10 ^{cbC} ±0.09	2.30 ^{bb} ±0.08	3.30 ^{aa} ±0.08

The mean values between treatments (upper case) and between intervals (lower case) with different superscripts varied significantly (P <0.05).



Table 3. Mean values of serum sodium concentration (m Eq/L) of kids in different treatment groups at different intervals.

Groups	Treatment intervals (Day)		
	Pre-treatment	Post-treatment	
	Day 0	Day 3	Day 6
T _c	146.58 ^{aA} ±1.35	146.71 ^{aA} ±1.34	147.51 ^{aA} ±1.4
T ₁	131.76 ^{bB} ±3.04	135.81 ^{abC} ±2.54	140.86 ^{ab} ±1.67
T ₂	132.35 ^B ±1.3	132.92 ^C ±1.34	134.75 ^C ±1.51
T ₃	141.44 ^A ±3.08	141.87 ^{AB} ±3.11	143.29 ^{AB} ±2.85
T ₄	134.01 ^{bB} ±1.05	136.34 ^{bBC} ±1.04	141.87 ^{ab} ±0.42

The mean values between treatments (upper case) and between intervals (lower case) with different superscripts vary significantly (P <0.05).

Table 4. Mean values of serum potassium concentration (m Eq/L) of kids in different treatment groups at different intervals.

Groups	Treatment intervals (Day)		
	Pre-treatment	Post-treatment	
	Day 0	Day 3	Day 6
T _c	5.56 ^{ab} ±0.17	5.59 ^{ab} ±0.17	5.62 ^{ab} ±0.17
T ₁	6.95 ^{aA} ±0.06	6.59 ^{bA} ±0.06	5.48 ^{cb} ±0.10
T ₂	7.20 ^A ±0.22	6.96 ^A ±0.16	6.69 ^A ±0.10
T ₃	7.02 ^A ±0.10	6.72 ^A ±0.14	6.38 ^A ±0.32
T ₄	6.85 ^{aA} ±0.03	6.64 ^{aA} ±0.05	5.46 ^{cb} ±0.12

The mean values between treatments (upper case) and between intervals (lower case) with different superscripts varied significantly (P <0.05).

Table 5. Mean values of serum chloride concentration (m Eq/L) of kids in different treatment groups at different intervals.

Groups	Treatment intervals (Day)		
	Pre-treatment	Post-treatment	
	Day 0	Day 3	Day 6
T _c	104.04 ^{aA} ±0.16	104.13 ^{aA} ±0.18	104.71 ^{aA} ±0.41
T ₁	99.87 ^{cb} ±0.14	101.44 ^{bb} ±0.30	103.82 ^{aAB} ±0.3
T ₂	100.19 ^b ±0.22	100.89 ^b ±0.37	101.59 ^b ±1.71
T ₃	101.38 ^b ±1.37	102.01 ^b ±1.26	103.65 ^{AB} ±1.02
T ₄	100.17 ^{cb} ±0.32	101.68 ^{bb} ±0.35	102.86 ^{aAB} ±0.21

The mean values between treatments (upper case) and between intervals (lower case) with different superscripts varied significantly (P <0.05).

Table 6. Mean values of serum bicarbonate concentration (m Eq/L) of kids in different treatment groups at different intervals.

Groups	Treatment intervals (Day)		
	Pre-treatment	Post-treatment	
	Day 0	Day 3	Day 6
T _c	29.00 ^{aA} ±1.83	29.44 ^{aA} ±1.94	30.15 ^{aA} ±1.9
T ₁	19.42 ^{bb} ±1.22	22.02 ^{abb} ±1.07	24.58 ^{aAB} ±1.52
T ₂	19.59 ^b ±0.86	19.78 ^b ±1.03	23.89 ^b ±3.44
T ₃	17.91 ^{bb} ±0.62	19.15 ^{bb} ±0.49	21.12 ^{ab} ±0.44
T ₄	17.3 ^{bb} ±0.73	21.42 ^{ab} ±1.67	22.83 ^{ab} ±0.72

The mean values between treatments (uppercase) and between intervals (lowercase) with different superscripts vary significantly (P <0.05).

Discussion :

The data on serum total protein concentration (Table 1) showed significantly (P <0.05) decreased values in all the treatment groups, T₁ - T₄ on day 0 pre-treatment, vs. the normal value recorded in the control group, T_c of healthy kids. This finding is corroborated by earlier reports (Meshram *et al.*, 2009; Zaki *et al.*, 2010). In the diarrhoeic lambs too, a significant decrease in the serum total protein concentration was observed by Hassan *et al.* (2013). The values had increased significantly on day 3 post-treatment, and on day 6 post-treatment further significant increases were observed in T₁, T₃ and T₄. The early favourable bio-response to a patented polyherbal preparation including *H. antidyserterica* (Kutaj) and *P. granatum* (Anar) is on record (Meshram *et al.*, 2009). The pre-treatment serum albumin concentration (g/dL) in T₁-T₄ (Table 2) was significantly lower than the normal value, recorded in the control group, T_c. However, following treatment, statistically significant progressively increasing values were observed on day 3 and day 6, presumably because of improved biosynthesis in the functional hepatocytes. Thus, in retrospect, the significantly decreased circulatory albumin concentration in the pre-treated diarrhoeic kids

may be attributed to (i) reduced absorption of amino acids (ii) impaired synthesis in the liver cells, or both. Further, restoration of the normal circulatory levels of albumin attests to the therapeutic efficacy of potent herbal preparations (present study), comparable to proven antibiotic agents (Zaki *et al.*, 2010).

Notably, in all pretreated diarrhoeic kids of groups T₁-T₄, the circulatory sodium (Na⁺) titre (mEq/L) (Table 3) had decreased significantly concurrent with significantly increased potassium (K⁺) titre (mEq/L) (Table 4), vs. the corresponding normal values, recorded in T_c. The increasing trend towards restoration of normalcy in the Na⁺ titre and the reciprocal decline in K⁺ titre were significant on day 3 and day 6 post-treatment in T₁-T₄. No comparable published report in kids is forthcoming. However, in the diarrhoeic calves a similar pattern of hyponatraemia concurrent with hyperkalaemia before treatment, and the restoration of normalcy in the cation (Na⁺: K⁺) balance with herbal Kutaj therapy was reported by Singh *et al.* (2016).

In the diarrhoeic kids of all treatment group T₁-T₄, the concentrations of serum chloride (Cl⁻) (Table 5) and the alkali reserve, bicarbonate (HCO₃⁻)



(Table 6) pre-treatment were significantly lower than the corresponding normal values in T_c. However, the circulatory anion concentrations increased significantly in T₁-T₄ on day 3 post-treatment. Carefully scanned published reports failed to reveal any comparable data on diarrhoeic goat kids. However, in diarrhoeic calves hypochloraemia before treatment and reversal following herbal treatment (Kutaj) was reported by Singh *et al.* (2016).

Conclusions :

A critical appraisal of restoration of blood biochemical homeostasis in the diarrhoeic goat kids with colibacillosis, based on the highly dependable parameters revealed that the efficacy of the homemade combination herbal preparation, T₄ (Kutaj bark + Pomegranate fruit rind dried methanol extracts, 1:1 ratio (w/w) was virtually at par with the standard antibiotic, Ciprofloxacin regimen (T₁). The other two mono-herbal regimens: Kutaj bark dried methanol extract (T₃) and Pomegranate fruit rind dried methanol extract (T₂) were also effective, but to a lesser extent in that order.

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Studies of Efficacy of Ultraviolet Disinfection on Table Eggs

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Abstract :

The present study was planned to evaluate the efficacy of ultraviolet rays (UV) irradiation for the sanitization of table eggs. A total of 48 table eggs were divided into treatment (UV) and control (C) groups consisting of equal numbers. The irradiation of eggs was done by exposure of eggs to 200 nm of UV rays for 30 minutes. Total viable counts and differential counts were enumerated in relation to *Pseudomonas spp.*, *E. coli*, *Staphylococcus spp.*, *Yeast* and *Mould* and *Salmonella spp.* The TVC counts of control group were significantly ($p < 0.05$) higher than treatment group from 7th day post UV irradiation till end of the experiment (21st day). The mean differential counts (DC) of *Pseudomonas spp.* and *E. coli* of 'UV' group were significantly ($p < 0.05$) lower than control group from 14th day post treatment till the end of experiment (21st day). The mean DC counts of *Staphylococcus spp.* of both the groups started rising from 14th day. However, 'UV' group of eggs showed lower DC counts of *Staphylococcus spp.* than control group, at each interval of study. The DC counts of *Yeast* and *Mould* of 'UV' group were significantly ($p < 0.05$) lower than control group from 14th day post treatment till end of experiment (21st day). All the samples were found negative for *Salmonella spp.* The UV rays irradiation of table eggs was found to be effective in control of microbial infection.

Key words: UV irradiation, disinfection, egg, shelf life

Introduction :

Eggs can become contaminated with bacteria from the hen's intestinal tract, faeces, infested nests, or from the surrounding environment, including air and conveyor belts during production (Turtoi and Borda, 2014). Eggs have traditionally been sanitized either by washing in water (Hutchison, 2004) or by immersing in disinfectant solutions. Washing of grade A table eggs is generally not allowed in the European Union (Anonymous, 2003). The major disadvantage of egg washing is the potential damage to the physical barriers, such as the cuticle, which may favor trans-shell

contamination with bacteria (EFSA Biohaz, 2005). In recent years, the use of UV light as a surface decontamination method has been met with increasing interest (Turtoi *et al.*, 2014).

The increasing consumer awareness of food safety issues has changed the public perception of a "good egg" from shell cleanliness and physical properties to that of microbial integrity. There is increase in the consumption of Table eggs in the urban centre, which demands investigation into egg contamination. There is a continuous consumer demand worldwide for eggs, due to which it is become necessary to provide periodical assessment to offer safe and



good quality eggs for consumption. Modern operations such as spraying, washing, dipping and irradiation have been designed to improve external and internal physical as well as microbiological quality of eggs. The present study was planned with the objectives to study the effect of ultra violet rays disinfection on table eggs.

Materials and Methods :

The white leghorn table eggs were procured from poultry farm of college of Veterinary and Animal sciences, Parbhani. A total of 48 eggs were divided into 2 groups comprising of equal number of eggs as Group 'UV', where eggs of the group were exposed to UV radiation above 250 nm for 30 min and in Group control, eggs of the group were kept as control throughout the study period without any treatment. The treatment observations were made on days 0, 7, 14 and 21 in both the groups.

A method of Musgrove *et al.* (2005) was used for collection of egg shell sample with some modification. An egg was aseptically transferred to UV irradiated polyethylene bag with zip lock containing 10 ml phosphate buffer saline (PBS). A rinse sample was obtained by shaking bag that contains egg for 1 minute. Egg was then removed and transferred to different sterile bag. Rinsate was immediately used for Total viable count (TVC), Differential count (DC). Method of Musgrove *et al.* (2005) was followed for egg content collection after the rinse procedure aseptically. Collected eggs in second bag were cracked in other polyethylene bag for collection of egg contents. Homogenization was made using Vortex shaker (Macro Scientific Works Pvt. Ltd, Delhi.). The homogenized contents were used for estimation of Total viable count and Differential count.

Microbial Analysis was carried out to record various parameters.

The total Viable Count (TVC) were determined by using Standard Plate Count Agar as per method described in Bacteriological Analytical Manual (1998).

Isolation and enumeration of *Pseudomonas spp.*, *E.coli*, *Staphylococci spp.*, *Salmonella spp.* and *Yeast* and *Mould* was done by using selective media as per method described in Bacteriological Analytical Manual (1998). The method of Coufal *et al.* (2003) with some modification was used for UV irradiation of Table eggs. UV rays above 250 nm capacity were used using specially prepared UV cabinet. The exposure time was 30 minutes. All the Table eggs of two groups i.e. Group 'UV' and Group Control were subjected to shelf life studies up to 21 days. The eggshell surface, egg content samples were collected at 0, 7, 14, 21 days post treatment. The samples were processed for estimation of Total viable count (TVC), Differential count of *Pseudomonas spp.*, *E. coli*, *Staphylococci spp.*, *Salmonella spp.* and *Yeast* and *Mould*. All the data were analysed by using Factorial Randomised Block Design as per method of Panse and Sukatme (1969).

Results and Discussion :

Ultraviolet rays are being used as disinfectants of eggs due to their germicidal property. The UV irradiation with wavelength near to 200 nm is absorbed strongly by purines and pyrimidines thereby destroying nucleic acid. The UV rays are used in food industry for various purposes (Frazier and Westhoff, 2008). The UV rays were used in disinfection of eggs by many workers in fertile eggs (Wells *et al.* 2011b).

In present study, a special Ultraviolet cabinet was prepared for disinfection of Table eggs. The cabinet was made up of plywood having dimensions of 45 cm (H) x 45 (W) x 68 (L). The cabinet was fitted with a total of two UV tubes (15W) of length 44 cm having intensity above

250 nm. A special rack was provided for keeping of trays containing eggs. The trays were specially designed in such a way to give maximum exposure of eggs to UV radiations from all directions. The capacity of cabinet was of 60 eggs.

Mean Total viable counts (TVC) of eggshell surfaces of different groups of Table eggs are given in Table 1.

Comparison of mean TVC counts within group of all two groups ('UV' and 'C' groups) indicate that significantly ($p < 0.05$) higher counts of TVC were seen in 'UV' group from 14th day post treatment to 21st day post treatment as compared to '0' day. The TVC counts in control group were significantly ($p < 0.05$) higher from 7th day to 21st day as compared to '0' day.

Ultraviolet radiation disinfected eggs showed significantly ($p < 0.05$) lower TVC values at each interval of study (0, 7, 14 and 21 days) as compared to control group. A significant ($p < 0.05$) reduction in TVC counts of eggshell surfaces by UV method was reported by De reu *et al.* (2006a). Wells *et al.* (2010) reported a minimum time of 8 minutes of UV exposures for significant ($p < 0.05$) bacterial reduction of eggshells. The observations in the present study also indicated that UV rays disinfection method can be successfully used for Table eggshell surface disinfection.

Evaluation of microbial quality of egg contents of Table eggs is an important criteria in food safety aspects. Under certain circumstances spoilage organism can penetrate eggshell surface (Hutchison *et al.* 2003). In present study microbial analysis of egg contents was done to assess the food safety. The mean TVC counts of egg contents of two groups were determined and results are shown in Table 2.

A significantly ($p < 0.05$) higher TVC counts were

observed in control group from 7th day of experiment till end of experiment (21st). In 'UV' group also similar observations were recorded, however comparison within groups indicate that significantly ($p < 0.05$) lower TVC counts were seen in UV group on 14th day post treatment than 'C' group. Effectiveness of UV irradiation in control of microbial contamination of eggs was reported by Kuo *et al.* (1997b).

Freshly laid eggs are sterile, at least inside but the shell soon become contaminated by fecal matter, cage or nest, water, packing material and handling. The types of microorganism recovered from eggshell are diversified. The egg has various ways of protecting itself from microbial invasion. The shell and thin layer of proteinaceous material known as cuticle are the first line of defense. The shell is porous. The keeping quality of egg depends upon microbial contamination. The range of organism responsible for spoilage of eggs is wide (Frazier and Westhoff, 2008). It is important to know range of microorganism responsible for contamination of eggs to select appropriate disinfection method for increased shelf life of Table eggs.

The mean differential counts of *pseudomonas spp.* of eggshell surfaces of two groups are presented in Table 3.

Contamination of Table eggs by *Pseudomonas spp.* is not uncommon and reported by Sabarinath *et al.* (2009). *Pseudomonas spp.* were also observed on eggshell surfaces on 14th day post treatment in Control group ('C' group). A significantly ($p < 0.05$) higher counts of *Pseudomonas spp.* was seen on 21st day post treatment in 'UV' group. The *Pseudomonas spp.* contamination appeared late on Table eggs upon storage at ambient temperature, indicating that the source of contamination is from the environment. Effectiveness of UV rays



in controlling Table eggshell surface contamination by various spoilage organism is well documented (Wells *et al.* 2010).

Pseudomonas spp contamination of Table egg content was also reported by many workers (De reu *et al.*, 2006b, Edema and Atayese, 2006, Sabarinath *et al.*, 2009). In present study also *Pseudomonas spp.* contamination of egg contents was seen significantly ($p < 0.05$) higher in control group on 21st day post treatment, whereas it was absent in UV irradiated ('UV' group) group (Table 4).

E. coli counts is an indicator of faecal and environment contamination of eggs. Differential counts of *E. coli* of eggshell surfaces of all two

groups ('UV' and 'C' groups) are presented in Table 5.

A comparison of mean DC counts of *E. coli* within 'C' group indicate that significantly ($p < 0.05$) higher counts were observed from 7th day to the end of the experiment (21st day). In UV group the DC counts of *E. coli* were in the range of $0.00 + 0.00$ to $2.89 + 1.03$ during study period. Comparison of mean DC counts of *E. coli* within UV group indicates that a significant increase of mean DC counts of *E. coli* was seen from 14th day of experiment. Whereas in Control group the eggs were contaminated from 7th day of experiment till the end of the experiment (21st day) indicating that environmental storage is an important criteria in shelf life of Table eggs. *E.*

coli contamination of eggshell was reported earlier by many workers (Hang ombe *et al.* 1999; Abdullah, 2010 and Chousalkar *et al.* 2010).

The results are depicted in Table 6. The *E. coli* counts ($7.13 + 1.70$) were significantly ($p < 0.05$) higher on 14th day in control group than 'UV' group.

The results are indicative of penetration of *E. coli* from environmental contamination into the egg contents.

Mean DC counts of *Staphylococcus spp* of eggshell surfaces are given in Table 7.

A comparison of mean counts indicates that significantly ($p < 0.05$) higher values of *Staphylococcus spp.* were reported from 14th day post treatment till the end of the experiment in the all groups. The counts of 21st day post treatment were $3.26 + 1.16$ ('UV' group) and $9.70 + 2.47$ ('C' group) indicating that UV irradiation was able in controlling *Staphylococcus spp* contamination and also increasing shelf life of egg. Earlier Wells *et al.* (2011a); De reu *et al.* (2006a) also reported similar observations.

Staphylococcus contamination is an indicative of personnel and environmental contamination of

eggs. Earlier Hang ombe *et al.* (1999) reported 3.33 percent *Staphylococcus spp.* contamination of Table eggs. Hutchison *et al.* (2003) reviewed that spoilage of eggs was caused due to penetration of organism from shell into contents of egg resulting into food poisoning.

In present study, also penetration of *Staphylococcus spp* were seen in control group from 7th day till the end of experiment (21st day). In 'UV' group the *Staphylococcus spp.* penetration was seen from 21st day post treatment. Comparison of DC counts of *Staphylococcus spp.* among group indicates that significantly ($p < 0.05$) lower counts were seen in 'UV' group as compared to Control group from 14th day post treatment indicating effectiveness of UV rays on prevention of penetration of *Staphylococcus spp.* into the eggs. (Table 8.)

The results of Yeast and Mould counts of eggshell surfaces of all two groups ('UV' and 'C' group) are shown in Table 9.

The 'UV' group showed presence of Yeast and Mould on eggshell surfaces on 14th day till end of the experiment. In control group from 7th day till the end of the experiment. Comparison of Differential counts among the groups indicate that in Control group values were significantly

Table 1. Mean Total Viable Counts (TVC) of eggshell surfaces of different group of Table eggs

Mean ± SE (log cfu/ml) (n=6)				
Groups	Days			
	0	7	14	21
UV	0.30 ± 0.30^{am}	1.83 ± 0.27^{am}	2.75 ± 0.82^{bn}	2.90 ± 0.54^{bn}
C	1.79 ± 0.63^{am}	5.48 ± 2.45^{bn}	9.21 ± 2.82^{co}	13.82 ± 2.80^{dp}
CD (Days) – 2.28 (a/b/c/d)				
CD (Groups) – 1.97 (m/n/o/p)				

Note: Means with different superscripts differ significantly ($p < 0.05$) from each other

Table 2. Mean Total Viable Counts (TVC) of egg contents of different groups of Table eggs

Mean ± SE (log cfu/ml) (n=6)				
Groups	Days			
	0	7	14	21
UV	0.07 ± 0.07^{am}	1.81 ± 0.82^{am}	3.39 ± 1.38^{bn}	3.59 ± 1.31^{bn}
C	1.28 ± 0.06^{am}	4.22 ± 0.44^{bn}	6.39 ± 2.10^{bo}	13.17 ± 2.77^{co}
CD (Days) - 2.53 (a/b/c)				
CD (Groups) - 2.19 (m/n/o)				

Note: Means with different superscripts differ significantly ($p < 0.05$) from each other

Table 3. Mean Differential Counts (DC) of *Pseudomonas spp* of eggshell surfaces of different groups of Table eggs

Mean ± SE (log cfu/ml) (n=6)				
Groups	Days			
	0	7	14	21
UV	0.00 ± 0.00^{am}	0.94 ± 0.94^{am}	1.38 ± 0.12^{am}	2.56 ± 1.38^{bn}
C	1.76 ± 0.03^{am}	2.12 ± 0.42^{am}	3.69 ± 1.16^{an}	9.69 ± 3.46^{bo}
CD (Days) - 2.15 (a/b)				
CD (Groups) - 1.86 (m/n/o)				

Note: Means with different superscripts differ significantly ($p < 0.05$) from each other



($p < 0.05$) higher on 14th day as compared to 'UV' group. Earlier many workers reported Yeast and Mould contamination of egg shell surfaces (Kuo *et al.*, 1997a; Kuo *et al.*, 1997b; Knape *et al.*, 1999; Jones *et al.*, 2004; Musgrove *et al.*, 2005b).

Yeast and Mould counts of egg contents in the two groups ('UV' and 'C' group) are shown in Table 10.

Comparison of mean DC counts amongst two groups ('UV' and 'C' group) indicate that mean DC counts of Yeast and Mould were seen significantly ($p < 0.05$) higher ($10.45 + 2.65$) in

control group on 21st day compared to 'UV' ($3.48 + 0.62$) group. Presence of Yeast and Mould within egg contents is indication of spoilage of eggs due to storage. The spoilage started on 14th day in control group and 21st day in 'UV' group of eggs. Frazier and Westhoff (2008) reported that humidity in storage atmosphere is responsible for fungal spoilage of shells. Yeast and Mould cover shells first and then contents. Moulds are also responsible for spoilage. Spoilage is called as fungal rotting. The higher counts of Yeast and Mould during experimentation in egg content are due to growth of Mould stimulated by egg contents. The observations of the present study

Table 4. Mean Differential Counts (DC) of *Pseudomonas spp* of egg contents of different groups of Table eggs

Mean ± SE (log cfu/ml) (n=6)				
Groups	Days			
	0	7	14	21
UV	0.00 ± 0.00 ^{am}	0.96 ± 0.96 ^{am}	1.61 ± 0.05 ^{am}	1.89 ± 0.69 ^{am}
C	1.97 ± 0.08 ^{am}	2.18 ± 0.36 ^{am}	5.83 ± 0.76 ^{bn}	14.20 ± 5.70 ^{cn}
CD (Days) - 2.94 (a/b/c)				
CD (Groups) - 2.55 (m/n)				

Note: Means with different superscripts differ significantly ($p < 0.05$) from each other

Table 5. Mean Differential Counts (DC) of *E. coli* of eggshell surfaces of different groups of Table eggs

Mean ± SE (log cfu/ml) (n=6)				
Groups	Days			
	0	7	14	21
UV	0.00 ± 0.00 ^{am}	0.68 ± 0.68 ^{am}	1.57 ± 1.29 ^{am}	2.89 ± 1.03 ^{bn}
C	2.26 ± 0.05 ^{am}	4.93 ± 0.12 ^{an}	7.92 ± 2.90 ^{bo}	10.34 ± 2.12 ^{cp}
CD (Days) - 2.83 (a/b/c)				
CD (Groups) - 2.45 (m/n/o/p)				

Note: Means with different superscripts differ significantly ($p < 0.05$) from each other

are in agreement with Musgrove *et al.* 2005b).

It was interesting to note that all the samples were found to be negative for the presence of *Salmonella spp* thereby indicating hygienic condition at farm. Earlier many workers reported similar results (Mahdavi *et al.*, 2012).

Conclusion :

UV chamber designed and prepared for present study is useful for Ultraviolet method of Table eggs sanitation at small scale level. The microbial contamination of eggshell surface and egg content in relation to Total Viable Count (TVC)

can be controlled by using Ultraviolet irradiation at above 250 nm for 30 minutes exposure of Table eggs. The Ultraviolet irradiation of Table eggs can reduce eggshell and egg content contamination by *Pseudomonas spp*, *E. coli*, *Staphylococcus spp* organism. The Ultraviolet method can be used for control of Yeast and Mould infection of Table eggs upon storage at ambient temperature. The shelf life of Table eggs at ambient temperature was found to be 21st day in UV treated eggs. Absence of *Salmonella spp* from eggshell surface and egg content is indicative of healthy flock and good sanitary conditions at collection and during subsequent

Table 6. Mean Differential Counts (DC) of *E. coli* of egg contents of different groups of Table eggs

Mean ± SE (log cfu/ml) (n=6)				
Groups	Days			
	0	7	14	21
UV	0.87 ± 0.04 ^{am}	1.18 ± 1.18 ^{am}	1.39 ± 1.17 ^{am}	2.16 ± 0.30 ^{bn}
C	2.69 ± 0.21 ^{bn}	3.41 ± 1.02 ^{bn}	5.45 ± 0.38 ^{cn}	7.13 ± 1.70 ^{do}
CD (Days) - 1.43 (a/b/c/d)				
CD (Groups) - 1.24 (m/n/o)				

Note: Means with different superscripts differ significantly ($p < 0.05$) from each other

Table 7. Mean Differential Counts (DC) of *Staphylococci spp.* of eggshell surfaces of different groups of Table eggs

Mean ± SE (log cfu/ml) (n=6)				
Groups	Days			
	0	7	14	21
UV	1.05 ± 0.97 ^{am}	1.69 ± 0.12 ^{am}	3.00 ± 1.03 ^{bn}	3.26 ± 1.16 ^{bn}
C	3.46 ± 1.28 ^{bn}	4.24 ± 1.07 ^{bn}	7.40 ± 2.81 ^{cp}	9.70 ± 2.47 ^{dp}
CD (Days) - 2.5 (a/b/c/d)				
CD (Groups) - 2.1 (m/n/o/p)				

Note: Means with different superscripts differ significantly ($p < 0.05$) from each other



operation at farm level.

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Table 8. Mean Differential Counts (DC) of Staphylococci spp. of egg contents of different groups of Table eggs

Mean ± SE (log cfu/ml) (n=6)				
Groups	Days			
	0	7	14	21
UV	0.97 ± 0.02 ^{am}	1.23 ± 0.78 ^{am}	2.74 ± 0.68 ^{am}	4.93 ± 1.36 ^{bn}
C	2.15 ± 0.05 ^{am}	5.02 ± 1.51 ^{an}	6.39 ± 2.8 ^{bn}	12.05 ± 5.84 ^{co}
CD (Days) - 3.60 (a/b/c)				
CD (Groups) - 3.11 (m/n/o)				

Note: Means with different superscripts differ significantly (p<0.05) from each other

Table 9. Mean Differential Counts (DC) of Yeast and Mould of eggshell surfaces of different groups of Table eggs

Mean ± SE (log cfu/ml) (n=6)				
Groups	Days			
	0	7	14	21
UV	0.67 ± 0.67 ^{am}	2.08 ± 1.07 ^{am}	3.58 ± 1.44 ^{bn}	4.16 ± 1.22 ^{bn}
C	2.45 ± 0.30 ^{am}	4.97 ± 1.6 ^{an}	7.01 ± 4.6 ^{bo}	9.37 ± 1.97 ^{co}
CD (Days) - 2.86 (a/b/c)				
CD (Groups) - 2.48 (m/n/o)				

Note: Means with different superscripts differ significantly (p<0.05) from each other

Table 10. Mean Differential Counts (DC) of Yeast and Mould of egg contents of different groups of Table eggs

Mean ± SE (log cfu/ml) (n=6)				
Groups	Days			
	0	7	14	21
UV	0.17 ± 0.03 ^{am}	1.13 ± 0.49 ^{am}	2.45 ± 0.23 ^{bn}	3.48 ± 0.62 ^{cn}
C	2.84 ± 0.53 ^{bn}	4.45 ± 0.30 ^{bn}	5.60 ± 1.40 ^{co}	10.45 ± 2.65 ^{do}
CD (Days) - 1.94 (a/b/c/d)				
CD (Groups) - 1.68 (m/n/o)				

Note: Means with different superscripts differ significantly (p<0.05) from each other



Management of Andrological Problems in Breeding Bulls

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Abstract :

Total of 213 cases of reproductive disorders were observed in 742 breeding bulls belonging to different breeds during the last five years. Two-third (76 cases) disorders were of andrological in nature consisting of impotentia coeundi (23) and Impotentia generandi (53). The incidence of Impotentia coeundi was highest in Indigenous cattle (5.6%) followed by buffalo (4.2%) bulls. Impotentia generandi incidence was highest in HF pure (5.63%) followed by HF cross (5.16%) and JY pure bulls (0.94%). The conditions were associated with managemental practices and pathological disorders of genital organs like orchitis, testicular hypoplasia, testicular degeneration and seminal vesiculitis. The combination of treatment includes use of feed supplements, injections of antibiotics, multivitamins, minerals and hormones together with certain change in management practices were attempted and culling was advised in unrecoverable pathological conditions.

Key words: Bulls, Andrological problems, Impotentia generandi & Impotentia coeundi

Introduction :

Many factors play role in fertility and breeding ability of the bulls, including semen quality, breeding soundness and desire to donate semen etc. This evaluation looks at five parameters: physical soundness (feet/legs, eyes, etc.), reproductive tract soundness, scrotal circumference that meets minimum requirement, percentage of sperm cells that are normal, and acceptable sperm motility (Heather Smith and Thomas). Studies on relation to body score, scrotal circumference, libido, pathological conditions of testicles and semen quality in cattle or buffalo breeding bulls along with breed variation, disease incidence therapeutic management and recovery rate is equally important from the point of semen production efficiency in the semen station. Available scanty information in this respect does not provide needed reliability for planning breeding bull replacement at semen station. Most of the breeding bulls at semen station are culled

because of lack of sexual libido and poor semen quality. In this study, an attempt, therefore, was made to study the andrological problems found in the bulls and also to manage the disorders, if possible.

Material and Methods :

Five years (2008-2012) health data of 742 breeding bulls of different breeds (viz. pure Holstein, pure Jersey, Crossbred Holstein, Crossbred Jersey, Indigenous and buffaloes), located at Semen Station, Central Research Station, BAIF Uruli Kanchan were studied. The breeding bulls were housed in individual pens at bull station with sufficient loafing area and are fed as per the NRC standards. Regular health checks and preventive vaccination against FMD, HS, BQ & Theileriosis (in pure breeds and their crosses) were undertaken as per set protocols. The breeding potential of a bull can be considered by its ability to donate semen and to fertilize. Therefore, andrological cases were

broadly divided into two types i.e. Impotentia coeundi (nil or reduced libido) and Impotentia generandi (inability or reduced ability to fertilize). Impotentia coeundi cases were treated with injections of vitamin E, Selenium, multivitamins and phosphorus. Some specific managemental practices like change in bullpen, change in dummy, collection time and place of collection were followed which was showed as better solution in recovery rather than parental drug administration. Impotentia generandi was found to be associated with pathological origin of genital organs and the common conditions like orchitis, testicular hypoplasia, testicular degeneration and seminal vesiculitis.

Result and Discussion :

Out of 213 different reproductive disorders of breeding bulls, 76 andrological cases were recorded and their distributions in various breeds were: HF (12), JY (2), XHF (13), XJY (10), Indigenous (22) & buffalo (17). Out of this, the incidence of Impotentia coeundi was recorded in 23 cases, 12 cases in indigenous cattle 9 cases in Buffalo and 2 cases in XHF. Impotentia generandi was found in 12 HF, 2 JY, 11 XHF, 10 XJY, 10 Indigenous and 8 buffalo bulls.

The incidence of Impotentia coeundi was highest in Indigenous (5.6%) and buffalo (4.2%) bulls. The recovery to treatment was highest in HF cross (100%) followed by buffalo (22.2%) and Indigenous (16.7%) bulls. The crossbred bulls were not affected (table no.1) indicating possibility of low or absence of libido in Indigenous breed and buffalo bulls as compared to exotic and crossbred bulls. Kumar *et al.*, (2008) stated that one fourth of buffalo bulls were having poor libido in their study. All the bulls of Impotentia coeundi were sound and healthy. The reason for that condition might be due to predisposition of particular breed or species. The main determinants in libido are learning or environmental rather than genetic effects Landaeta-Hernandez *et al.*, (2001). Impotentia coeundi cases were treated with injections of vitamin E and Selenium, multivitamins and phosphorus. Vitamin E and

Selenium helped to reduce the stress. Multivitamin provided vitamin A and other vitamins. Deficiency in vitamin A, phosphorus and Cobalt may cause reduced sex drive. The treatment of this condition with drugs and hormones is of questionable value and caes should be taken while resorting Sane, *et al.* (1982). Certain managemental practices like change in bullpen, change in dummy, collection time and place of collection were found to be providing better solution in recovery compared to only the parental drug administration.

The incidence of Impotentia generandi was highest in HF (5.63%) followed by HF cross (5.16%) and least in JY (0.94%) as depicted in table no.1. The recovery rate was highest in HF (41.67%) and HF cross (38.46%). The condition associated with pathology of genital organs was mostly due to orchitis, testicular hypoplasia, testicular degeneration and seminal vesiculitis leading to aspermia, oligospermia, azoospermia, low motility and post thaw discard. A single case of orchitis was recorded due to trauma and recovered after antibiotic and anti-inflammatory drug administration. The seminal vesiculitis cases were confirmed by per rectal examination. The antibiotic (Inj. Enrofloxacin) therapy was given for 3 to 5 days by intramuscular route. The recovery depends upon the severity of affection i.e. inflammation, fibrosis and adhesions. Seminal vesiculitis is the most common condition affecting the gland. The incidence varies from 3 to 4 % in European breeds. In India few cases were recorded (Johari, 1957; Sane *et al.*, 1965 and Kaikini *et al.*, 1968). The combination treatment viz. Protoface, Speman forte, Tentex forte powder orally and antibiotics, multivitamins, Calcium, Phosphorus and hormones parentally along with special managemental practices resulted in better recovery rates in cases of Impotentia Coeundi due to poor libido.

Specific management changes were adopted (as that of Impotentia coeundi) but in non respondent cases, culling of bulls was practiced. Similarly, unrecoverable pathological conditions viz. testicular hypoplasia, testicular degeneration



Table 1: Breed wise andrological cases, affections and recovery of breeding bulls during five years (2008-12)

Breed	Total No. of Andrological Cases	Impotentia Coeundi			Impotentia Generandi		
		No. of cases	Affection %	Recovery %	No. of cases	Affection %	Recovery %
HF	12	00	0.0	0.0	12	5.63	41.67
JY	02	00	0.0	0.0	02	0.94	00.00
HF cross	13	02	0.9	100.0	11	5.16	38.46
JY cross	10	00	0.0	0.0	10	4.69	30.00
Indigenous	22	12	5.6	16.7	10	4.69	12.00
Buffalo	17	09	4.2	22.2	08	3.76	28.57

and fibrosis of seminal vesiculitis cases were culled. Testicular hypoplasia is congenital and hereditary in origin caused by single recessive autosomal gene disorder with complete penetrance and the cases were recommended for culling.

Conclusion :

The incidence of Impotentia coeundi was highest in Indigenous and buffalo bulls. Certain modifications and improvement in management practices greatly helped in recovery compared to parental therapy alone. The incidence Impotentia generandi was highest in HF followed by XHF and least in JY. The recovery rate was also highest in HF & HF crosses. The improved management practices, parental therapy was attempted successfully in many cases of Impotentia coeundi.

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Early Disease Diagnosis with Simple Laboratory Techniques at Field Conditions

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Abstract:

Most of the diseases at field levels can be primarily diagnosed with the help of impression smears examinations like Hemorrhagic septicemia, PPR, Tuberculosis, subclinical coccidiosis, immature amphistomiasis, Anthrax, CCPP, avian mycoplasmosis, leucocytozones, avian leucosis complex and Marek's diseases. Simple impression smear staining method by Leishman's stain was found very quick and simplest method to diagnose these diseases and can be carried out at the door steps of farmers. The repeatability in the microscopic observations of this method was observed cent percent.

Key words : impression smear, staining, disease diagnosis, field veterinarians.

Introduction :

Field veterinarians many times feel incomplete due to unavailability of specialized tools for disease diagnosis such as histopathology, immunohistochemistry, PCR, Elisa etc. Also these tests are more time consuming and expensive. As Veterinarians are working in field conditions at grass root levels and they need to plan the disease prevention and treatment strategy to minimize the economic losses of dairy farmers, goateries men, poultry owners and shepherds. Looking towards the needs of veterinarians and farmers, simplest innovative tests and methods can be used as diagnostic tools to confirm final disease diagnosis in few minutes, with the help of rumen impression smear cytology from carcass of ruminant and poultry. It is true that the importance of

histopathology, ELISA immunohistochemistry etc., will not be replaced by these methods, but an early diagnosis at field conditions will definitely be beneficial to Veterinarians and farmers to plan the preventive measures and treatment strategy immediately after preliminary disease diagnosis.

Materials and methods :

Total 502 carcasses of sheep, goat, poultry and cattle were screened by impression smears in the present study and were confirmed and correlated by using data of clinical signs showed before death, postmortem lesions, microbiological investigations and histopathology. These carcasses were presented at Omega Laboratories, Lonand for diagnostic postmortem. From August 2017 to August 2018



(Table 1). Detailed postmortem examinations were carried out and tissue impression smears were prepared and tissues were collected for the histopathological examinations and microbiological confirmations.

During the post mortem examinations, besides the observations of gross lesions, main focus was kept on impression smears collection, their

Table 1: Numbers of carcasses examined and tissues collected for investigations.

Species	Numbers
Sheep	101
Goat	066
Poultry (desi)	172 farms
Poultry (broilers)	123 farms
Layers (breeders)	028 farms
Cattle	012
Total	502

staining and demonstration of important microscopic cytological features of the some of the specific diseases, which are very important at field conditions. However, same tissues were confirmed by histopathology and with the help of microbiological tools to establish pathogenesis of specific microbes.

Impression smears were taken from the affected organs in triplicate and were air dried. Out of three, one was fixed with methanol for Giemsa stain and another slide was directly stained with Leishman's stain. Third slide was stained with gram stains and/or acid fast stains, whenever needed. After staining, these slides were air dried and observed under microscope.

Affected tissues were collected in 10% formalin and were processed for routine histo-

pathological examinations.

Whenever bacterial diseases were suspected, affected tissue samples were processed for microbiological investigations and specialized in vitro media / agar broths were used to achieve specific colonies and growth patterns. Virological isolations were not carried out at laboratory.

To establish correlation between the impressions smear examinations and gross pathology for primary disease diagnosis at field conditions; minimum laboratory tools were used. Besides impression smear observations, simultaneous histopathological and microbiological confirmation was established to strengthen the importance of impression smear examinations at field conditions.

Results and discussion :

In the present study, 502 carcasses were studied through impression smears examination and simultaneous correlation with their gross pathology by using pathognomonic lesions, microbiological investigations and histopathology where ever necessary. During last one year following numbers of pathological conditions encountered in different types of animals and were confirmed by impression smears, microbiological investigations and histopathology. Some of the conditions which are important at field levels are incorporated in this paper and their repeatability of the impression smears observations was confirmed; their numbers mentioned in Table 2 and 3.

1. PPR: PPR is a very common infectious disease in small ruminants, causing heavy mortality. Generally recently transported animals were found to be more susceptible to PPR. Gross lesions in PPR were bran like deposits on oral mucosa, hemorrhages on ileocaecal junctions, zebra markings in

Table 2: Different diseases of sheep and goats recorded on laboratory diagnosis

Animals	HS	PPR	Amphistomes	Subclinical Coccidia	TB	Mycoplasama	Protozoal	Anthrax
Sheep	52	40	20	03	0	03	08	07
Goat	35	34	03	11	3	05	05	02

Table 3: Different diseases of poultry recorded on laboratory diagnosis

Animals	Mycoplasma	MD	ALC	Biotin deficiency	Leucocytozone
Broilers	60	00	00	10	00
Desi birds	32	08	08	11	03
Commercial Layers and breeders	10	11	13	09	07

intestines and variable degree of pneumonia (Plate 1).

Impression smear examinations revealed presence of intracytoplasmic eosinophilic inclusions called as synchytia formations in epithelial cells of bronchi, abomasums and intestines (Plate 2).

2. Hemorrhagic septicemia in sheep and goats: this is also concurrent with PPR due to transportation stress as well as seasonal outbreaks in sheep and goats. Gross lesions includes lung congestion, edema, fibrinous

exudates in bronchus and partial marbling and consolidation of lung and hemorrhages on endocardium (Plate 3).

Impression smear of lung showed bipolar organisms, neutrophils, macropahges and fibrinous shreds (Plate 4).

3. Tuberculosis in goat: Tuberculosis in live goats generally went unnoticed unless postmortem is not carried out, generally farmers sold out weak and emaciated goats for slaughter, however interested farmers can carry out postmortem of such weak



Plate 1: A- Zebra markings, B- Zebra markings from outside of intestines, C- Necrosis and hemorrhages on ileocaecal junction, D- Lung congestion and edema

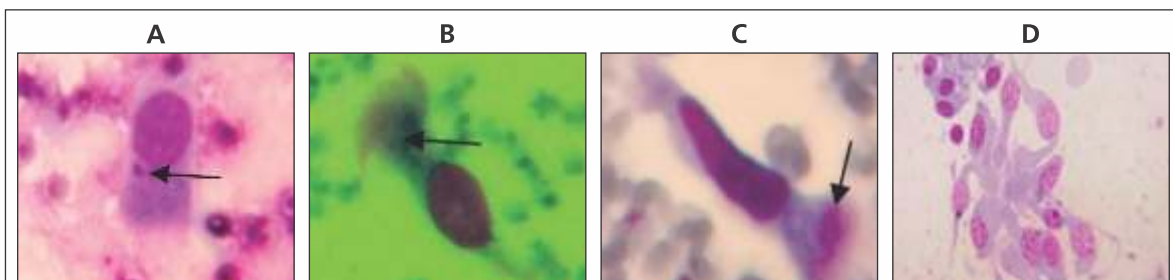


Plate 2: A, B and C indicates intracytoplasmic sychitia formation in bronchial epithelial cells and D indicates normal bronchial epithelial cells. (Leishman's stain 100 X)

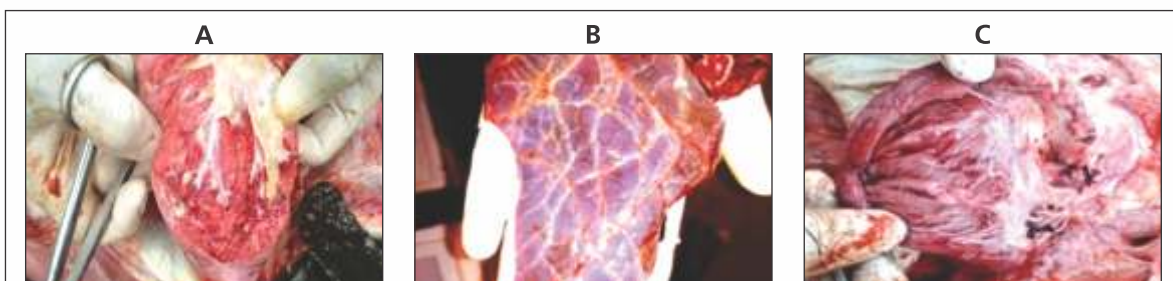


Plate 3: A- Fibrinous exudates in bronchi , B- Marbling of lung lobes and C- Endocardial hemorrhages

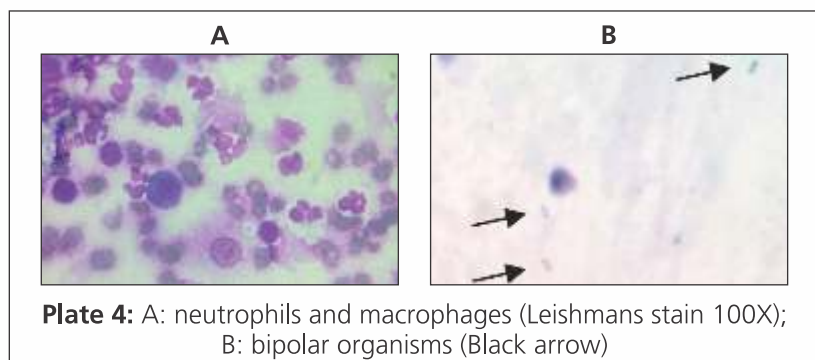


Plate 4: A: neutrophils and macrophages (Leishmans stain 100X); B: bipolar organisms (Black arrow)

emaciated animals and tuberculosis get noticed. Postmortem observations include small calcified off white colored nodules of various size on lung, pleura, in media-stinal lymph nodes and intestines (Plate 5).

Impression smears from nodules showed multinucleated giant cells, macropahges and acid fast bacilli in some of the macrophages (Plate 6).

4. Immature amphistomiasis Many times complete post mortem is not attempted at field level, especially digestive system if has been not cut opened, the typical findings of amphistomes in duodenum are missed. Post mortem lesions includes submandibular gelatenous edema, ascites, gelatinous transformation of adipose tissues, thickening and edema of duodenum and

presence of tiny pinkish reddish spots Impression smears and scrapping from duodenum revealed large numbers of

immature stages of amphistomes with prominent suckers (Plate 7).

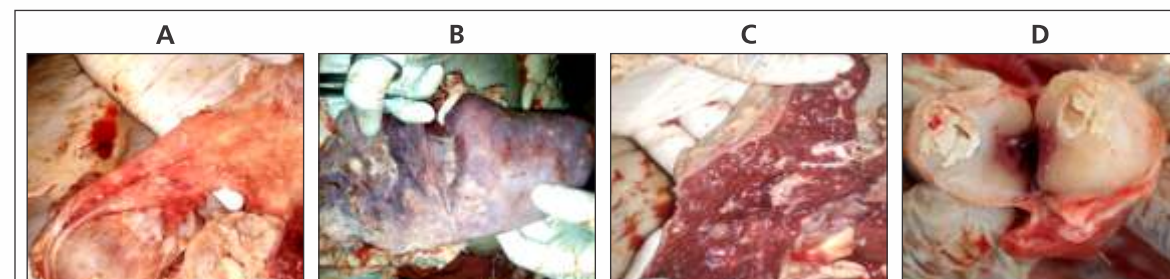


Plate 5: A, B and C showing variable sized nodules on lung; D - cheesy material in mediastinal lymphnodes

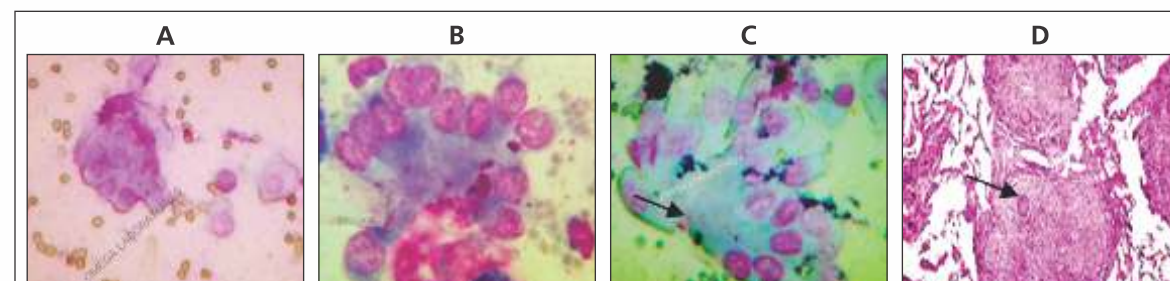


Plate 6 : A and B multinucleated giant cell (Leishman's stain 100X) ; C- multinucleated giant cell with acid fast bacilli in cytoplasm (Acid fast stain 100X, black arrow head) and D: Granulomatous lesions in lung and multinucleated giant cell denoted by black arrow (10 X H& E stain)

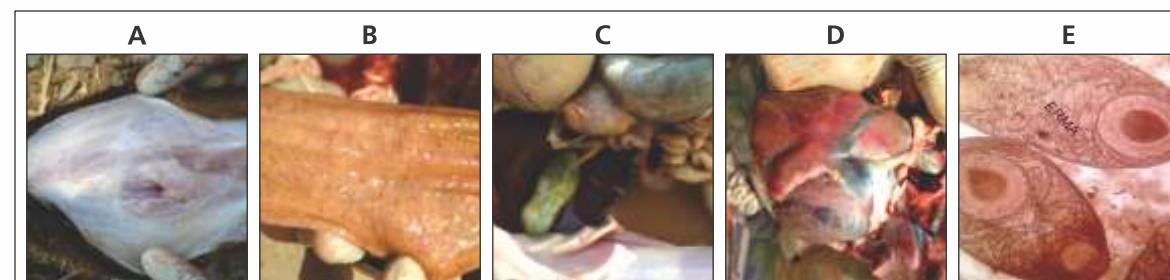


Plate 7: A: gelatinous sub mandibular edema., B: small tiny pinkish amphitomes on mucosa of duodenum, C : ascetic fluid, D: gelatinous transformation of epicardial adipose tissues., E : Immature amphistomes with prominent suckers (unstained 40X)

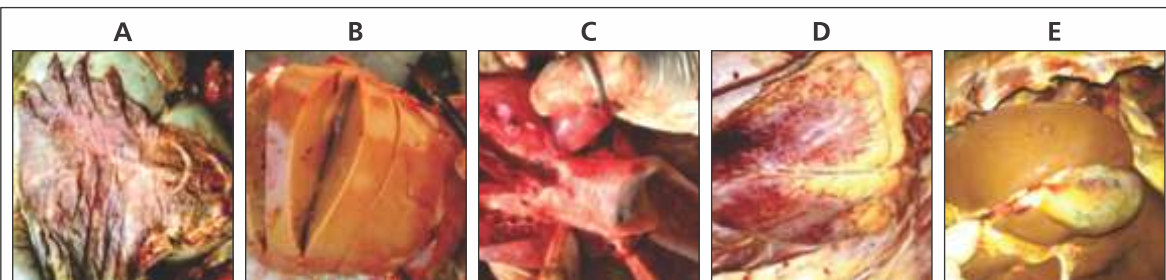


Plate 8: A- Abomasum ulceration, B- icteric liver, C- lung edema and congestion D- Hemorrhages on epicardium, E- Hemorrhages on gall bladder and icterus



Plate 9 : A red arrow indicates bile pigments in lymph nodes impressions and black arrow indicates Kock blue bodies

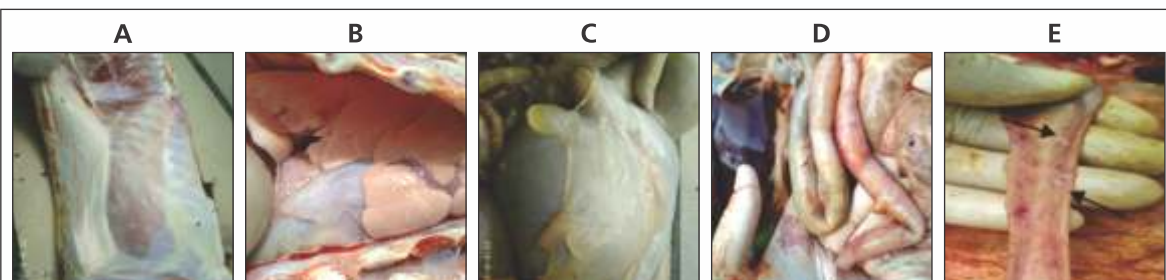


Plate 10: A: Pale subcutaneous tissues and musculature, B: Pale visceral organs, C: Adipose tissues showed Gelatinous transformation, D: thick intestines, E: small white proliferative nodular lesions in mucosa of intestine (Black arrow)

5. Hemoprotozoal mixed infections theileria and anaplasma: many times hemoprotozoal infections in sheep and goat are neglected. Gross pathology includes enlargement of lymphnodes, swelling and edema of all palpable lymph nodes, small

punched types of ulcers in abomasums, icterus, hemorrhages on gall bladder, enlargement of spleen, multifocal necrosis of liver, lung edema and pin point hemorrhages on epicardium and endocardium (Plate 8).

Impression smears of lymph nodes showed Koch blue bodies, pigment deposition in macrophages of lymphnodes and lung (Plate 9).

6. Sub clinical coccidiosis in sheep and goats: many times it was ignored or not diagnosed at field levels due to its chronicity. Gross pathology includes palor of subcutaneous tissues, musculature and visceral organs ; gelatinous transformation of adipose tissues, thickening of intestines and small white colored granular proliferative lesions in mucosa of intestines (Plate 10).

Impression smears and scrapping of intestinal lesions showed presence of large numbers of oocytes and gamatocytes of eimeria (Plate 11).

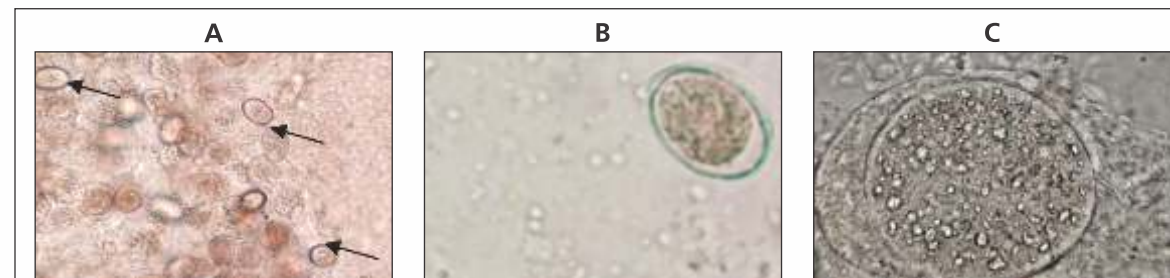


Plate 11 : A: Oocytes and gamatocytes (Black arrow) ,B: only oocysts of eimeria spp; C: Gamatocytes in enterocyte (Unstained intestinal contents and scrappings)

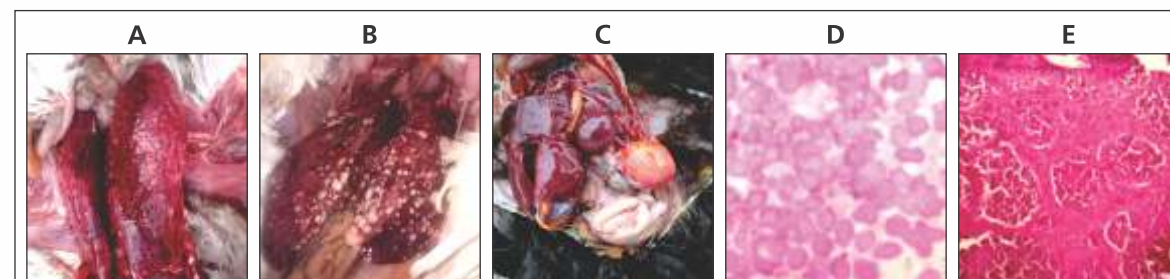


Plate 12 : A and B : Enlarged liver with multiple nodules, C: enlarged spleen and D: homogenous types of lymphocytes in impression smears (Leishman's stain 100X) and E: bundles homogenous lymphocytes in liver H&E stain 10X



9. Leucocytozoses: is a common vector born condition observed in caged layers than broilers. Gross pathological observations of leucocytozoses include mild icterus, depression, irregular, necrotic foci on liver and spleen in broilers and layers and impression smears of liver and spleen revealed presence of schizonts of various stages (Plate 14).

10. Mycoplasmosis: very common problem in field in poultry sheep and goats. In all these species respiratory problems and concurrent secondary bacterial complication with *E. coli* and other bacteria were observed. Impression smears revealed presence of tadpole shaped organism of mycoplasma species and the colonies are of typically fried egg type's colonies on serum agar (Plate 15).

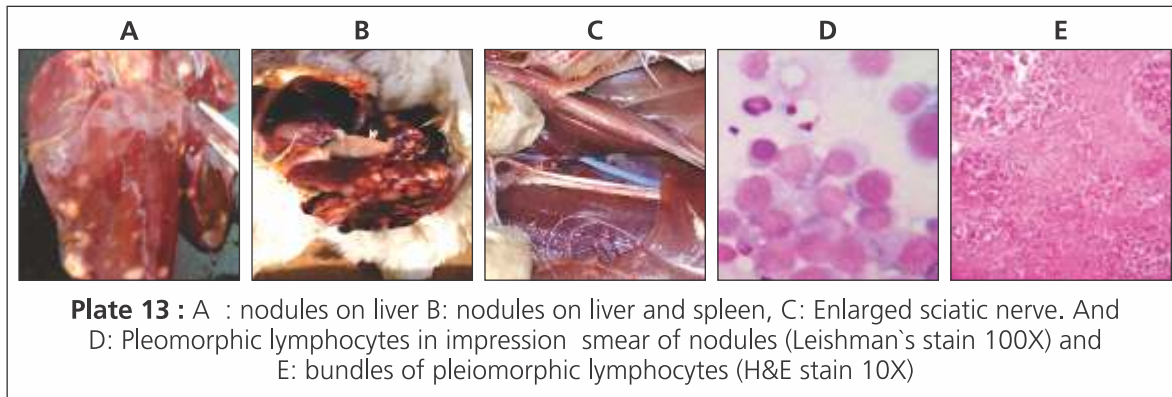


Plate 13 : A : nodules on liver B: nodules on liver and spleen, C: Enlarged sciatic nerve. And D: Pleomorphic lymphocytes in impression smear of nodules (Leishman's stain 100X) and E: bundles of pleiomorphic lymphocytes (H&E stain 10X)

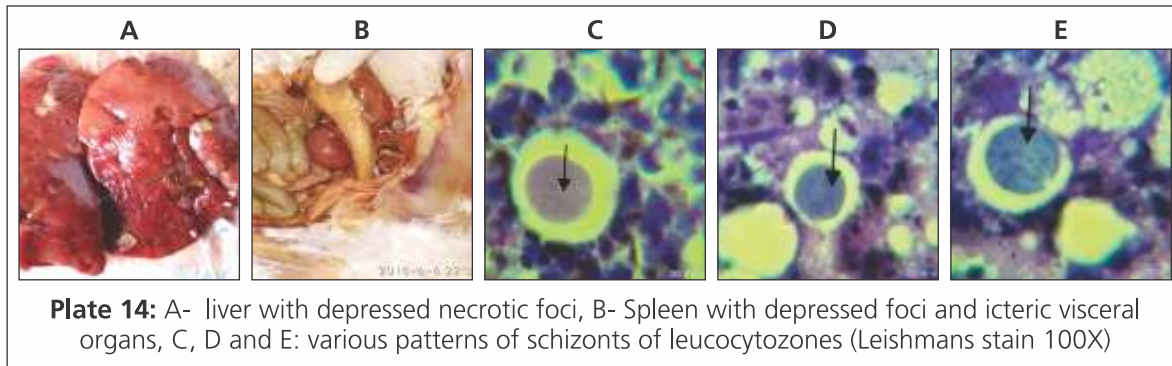


Plate 14: A- liver with depressed necrotic foci, B- Spleen with depressed foci and icteric visceral organs, C, D and E: various patterns of schizonts of leucocytozoses (Leishman's stain 100X)

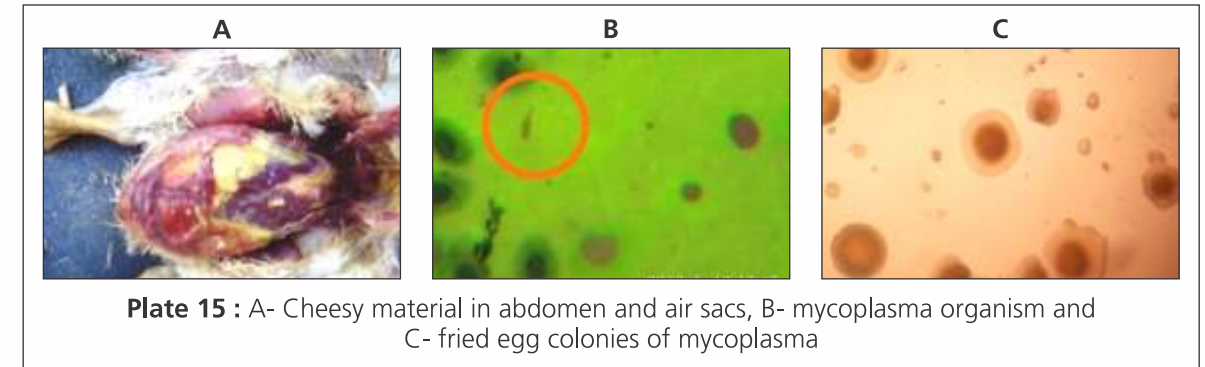


Plate 15 : A- Cheesy material in abdomen and air sacs, B- mycoplasma organism and C- fried egg colonies of mycoplasma

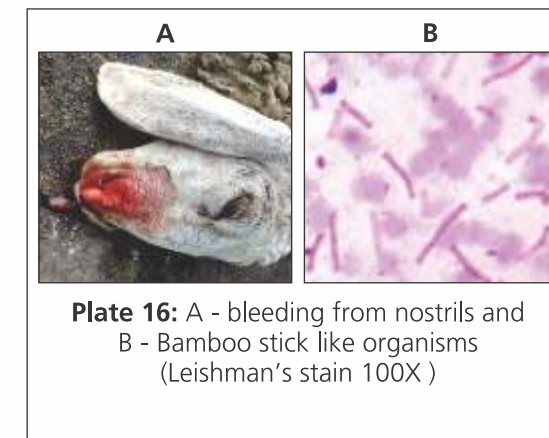


Plate 16: A - bleeding from nostrils and B - Bamboo stick like organisms (Leishman's stain 100X)

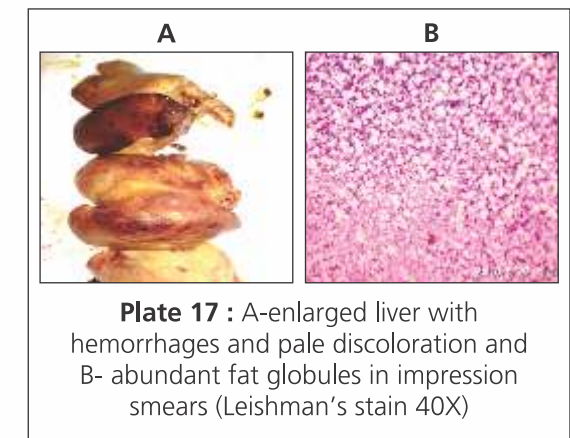


Plate 17 : A-enlarged liver with hemorrhages and pale discoloration and B- abundant fat globules in impression smears (Leishman's stain 40X)

Conclusions :

Impressions smear examination and its correlation with gross pathology and microbiological investigations has been established. Hence, at field level, impression smear examination will act as an early disease diagnostic tool, which will be beneficial to field veterinarians.

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Evaluation of Antibacterial Activity of *B. ovalifoliolata* Extract Mediated with Silver Nanoparticles

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Abstract :

An experiment was conducted for comparative evaluation of antibacterial activity of ethanolic extract of *B. ovalifoliolata* (BE), Silver Nanoparticles (AgNPs) and *B. ovalifoliolata* extract mediated with silver nano particles (BENS) using modified Agar Well Diffusion Method and to record Minimum Inhibitory Concentration (MIC) and Cytotoxicity Study (MTT Assay) for the antimicrobial susceptibility against resistant organism. The zone of inhibition against *Staphylococcus aureus* was 15.0, 10.33 and 17.67 mm for BE, AgNS and BENS, respectively. Lowest MIC value 1.77 µg/ml and highest cell viability even at 85ppm for BENS was recorded suggesting that mediation of herbal extracts with silver nanoparticles has enhanced beneficial effects rather than using them individually.

Keywords : Antibacterial, Nanoparticles, Herbal extract, *Staphylococcus*.

Introduction :

Wounds are very common in veterinary practice and often infected and leads to cellulitis, over growth of scar tissue, necrosis and gangrene, (Hengel, 2008). In recent past, increased prevalence of antibiotic resistant pathogens and diminished effectiveness of current therapies has lead to the use of alternative therapies like use of natural products and herbal extracts. (Thirumurugan, et. al. 2009). Researchers have been trying to develop new drugs from natural products to act against the Methicillin resistant *staphylococcus aureus* (MRSA) and multidrug resistant *Pseudomonas aurginosa* and ampicillin resistant *E. coli*. Silver nanoparticles are nontoxic to humans and most effective against bacteria, virus and other eukaryotic organisms at low concentrations and without any side effects (Jeong et al. 2005). In recent years, green

synthesis of silver nanoparticles using plant extracts was exploited to a vast extent because the plants are widely distributed, easily available, safe to handle and with a range of metabolites (Kulkarni et al. 2012). The present *in vitro* study was under taken to compare the antibiotic properties of *Boswellia ovalifoliolata* ethanolic extract (BE) and silver nanoparticles (AgNps) and silver nanoparticles mediated with *B. ovalifoliolata* (BENS)

Materials and Methods :

The stem bark of *B. ovalifoliolata* was collected from forests of Tirumala hills of Andhra Pradesh state and the ethanolic extract of the bark was obtained by soaking 100g of bark powder in 500 ml of ethanol for 72 hrs with intermittent stirring and then filtered using whatman No. 1 filter paper. The filtrate was then evaporated at 55°C

in a hot air oven to yield the dry plant material of 10%w/w. 1mM concentration of sodium citrate and Silver nitrate were mixed in a conical flask and agitated for about 2 hrs. The aqueous solution was heated to 95°C on slow heating. During the heating process, 2-3 drops of 0.01 M sodium borohydrate was added and finally the solution was cooled to room temperature. The prepared Nano Silver particles in solution form (AgNPs) were stored in a polyvinyl bottle for further studies.

The ethanolic extract of *B. ovalifoliolata* (10g) was added to 1mM of silver ion solution to make up a final solution of 200 ml and centrifuged at 18000 rpm for 10 minutes. The pellet was collected and stored at 4°C. The supernatant was heated to 95°C. A change in the color of the solution (pale to dark color) was observed during the heating process, which indicated the synthesis of *B. ovalifoliolata* extract mediated with Nano Silver (BENS). Synthesis and characterization of BENS were carried out at Frontier Technology Laboratory, RARS, Tirupati. The *B. ovalifoliolata* extract (BE), *B. ovalifoliolata* extract mediated with nano silver (BENS) and Nano Silver particles were evaluated using modified Agar Well Diffusion Method (Oboh, et al., 2007), Minimum Inhibitory Concentration (MIC) (Geert Huys, 2002) and Cytotoxicity Study (MTT Assay) (Mosmann, 1983) for the antimicrobial susceptibility against resistant organism *Staphylococcus aureus*.

Results and discussion :

Observation of antibacterial activity of the test compounds was given as the zone of inhibition against gram positive organism *Staphylococcus aureus*. The mean zone of inhibition of AgNPs, BE and BENS was 10.33 ± 0.33 mm/100µl, 15.00 ± 0.58 mm/100 µl and 17.67 ± 0.33 mm/100 µl respectively against the standard strain of *Staphylococcus aureus* and is depicted in Table

Table 1: Mean zone of inhibition of nanoparticles against *S. aureus*

Group	Zone of inhibition (mm)
AgNPs	10.33 ± 0.33 ^a
BE	15.00 ± 0.58 ^b
BENS	17.67 ± 0.33 ^c
df	(2, 8)
F-Value	74.400
Sig	0.000

Mean values with different superscripts differ significantly (p< 0.05).

1, and Plate 1. The zone of inhibition of BENS increased over 70% and 13% when compared to AgNPs and BE, respectively. The zone of inhibition of BENS was significantly higher (p<0.05) compared to AgNPs and BE indicating that mediation of silver nanoparticles with herbal extracts has higher antibacterial effect when compared to their individual compounds. Ramgopal et al., (2011) reported a maximum zone of inhibition of 14 mm against *Staphylococcus aureus* with soap nuts mediated silver nanoparticles. Savithamma et al., (2012) also reported highest antibacterial efficacy of *B.*

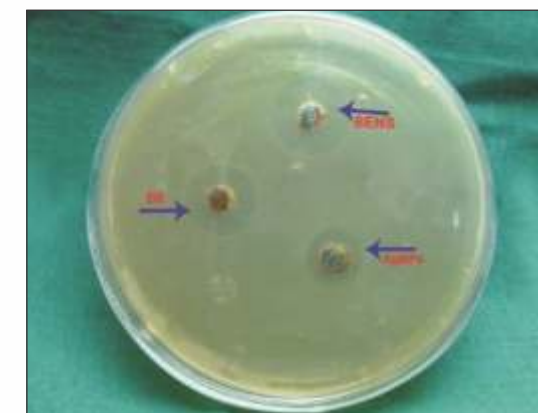


Plate 1 : Antibacterial activity of BE and nanoparticles against *S. aureus*

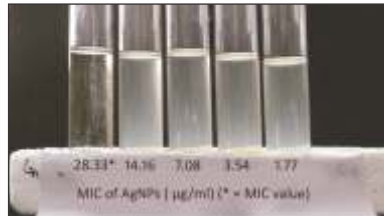


Plate 2a : MIC of AgNPs against *S. aureus*



Plate 2b : MIC of BE against *S. aureus*

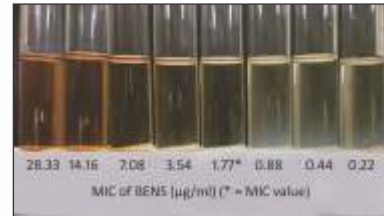


Plate 2c : MIC of BENS against *S. aureus*

ovalifoliolata mediated silver nanoparticles against *Bacillus*, *Proteus*, *Klebsiella*, *E. coli* and *Pseudomonas*. Ghosh *et al.*, (2010) opined that inhibitory action of silver nanoparticles is due to the penetration of nanoparticles inside the cell which cause further damage by interacting with sulphur and phosphorus containing compounds such as DNA. DNA losses its replication ability, expression of ribosomal subunit and cellular proteins and enzymes essential to ATP production become inactivated and silver nanoparticles binds to the functional group of proteins resulting in protein denaturation. However, the exact mechanism of action has not been fully discovered. The MIC of AgNPs, BE and BENS was 28.33µg/ml, 4.16 mg/ml and 1.77µg/ml respectively against the *staphylococcus aureus* (plate 2a,b,c) and indicated that BENS is highly effective in acting against *S. aureus* organisms even at lowest

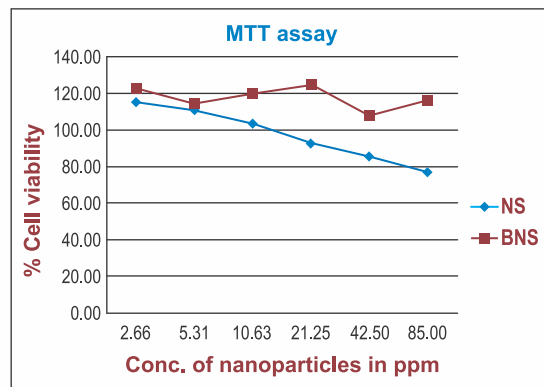
concentration. Alsaba *et al.* (2011), reported that acety-11-keto-β-boswellic acid is the most active compound isolated from *B. serrata* showing an MIC range of 2-8µg/ml against the gram positive organism.

The results of MTT assay (plate 3) showed that *B. ovalifoliolata* mediated silver nanoparticles was practically nontoxic even at higher concentration of 85 ppm while AgNPs produced 76.8% of cell viability at a concentration of 85 ppm.

Cytotoxicity studies revealed that BENS showed no toxicity at the doses studied i.e, between 2-85 ppm while citrate coated silver nanoparticles exhibited toxicity from 10 ppm onwards in mouse spleenocytes indicating that mediation of silver nanoparticles with *B. ovalifoliolata* has reduced the cytotoxic effect of AgNPs. However, Somayyeh *et al.*, (2011) conducted toxicity study of chemical mediated nanosilver on osteoblast cancer cell line and demonstrated concentration-dependent toxicity and IC50 value of 3.42 µg/ml in that cell line. Faedmaleki *et al.*, (2012) reported the cytotoxic effect of chemical mediated silver nanoparticles in HepG2 cell line and mice liver primary cell culture and found IC₅₀ value of 2.76 ppm and 121.7 ppm, respectively.

In present study, BENS showed better antibacterial property against *Staphylococcus aureus* as evidenced by highest zone of inhibition (17.67 mm) and lowest MIC value (1.77 µg/ml).

Plate. 3: Cytotoxicity of nanoparticles



The zone of inhibition of BENS increased over 70% and 13 % when compared to AgNPs and BE respectively suggesting that mediation of herbal extracts with silver nanoparticles has enhanced beneficial effects rather than using them individually and this can be effective on wound healing as they acted against gram positive organisms which causes infection and delayed wound healing.

Acknowledgments :

Special thanks to Dr. TNVKV Prasad, Professor, Nano technology, Frontier technology laboratory (RARS), Tirupati for synthesizing and providing the silver nanoparticles and mediating it with the herbal extract.

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Pyometra in a Pitbull Dog

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Abstract :

In-house survey radiograph revealed the presence of pyometra in intact pitbull female dog as a consequence of pathogenic bacterial infection. Haemato-biochemical profile revealed leucocytosis resulting from neutrophilia and hyperglobulinemia with concurrent lowering of the circulatory albumin concentration and the A/G ratio. The mandatory surgical intervention was performed and grossly enlarged pus-filled uterus was carefully excised and sanitized. After the initial systemic broad spectrum antibiotic shot, the follow-up treatment was undertaken and the animal recovered uneventfully in 2 weeks.

Key words : Pyometra, infection, diagnostic protocol, antibiotic

Introduction :

Pyometra, signifying secondary microbial infection of the uterus associated with hormonal changes, often leads to a life-threatening clinical condition in the intact middle aged or older dogs that must be treated promptly (Jitpean, 2015). In the nature's scheme, the white blood cells - ordained to protect against bacterial pathogens - are inhibited from entering the uterus during the estrogenic phase of the reproductive cycle, culminating in estrus, or 'heat'. This bio-mechanism permits safe passage of the sperms into the female's reproductive tract. Thereafter, the high progesterone blood titers induce thickening of the endometrium in preparation of pregnancy and fetal development. If pregnancy does not supervene even after several consecutive estrous cycles, the thickened cystic lining epithelium secretes fluids that create a micro-environment, highly propitious to bacterial growth (Watts and Wright, 1995). Further, the high progesterone titers

compromise the normal myometrial contractility. Drainage of pus from the septic uterus depends on the patho-morphological state of the gateway, cervix. If persistently closed, the accumulated pus causes the abdomen to distend abnormally. The bacteria release toxins that are quickly absorbed into the blood stream, and the affected animal becomes severely ill, exponentially (Watts *et al.*, 1997). Pyometra is often associated with mammary tumors (Mts).

Clinical Observations :

In the instant case, Angel Mosley, a 8 year old intact female dog was presented to the Angel Animal Hospital, Farmington Hills, MI, USA with a history of anorexia and dysgalactia for 3-4 days. Anamnesis revealed that no heart worm or tick/ flea preventive vaccination was given to the patient. On physical examination the animal was found visibly dehydrated, corroborated by the skin-fold test. Further, the tensed abdomen

appeared to be the consequence of foreign body (ham bone was fed by the owner), or tumor(s), or infection in the GIT.

Following in-house exploratory abdominal plain radiography, supportive complete blood count (CBC) and blood biochemistry panel were determined at the regional center of the IDEXX Diagnostics, USA. The clinico- hemato-biochemical data are useful in predicting, with a high degree of confidence, the prognosis and assessment of severity of pyometra in the female dogs, often accompanied with mammary tumors (Jitpean, 2015).

The radiograph clearly revealed the presence of pyometra (Photo 1), presumably a consequence of pathogenic bacterial infection with accumulation of pus. Infection is corroborated by the demonstration of neutrophilia in the CBC (Table 1), and hyper-globulinemia with lowering of the albumin/globulin A/G ratio in the blood biochemistry profile (Table 2). The stained blood slide was -ve for the heartworm microfilaria. and blood glucose remained close to the physiological range. Therefore, the mandatory surgical intervention was considered a safe remedial procedure.

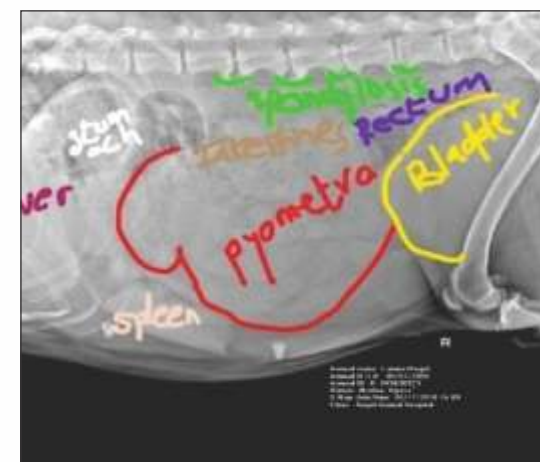


Photo 1: Abdominal radiograph (Lateral view)

Treatment and Discussion :

The patient was admitted to the clinic in the morning hours, fasted overnight in the owner's premises. In the OT equipped with all vital body functions monitoring gadgets, pre-anesthetic atropine was injected s/c. Anesthesia, induced with propofol, was maintained with isoflurane gas. The surgical site was shaved and scrubbed with chlorhexidine soap, followed with chlorhexidine tincture. The grossly enlarged pus-filled uterus was carefully excised (Photo 2) and sanitized in the incinerator. The dog was given the initial shot of systemic broad spectrum antibiotics and discharged.

Detailed advisory treatment was suggested to the client for post-operative care and follow-up treatment schedule was provided. After two weeks of surgical intervention, uneventful recovery was recorded as the patient was doing well with improved behavioral profile, manifested in playful disposition and eating and drinking regularly.



Photo 2: Surgical removal of pus filled uterus



II. Hemato-biochemical profile (pre-surgery)

Table 1. Patient's hematological profile

Parameter	Value	Reference Range	Status
TEC ($1 \times 10^6/\mu\text{L}$)	6.8	5.4-8.7	N
Hemoglobin (g/dL)	15.9	13.4-20.7	N
PCV (%)	45.9	38.3-56.5	N
MCV (fL)	15.9	13.4-20.7	N
MCHC (g/dL)	34.6	32.6-39.2	N
Reticulocytes (%)	0.5		
TLC ($1 \times 10^3/\mu\text{L}$)	39.8	4.9-17.6	H
Neutrophil (%)	90.9	2.9-12.7	H
Lymphocytes (%)	0.6	1.1-5.0	L
Monocytes (%)	7.7	0.1-1.2	H
Eosinophils (%)	0.7	0.1-1.5	N
Basophils (%)	0.1		N
Neutrophils ($1 \times 10^3/\mu\text{L}$)	36.2	2.9-12.7	H
Monocytes ($1 \times 10^3/\mu\text{L}$)	7.7	0.1-1.2	H
Eosinophils ($1 \times 10^3/\mu\text{L}$)	0.3	0.1-1.5	N
Basophils ($1 \times 10^3/\mu\text{L}$)	0.04	0-0.1	N
Platelets ($1 \times 10^3/\mu\text{L}$)	290.0	143-448	N
Total T ⁴ (Thyroxine) titre ($\mu\text{g/dL}$)	0.8	1.0-4.0	L

Interpretative range

< 1.0 Low Hypothyroid state 1.0-4.0 Normal Euthyroid state

> 4.0 High Hyperthyroid state (Thyrotoxicosis) Comment: fT⁴ and canine TSH assay may be done for better insight in individual cases.

Discussion:

Pyometra is a disease in India and several other countries where optional spaying is not performed, routinely. On an average, the disease affects nearly 19% of all intact (unsprayed) female dogs up to 10 years of age (Jitpean *et al.*,

2012). Genetic factors significantly influence the pre-disposition to pyometra (Nikanen and Thrusfield, 1998). It was well-established quite early that progesterone-primed uterus is rendered highly vulnerable to infection by the opportunistic pathogenic bacteria, mainly

Table 2. Patient's biochemical profile

Parameter	Value	Reference Range	Status
Glucose (mg/dL)	60.0	63-114	L
SDMA ($\mu\text{g/dL}$)	9.0	0-14	N
Creatinine (mg/dL)	0.7	0.5-1.5	N
BUN (mg/dL)	9.0	9.0-31.0	N
Calcium (mg/dL)	9.0	6.4-11.8	N
Phosphorus (mg/dL)	3.2	2.5-6.1	N
Na ⁺ (m Mol/L)	145.0	142-152	N
K ⁺ (m Mol/L)	4.1	4.0-5.4	N
Cl ⁻ (m Mol/L)	111.0	108-119	N
HCO ₃ ⁻ (m Mol/L)	18.0	13.-27	N
Anion gap (m Mol/L)	20.0	11-26	N
Total protein (g/dL)	6.3	5.5-7.5	L
Albumin (g/dL)	2.1	2.7-3.9	H
Globulin (g/dL)	4.2	2.4-4.0	L
A/G ratio	0.5	0.7-1.5	N
Serum ALT (U/L)	19.0	18-121	N
Serum AST (U/L)	42.0	16-55	H
Serum ALP (U/L)	170.0	5-160	N
Bilirubin conjugated (mg/dL)	0.2	0-0.3	N
Bilirubin unconjugated (mg/dL)	0.1	0-0.2	N
Cholesterol total (mg/dL)	309.0	131-345	N
Amylase (U/L)	733.0	337-1469	N
Lipase (U/L)	93.0	138-755	N
Creatinekinase (U/L)	110.0	10-200	
Hemolysis index	1+		

Escherichia coli (Tuenissen, 1952; Dow, 1959; Hardy and Osborne, 1974) with potent virulence factors (Chen *et al.*, 2003; Arora *et al.*, 2006).

Surgical ovario-hysterectomy is considered to be best remedial option. However, purely medical alternatives are also emerging (Fieni *et al.*, 2014).



Results of commonly employed clinical and laboratory investigations are useful as predictive bio-markers (Hagman, 2009). In the present study (Table 1), marked leucocytosis associated with neutrophilia and monocytosis clearly reflect bacterial septicemia. Lymphopenia is a dependable indicator of the clinical state of stress. Blood glucose concentration just below the physiological range (Table 2) is presumably related to temporary energy deficit. Reduced circulatory albumin with increased A/G ratio serving as a useful marker (present study) is corroborated by an earlier report (Jitpean, 2015). Improved diagnostic methodology is essential for timely therapeutic intervention (Fontaine *et al.*, 2009; Christensen *et al.*, 2012).

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Metastatic Pulmonary Neoplasia in a Spayed Female Domestic Longhair Cat

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Abstract :

In lung tissue of a feline patient, metastasis appeared as multiple widely scattered nodules in thoracic radiographs. The clinical profile included respiratory distress, evidenced by wheezing on auscultation. In view of the terminal disease, palliative chemotherapy was the only option.

Key words : Neoplasia, metastasis, lungs, cytology, chemotherapy.

Introduction :

Pulmonary neoplasm, mainly adenocarcinoma is a silent killer in cats, typically over 10 years of age without any breed or gender predilection. Anorexia, weight loss, and lethargy are the most frequent clinical signs. Respiratory distress, evidenced by dyspnea, tachypnea and coughing in nearly one third of the affected cats is the consequence of fluid accumulation (pleural effusion) in the thoracic cavity with inability of the lungs to expand fully (Thayer, 2014).

Generally malignant, neoplasia in the lungs may be primary (Hifumi *et al.*, 2010), or secondary/ metastatic in origin (Gottfreid *et al.*, 2000). Adenocarcinoma (papillary or bronchoalveolar), followed by anaplastic and squamous cell carcinoma (with known propensity to invade the surrounding lung tissue, or the regional lymph nodes) constitute the less common primary forms. Adenocarcinoma may spread to different areas of skin, long bones, and paws leading to the lung-digital-syndrome, (LDS) with lameness.

Metastatic pulmonary neoplasm results from infiltration of invasive cancer cells from different parts of the body: mammary/ thyroid carcinoma, hemangiosarcoma, osteosarcoma, and oral or digital melanomas via blood circulation (Thayer, 2014). A variety of tumors may appear in the form of single or multiple lump or bump on or under the skin in aging cats. Basal cell carcinoma, mast cell sarcoma, squamous cell carcinoma and fibrosarcoma are most frequently identified (Miller *et al.*, 1991). The diagnostic protocol includes radiography. Thoracic imaging is generally a three-view profile: right and left lateral and dorso-ventral. Located mainly in the peripheral or middle portions of the lungs, metastatic lesions appear as multiple more circumscribed and smaller interstitial nodes, compared to the primary lesions, which appear as prominent nodules, often formed by a large mass with a cluster of smaller secondary nodules. Contrast-enhanced CT test is the most sensitive means to detect pulmonary lesions. Ultrasound monitoring and cytopathological evaluation of



the FNA sample of the mass corroborate the diagnosis, based on histo-pathologic evaluation (Fossum, 2013).

Clinical Observations:

Patches-II Plumb, a 12-year-old spayed female Domestic Long Hair (DLH) cat was presented to Milford Veterinary Clinic, USA for a checkup in view of her deteriorated health with upper respiratory tract issues and lethargy. Physical

examination revealed no fever, pulse rate: 210 bpm and respiration rate 24 bpm, visible mucous membranes pink, CRT <2 seconds, weight 11.36 lb. On auscultation, wheezing in the lungs was heard with a rattling sound of mucus in the throat. The owner was concerned about the lethargy, limping and respiratory issue which he believed to be related to 'Valley Fever'.

Blood investigation (Table 1 and Table 2) did not

reveal any marked deviations from normal. However, the thoracic radiographs: R/L view, D/V view (Fig. 1, Fig. 2) showed discrete areas of radiopacity, scattered all over the lung field. Patches II Plumb was given a dose of antibiotic, Convenia®, and advised symptomatic treatment

at home: oral L-lysine (immune modulator) 3 ml OD, Cough tab ¼ QID x 5 days, Sporanox® Itraconazole 50 mg to be compounded and applied inside of the ear pinna for 8 weeks.

Table 1. Initial Hemogram of feline patient

Parameters (Units)	Result	Reference Interval	Comments
TLC (10 ³ /µL)	6.07	2.87-17.02	Normal
Neutrophils (10 ³ /µL)	4.10	1.48-10.29	Normal
Lymphocytes (10 ³ /µL)	1.35	0.92-6.88	Normal
Monocytes (10 ³ /µL)	0.20	0.05-0.67	Normal
Eosinophils (10 ³ /µL)	0.37	0.17-1.57	Normal
Basophils (10 ³ /µL)	0.05	0.01-1.57	Normal
Neutrophils (%)	67.6		
Lymphocytes (%)	22.2		
Monocytes (%)	3.3		
Eosinophils (%)	6.1		
Basophils (%)	0.8		
TEC (10 ⁶ /µL)	9.68	6.54-12.20	Normal
HCT (%)	44.3	30.3-52.3	Normal
Hemoglobin (g/dL)	14.2	9.8-16.2	Normal
MCH (pg)	14.7	11.8-17.3	Normal
RDW (%)	23.2	15.0-27.0	Normal
Reticulocytes (10 ³ /µL)	0.3		
Thrombocytes (10 ³ /µL)	16.1	13.2-20.8	Normal
MCV (fL)	16.5	11.4-21.4	Normal
PCT (%)	0.83	0-0.79	High

Table 2. Blood biochemical profile of the feline patient

Parameters (Units)	Result	Reference Interval	Comments
Glucose (mg/dL)	94	71-159	Normal
SDMA (µg/dL)	15	0-14	High
Creatinine (mg/dL)	2.0	0.8-2.4	Normal
BUN (mg/dL)	20	16-36	Normal
Total protein (g/dL)	7.8	5.7-8.9	Normal
Albumin (g/dL)	3.5	2.3-3.9	Normal
Globulin (g/dL)	4.3	2.8-5.1	Normal
Albumin/ Globulin ratio	0.8		
Total calcium (mg/dL)	8.9	7.8-11.3	Normal
Inorganic phosphate (mg/dL)	4.0	3.1-7.5	Normal
Sodium (Na ⁺) (mmol/L)	157	150-165	Normal
Potassium (K ⁺) (mmol/L)	4.1	3.5-5.8	Normal
Chloride (Cl ⁻) (mmol/L)	118	112-129	Normal
ALT (U/L)	42	12-130	Normal
ALP (U/L)	36	14-111	Normal
Total Bilirubin (mg/dL)	0.2	0-0.9	Normal
Total Cholesterol (mg/dL)	139	65-225	Normal
Total T ₄ (µg/dL)	1.5	0.8-4.7	Normal
Thyroid status in cats: serum titer in µg/ dL Hypothyroid (Subnormal) < 0.8 Euthyroid (Normal) 0.8-4.7 Hyperthyroid (Abnormal) > 4.7			



Radiography revealed diffuse radiopacity all over the lung field, presumably associated with metastatic neoplasia on the in-house thoracic radiographs (R/L, D/V views; Fig. 1, Fig. 2). Further, metastatic pulmonary neoplasia was evidenced by the definitive demonstration of numerous ill-defined soft tissue (alveolar) radio opaque nodules of varying size within all lung lobes with the largest in the left caudal lobe along with a mildly diffuse interstitial pattern. Thus, the thoracic radiographic profile of the feline patient is in sharp contrast to the more familiar 'cannon ball' pattern metastases in dogs (Forrest and Graybush, 1998).

Despite apprehensions of 'Valley Fever', fungal pneumonia is ruled out since cats are less vulnerable to coccidiomycosis. Widely distributed nodules with diffuse pneumopathy, imaged in the radiographs, were most consistent with metastatic neoplasia. The cervical mass represented the feline's primary tumor and the lung lesions, the spread of the malignancy.

Treatment and Discussion :

The cat suffered from a terminal disease, and the primary focus of treatment schedule was on improving her clinical condition in the short-term context, and to go for palliative chemotherapy. In the interim period, NSAID, Meloxicam alternatively, topical transdermal Piroxicam ointment (1.5 mg/ml), application with a sterile hand glove inside of the alternate ear @ 0.1



Fig.1. Thoracic radiograph (R/L) Patches II Plumb



Fig.2. Thoracic radiograph (D/V) Patches II Plumb

ml/24 hr. for 16 weeks was suggested. The cat was euthanized on owner's request.

Cytological evaluation (FNA tissue sample) of the primary skin tumor of patient is not definitive because of numerous disrupted cells. It is logical to expect metastatic pulmonary neoplasm of the same cell type. The Oncologist recommended broad spectrum chemotherapeutic agent, i/v Carboplastin. One shot is administered every three weeks. The initial trial with 1-2 treatments is aimed to evaluate, with imaging evidence, the bio-response. If positive in terms of reduced number and size of the nodules, then 2-3 more

chemo shots are given. Carboplastin i/v is well-tolerated in the feline cancer patient. The side effects, mainly gastro-intestinal complications or sequel to bone marrow toxicity, observed in only 15-20% cases, 3-5 days after start of chemotherapy, may be alleviated with judicious chemo dose adjustments and supportive medicines (Muller *et al.*, 1983; Fossum, 2013).

This communication highlights the importance of early detection of underestimated relatively small skin tumor (s), often masked in long hair breeds of cat like DLH.

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Obstetrical Management of Post-Partum Uterine Prolapse in a Non-Descript Goat

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Abstract :

A case of uterine prolapse in two year old Non-descript goat was successfully managed by reduction, replacement and repositioning.

Keywords: Goat, Epidural anaesthesia, Uterine prolapse, post partum.

Introduction :

Post partum uterine prolapse occurs most commonly in the cow and ewes but less common in the doe goat and rare in the mares. Uterine prolapse is one of the most potentially dangerous complications associated with calving (Kumar and Yasotha, 2015). Prolapse of uterus generally occurs immediately, or after a few hours of parturition, when the cervix is open and the uterus lacks tone (Hanie, 2006). Animals with uterine prolapse treated promptly will recover without complication, while delay in treatment could result in death of animal due to internal haemorrhage caused by the weight of the organ (Noakes *et al.* 2009). The prognosis depends on the severity of the case, duration of its existence or how quick it is attempted with suitable treatment or management. The present clinical article deals with a case of complete post partum uterine prolapse and its successful obstetrical management in a goat.

Clinical observations :

A two year non descript goat was presented to the TVCC, LUVAS, Hisar with a history of mass

protruding from vagina after two hours of kidding (Fig.1). The animal showed symptoms of abdominal distress and frequent straining. On clinical examination, the mass was confirmed as uterus with cotyledons. Fetal membranes were already detached from prolapsed uterus. The animal was mildly dehydrated with sunken eye balls. All physiological parameters were within the normal range.

Treatment and Discussion :

Following clinical examination, the doe was given posterior epidural anaesthesia (2% xylocaine, 1.5ml) into the sacrococcygeal space to prevent straining during replacement of the prolapsed mass. The prolapsed mass was lifted to the level of ischial arch and urine was evacuated by catheterization. The debris and faecal materials were gently removed and the prolapsed uterus was washed with permanganate solution (1:1000) and ice packs were applied to reduce the swelling. For easy repositioning, the everted mass was elevated above urethra to facilitate passive venous congestion of uterus, so that edema of



Figure 1 - Complete post partum uterine prolapsed and its Successful Obstetrical management.

prolapsed mass is reduced (Selvaraju *et al.* 2010). The doe was made to stand on its fore limbs by raising the hind limbs.. After application of 2% Lignocaine jelly and soframycin (Framycetin Sulphate 1%) cream onto the surface of prolapsed mass, the mass was replaced. To prevent the reoccurrence of the prolapse, perivulvar retention sutures were applied. Once the uterus was in position, Oxytocin 10 IU IM was administered to enhance the uterine motility.

Postoperatively the animal was administered inj. Calcium borogluconate (100 ml, slow i/v), inj. melonex (0.5mg/kg bd wt, i/m), inj. DNS 5% (200 ml, i/v), inj. ceftriaxone (200mg,i/m) and inj. Chlorpheniramine maleate (30 mg, i/m). The antibiotic, anti-inflammatory and antihistamine was continued for five days and the vulvar tension sutures were removed on day 7 and the animal recovered uneventfully.

Hormonal imbalance, hypocalcemia (Roberts 2004), poor uterine tone, increased straining, conditions that increase the intra abdominal

pressure including tympany, excessive estrogen content in the feed (Kumar and Yasotha 2015), excessive relaxation/ stretching of the pelvic and the perineal regions and forced traction of the foetus (Noakes *et al.* 2009) are the contributing factors for the uterine prolapse. Condition normally occurs during the third stage of labor, when the fetus has been expelled and fetal cotyledons are separated from the maternal caruncles (Noakes *et al.* 2009). Complications develop when lacerations, necrosis and infections are present and also when treatment is delayed. Hemorrhage and shock are potential sequel of prolonged prolapse. Prompt treatment of the condition is essential to prevent toxemia and death of the animal. The uterine prolapse can be replaced with the animal in standing and recumbent position (Hanie 2006). Successful recovery, in the present case was recorded due to prompt treatment of the goat.

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Fungal Pneumonia in a Labrador Dog

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(received 22/08/2018 - accepted 25/09/2018)

Abstract :

A case of fungal pneumonia in an adult male Labrador having short moist cough refractory to antibiotics and deterioration with steroids was treated successfully with itraconazole.

Key Words : Fungal pneumonia , itraconazole, Labrador, miliary pattern.

Introduction :

Though bacterial pneumonias are most common in dogs and cats, long standing cases refractory to antibiotics warrants differential diagnosis. Fungal pneumonia, less common than bacterial pneumonia, is a cause of great concern in humans as infection in dogs and cats act as sentinel for human exposure and potential infection (Greene and Bromel, 2012). Fungi such as Blastomyces, Histoplasma, Candida, Cryptococcus or Aspergillus spp. have been associated with fungal pneumonia. Their incidence may vary geographically as per predominance of the fungi in the area. Clinical reports on fungal pneumonia in dogs with its radiographic features and therapeutic response to itraconazole seems scarce in Indian literature. Therefore, present report describes a case of fungal pneumonia with its successful treatment with itraconazole.

Clinical Observations :

A six year old male Labrador dog was referred with the history of coughing for more than one year. Treatment with different antibiotics and

steroids remained futile. Detailed clinical examination revealed marked weakness, lethargy, normal temperature (101.5°F), short moist cough, exertion, tachypnoea / dyspnoea, exercise intolerance and respiratory distress. Chest auscultation revealed crackling sound during breathing. Radiographic examination of chest revealed diffuse miliary to nodular interstitial pulmonary changes (Fig. 1). Haematological examination showed normal values for Hb. (11.2 g/dl), Packed cell volume (34.0%) and total erythrocyte count (5.0 million/mm³); increased total leukocyte count (14500 /mm³); no blood protozoa or rickettsial organism ; neutrophilia with shift to left (74%); and monocytosis (14%). Electrocardiogram was within normal range with sinus rhythm (H.R. 100 bpm, 'P' 0.03 mV, 0.04 sec, R 1.0 mV, 0.04 sec., no 'Q' and 'S' waves, QRS 0.04 sec. and T 0.4 mV, 0.04 sec). Cardiac troponin-I was slightly elevated (0. 22 ng/ml). Based on observations and investigations the diagnosis was arrived at fungal pneumonia.

Treatment and Discussion :

The treatment was initiated with itraconazole@



Fig:1. Lateral radiograph of Male 6 years old Ladrador (Sheroo) showing diffuse miliary to nodular interstitial pulmonary changes suggestive of Fungal Pneumonia

5.0 mg/Kg orally BID for five days followed by 5.0 mg/kg orally once daily (Legendre, 2006) for three months. A cough syrup (containing Dextromethorphan HBr 15 mg, Chlorophenaramine Maleate 2 mg, Phenylephrine HCl 5 mg per 5 ml – One TSF PO TID) was given for a fortnight. Owner was advised not to give any antibiotic or steroid.

Chronic refractory short moist cough worsening with steroids and refractory to antibiotics coupled with respiratory distress and crackles on chest auscultation aroused suspicion of congestive heart failure or pneumonia not of bacterial etiology. Leucocytosis with neutrophilia (shift to left) and monocytosis suggested chronic nature of the infection. Almost normal electrocardiogram with minor elevation of cTn-I level, as seen in other non-cardiac diseases, excluded major cardiac involvement. Chest radiographs (both right lateral recumbency and VD views) showing diffuse miliary to nodular interstitial pulmonary changes (Fig. 1) confirmed fungal pneumonia (Thrall, 2013).

Diagnosis of fungal pneumonia relies on a combination of clinical and physical



Fig:2. Lateral radiograph of the same dog (Sheroo) after 2 months of Itraconazole therapy showing absence of miliary or nodular changes in lungs.

examination, blood work, and thoracic radiographs (Cohn, 2009; Hawkins, 2014). Bronchoalveolar lavage (BAL) cytology and culture assist in etiological identification (Andreasen, 2003; Hawkins, 2014). Fungal infections are refractory to antibiotics and condition is deteriorated with steroids, hence their use was stopped. Amphotericin B and azole antifungals are the drugs of first choice for the treatment of fungal infections. Itraconazole, an azole, was chosen for its efficacy but lower toxicity than amphotericin B (Legendre, 2006). With its continuous use for two months coughing was almost stopped with no respiratory distress and absence of miliary or nodular changes in chest radiograph (Fig.2). Nevertheless, itraconazole was continued for one month more even after improvement as suggested by Krohne (2000).

Acknowledgements :

Authors are thankful to The Chairman, Managing Trustees and Board of Trustees for providing the necessary facilities at Nandini Veterinary Hospital.



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Congenital Simple Anonychia in a Tortoise

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(received 05/09/2018 - accepted 8/10/2018)

Abstract :

A rare case of congenital simple anonychia in a female tortoise was diagnosed.

Key words : Anonychia, congenital, tortoise

Introduction :

Anonychia, condition consisting of absence of nails since birth, is a extremely rare congenital anomaly. Sporadic cases have been reported in humans in India and abroad (Priolo *et al.*, 2000; Avhad and Jerajani, 2012). In India case reports of anonychia in chelonians could not be traced and because of rare documentation, the present case of congenital simple anonychia in a tortoise is reported.

Clinical Observations :

A female tortoise weighing about 100 gms was referred at the hospital with history of absence of nails since birth. On detailed clinical examination, there was absence of nails in all fingers of both fore and hind limbs except in one finger of right hind foot (Fig.1) with out any other anomaly or muscle atrophy. The tortoise was otherwise normal.

Radiological examination with respect to phalanges was normal. Based on the clinical features and history and healthy diagnosis of congenital simple anonychia was recorded.

Discussion :

Absence of nails in the tortoise since birth indicated that the anomaly was congenital. Clinical examination revealed absence of nails in all phalanx except one in right hind limb without any other anomaly. Such cases are termed as



Fig.1. Photograph of a tortoise showing absence of nail in all fingers of fore and hind limbs except one finger of right hind limb.

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congenital simple anonychia. Anonychia is a rare congenital anomaly in humans and animals. It may occur as a part of syndrome associated with the anomalies of phalanx/digits or simple without any coexisting anomaly. The later one is extremely rare (Priolo *et al.*, 2000). In humans, simple congenital anonychia has been ascribed to frameshift and nonconservative missense mutation in the exon 2 of R-spondin 4 gene present on chromosome 20p13, which affects the highly conserved first furin-like cysteine-rich domain that plays a crucial role in nail morphogenesis, resulting in absence of nails (Blaydon *et al.*, 2006). Recently a case of anonychia with the absence of 3rd phalanx and fracture of 2nd phalanx on digit 2 in an English Setter dog has been reported (Dogan *et al.*, 2016). However, no case of simple anonychia or a part of syndrome associated with other anomalies could be traced in chelonians in India.

Acknowledgements :

Authors are thankful to The Chairman,

Managing Trustees and Board of Trustees for providing the necessary facilities..

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Overgrown Beak Syndrome in Chelonians

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(received 04/10/2018 - accepted 08/11/2018)

Abstract :

Thirty cases of overgrown beak syndrome in chelonians were recorded where its prevalence was recorded as 2.0 percent among chelonians.

Key words : Chelonians, overgrown beak, tortoises, turtles

Introduction :

Chelonians, that is tortoises and turtles, grab and chew their food using sharp edges of beaks. Beak is keratinized horny cover over the upper and lower jaws which grows continuously. Under natural conditions beaks wear down as fast as they grow. However, in captivity beak overgrow when chelonians are improperly fed and kept in poor husbandry conditions. Faulty feeding (high protein and low calcium, soft diets) and deficiency of vitamin D or A, during growth seems to be responsible for the pathogenesis of overgrown beaks. Overgrown beaks impairs eating, thus may further compound nutritional deficiencies leading to serious beak damage. It seems overgrown beak syndrome in chelonians has not attracted enough attention in India. Therefore, present investigation was undertaken to study clinical, radiological and managemental aspects of overgrown beak syndrome in tortoises/turtles.

Clinical Observations :

During last two years, 30 chelonians (turtles 10 / tortoises 20) with deformed beaks were referred at the hospital with the history of inability to eat properly and beaks overgrew over a period of

time. These chelonians were being kept either in AC rooms or hardly had any chance to bask in the sun. Their diet consisted of milk, rice, chapati, banana, pulses, apple, chiku, commercial pellet diet, or soft leafy vegetables. During period under study, a total of 1500 chelonians were attended for diagnosis and treatment. Clinical examination revealed that the beaks were not aligned properly in all cases either due to overgrown upper beak (Fig.1), lower beak (Fig 2) or both (4 cases) in 15, 11 and 04 cases respectively. In 6 cases, fingers nails were also very much overgrown (Fig.3).The tortoises/turtles were interested in food but was not able to eat properly. They were lethargic and their radiological examination revealed no fracture of mandible or maxilla but generalized



Fig. 1. Turtle showing overgrown upper beak



Fig. 2. Turtle showing overgrown lower beak



Fig. 3. Turtle showing overgrown nails

bone density was poor (Fig. 4). The beaks were trimmed to align properly and owners were advised to feed proper nutritional diets with calcium blocks.

Analysis of history, husbandry practices and diets given revealed that these were improper, soft, lacking nutritional balance and fibre. These chelonians were neither offered calcium blocks nor had any access to hard material to rub their beaks. Air conditioning environment, lack of sun



Fig. 4. Radiograph of a tortoise with overgrown beak showing generalized poor bone density

basking further compounded the problem.

Treatment and Discussion :

Based on clinical and radiographic details these cases were diagnosed as overgrown beak syndrome aptly termed as Parrot beak. Prevalence of parrot beak syndrome during last two years came to 2.0 per-cent (30 cases out of 1500). Boyer (1996) has noted parrot beak, curling of carapace and net like porosity of and overgrowth of the bridge between carapace and plastron. Neither clinical case reports nor any study on the prevalence of Parrot beak syndrome in chelonians in India is available. Beak trimming with supplement of calcium blocks, fibrous diet, sun basking and no air conditioning led to recovery (Fig.5).

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Fig. 5. Turtle at Fig.1 after trimming of upper beak

Surgical Management of Penile Trauma in a Dog

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(received 01/09/2018 - accepted 04/10/2018)

Abstract :

Surgical correction of penile trauma in a dog was attempted successfully.

Key words: Penile trauma; surgical correction, dog.

Introduction :

Male canines are one of the few animals that have a locking bulbous glandis or "bulb", a spherical area of erectile tissue at the base of the penis. Because of its exposed location, the penis is relatively accessible to injury (Boothe, 2003). Penile wounds may occur during mating, dogfights, and fence jumping or from automobile accidents or gunshot. Penile lacerations and gunshot wounds may involve the urethra (Papazoglou *et al.*, 2012). Severe penile trauma may fracture the os penis. Hemorrhages, frequently intermittent but often profuse, is the most common clinical sign of penile wounds. Repeated hemorrhage is associated with penile erection, which in turn is caused by irritation from injury.

Clinical Observations :

A 3 year old male dog was presented to State Institute of Animal Health (SIAH), Tanuku with laceration to penis due to fence jumping and accident happened 3 hrs before clinical presentation. The dog was in severe pain and the penis had hemorrhage from the wound on corpus cavernosum with hematoma formation underneath the wound (Fig 1).

Treatment and Discussion :

The dog was sedated with diazepam @ 0.5 mg/kg b.wt. IV, butorphanol @ 0.2 mg/kg b.wt IM. The wound was cleaned with normal saline and urethra, os penis were found to be intact. Surgery was attempted under Ketamine (@ 5 mg/ kg b.wt) + Diazepam (0.5 mg/kg b.wt.) anaesthesia. Urinary catheter was placed inside the urethra (Fig 2) and using 4-0 Vicryl (synthetic monofilament absorbable suture material armed in a taper-cut needle) in a interrupted pattern, tunica albuginea was sutured (Fig 3). Urinary catheter was removed after ensuring patency of



Fig. 1. Penile wound with laceration, hemorrhage and hematoma



Fig. 2. Urinary catheter was placed while suturing the wound



Fig. 3. Tunica Albuginea was sutured with Vicryl 4-0 in a interrupted pattern

urethra. Post operatively, antibiotic Intacef tazo 562.50 mg IV a (ceftraixone+tazobactum) and Melonexa (meloxicam @ 0.2 mg/kg b.wt on first day and 0.1 mg/kg b.wt for rest of the 4 days) were used for 5 days. Elizabethan collar was placed around dog' neck and avoidance of contact with females was advised to the owner to prevent erection. The penile wound showed complete healing after 7 days after surgery.

Penile trauma may lead to hematoma formation and strangulation and extensive necrosis of the penis. Minor lacerations should be managed as open wounds. But in dogs with major lacerations or persistent hemorrhage during excitement, as in the present case, surgical correction was needed. In delayed cases, if penile necrosis occurs, however, partial or complete amputation of the penis should be performed (Papazoglou et al., 2002). Rupture of the penile urethra is usually accompanied by fluctuant subcutaneous swelling associated with extravasation of urine, which was not seen in the present case. Post

operative management with antibiotics, analgesics and using Elizabethan collar are necessary for preventing irritation, self inflicted wound. The penis sometimes emerges from the penile sheath during sexual arousal, so avoidance of contact with female dogs is necessary during post operative recovery.

Acknowledgement :

The authors are thankful to the Director of Animal Husbandry, Andhra Pradesh for providing the necessary facilities to carry out the work.

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Ventral Abdominal Hernia in Two Pigeons (*Columba livia*)

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(received 26/09/2018 - accepted 28/10/2018)

Abstract :

Two cases of abdominal herniation were diagnosed and subjected to surgical corrections. One case survived successfully with loss of other due to additional complications of the herniation.

Key words : pigeon, ventral, abdominal, hernia

Introduction :

Abdominal or ventral hernia is caused by combination of increased abdominal pressure (fat, ascites, organomegaly) and weakened musculature due to hormonal influences, obesity, lack of exercise and chronic malnutrition. On occasions, herniation will occur secondary to abdominal lipoma, cystic structures, neoplasia, or other space occupying masses (Forbes, 2002). The condition is commonly seen in female pigeons during breeding season owing to increase in intra-abdominal pressure due to enlargement of ovary and oviduct. Although most hernias occur in ventral midline, but lateral to body wall and dorsal to vent has also been the common site of occurrence. During examination or surgical procedure, precaution must be taken as the underlying viscera may be attached to the skin (Donley, 2010).

Clinical Observations :

Case 1: A 4 year old female English Carrier Pigeon (*Columba livia*) was presented to Referral Veterinary Polyclinic, Izatnagar, with a history of

progressively increasing painless swelling at ventral abdomen since 4 months and gradual loss of weight and loss of appetite over few weeks. Bird was not laying eggs since the condition commenced. Bird was having rectal temperature of 104.1°F, pulse rate of 208 beats per minute, respiratory rate as 30 breaths per minute and body weight around 350 g. As per owner the diet consisted of commercially available bird food.

Physical examination confirmed ventral hernia, which was a painless reducible swelling in the abdominal region close to cloaca (Figure 1). This was confirmed by plain radiograph of bird in lateral recumbency with wings upraised. Radiograph revealed loss of integrity of abdominal wall (Figure 2). The swelling appeared spherical and about 5 cm in diameter.

Case 2: A 2 year old male common Pigeon (*Columba livia*) was presented to Referral Veterinary Polyclinic, Izatnagar, with a history of progressive irreducible swelling at ventral abdominal region (Figure 4), anorexia and weakness since 25 days. Bird was kept under



Figure 1: Case 1-Reducible abdominal swelling

corn maize, sunflower seeds and bajra diet and was reared most of the time in captivity with lack of exercise. The case was presented for treatment only after the bird became inactive and flightless.

Case 2: As the bird was dull and depressed also immobile with weak pulse and temperature was 104.2°F.

Treatment and Discussion :

The case 1 was kept off feed for 2 hours before surgery. Case 2 : As the bird was dull and depressed, immobile with weak pulse and temperature was 104.2°F, the bird was stabilized with intra venous fluids through wing vein and was considered for emergency surgery. Then the cases were aseptically prepared for repair of hernia under GA using diazepam 1mg/kg BW and Ketamine 15mg/kg BW intramuscularly. Surgical procedure was adopted as that of Jahromi *et al.*, (2009). Bird was positioned in dorsal recumbency. After aseptic preparation of operational field, a ventral midline celiotomy was performed. Care was taken not to damage underlying viscera during skin incision and hernia



Figure 2: Case1-Lateral radiograph with wings upraised positioning revealing loss of abdominal integrity

contents were reduced and excess fat was removed. Skin incision was extended towards sternum cranially and just before cloaca caudally. In case 1, hernia consisted loops of ileum and abdominal fat without any adhesions. After reducing hernia contents, herniorraphy was done by closing flaps of abdominal muscles using no. 2-0 polyglycolic acid suture in vest over pant method and skin was closed by no. 2-0 polyamide completing standard two layer closure (Figure-3). Heat from a light source was maintained to control post operative hypothermia. Post operatively bird was administered enrofloxacin 10%(Meriquim liquid, Varsha labs) @20mg/kg for 5 days and Meloxicam 0.25 mg/kg BW (Melonex oral suspension) for 3 days along with antiseptic wound dressing using povidone iodine. Also Vimeral liquid (Virbac India) orally was advised for one month. The bird was followed for 90 days and recovered uneventfully.

In case 2, it was found that massively swollen intestinal loops filled with partly digested feed and firmly adhered with each other (Figure 5). Liver was also enlarged and it was suspected as a



Figure 3: Case 1-Immediate post operative

case of hepatic lipidosis. Efforts to separate the adhesions or either reducing the hernia contents were futile as the contents were strangulated and ischemic. Bird died during surgery. Heat from a light source was maintained to control post operative hypothermia. Post operatively bird was administered enrofloxacin 10%(Meriquim liquid, Varsha labs) @20mg/kg for 5 days and Meloxicam 0.25 mg/kg BW



Figure 4: Case 2-Irreducible abdominal swelling

(Melonex oral suspension) for 3 days along with antiseptic wound dressing using povidone iodine. Also Vimeral liquid orally was advised for one month. The bird was followed for 90 days and recovered uneventfully.

Avian abdominal hernias are dissimilar to mammalian hernias due to absence of opening in the aponeurosis of abdominal muscles and typically there is no specific hernia ring, instead there is thinning and gradual separation of abdominal muscles. During the repair of hernia salpingohysterectomy is usually recommended (Altman, 1997).

Abdominal hernias occur frequently in female psittacine species, particularly in budgerigar. The hernia is frequently associated with weakening of abdominal musculature associated with egg laying, egg-binding, or hyperoestrogenism. Rarer causative factors of either sex include trauma, straining, or abdominal masses. Lateral view of radiograph and contrast radiograph are most helpful, showing loss of integrity of abdominal wall in association with projecting soft tissue mass of varying size. Hernia may contain enlarged liver and small intestinal loops

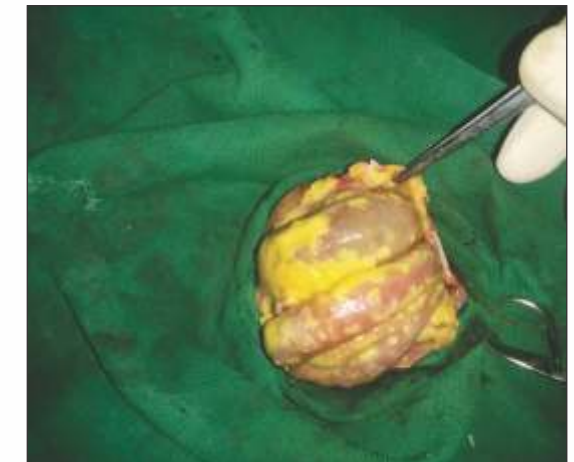


Figure 5: Case 2- enlarged duodenal loops and pancreas



glued with adhesions in the form of a fibrin mesh, which form one ball (Smolec *et al.*, 2009)

Hepatic lipidosis in birds is most commonly due to the feeding of a high-fat, low protein diet, where the fat becomes the major source of calories. All-seed diets are a typical example of this sort of diet, but hepatic lipidosis occurs in most avian species. Vitamin E (as an antioxidant) and B complex vitamins may also be beneficial (Donley B, 2010). Langlois and Jones (2001) reported ventral abdominal hernia in a Red Lory associated with hepatic lipidosis, hyperoestrogenism and its surgical correction by ventral midline celiotomy. Also post operative management by diet modification and increased exercise resulting in decreased liver size over a period of time.

Jahromi *et al.*, (2009) reported a traumatic linea alba tear and ventral abdominal hernia in common Myna and followed minimum area of feather removal. Similar method was followed in the present case 1. Gomaa and Nassan (2015) gave an overview of diagnosis and surgical approach of different swellings including ventral abdominal hernias in Egyptian swift pigeons. Smolec *et al.*, (2009) reported correction of abdominal ventral hernia in a pigeon by standard two layer closure under general anesthesia and opined this is uncomplicated and safe approach.

In present case report, case 1 was long standing, still bird recovered well as there were no adhesions and strangulation of hernial contents, whereas in case 2, bird was presented for

treatment very late with severe complications like hypotension, adhesions, strangulation of hernia contents with ischemia and hence could not survive.

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Occurrence of Stick Tight Fleas on a Organised Desi Chicken Farm

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(received 11/10/2018 - accepted 13/11/2018)

Abstract :

An organized desi chicken farm of 150 desi chicken birds suffered flea infestation, where 12 young chicks were heavily infested with *Echidnophagagallinacea* around the eyes and five of them died of anaemia. The affected chicks were treated with Deltamethrin, as an external application @ 1.25% concentration and were found free off the fleas after three days.

Keywords : *Echidnophagagallinacea*, Desi chicken, Anaemia, Infestation.

Introduction :

Echidnophagagallinacea, the stick-tight flea is a common ecto-parasite of poultry. Young birds are more severely affected and in heavy infestation, ulceration around the eyes and blindness are the common clinical manifestations in affected birds (Lalitha and Joseph, 1982). Poultry may develop clusters of the fleas around the eyes, comb, wattles, and other bare spots.

Clinical Observations :

Flea infestation was observed in an organized desi chicken unit, Coimbatore during routine



Birds affected with fleas

farm visits. The young ones were heavily infested with the fleas mainly around the eyes. The birds were restless, off-feed and very weak. The fleas were collected in 70% alcohol and sent to the Department of Veterinary Parasitology, for identification.

The specimens were identified as *Echidnophaga gallinacea* as per the distinct morphological characters described by Soulsby(1982).

Treatment and Discussion :

Echidnophagagallinacea infestation was observed around the eyes in 12 young chicks maintained in an organized desi chicken farm with 150 desi chicken birds at Coimbatore. Five young chicks were reported died of anaemia and 7 infected chicks were treated with Deltamethrin as an external application @ 1.25% concentration and were found free off the fleas after three days. The flea infestation is restricted to hill and sub montane districts like Coimbatore and was also reported earlier in Coimbatore during the year, 2013. The fleas are difficult to remove because their heads are embedded in the host's flesh and they cannot be brushed off. Female fleas attach at one site on their hosts and



feed for prolonged periods, causing tissue to become swollen and ulcerated. Eggs are laid in the ulcers that have formed on the host's skin. Young birds may die from infestation, due to anemia produced by the fleas' feeding.

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Therapeutic Management of Malassezia Otitis Externa in Dogs

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(received 11/10/2018 - accepted 13/11/2018)

Abstract :

Two dogs with a history of persistent ear scratching, rubbing, head shaking and foul smelling yeasty odour were confirmed as causes of otitis externa due to Malassezia dermatitis and were treated with Ofloxacin, clotrimazole, betamethasone locally and ketaconazole orally along with supportive therapy.

Keywords : Otitis externa, Malassezia dermatitis, ketaconazole.

Introduction :

Otitis externa is a routine complaint in canine practice. In allergies, endocrinopathies, immunosuppressive disorders and other skin diseases, malassezia otitis is most commonly observed (Reddy *et al.*, 2016). In otitis externa ear cultures, malassezia occurs frequently, next to Staphylococcus (Lathamani *et al.*, 2016). The organism produces lipases and proteases which causes cutaneous inflammation by changes of cutaneous pH (Masuda *et al.*, 2015). Diagnosis of malasseziosis can be done by cytology of exudates collected from ear canal and by evaluating each ear separately (Scott *et al.*, 1995). In the present report, the dogs with otitis externa were treated with antifungal and local glucocorticoid therapy along with oral ketaconazole and supportive therapy successfully.

Clinical Observations :

Two dogs were presented to clinic with history of persistent ear scratching, rubbing, head shaking and foul smelling yeasty odour for 2 weeks. On

clinical examination of dogs, thickening of ear skin, erythema, lichenification, alopecia were noticed around the ears. Tape impression smears, skin scrappings were collected from the lesions and were subjected for laboratory examination. Whole blood and serum samples were collected for routine haematology and serum biochemistry.

Treatment and Discussion :

Dogs were treated with Pomisol ear drops (containing ofloxacin 0.3 %w/w, clotrimazole 1.0%w/w, betamethasone dipropionate 0.025%w/w and lignocaine HCL 2%w/w) @12 drops in each ear BID and ketaconazole @5mg/kg BW orally for fourteen days. Supportive therapy was given with Livotas syrup - 10ml daily for 3 weeks. The owners were advised to use Micodin (miconazole nitrate 2% w/v and chlorhexidine gluconate 2%w/v) shampoo, weekly twice. Recovery was assessed based on the evaluation of otic discharges and clinical observations.

Dogs with otitis externa and Malassezia



Right Solution for Genital Tract Infections

Broad Spectrum bactericidal action against bacteria causing the uterine infections

Effectively kills the bacteria from all parts of uterus

ENDOMETRIUM



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Fig. 1. (showing erythema of ears)

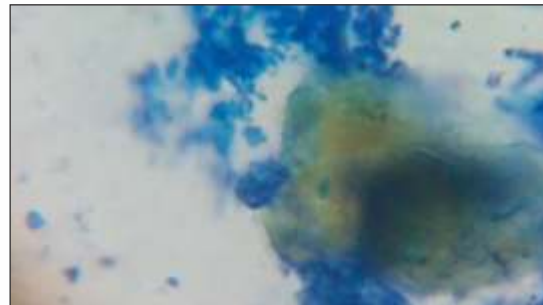


Fig 2. (Malassezia organisms under oil immersion objective)

dermatitis infection had yeasty odour along with lichenification of the skin (Fig.1). Tape impression smears collected from ears revealed malassezia organisms under oil immersion objective after staining with New Methylene blue (fig.2). Skin scrapings were negative for mites. No other abnormalities were observed on examination of clinical samples. The affected dogs responded well to the therapy with ear drops and ketaconazole tablets.

Duration of treatment depends on severity of infection and otic drops were advised to continue for one more week and weekly once shampooing was advised regularly for six months (Reddy *et al.*, 2014). Malassezia organisms are commonly seen even on healthy dog skin and only clinical presentation of the disease will be seen with overgrowth of Malassezia (Bass, 2004). Therapy in Malassezia infection must be directed for both yeast control and elimination of any detectable predisposing factors. Topical and systemic therapies were helpful in reducing the infection (Deshmukh *et al.*, 2008). Pomisol ear drops, which contains antibacterial, antifungal and glucocorticoid drugs helps in inhibition of the growth and multiplication of malassezia organisms and reduction in inflammation and pruritis. In the present cases, the primary cause for development of the disease was poor managemental practice and stress factors, where malassezia associated external otitis cases were successfully treated with pomisol ear drops

(Containing ofloxacin, clotrimazole, betamethasone) and Ketaconazole tablets along with supportive therapy.

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Medical Management of Sarcoptic Mange in Pups

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Abstract :

Two puppies were presented to the clinic with erythema, scratching of ears the with dullness and slightly enlarged popliteal lymph nodes. Leukocytosis noticed on haematological examination and skin scrapings revealed presence of Sarcoptes mites. The puppies were treated with sulfur ointment topically along with antihistamines.

Key words : Sarcoptes ,Sulfur ointment, leukocytosis, puppies.

Introduction :

Sarcoptic mange is a highly contagious, zoonotic skin condition of animals characterized by intense pruritis, which is caused by mite, *Sarcoptes scabiei* var. *canis* that burrows deep into epidermis of the host (Anita and Peter, 2008). The mites cause marked irritation characterized by intense itching and scratching that results in partial to complete alopecia. Humans can get infection after having contact with infected dogs. Robert (2011) reported clinical forms of mange in dogs of which localized form is mostly seen in dogs less than 2 years and generalized form affects older dogs. Present report deals with management of sarcoptic mange in young puppies.

Clinical Observations :

Two puppies were presented to the Department of Veterinary Medicine, College of Veterinary Science, Tirupati with the history of erythema and scratching of ears for the past one week. Severe pruritus of ears was noticed. Clinical

examination revealed that the pups were dull, with slightly enlarged popliteal lymph nodes. Examination on skin scrapings from the erythematous region of the ear revealed Sarcoptes mites. On haematological examination neutrophilia and eosinophilia was noticed. Erythematous lesions were seen on elbow region and ventral abdomen. Based on the history and clinical signs, the cases were diagnosed as sarcoptic mange.



Picture 1. Showing erythema and alopecia of ears



Picture 2. Showing erythema of ears



Picture 4. Showing Sarcoptes mite

Treatment and Discussion :

Pups were treated with sulfur ointment topically, antihistamines like Avilin@0.5mg/kg body weight for 5 days. After two weeks of initiation of therapy the animal showed improvement and skin scrapings from the ear after two weeks of therapy revealed absence of sarcoptes mites. Age wise prevalence of sarcoptic mange in dogs in relation to age indicated that dogs under one year of age were significantly more affected than the dogs over one year of age. Present record is in line with Irfan *et al* (2003). As the spread of the disease is through contact, the higher prevalence in dogs under one year of age could be due to their tender skin, tendency to huddle and close contact. Treatment with sulfur showed marked improvement in this case study. Sulfur ointment is relatively cheap medicament, easy for application and doesn't possess any side effects/toxicities. Use of Lime-sulfur or amitraz dips are usually effective and fipronil topical treatment was found to be useful. (Curtis, 2004).



Picture 3. Showing Sarcoptes eggs

Treatment success in cases is due to continuous application of sulphar ointment till recovery.

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Clinical Management of Mange Mite Infestation in large White Yorkshire pigs

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(received 13/10/2018 - accepted 15/11/2018)

Abstract :

A group of large white yorkshire pigs showed intense pruritus, erythema with papule formation in the skin. Diagnosis was made by microscopic examination of skin scrapings, which revealed adult sarcoptic mite along with numerous immature mites. All the animals were successfully treated with Ivermectin single dose and topical application of herbal ointment until recovery.

Keywords : Mange, mite, yorkshire, Ivermectin.

Introduction :

Porcine sarcoptic mange infection (Scabies) is a common dermatosis caused by *Sarcotic scabie var suis*. The disease occurs in all countries where pigs are raised in large numbers. Sarcoptic mange is a common disease and represents the most important ectoparasitic disease of swine. Sarcoptic mange occurs in many other species but the mite *Sarcoptes scabies var suis* is specific only for swine. Sarcoptic mange occurs in all age groups but is inapparent in neonatal pigs until signs and lesions have had time to develop. The name *Sarcoptes scabiei* is derived from the Greek word "sarx" (flesh) and "koptein" (to smite or to cut) and the Latin word "scabere" (to scratch). Scabies was first described more than 2500 years ago. Sarcoptic mange was first reported about 60 years ago. This communication describes a clinical presentation of scabies and its successful therapeutic management in a group of large white Yorkshire pigs.

Clinical Observation :

A group of newly purchased large white Yorkshire pigs in the institute pig farm, NRC Pig, Rani, Assam showed, intense pruritus, erythema with papule formation along with scale and crust formation in the ear, face and rest of the body (Fig.1). Alopecia was also observed in few pigs. Diagnosis was made by the characteristic clinical signs, skin lesions and microscopic examination of skin scrapings. A deep skin scraping was taken (skin scraping until capillary blood appears described by Soulsby (1986). Mites were extracted from the collected skin scraps using Alkali Maceration technique described by Hassanien (1994) after addition of suitable amount of potassium hydroxide 10 % and heating in water bath adjusted at 90° C for 10-15 minutes. The treated samples were centrifuged at 1000-1500 rpm for at least 10 minutes, the sediments were examined microscopically for diagnosis of the causative agent. Microscopic examination of the skin



Fig.1. Large white yorkshire pigs showed crust formation in the ear affected by sarcoptic scabies.

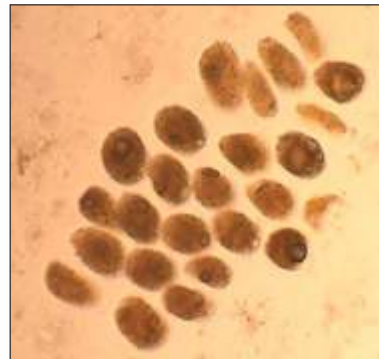


Fig.2. Numerous immature sarcoptic scabies mites in the skin scrapings of affected pig

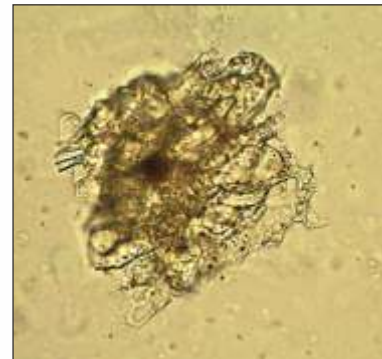


Fig. 3. Mature sarcoptic scabies mite found in the skin scrapings of affected

scrapings revealed Adult mite along with immature mites. The obtained species of mites were identified morphologically as described by Soulsby (1986). The mites were round in shape with short stubby legs. The immature mites were found numerous and were oval to round in shape (Fig.2).

Treatment and Discussion :

All the animals were successfully treated with Ivermectin @ 1ml/50kg, S/C, single dose and topical application of topicure ointment until recovery. Scabies, is a highly contagious skin infection in pigs caused by mainly sarcoptic mite infestation. Mange mites (Psoroptes, Sarcoptes) feed on the surface or burrow within the skin, making very slender, winding tunnels from 0.1 to 1 inch long. The fluid discharged at the tunnel openings dries to form nodules. A toxin is also secreted which causes intense irritation and itching (Soulsby 1986, Mounsey et al. 2010). Mange mite infestations are contagious and treatment of all animals in a herd is essential to achieve control (Rahbari, et al. 2009). If left untreated, secondary bacterial infections and severe weight loss can occur. The disease might be spilling over to peoples in close contact to infected animals (Mitra, et al. 1993). The skin

infection of pig unit was treated successfully to clean the pig sheds from mange infestation and to prevent development of infected foci which act as a source for spreading of infection to new animals as well as to human.

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Occurrence of *Staphylococcus aureus* Associated Pyemia in Pigs

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(received 13/10/2018 - accepted 15/11/2018)

ABSTRACT:

The present case study in two pigs recorded occurrence of *Staphylococcus aureus* with numerous abscesses in different organs. After death, postmortem examination recorded pyemic lung lesions, abscess in the spleen, ureter, kidney, skin and muscles. *S. aureus* was isolated and antibiogram analysis showed that the isolates were susceptible to antimicrobials such as ceftriaxone, ciprofloxacin, gentamicin, sulfadiazine and trimethoprim, while penicillin G showed highest resistance.

Key words: Pigs, *S. aureus*, Pyemia, Pathology, PCR, Antibiogram

Introduction:

Staphylococcus aureus has been associated with numerous pathological conditions in pigs like abscesses of skin, umbilicus, bones, joints, mammary gland and internal organs, vegetative endocarditis and polyarthritis (Nielsen et al., 2009; Frana et al., 2012; van der Wolf et al., 2012). *Staphylococci* organisms are ubiquitous in nature, prevalent in swine facilities. *Staphylococci* causes pyogenic infections of various organs and tissues in almost all species of animals. The most common disease producing organisms are *Staphylococcus hicus*, causing exudative epidermidis, *Staphylococcus aureus* that causes abscesses and pyogenic infections of various organs and tissues. Most cases of *S. aureus* occur in individual animals and animal to animal spread is rare (Frana et al., 2012). In human, *S. aureus* is associated with septicemia, severely necrotizing and purulent pneumonia, endocarditis, upper respiratory infections, subcutaneous abscesses, enterocolitis and toxic

shock syndrom. The present study was attempted for detection of *S. aureus* associated with some pathological conditions of pigs by molecular detection from both, clinical and post mortem samples.

Clinical Observations:

Post mortem examination:

Two crossbred pigs of 2 months old were brought for postmortem examination and diagnosis. The pigs were reared in an intensive pig farm, Guwahati, Assam. Detailed post mortem examinations of the carcasses were carried out and gross lesions were systematically recorded. The gross lesions were pyemic condition in the lungs, abscess in the spleen, ureter, kidney beneath the skin and in the shoulder and thigh muscles and upon incision it revealed thick creamy white pus.

Isolation and identification of *S. aureus*:

For isolation and identifications of the causative

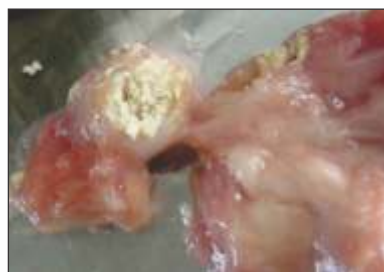


Fig.1. Abscess in the muscle with yellowish cheesy pus



Fig. 2. Abscess in the spleen showing whitish creamy pus



Fig. 3. Abscess in the ureter filled with thick yellowish cheesy pus

organism, the pus samples and joint fluid were collected aseptically in a sterile vial for culture. Samples were inoculated to nutrient broth and were incubated aerobically at 37°C for 24 hours. From the nutrient broth, the culture was streaked on to a nutrient agar plate containing 10% sodium chloride and kept overnight at 37°C for 24 hrs. The organisms were characterized as Staphylococci based on morphological, cultural and biochemical characters (Cowan *et al.*, 1993). The organism was found to be positive for catalase, glucose, trehalose, mannose, sucrose, mannitol and Voges-Poskaur reagent.

PCR detection:

For confirmatory diagnosis all the *S. aureus* isolates were subjected to PCR analysis (Sasaki *et al.*, 2010). Primers for specific identification of *Staphylococcus aureus* were included in the PCR (Sasaki *et al.*, 2010). Total cellular DNA was extracted with QIAGEN DNeasy® tissue kit according to the manufacturer's protocol. . Oligonucleotide primers used for species identification of *S. aureus* were 5'-TCGCTTGCTATGATTGTGG-3' (forward) and 5'-GCCAATGTTCTACCATAGC-3' (reverse). For conducting PCR, 25-µl reaction mixture containing 3µl of template, 1× PCR buffer, 2 mM of MgCl₂, 200 µM of each of the four deoxynucleotide (dNTPs), 20 pmol of each of the two primers and 1 U Taq DNA polymerase

was prepared. The reaction mixture was subjected to amplification in a GeneAmp PCR system, 9700 thermal cycler (Applied Biosystems, USA) according to the program: initial denaturation at 95°C for 2 min followed by 30 cycles of denaturation at 95°C for 30 s; annealing at 56°C for 35 s, extension at 72°C for 1 min, and a final extension of 72°C for 2 min. Amplified PCR products were separated by agarose gel electrophoresis (1.5% agarose in 0.5× TBE). DNA fragments were observed by UV transilluminator and photographed by using gel documentation system (Alpha Infotech Corporation, Multi Image System, San Leandro, CA, USA).

Histopathological Examination:

Representative tissue samples showing gross lesions were collected in 10% formalin. The formalin fixed tissues were processed for histopathological study by routine paraffin embedding technique and sections of 4-5µ thickness were prepared and stained by routine haematoxyline and eosin stain.

Antibiotic sensitivity test

Antibiotic susceptibility testing was performed by the disk diffusion method according to the Clinical and Laboratory Standards Institute guidelines (CLSI, 2008).

Results and Discussion :

In present study, *S. aureus* was isolated from

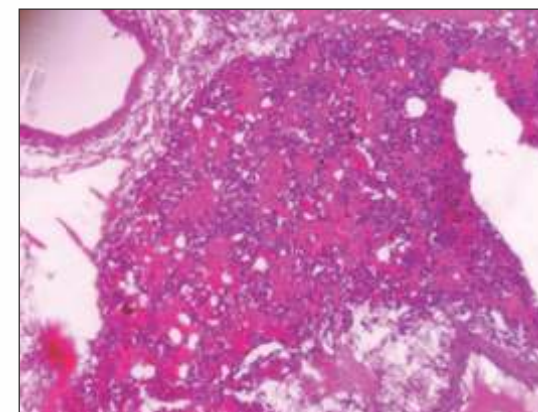


Fig. 4. Pneumonic lung with infiltrating cells (H&E)

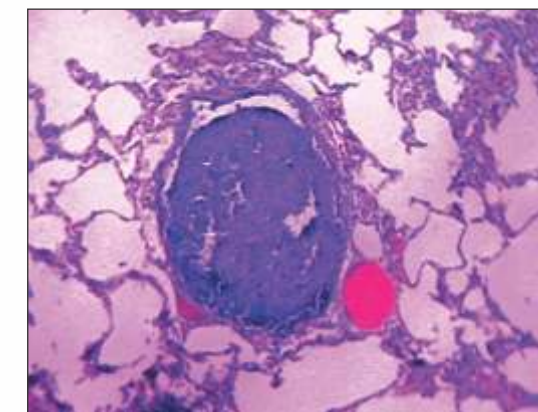


Fig. 5. Microabscess in the lungs (H & E)

both the pigs from lung, pus samples and joint fluid. The present finding agreed with the findings of van der Wolf *et al.* (2012) who also reported isolation of *S. aureus* from such disease conditions of pigs. The PCR assay employed in the study correctly identified various post mortem samples found to be positive for *S. aureus* following isolation and identification by bacteriological methods. Amplification of 359-bp band (Fig.6) in PCR has been reported to be confirmatory for the species identification of *S. aureus* (Sasaki *et al.*, 2010). The other bacteria isolated (in association with *S. aureus*) were Streptococcus species and *E. coli*. The present finding was in conformity with the findings of various authors (Gardner, 1990; Jackson and Cockcroft, 2007) who also isolated these bacteria from such disease conditions of pigs. This finding is also in agreement with the findings of Nielsen *et al.* (2009) who opined that pigs may spontaneously develop pyemia and based on records from the post mortem meat inspection, approximately 125,000 per year pigs (0.4% of the total number of slaughtered pigs) are diagnosed with pyemia in Denmark.

In post mortem examination, predominant lesions were abscess in the lungs and muscles (Fig.1) and other organs such as spleen, ureter,

kidney, subcutaneous tissue and muscle. The abscess contain creamy whitish and yellowish pus and surrounded by a thick fibrous capsules. The H&E stained section of the lungs revealed presence of suppurative pneumonia along with micro abscesses (Fig.4 and Fig.5). In the skin and muscle, abscesses were detected in various locations like in the neck, shoulder and back. Swine skin abscesses often arise when there is an initial break in the skin, which gives access to pyogenic bacteria and it is known to affect all ages. Pus pockets recorded in other organs such as spleen, ureter (Fig.2 & Fig.3) and kidney which represent pyemia. The presence of micro abscesses in the marginal zone of the spleen has been linked to sepsis. Similar lesions were recorded in pigs by earlier worker.(Neilson *et al.*, 2009). Naturally occurring pyemia in pigs is often associated with lesions in the lungs and the skeleton (Ministry of Food, Agriculture and Fisheries, Danish Veterinary and Food Administration, 2007, unpublished data).

Antibiotic sensitivity pattern of *S. aureus* from the isolates revealed that most of the isolates were susceptible to antimicrobials such as ceftriaxone, ciprofloxacin, gentamicin, sulfadiazine, trimethoprim and the isolates showed highest frequency of resistance to



Surgical Management of Cervical Oesophageal Obstruction in a Buffalo

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Abstract :

A buffalo was diagnosed for oesophageal obstruction and by performing cervical oesophagotomy, a piece of leather covered with ingesta was retrieved.

Keywords : Choke, Buffalo, Oesophageal obstruction, Oesophagotomy.

Introduction :

Obstruction of the oesophagus rarely occur in ruminants. Sudden closure or occlusion of normal esophagus by foreign body or food mass, characterized by hyper salivation, deglutition inability and regurgitation is called as Choke. Apart from cattle, oesophageal obstruction has been occasionally reported in buffaloes (Tyagi and Singh, 1999), at pharynx, cranial aspect of the cervical esophagus, thoracic inlet, or the base of the heart and it may be intra or extra luminal (Mohamed *et al.*, 2015). Intra-luminal obstruction of esophagus is commonly referred to as choke and occurs due to attempts to swallow of whole fruit like turnips, lemons, apples, phytobezoars, pieces of leather and rubber (Salunke *et al.*, 2003), ingestion of cloth or rexin material, mango seeds, tarpaulin cloth (Ravikumar *et al.*, 2003) and coconut shell (Madhava Rao *et al.*, 2009). Oesophageal obstruction is considered to be an emergency surgical condition and most frequently encountered clinical presentation in bovine

(Mohamed *et al.*, 2015).

Clinical observations :

A 4-year-old she buffalo was presented to the Teaching Veterinary Clinical Complex, PGIVAS, Akola with a history of inappetance with moderate tympany, salivation, regurgitation of feed material through nostrils since last two days. The case was treated by local veterinarian symptomatically. Clinico-physiological parameters were within normal physiological range. The animal was coughing at regular intervals. On palpation, a hard irregular swelling at left ventro-lateral mid cervical region in the jugular furrow was palpable. On the basis of history and clinical observations, the case was diagnosed as oesophageal obstruction. Due to severe respiratory distress of the buffalo, it was decided to perform oesophagotomy in standing position without any delay.

Treatment and Discussion :

Animal was restrained in standing position and

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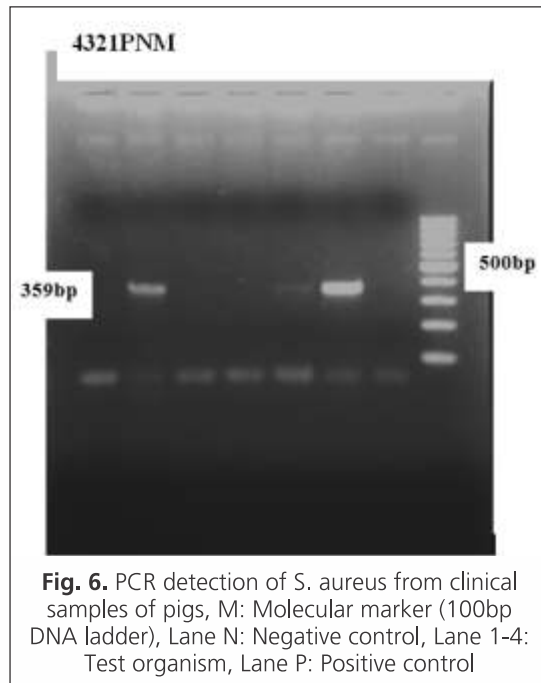


Fig. 6. PCR detection of *S. aureus* from clinical samples of pigs, M: Molecular marker (100bp DNA ladder), Lane N: Negative control, Lane 1-4: Test organism, Lane P: Positive control

penicillin G. The present finding was similar with the findings of Oppliger (2012) and van der Wolf, 2012) who also recorded a substantial increase in resistance of *S. aureus* isolates from pigs to antimicrobials such as penicillin, tetracycline and ampicillin.



left ventro-lateral mid cervical region was prepared aseptically (Fig.1). Local analgesia was achieved by infiltrating 2 % lignocaine HCl in linear fashion directly over the obstructed mass. A four inch longitudinal skin incision was made on the cervical part over the obstructing foreign body and cutaneous fascia was separated. The oesophagus was approached between the sterno-cephalicus muscle and trachea. After exposing the oesophagus, tourniquet was applied at the proximal and distal end of obstructed mass with the help of umbilical tape. The foreign body retrieved from the incision site was hard irregular leather piece covered with ingesta (Fig 2). The esophagus was cleaned with normal saline thoroughly. The esophageal incision was closed with a two-layer suture pattern. In the first layer, the mucosa was closed with the continuous suture pattern and the sub mucosa and muscular is were closed with the cushioning pattern using 1-0 chromic catgut (Fig. 3). The muscles were sutured using catgut no.1 with simple interrupted sutures. Skin apposition was made by placing simple interrupted sutures using nylon. Post-operatively, Inj. Streptopenicillin @ 10 mg/kg bwt and Inj. Meloxicam @ 0.3 mg / kg bwt was administered I/M for 5 consecutive days. Oral feeding was withheld and animal was strictly maintained on fluid therapy for 5 days and semi solid soft diet was advised from 6th day onwards. The sutures were removed



Fig.1. Preparation of surgical site

on the 12th postoperative day and animal recovered uneventfully without any complications.

Esophageal obstruction caused by foreign objects is considered as one of the most important emergency surgical condition that requires immediate surgical intervention. Blockage of the esophagus causes life threatening bloat in ruminants. Bovines are more frequently affected by esophageal obstruction than other animals and this is attributable to their peculiar feeding habits. Many authors reported that extra luminal incomplete obstruction occurs when pressure is exerted on the esophagus by the neighboring organs, tissues, or space occupying lesions such as large periesophageal abscesses, enlarged mediastinal lymph nodes and thymic form of lymphosarcoma, aortic tumors, or mediastinal lymphadenopathy (Marzok *et al*, 2015). In the present case, the choke was noticed due to ingestion of leather piece, may be due to pica or indiscriminate feeding habit of the animal (Yadav *et al*, 2008). The prognosis of oesophageal obstruction is not always favourable because extensive tissue damage with consequent formation of scar tissue, stenosis, and even esophageal perforation (Mohamed *et al.*, 2015). Emergency surgery and correct follow up after operative procedure of the buffalo resulted in



Fig. 2. Leather piece covered with ingesta



Fig. 3. Closing of oesophagus

successful case recovery.

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Therapeutic Management of Demodectic Mange in Boer Bucks

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Abstract :

Boer bucks with nodules all over the body were clinically investigated and their scrappings revealed demodectic mange infestation. Successfully, the cases were treated with anti-parasitic, antibiotic and multi-vitamin therapy within 3 weeks.

Key words: *Demodex caprae*, Boer, goats, therapeutic, management

Introduction :

Demodectic mange among caprines is a common disease and is caused by *Demodex caprae*. Symptoms of caprine demodicosis are similar to those of bovine demodicosis and are characterized by apruritic cutaneous nodules mostly on muzzle, withers, back and neck (Taylor *et al.*, 2016). The nodules range from pea sized upto 2.0 cm in diameter (Urquhart *et al.*, 1996). The disease is caused by *Demodex caprae* and is transmitted by prolonged contact (Taylor *et al.*, 2016). This disease has a worldwide distribution with higher prevalence in warm tropical countries. Caprine demodicosis is not a serious pathological condition but causes economic losses due to skin condemnation or poor hide quality (Urquhart *et al.*, 1996). *D. caprae* is a deep penetrating mite and sebaceous glands or hair follicles are sites of predilection. Dairy goats like Sannen are more predisposed or sensitive to *Demodex* infestation and develop multiple cutaneous nodules (Williams and Williams, 1982). The present study discusses therapeutic management of demodectic mange diagnosed

in two Boer bucks.

Clinical Observations :

Two Boer bucks were presented to the Teaching Veterinary Clinical Complex with similar lesions on the skin. The lesions consisted of pea sized to rupee coin sized raised nodules with encrusted



Figure 1. Nodules on skin on Boer buck infested with *Demodex caprae*

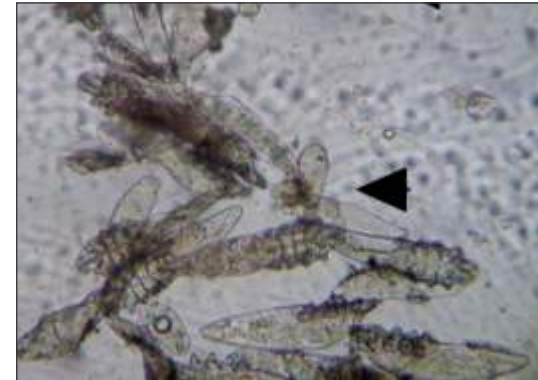


Figure 2. *Demodex caprae* in caseous exudates retrieved from cutaneous nodules (100X). Structures marked with black arrows are larvae of *D. caprae*

surfaces. The nodules were abundant on face, neck, withers, back and even extended upto the limbs. Nodules on the limbs and face were smaller than those on the withers, neck and back. No change in feed intake, faecal consistency, urination or any other behavior was reported in affected cases. Clinical parameters were found to be within normal limits. Visible mucous membranes were found normal. The nodules were palpated to check the consistency. The smaller nodules were hard, while the larger ones on the back had slight doughy consistency.

Skin scrapings were collected from encrusted surface of three nodules. Scrapings were collected using sterile scalpel blade after applying liquid paraffin to the blade as well as the site of collection on the skin. Hair was clipped from the site of collection. Skin on selected site was scraped till oozing of capillary blood and scrapings were collected into a vial containing 10% potassium hydroxide. A large nodule on the back of both bucks was chosen for aspiration of contents. Hair surrounding nodules were clipped and site was prepared aseptically. A sterile 18G needle was used to puncture one large nodule on the back of each buck. The

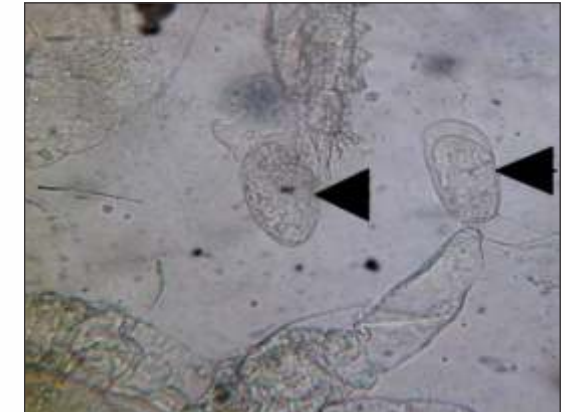


Figure 3. Eggs of *D. caprae* in skin scraping (400X).

material could not be aspirated by syringe and hence the punctured nodule was pressed to exude out the yellowish cheesy contents.

Treatment and Discussion :

The two Boer bucks were treated with Ivermectin Inj. (Hitek) at a dose rate of 0.3 mg/Kg body weight, subcutaneously thrice on the first day, fourteenth day and on twenty eighth day. Simultaneously the affected goats were treated with chlorpeneramine maleate (Anistamin) 2ml daily once for five days and antibiotic straptopenicillin (Dicrysticin) 2ml, once daily for five days. The goats were administered 10 ml of multivitamin (Vimeral) orally for 10 days, as supportive therapy. Bucks recovered by day 35 after initiation of treatment.

Demodectic mange in goats due to *Demodex caprae* is characterized by presence of nodules on muzzle, withers, neck, back and rump. Fleischer *et al.* (1996) observed protruding nodules on neck, trunk and upper portion of the limbs and pressing of nodules yield creamy mass containing large number of immature and adult mites. In present cases, pea sized to 2 cm sized nodular lesions were observed on the muzzle,



trunk, withers, rump and limbs. Nodules on limbs extended well below knees and fetlocks. Nodules contained yellowish coloured cheesy material. Microscopic study of cheesy exudates revealed immature and mature parasites along with eggs. The nodules are subcutaneous and are produced from inflammatory exudates inside hair follicles and sebaceous glands (Fourie, 2018). The condition can be treated easily with organophosphate insecticides or macrocyclic lactones (Taylor *et al.* 2016). Strabel *et al.* (2003) treated two goats with oral ivermectin @ 0.67 mg/Kg body weight, once weekly for 12 weeks or pour on eprinomectin. In present case, both bucks were successfully treated with three doses of ivermectin injected subcutaneously at 0.3 mg per Kg body weight administered at 14 days interval.

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Dystocia Due to Fetal Anasarca with Ascites and Cleft Palate in a Bidri Goat

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(received 17/10/2018 - accepted 25/11/2018)

Abstract :

A full term dystotic Bidri goat with fetal anasarca and complication of ascites was delivered successfully by per vaginal delivery.

Keywords : Bidri doe, Anasarca, Ascites, Per-vaginal.

Introduction :

Generalized edematous condition of body, called as anasarca is less commonly reported in small ruminants but commonly seen in cattle and may also affect sheep. Rarely mild hydrops of amnion and/or allantois and edema of the placenta may accompany the condition and is caused by recessive autosomal character (Roberts, 1971). This condition frequently leads to dystocia due to increase in fetal volume caused by the excess of fluid in the subcutaneous tissues, particularly of the head and hind limbs. These fetuses can be delivered by forced traction (Jayachandra *et al.*, 2013) or in severe cases caesarean section (Naokes *et al.*, 2005). The present paper describes a case of dystocia due to fetal anasarca along with ascites and cleft palate delivered per vaginam in Bidri goat.

Case History and Observations :

A four year old, full term Bidri doe was presented with straining since 3-4 hours and allantois has ruptured 2 hours back. On general examination, doe was in good body condition, showing mild dullness and intermittent straining with swollen, edematous unrecognizable mass at the vulva

without any fetal limbs. Respiration rate and heart rate were within normal range and conjunctival mucosa also showed normal pink colour. On gynaeco-clinical examination, fetus was in anterior longitudinal presentation, dorso-sacral position and the round edematous mass was found to be fetal head. Both fetal limbs were incompletely extended into fairly lubricated birth passage. Deeper palpation revealed generalized subcutaneous edema of the fetus. Further, exploration of birth passage did not show any edema or damages, suggestive of no prior handling of the case. Hence, the case was diagnosed as dystocia due to fetal anasarca.

Treatment and Discussion :

Passage was lubricated with 30-40 ml of one per cent carboxymethyl cellulose sodium gel then fetal limbs were completely extended by putting traction on both limbs followed by forced traction. After the fetal thorax entered the vaginal passage, obstruction was noticed. Repeated examinations of fetus revealed abdomen severely distended suggestive of fetal ascitis. To remove the fluid in fetal abdomen, a BP blade number 12 fitted to 3 number BP



Dystocia due to Foetal Muscular Pseudo Hypertrophy and Generalized Emphysema in a Non-Descript Buffalo

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(received 17/10/2018 - accepted 25/11/2018)

Abstract :

Muscular pseudo-hypertrophy of a localized region, called as steatosis, was observed in a full-term buffalo calf complicated with generalized emphysema and the case was relieved by caesarean section.

Keywords : Buffalo, Muscular Pseudo-hypertrophy, Steatosis, Caesarean.

Introduction :

Enlargement of the atrophic muscle due to replacement of muscle by fat and fibrous tissue is known as muscular pseudo-hypertrophy, commonly referred as steatosis, in pigs and cattle (Valentine and McGavin, 2007). Steatosis is characterized by too much fat deposits within the muscle, effectively replacing muscle fibers often forming an enlargement (Cooper and Valentine, 2016). The incidence of congenital musculo-skeletal anomalies of thorax and neck is reported as 1.48 per 10,000 births in cattle (Doyle *et al.*, 1990). The reporting of this condition is very scarce in veterinary compared to human medicine. The present report describes the gross aspects of congenital muscular hypertrophy complicated with generalized emphysema in a full-term buffalo calf and its successful delivery by caesarean operation.

Clinical Observations :

A 10-year-old non-descript buffalo was presented to obstetrical ward with a history of full term pregnancy and straining for more than 36 hours with presence of fetal head in the birth

canal last in few hours. The allantois bag ruptured around 30 hours back. The case was handled unsuccessfully by a field veterinarian and due to negligence of the owner, fetal head outside of birth canal was partly damaged, leading to death and emphysema of fetus. The respiration and heart rates were slightly above the normal range with rectal temperature of 100.5°F and congested conjunctival mucus membrane. Gynaeco-clinical examination revealed excessively enlarged neck and thorax of fetus, with head outside the birth passage and bilateral shoulder flexion of foetus. The vaginal passage and vulval lips had lacerations and edema indicative of extensive handling of the case.

Treatment and Discussion :

The caesarean section was performed through left paramedian approach and a dead emphysematous female fetus was delivered. While delivering the fetus, care was taken to restrict the incision length by partly removing gas from fetus by incising the fetal skin at several places and relieving the gas, which helped in reducing the size of fetus. The surgical wounds

term, and prolong the second stage of parturition. The fetal head and hind limbs were known to be affected often more and most of the time fetus presented posteriorly, frequently enormous fluid present in the peritoneal and plueral cavities (Noakes *et al.*, 2005). However, in the present case fetus was in anterior presentation and was having cleft palate which appears to be rarer. Similar cases of fetal anasarca associated with ascitis were reported and delivered per-vaginally (Prabaharan *et al.*, 2016) and by caesarean section (Philip *et al.*, 2012).

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handle was carefully inserted below the fetus without damaging the passage, in a flat/horizontal direction. At the point of the fetal abdomen, BP blade was rotated to vertical position piercing the distended abdomen followed by pulling out to extend the abdominal incision. All the fetal abdominal fluid, sero-sanguinous and yellowish in nature, was drained out. Thus on reduction of fetal size, then a dead female kid was removed with mild traction.

Gross examination of the fetus (Fig. 1) revealed that, fetal head was severely distorted due to edema and was having cleft palate. Whole of the fetal body was carrying subcutaneous edema confirming the clinical observations. The doe was treated with supportive anti-biotic (Enrofloxacin @ 5mg/Kg. B.Wt), anti-histaminic (Chlorpheniramine maleate @0.2 mg/Kg. B.Wt) anti-inflammatory (meloxicam @0.2/mg/Kg. B. Wt.) for 3 days and the doe recovered without any complications.

The anasarca conditions are rarer in goats compared to cattle (Velankar and Deopukar, 1994). The definite cause is still unknown, but is usually result of a circulation disturbance of liquid exchange and may be of placental origin and often associated with edematous fetal membranes. Moreover, the obstruction of the lymphatic may prevent the disposal of peritoneal fluid leading to fetal ascities (Sloss and Dufty, 1986). Anasarca fetus were reported to carry till



Fig. 1. Fetal Anasarca, showing generalized sub-cutaneous edema and the opened abdomen for its easy delivery.



were sutured as per standard procedure, followed with intravenous fluids (Intalylte®, Intas Pharmaceuticals Ltd., 5 L, daily) and other supportive treatments like antibiotics (Ceftriaxone, Intaceph®, Intas Pharmaceuticals Ltd., 3 gm, I.V, daily), analgesics (Meloxicam® @0.5 mg/Kg. B. Wt. I.M.) and intrauterine (Liq. Lenovo, 60 ml, I/U) therapy for five days. Skin sutures were removed after 12 days and the animal recovered uneventfully.

On examination of fetus, neck and thorax were grossly enlarged compared to whole emphysematous fetus (Fig. 1). The spherical masses were seen on dorsal region of neck and thorax, which confirmed the dystocia case due to muscular pseudo hypertrophy concurrent with generalized emphysema. However, bulging of temporal regions or eye ball and broad ear pinna could not be appreciated as per earlier reports (Singh *et al.*, 2017). In present case, dorsal muscles of thorax and neck were hypertrophied and appreciated as round hard masses. Deletion mutation in the myostatin or growth and differentiation factor 8(GDF8) gene was attributed for failure of muscle fibre deposition regulation (Belling *et al.*, 2005), which may be the cause for pseudo hypertrophy of muscle. Many congenital defects of genetic and environmental factors (including viruses and toxins) have been reported (Leipold *et al.* 1983),



Fig. 1. Pseudohypertrophy concurrent with generalised emphysema (Arrow mark: showing enlarged muscular mass on dorsal aspect of neck)

but the specific cause of the hypertrophy of the neck still not known. Similar cases without emphysema were reported and successfully delivered after partial fetotomy (Ghuman *et al.*, 2012, and Singh *et al.*, 2017) and caesarean section (Prabaharan *et al.*, 2013). The present report discusses a rare case of pseudomuscular hypertrophy concurrent with generalised emphysema and its delivery by caesarean section.

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Dystocia Due to Arthrogyposis of Calf in a Non-descript Cow

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Abstract :

A non descript cow with dystocia due to fetal origin was relieved by caesarian section and dead arthrogyposis calf was removed successfully.

Key words : Arthrogyposis, Foetal dystocia, Caesarian section, Cow.

Introduction :

Arthrogyposis or arthrogyposis multiplex congenital (AMC) is ankylosis of the limbs, usually combined with a cleft palate and other growth deformities. It is seen in all breeds of cattle while kittens and puppies are infrequently affected (Jubb *et al.* 1993). Arthrogyposis has more than one etiological and pathological entity. The principal cause of AMC is believed to be decreased fetal movements (akinesia) caused by maternal or fetal abnormalities. At birth, affected calves exhibit joints fixed in abnormal positions and frequently have scoliosis and kyphosis. Calves are usually unable to stand or nurse and muscle changes, notably atrophy, have also been seen. The present case report describes a case of successful management of dystocia due to arthrogyposis of calf in a non descript cow.

Clinical Observations :

A referred case of dystocia was presented to the Teaching Veterinary Clinical Complex PGIVAS, Akola with history of labor pains since last 6-8 hours. The cow was straining intensely and

exhausted. The per-vaginal examination revealed that the fetus was in dorsal transverse presentation and left cephalo-iliac position. The joints of the fetal limbs were found to be very rigid and fixed. So based on the examination the case was tentatively diagnosed as of dystocia due to fetal anomaly and hence decided to carry out caesarean section.

Treatment and Discussion :

The caesarean section was performed under local infiltration anesthesia with 2% lignocaine HCL and incision site was parallel to the milk vein. The fetus was removed after caesarean section and the joints from the forelimbs and the hind limbs as well as the neck were found to be rigid. The fetus was diagnosed as an arthrogyptic fetus (Fig. 1). The routine post operative care to the animal was carried with antibiotic, analgesics and fluid therapy along with echbolics for five days and the suture were removed after ten days. In domestic animals hereditary arthrogyposis has been associated with forms of myelodysplasia in cattle and pigs (Leipold *et al.*, 1983), Akabane virus infection in uterus (Konno *et al.* 1982) and toxic plants like lupines are also



Fig. 1. Arthrogryposis calf with ankylosis of the limbs.

of recurrence for these cases varies with the type of genetic disorder. There is a rare autosomal recessive form of the disease known to exist (Ghodasara *et al.*, 2013).

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associated with the disorder. The arthrogryposis syndrome in Charolais is caused by an autosomal recessive gene with complete penetrance in the homozygous state. However, in most cases, arthrogryposis is not a genetic condition. The risk

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Successful Management of Post-partum Complete Eversion of Uterus in a Buffalo

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Abstract :

An unusual case of complete eversion of uterus following a normal parturition in graded Murrah buffalo and its successful management is reported.

Keywords : Eversion of uterus, Post partum, Buffalo

Introduction :

Genital prolapse is considered as an emergency maternal disorder and the incidence of prolapse reported was rare after 48 to 72 h of parturition (Yotov *et al.* 2013). Of the total 42.9% recorded obstetrical problems in buffaloes, pre-and post partum vaginal prolapse accounted for 67.3 and 21.7 per cent, respectively, while 11% exhibited postpartum uterine prolapse (Samad *et al.* 1987). Uterine prolapse is considered as medical emergency. If the affected animal is not treated quickly, animal goes into shock or die due to blood loss. In the present report, an unusual case of complete eversion of uterus following a normal parturition in graded Murrah buffalo and its successful management is discussed

Clinical observations :

The pluriparous graded Murrah buffalo weighing approximately 550 kg and with a history of genital prolapse immediately after normal calving was presented to Teaching Veterinary Clinical Complex, Akola. Upon

physical examination, the buffalo had a body temperature of 101°F, alert with pink mucous membranes. There was complete eversion of uterus along with cervix and vaginal walls. The buffalo was straining strongly and prolapsed mass was slightly swollen with slight bleeding. The case was diagnosed as post partum complete prolapse.

Treatment and Discussion :

The buffalo was administered with 5 ml of 2% Lignocaine HCL as epidural anesthesia to prevent excessive straining and pain during repositioning. The prolapsed mass was thoroughly washed with 1 percent potassium permanganate cold water. The maternal caruncles and placental debris which was attached was also removed. The ice bags were applied on the prolapsed mass to reduce swelling. Two Pop in Spray was sprayed on the prolapsed mass. Simultaneously Inj. Avilin 10 ml, Inj. Melixcom 20 ml was injected in 5 % DNS (500ml) to the patient. Inj. Stadren 15 ml was administered intramuscularly to avoid bleeding.



Fig. 1. Complete eversion of uterus in graded Murra buffalo



Fig. 2. Reposition of prolapsed uterus and mattress suture on vulva

The buffalo was repositioned in normal seating position and with closed palm hand, the inside mass was pushed first. By keeping the same pressure with other assistance, the remaining mass was pushed. The everted uterus was repositioned normally and mattress suture was applied on upper portion of the vulval lips with cotton material to avoid further recurrence and tearing. The buffalo was treated medically with Inj. Intacef 3 gm i/v, DNS- 1000 ml, Inj. Calberol 200 ml slow i/v, Inj. Urimin 10 ml i/m and Inj. Tribivet 10 ml i/m. The suture was kept for two days and then removed. The 30 ml Wokadine mixed in 300 ml NS was injected intrauterine for three days to prevent the bacterial infection. The fluid therapy, antibiotics, analgesic and echbolic were given for five days.

To prevent reoccurrence of prolapse various techniques such as rope truss (Dharani *et al.* 2010), horizontal mattress suture (Singh *et al.* 2011) and Buhner's suture (Yotov *et al.* 2013) techniques have been reported. In the present case, mattress suture with cotton material was used to prevent recurrence and worked successfully. Predisposing factors for genital prolapse includes high levels of estrogens around parturition, increased intra-abdominal

pressure (Roberts, 1971), altered micro- and macro mineral metabolism (Bhatti *et al.* 2006), foods containing phytoestrogenic substances (Miesner and Anderson, 2008) and genetic predisposition. In the present case, the deficiency of calcium and excessive relaxation of ligaments due to high estrogen during calving may be the cause for eversion of uterus. The case was presented immediately and hence there was no blood loss and contamination. The prompt treatment successfully managed an unusual case of complete eversion of uterus in a buffalo.

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Successful Management of Uterine Torsion in a Sheep

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Abstract :

The distinctive case of uterine torsion in a sheep was successfully diagnosed and torsion was relieved by Sharma's modified schaffers plank method successfully.

Keywords : Uterine torsion, Dystocia, Plank method, Sheep

Introduction :

Uterine torsion is the major obstetrical condition of bovines encountered any time during last third stage of gestation but frequently observed during first stage of labor (Singh *et al.* 1979). Uterine torsion results in partial or complete obstruction of the caudal part of uterine body, preventing passage of the lamb. If the degree of torsion is less than 180 degree, it may be possible to pass the hand and palpate the lamb while in



Fig. 1. Rolling of sheep towards right side

complete obstruction may occur if the degree of torsion is greater than 180 degree (Naidu, 2012). Uterine torsion can be managed successfully either non-surgically by rolling of the dam (Manokaran *et al.* 2014) or surgically by caesarean section (Phogat *et al.* 2007).

Clinical observations :

A 4 year old sheep was presented to TVCC, PGIVAS, Akola with the history of completion of gestation period, continuous straining since last sixteen hours and showing symptoms of lambing but there is no progression. The rectal temperature was 103.5°F, mucus membranes were slightly congested and inappetence since last one day. On clinical examination vulval lips were slightly swollen while per vaginal examination revealed obstruction in vaginal passage caudal to the cervix. The direction of vaginal folds twisting is towards right side. The vaginal passage was completely obstructed and the fetus was not palpated indicating right side uterine torsion of more than 180 degree. The case was diagnosed as that of uterine torsion



Fig. 2. Successful detorsion and fetus removed.

with right side three quarter twist.

Treatment and Discussion :

The sheep was restrained on right lateral side and both fore and hind limbs were properly tied. The small size wooden plank was kept on the left flank region and constant pressure was applied by hands. By maintaining the pressure on the plank, the ewe was rolled towards right side. After four successive rotations, the torsion was relived and red colored blood mix fluid comes out through vaginal passage. The caudal epidural anesthesia (2 % lignocain HCL, 2.5 ml) was administered, then lubricated gloved hand was passed and by giving manual traction one dead fetus was removed successfully. As the case was presented very late, the fetus was dead and there was also rolling of umbilical cord. Two Cleanex boli were placed inside uterus. Inj. Dextrose 5% 300 ml IV ,Inj. Ringers Lactate 200

ml IV, Inj. Meloxicam (Melonex) @ 0.2mg/kg, Inj. Amoxicillin (Intamox) @ 10mg/kg , Inj. Chlorpheniramine maleate (Cadistin) @ 0.5mg/kg body wt were given by IM for three days.

Torsion of uterus is rare in sheep (Smith and Ross, 1985) and goat (Gupta, 2005). Torsion usually occurs in early stage of first stage of labor in sheep and diagnosis is difficult and can be made in post cervical torsion by typical fold in the vagina or sometimes only in case of partially dilated cervix (Sharma *et al.* 2004). In the present case, the torsion was post cervical and more than 180 degree with delay in presentation to hospital. However, the detorsion was successfully made with removal of one dead fetus.

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Polycystic Kidney Disease in a Persian Cat

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(received 22/08/2018 - accepted 24/09/2018)

Abstract :

A case of polycystic kidney disease was diagnosed on the basis of clinic-biochemical and sonographic investigations in a young Persian female cat.

Key words : Cat, polycystic kidney disease, ultrasonography.

Introduction :

Polycystic kidney disease is an inherited disorder characterized by more than one fluid filled cyst in the kidney and has been reported in humans, dogs and cats (Eaton *et al.*, 1997; Igarashi *et al.*, 2002). Multiplication and progressive increase in size leads to potentially fatal kidney failure (Wills *et al.*, 2009). Disease has been identified as autosomal dominant polycystic disease. The present report describes diagnostic features of polycystic kidney disease in a cat.

Clinical Observations :

A 7 month-old female Persian cat, weighing 4.0 Kg, was presented to the hospital with the history of behavioral change, reduced appetite, pain in lumbar region, vomiting and weight loss. Detailed clinical examination revealed normal body temperature (102.0°F), nausea/vomiting, polydipsia-polyuria, painful lumbar region on palpation, dribbling of urine, marked weakness, tachypnoea, pale mucus membrane, reduced appetite and dehydration (skin tenting >3 seconds).

Abdominal palpation revealed enlarged palpable left kidney and urinary bladder. Haemogram

revealed haemoglobin (9.4 g/dl), packed cell volume (30.0%), total erythrocyte count (4.6 x10⁶ per mm³), and total leucocyte count (6000 per mm³) within limits ; and no blood protozoa and ehrlichia. Blood serum investigation showed higher values for serum creatinine (4.5 mg/dl), blood urea nitrogen (40 mg/dl), serum inorganic phosphorus (7.1 mg/dl) and lower value for serum calcium (6.4 mg/dl). Urine examination showed low specific gravity (1.010), presence of protein (+), presence of pus cells (2-3 per high power field), presence of erythrocytes, and absence of glucose.



Fig. 1. Ultrasonogram of a 7 month old female Persian cat showing three cysts in the left kidney.



Fig. 2. Ultrasonogram of the same cat showing normal right kidney.

Abdominal survey sonography showed three anechoic structures (0.66 x 0.70 cm ; 0.41 x 0.54 cm; and 0.54 x 0.45 cm) in the parenchyma of the left kidney (size 3.89 x 2.22 cm) with poor differentiation of renal cortex and medulla (Fig 1). The right kidney was 3.64 x 1.74 cm in size and did not reveal any cyst. (Fig.2). Liver, spleen, gall bladder and urinary bladder had normal echo-texture. Based on sonography and other investigations the cat was diagnosed with polycystic kidney disease.

Treatment and Discussion :

The cat was treated with Ringers lactate/DNS @ 100 ml/kg.b.wt IV daily (7 days), odensteron @ 0.2 mg/kg IV/PO (for 5 days), amlodipine @ 0.125 mg/Kg PO OD daily, benazepril @ 0.25 mg/kg PO BID, phosphate binder (containing dried aluminium hydroxide 200 mg, magnesium hydroxide 200mg and activated dimethicone 20 mg/5 ml) @ 1.0 ml PO TID with meals daily, nandrolone @ 1.0 mg/kg IM every third week with the free access to fresh drinking water and renal diet. The cat survived three months post treatment.

Polycystic kidney disease is a genetic disease and has been identified in Persian cats as autosomal dominant. The presenting signs of polydipsia-polyuria, painful lumbar region on palpation, dribbling of urine, marked weakness, tachypnoea, pale mucus membrane, reduced appetite and dehydration are in tune with the

observations of Phoon *et al.*, (2015). These signs along with increased serum creatinine (4.5 mg/dl), BUN (40 mg/dl), serum inorganic phosphorus (7.1 mg/dl); and presence of protein, pus cells, and RBCs in the urine were suggestive of renal failure stage-3 (IRIS, 2013). Though, there is no gold standard test for ante mortem diagnosis of polycystic kidney disease, confirmatory diagnosis is made at postmortem (Wills *et al.*, 2009). Ultrasonography holds promise and is a practical way of diagnosing polycystic disease as sensitivity of ultrasound scanning in detection of polycystic disease is upto 91.0% (Eaton *et al.*, 1997). There is no specific cure for the condition and eventually kidney failure develops.

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A case of Fetal Mummification in a Osmanabadi Goat

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(received .26/10/2018 - accepted 28/11/2018)

Abstract :

A multiparous Osmanabadi goat with history of kidding first live healthy kid and second kid with mummified fetus was delivered successfully per vaginally by manual traction.

Key Words : Fetal Death, Mummification, Dystocia, Osmanabadi Doe

Introduction :

One or two mummified foetuses presented in the uterus with one or more normal viable foetuses is observed frequently in swine, occasionally in dogs and cats and uncommonly in sheep, goat, cattle and horses. Fetal mummification associated with a persistent corpus luteum is observed mainly in cattle and rarely in goat (Roberts 1962). The commonly observed foetal mummification in the middle to last third of gestation but it is uncommon in sheep and goat (Roberts 1971). Markandeya (1991) reported a case of fetal mummification in goat where one viable kid born along with two mummified foetuses. The condition of foetal mummification was said to be more common in cats, swine and dogs, which carry large number of foetuses result in uterine overcrowding and placental insufficiency (Arthur, 2001). Roberts opined that mummified foetuses would not affect the growth of other foetuses in multitocous animals. A rare case of accidental pre-pubic tendon rupture with foetal

mummification in a goat and its treatment by caesarean operation is reported by Singh *et al.* (2008). The prognosis for further breeding is good since there has been no intrinsic damage to the reproductive tract.

Clinical Observations :

A multiparous Osmanabadi goat aged two and half years was presented to Dept. of Veterinary Gynaecology and Obstetrics, Veterinary College, Bidar with a history of parturating one live healthy kid yesterday and retained placenta. History revealed that, the animal had normal kidding and bred by natural service. No abnormal parturition was reported during previous kidding. On per vaginal examination revealed presence of a hard, brownish, viscous, chocolate coloured material of the fetus, twisted and contorted dead fetus of lesser age (mummified fetus), surrounded by dried chicken like mass and the fetal membranes. Based on the findings it was confirmed as mummification of the fetus.



Fig 1: Manual removal of mummified fetus

Treatment and Discussion :

After lubricating the birth canal by carboxy methyl cellulose (CMC), a hard, brownish, dried chicken like mass and dead fetus of lesser age (mummified fetus) with anterior presentation was removed manually (Fig. 1). The mummified fetus was covered with sticky exudates. The fetal fluids were not palpated in uterus and the dehydrated fetus was absorbed. Placenta was adhered with uterus (Fig. 2). The greater loss of fluids from the placental membranes and putrified dead fetus indicated longer duration of the fetal death. Animal was treated with fluids, broad-spectrum antibiotics (Ceftriaxone), anti-inflammatory drug (Meloxicam), anti-histamines, intrauterine boluses (Ultrox) for consecutive 4 days. After one week, the animal recovered uneventfully and discharged.

Markandeya *et al.* (1991) and Doijode (1993) reported cases of mummification in goats where out of three foetuses, two were mummified and another one was completely developed and viable one. Ogbu *et al.* (2011) reported a case of dystocia due to mummification where both the foetuses were dead. In the present study, out of two foetuses one foetus was live and other one was mummified.



Fig 2: Mummified fetus with placental attachment

Fetal death in domestic animals occurring in middle or last third of gestation that does not result in luteolysis and abortion causes autolytic changes in the fetus, absorption of fetal fluids and mummification (Roberts, 1971). The present case study, one of the fetuses was lacking eyeballs and skin, that might be due to resorption of skin and subcutaneous layers. Although spontaneous abortion of a mummified fetus can occur, expulsion of the fetus usually requires veterinarian intervention (Lefebvre *et al.*, 2009).

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Staphylococcal Dermatitis in a Goat

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(received 13/11/2018 - accepted 25/11/2018)

Abstract :

A goat presented with history of skin infection and clinical indications of red skin and inflammation around eyes, ear and nose revealed characteristics Gram positive cocci in clusters. Affected goat was treated with topical antibiotic ointments and injectable antibiotic oxytetracycline successfully.

Key words : Dermatitis, Goats, Skin infection, Staphylococcus

Introduction :

Dermatitis is the broad term for a number of chronic skin conditions that are characterised by the inflammation of the skin. Dermatitis may appear as dry, red patches, crusty scales or painful blisters anywhere on the body. Staphylococcal Dermatitis is a bacterial skin disease and is caused by *Staphylococcus aureus*. Staph infections generally occur in areas of heavy rain and high humidity. A case of successful treatment of staphylococcal skin infection is reported and discussed.

Clinical Observations :

A goat of age 4 months was presented with history of skin infection. Clinical examination revealed red skin around eyes, ear and nose (Fig. 1). There is loss of hair in the affected area. There was inflammation of ears skin and redness. Owner also reported anorexia and restlessness. A sample from affected area was taken and examined microscopically by Gram's staining. It revealed characteristic Gram positive cocci in clusters. Antibiotic sensitivity test was performed with antibiotic discs (Himedia)

namely Enrofloxacin, Gentamycin, Ceftriaxone, Chloramphenicol, Oxytetracycline, Streptomycin, Amikacin on Soyabean casein digest agar by disc diffusion method as described by Ellner (1978).

Treatment and Discussion :

Affected goat was treated with long acting Oxytetracycline two doses @ 20 mg/kg b.wt. Intramuscularly on alternate day. Avilin @ 1ml I/M was given daily for three days. Treatment of Staphylococcal dermatitis in goats involves topical antibiotic ointments and injectable



Fig. 1: Picture showing clinical signs around ears, eyes and nose in goat suffering from dermatitis



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Fig.2: Antibiotic Sensitivity test

to isolate the affected goat from rest of flock.

Animals with this condition will have moist red skin around the eyes, ears, and bridge of nose (<http://oces.okstate.edu>). This bacteria is very hard to eliminate since it is a highly adaptive and opportunistic bacteria. The infection normally first appears in areas often in contact with the ground on the underside of the goat -udder, teats, scrotum, insides of legs, stomach but it can spread to the entire surface of the goat's body. It also infects the hair follicles, causing the hair to fall out, resulting in a hairless goat with sores over its body (<http://www.life-slice.com>).

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antibiotics mainly penicillin or oxytetracycline (<http://www.infovets.com>) intramuscularly. Oxytetracycline was also found sensitive in Antibiotic sensitivity test. Topical application of antibiotic cream was done to reduce inflammation and redness. One week after therapy itching, inflammation and redness of skin disappeared completely. As the infection can spread to other animals, owner was advised

Traumatic Cervical Vertebral Malalignment Syndrome in a Dog

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(received 16/11/2018 - accepted 29/11/2018)

Abstract :

An adult Dachshund incurred accidental trauma during a playful episode on vacation, and after a lag of two weeks was presented to the Milford Veterinary Clinic for treatment of severe neck pain. Radiographs revealed C₁-C₄ vertebral malalignment, which was cured by medical management with restricted movements.

Key words : Traumatic, vertebral, malalignment, cervical, radiography, pain management, laser therapy, dog

Introduction :

Pain in the cervical region, observed in companion animals, may originate from the nervous system itself or the surrounding anatomical structures. Perusal of the published literature revealed paucity of evidence-based reports on the differential diagnosis, management and treatment of pathomorphological aberrations in the neck region of pet dogs following accidental impact of any hard object. Functional recovery can often be achieved with non-surgical treatment; surgical intervention is associated with a high incidence of peri-operative mortality (Hawthorne *et al.*, 1999). In this communication, diagnosis and favourable response to neck immobilization for spinal stabilization, and medical management of severe neck pain in a dog patient with effective home care support is discussed.

Clinical Observations :

Oscar Stinchcomb, 8-year-old neutered male Dachshund (photo 1), was presented to the Milford Veterinary Clinic for treatment of severe neck pain.



Photo 1. Oscar Stinchcomb getting the Laser treatment



Fig. 1. Right lateral view of patient's cervical radiograph.



Fig. 2. Left lateral view of patient's cervical radiograph.

During the course of the routine annual health check-up recorded a moderate increase in the rectal temperature (103.3°F; N: 100°-102.5°F) with a low grade (2/6) heart murmur.

While on vacation, the dog suddenly jumped off the couch in a futile attempt in the window sill and started yelping in intense pain.

Since the pain perception by the pet had increased exponentially, the owner took the dog to local veterinarian who prescribed some pain medications.

As neck pain continued constantly and the rectal temperature remained elevated (102.9° F) on the repeat visit to the clinic, urinalysis was recommended. Testing of the freshly voided urine sample revealed increased pH value (relative alkalinity) with detection of blood: mostly intact red cells (hematuria), protein, and struvite crystals (phosphates), suggestive of underlying UTI. A blood panel done later did show elevated RBC, which is attributed to the mild dehydration.

On systematic digital palpation, accentuated pain perception was recorded in the cervical, mid-thoracic and lumbar regions. Notably, on neck rotation the dog patient evinced severe pain only on up and down movement; lateral movements on either right or left side were

absolutely uneventful. These clinical observations are suggestive of inter-vertebral disc disease (IVDD), to which Dachshunds are known to be highly susceptible. In perspective, radiographic imaging of the neck region was recommended. In-house radiographs: right and left lateral views (Fig.1; Fig.2) clearly revealed malalignment of the C₁-C₄ vertebrae. Further, C₂-C₃, and C₃-C₄ appeared impacted on each other, and C₂ slightly elevated, apparently because of concussion. Dorso-ventral view could not be recorded because of the excruciating pain experienced in up and down head movements.

Treatment and Discussion :

The dog patient was given Buprenex[®] (Buprenorphine) @ 5 µg kg⁻¹ subcutaneously, and Meloxicam[®] with food OD for 5 consecutive days, and thereafter as per need. Polyflex[®] was administered subcutaneously @ 30 mg kg⁻¹. Take home Clavamox[®] @ 10 mg kg⁻¹ PO bid for 10 days was prescribed. Neck immobilization, and restricted movements, the use of muscle relaxant Methocarbamol (Roboxin[®]) orally @ 44mg bid on the first day and then @ 22mg bid for 30 days was prescribed, and noise-free environment was recommended. Laser therapy of the affected cervical spine for two weeks (3 sessions per week) facilitating the recovery process of the patient.

Several reports on management of cervical vertebral fractures in the pet dogs (Stone *et al.*, 1979; Denny, 1983; Steyn, 1986; Blass *et al.*, 1988) have highlighted better chances of functional recovery for non-surgical medical management of cervical fractures, concurrent with innovative neck immobilization in the companion dogs on early presentation at the referral veterinary clinic. This approach is equally applicable to accidental traumatic cervical malalignment, not culminating in fractures, under report in the instant case. Radiography of the affected region remains the major diagnostic tool. However, in suspected cases of acute traumatic cervical spinal cord injury (SCI), cervical spondylotic myelopathy, and spinal cord herniation likely to result from severe concussion, state-of-the-art imaging techniques like MRI may be employed (Talekar *et al.*, 2016).

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Animal Science

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Dr. Eaknath B. Chakurkar, Director (A), ICAR-CCARI Goa has 25 years of professional experience in the field of Animal Sciences.

He has published 52 Research articles in referred journals, Six technical bulletins and 10 extension folders. He has developed techniques having expertise in Infertility management in dairy animals, Embryo Transfer in cattle, Artificial Insemination in Pigs, Goat reproduction and Rabbit production.

Agonda Goan, a local pig breed is registered with NBAGR, which exhibits local adaptability and higher consumer preference. Artificial insemination in pig was standardized for the production of crossbred pigs. He has the experience of handling two projects from DBT, four projects from RKVY apart from other institute projects. He has also submitted a provisional application for patent entitled "Extender for preservation of boar semen" to the Indian Patent Office on 10th August, 2016.

He is the recipient of the 'Fakhrudin Ali Ahmad Award' for the biennium 1996-97 and has been awarded the 'Fellow' of National Academy of Veterinary Science in the year 2007.

Q. 1. Why piggery is considered on separate professional lines than that of agro allied business?

Piggery sector plays an important role, besides the scope for commercial farming and export opportunities to provide critical employment opportunities to the tribal masses and poor farmers as well as improving their living standard, livelihood and nutritional security. India's pig population estimate is about 9.40 million (FAOSTAT, 2013) which constitutes nearly 1% of world's pig population and sector is gaining slow but steady momentum during the last few years indicating the scope for further improvement and opportunities. The share of pork to the total meat production has been about 10% and almost static for last 15 years. Average meat yield of pigs in India is 35 kg/animal, which is about 55% less than the corresponding value of world average. The total pigs in India have decreased by 7.54% over the previous census and the total pigs in the country are 10.29 million numbers in 2012. The total pigs contribute around 2.01% of the total livestock population. Out of the total population, number of males are 4.96 million (3.68 million indigenous and 1.28 million exotic) and 5.33 million are females (4.16 million indigenous and 1.17 million exotic). The bulk of the pig population in India is still of indigenous type with poor growth rate and productivity however after 2012 population of crossbred pigs is increasing leading to more pork production per animal. In India, Pig farming sector is highly un-organised and 70% of the pig population is reared under traditional small holder, low-input demand driven production system, except for limited number of semi-commercial pig farms in

Kerala, Goa and Punjab. The typical production system of pigs in traditional areas consists of a simple pigsty and feeding comprises locally available grains, vegetables and agricultural by-products along with kitchen waste. Pork consumption being popular among select populations, improved pig husbandry programmes and pig-based integrated fish farming have significantly contributed in the poverty alleviation strategies of the Government.

Q.2. Pig industry has no even distribution in our country, why so?

Distribution of pig population across the country is not uniform, for instance, thick population of pigs is recorded in the eastern (2.8 million) and north-eastern (4.5 million) states; highest population is in Assam (2 million), followed by Uttar Pradesh (1.35 million), West Bengal (0.82 million), Jharkhand (0.73 million) and Nagaland (0.70 million). Most of the pig population is again in the tribal belts of the country where the people are non-vegetarian. As per the last livestock census data, there is a change in population of indigenous and crossbred/exotic pigs in India. The majority of the pig population in India is of indigenous breeds (76 percent) though population of cross-bred and exotic pigs increased by 12.7 percent from year 2003 to 2012. The trends shows that the major share of the pig population is indigenous pigs, the level of population was almost steady from 1992 census. However crossbred pigs were 14% in 1992 and reached to 23.86% in 2012.

Over 20% of the pigs kept in India are crossed with exotic breeds, but with a large amount of inbreeding because of non-systematic breeding and selection. Pig



farming is still un-organized venture that requires research and technology driven support to make it a vibrant enterprise. The exotic breed mainly comprises Hampshire, Large White York Shire, Duroc, Landrace, and Tamworth while some of the popular indigenous pig breeds include Ghungroo, NiangMegha, AgondaGoan, Ankamali and Tany-Vo etc.

As an example the pigs are reared all over the coast but more popular in states of Goa and Kerala. According to the recent breed survey (2013) conducted by animal husbandry statistics division of DADF, there are around 37,600 non-descript pig population in the state of Goa, out of which 19,800 are female pigs. Interestingly, overall crossbred pig population is less than 2,000. Among the indigenous pigs, AgondaGoan is small sized local pig of Goa and has been registered under National Bureau of Animal Genetic Resources-NBAGR. This is the third indigenous pig breed registered in the country, the other two being Ghunghroo and NiangMegha. These pigs are mostly black colored, and have short snout and rough bristles. People prefer these animals for sausage making and breed is known for its high dressing percentage. It is well adapted to local coastal environment. Among other pig strains of the coastal region, Ankamali pigs are the domesticated native pigs of Kerala. In Kerala, the introduction and popularity of the exotic white pigs led the black pig varieties to an endangered level. The scavenging practice was also a reason for the rejection of the local variety. But there have been some farmers who retained and bred the black pigs. Ankamali pigs did not show genetic closeness either with other native Indian pig types or exotic Large

White pigs with high bootstrap values indicating genetic distinctness. Apart from these pig strains, Nicobari and Andaman wild pigs are found in the coastal part of Andaman and Nicobar. Another pig breed called Ghungroo can be located in parts of West Bengal and is known for its prolificacy and mothering ability. The breed has also been registered under ICAR-NBAGR.

Q.3. How you analyse prospects of pig farming sector?

Pig farming is important especially because they have faster growth rate, shorter generation interval and excellent feed conversion efficiency. Pigs are multipurpose animals providing about 40% of meat consumed in the world market, and by-products like dung as manure and bristle for brush industry. It is produced under a variety of production systems ranging from simple backyard pigs to family operated farms or large scale integrated pig industries with sophisticated bio-safety measures. The major production system in India and other developing countries is backyard or scavenging system with practically zero input. As result of low input there is low output resulting from low producer pigs. Under semi-intensive system of rearing, pig growers mostly keep indigenous pigs with moderately high production potential and crossbreds, feeding them with locally available grains and feed ingredients mixed with oil cake and bran along with food waste, with the provision of housing mostly as a night shelter. In the large scale production system, mostly purebred improved breeds are intensively reared with proper management like a balanced diet and assured veterinary services etc.

As compared to other species Pig production, has a high potential to contribute to a greater economic gain due to their high feed conversion efficiency, early maturity, short generation interval, high litter size and relatively small space requirement. Pigs can tolerate high level of dietary fibre which is important since the high cost and scarcity of grains and concentrates are of major constraints in present day livestock production. Pig is a more efficient carcass yielder than other meat purpose animals. Pork has superior curing qualities which are obvious advantages for processing and marketing.

Pig production in India has enormous potential to upscale and contribute to high economic gain. They are equally adapted to diversified and intensive agriculture. Also, there is a vast scope for this industry in India as the contribution of pigs to Indian exports is very poor. About 934 tonnes of pork and pork products were exported during 1995-96. The value of pork and pork products exported is Rs. 262 lakhs against the total value of Rs. 61604 lakhs on account of meat and meat products export. The contribution of pork products in terms of value works out to 0.80% of total livestock products and 4.32% of the meat and meat products.

The drivers of piggery development programmes in the country are restricted to governmental and institutional players, like Department of Animal Husbandry, Dairying and Fisheries of Govt. Of India, veterinary/animal husbandry/animal resource development departments and livestock development boards of different states and Indian Council of Agricultural Research through the National Research Centre on Pig, All India Coordinated

Research Project on Pig and Mega Seed Project on Pig. There is an acute absence of private organizations involved in pig breeding and pork production.

Q.4. Are Pig breeding and policies defined?

Pig rearing is still in budding stage in India. Nevertheless, there exists a great scope for piggery sector to bring a visible change in the livelihood and nutritional security of millions of poor, under-privileged marginal and landless farmers. A viable and vibrant model of small holding piggery enterprise has the potential to improve the scenario of rural India. This can be ensured with timely coordination, support and awareness creation about the husbandry practices including foundation stock, breeding, feeding and health management. Highest priority shall be given on developing low-cost production technologies in order to effect economic pork production.

Nation Livestock Policy (2013): Pig breeding policy will focus on improving growth, prolificacy, quality and quantity of meat and survivability.

- Conservation of some of the meritorious indigenous breeds of pigs in their defined local tracts.
- Crossbreeding with high yielding, disease resistant exotic breeds with maximum 50% level of exotic germplasm in crossbreeding.

But, it needs to be focused more as

- Pigs have never been in the forefront of livestock development program in India until recent past. Similarly, there is no distinct pig breeding policy.



- No state in India has generally adopting a well defined pig breeding policy.
- Country Report of Animal Genetics Resources of India drafted by DAHD, MoA did not mention anything about pig breeds and policies for propagations etc

In recent years, several global companies have shown keen interest in Indian pig industry and entrepreneurship. One such firm is Polar Genetics having a joint venture with Indo-Canadian Swine Breeders, which aims to popularize pig farming and enterprise in India. Recently, Canadian government has secured export market access for Canadian pork and pork products to India. India is considered as a bigger market because there is greater scope for starting modern practices in piggery which is still at a nascent state of development in the country.

successful fertilization resulting in the formation of normal offspring or young one.

All over the world, A.I. has helped to improve the reproductive performance and genetic use of farm animals. Artificial insemination technology is not merely an important method of impregnating female animals. Instead, it is a powerful tool mostly employed for rapid genetic improvement of the animals more importantly farm livestock. The genetic influence of several breeds of male animals possessing superior quality semen can be spread more widely. AI is a safe and an inexpensive method of introducing new genes into animal herds. In artificial insemination, the germplasm of the superior quality boars can also be effectively utilized with the least consideration for their location in distant countries or even continents. Also, by adoption of A.I., there would be considerable reduction in both genital and non-genital diseases in the farm animals. In contrast, natural mating results in slower genetic gain and indiscriminate use of limited number of breeding males can lead to decline in overall production.

States and the developed procedures became established worldwide.

Extensive studies on pig AI were conducted in the United States, Japan and in Western Europe where boars were easily trained on mounting dummies. All artificial vaginas developed for semen collection provided method of applying pressure to the glans or a gloved hand, minimizing the amount of bacterial contamination in the collected semen. The development of a method to store semen long enough for shipment and use in the field was initiated when a yolk-phosphate semen extender was developed.

Polge *et al.* (1948) were the first to recommend a storage temperature of 15–20°C. With AI expanding rapidly, demands for quality semen also increased. The simplest solution was to dilute each ejaculate further by using less sperms per insemination dose. The Beltsville Thawing Solution (BTS) was developed in Beltsville and made the dilution of semen possible and increase the storage time up to 48 hours. The composition of BTS is still the basic for some of the currently used semen diluters. Pregnancy rates of 60% and litter sizes of six piglets were common in the beginning of the use of pig AI. More research and development was funded since 1977 and in the years 1980–1990, the results improved. There was increase in knowledge on estrus cycle of the sow, timing of the A.I. and dilution of boar semen. Once the results were similar to natural mating, commercial farms started using AI and the use of pig AI increased rapidly. Later, the demand for self-service AI increased in order to save labour. Currently, AI farrowing rate in established farms ranges between 75-85% with 10-13 total number of piglets at birth. Piggery

sector's requirement for improved genetic traits and rapid genetic improvement has stimulated the need for viable technology like AI and their wider use in breeding management programs. Adoption of this technology has resulted in better sow productivity, litter performance and ultimately higher economic benefits to the pig farmers.

Q. 5. Reproductive technology like AI has any scope in piggery sector?

Artificial Insemination (A.I.) is one of the most important techniques ever devised for the genetic improvement of animals. It is the process of collecting semen from a healthy male animal, evaluating, processing and manually depositing the extended semen into the reproductive tract of a receptive female animal with the help of artificial means like A.I. gun or catheter. Both collection and insemination are accomplished through artificial means. Semen with sperms are collected from the male, evaluated for quality and subsequently introduced into female reproductive tract at the receptive estrus period with the help of instruments under hygienic conditions. This process aids in

Q. 6. Whether AI has been practiced all over the world in pig units?

AI in pigs was initiated by Ivanowin the early 1900s. and work in other species was in progress like Milovanov (1964) established major projects for sheep and cattle breeding and designed artificial vaginas, similar to those used today. In 1912, Ishikawa started a similar program in horses (Nishikawa 1964) and this developed AI was later applied in cattle, swine, goats, sheep and poultry. Growth of AI occurred in the 1940s in the United

Q. 7. How superior boars are available for AI technology?

In developed countries, setting up of AI centers for management of superior boars and production of quality semen has allowed for boar selection for fertility and sperm production using in-vitro and in-vivo techniques. More than 95% of inseminations conducted worldwide are made with liquid-stored semen at 14-18°C for 0-6 days. There are about 172 numbers of AI centers in Europe and AI with liquid-stored semen has reached a very high level in USA and Mexico at around 90% and in Canada at 80%. In South American countries, pig production has greatly increased as a total in the last decade (Brazil, Argentina and Chile by 450, 112 and 65%, respectively). This features an extremely high AI level with almost 100% in Chile and 66% in Brazil.

Today, boars can be effectively managed for production of 20 to 40 numbers of insemination doses containing 2.5 to 3.0 billion motile sperms in 60 to 80 ml of semen extender or 40 to 60 doses with 1.5 to 2.0 billion sperm in similar or reduced volumes for use in AI. Also, with the advent of improved management approaches, one proven boar can provide quality semen for more than 30-50 inseminations per week. In contrast, for natural mating, a boar could typically only mate 4 to 6



females per week. Regardless of the sperm dose, present day liquid semen extenders are designed to maintain sperm fertility and viability for 3 to 7 days. Frozen-thawed boar sperm has reduced in-vitro and in-vivo life span compared to liquid semen. On farm, AI using liquid semen is the predominant form for commercial sow breeding and relies on manual detection of estrus with sows receiving two cervical or two intra-uterine inseminations of the traditional or low sperm doses on each day detected in standing estrus.

scavenging, there is no control over breeding process.

In the last one decade, artificial insemination in pigs is gaining momentum in India, especially in the states of Goa, Kerala, Karnataka, Tamil Nadu, Maharashtra, Uttar Pradesh, besides North Eastern states, where the method has emerged as one of the most potent techniques to boost pig production. ICAR Central Coastal Agricultural Research Institute has established well equipped AI lab for semen collection processing as well as for training professionals and providing services to local farmers. Exotic breeds in the country mainly comprises Hampshire, Large White Yorkshire, Duroc, Landrace, and Tamworth, while some of the popular indigenous pig breeds include Ghungroo, AgondaGoan, NiangMegha, Ankamali, TanyVo, Doom and Nicobari. During the last few years, A.I. became important component in ICAR-sponsored projects and breeding programmes. Over the years, significant genetic improvement along with enhancement in litter size and other economic traits were attained in many research centres. Favorable field results have been reported after AI with liquid-stored pig semen stored at 14-18°C (57°F to 64°F) temperature range. Simple to learn technique and comparatively cheaper AI equipments also made the AI technology easier to be applied in the farmers' field. Indigenous boar semen extenders are also available by which boar semen can be preserved in liquid state up to 4-7 days without losing the fertilizing capacity of spermatozoa. With proven method of semen preservation at liquid state, AI using quality semen can now be performed with better results.

Artificial insemination has now started to

dominate the reproductive process on many piggery farms across India. Nevertheless, overall AI coverage is far low as compared to western countries and there is a clear requirement for wider adoption of this technology in most of the states. Wider adoption of AI technique in pig production can act as catalyst for propagation of quality pig germplasm in both rural and urban areas of the country. On-farm AI can also provide substantial economic benefits, especially in commercial units. Central government's Department of Animal Husbandry tends

to support state governments under its national level programmes on piggery development to establish pig rearing and breeding units. More focused and extensive government-sponsored A.I. programs and schemes can substantially contribute to overall genetic progress in pig population in the country. Although slow but pig production in India is progressing with all aspects like breed conservation, crossbred production, improvement in management and use of advance technologies like AI.

Q.8. How breeding policy can be linked with AI technology?

Unlike in western countries, piggery has never been in the forefront of animal husbandry and livestock development program in India until recent past. During the past few years, piggery enterprise in the country has entered a new stage of development towards large-scale and commercial pig production. Pigs are reared under a variety of production systems ranging from simple backyard family-operated farms, low-input scavenging system of rearing or large scale integrated farms with sophisticated management and bio-safety measures. In this scenario with increase in demand, the main challenge faced by the pig farmers and agri-entrepreneurs is the difficulty in accessing quality and proven germplasm in their region leading to decline in pig production. Conventional natural mating results in slower genetic gain and indiscriminate use of limited number of breeding boars available in particular locality leads to serious decline in overall farm productivity. Most of the indigenous pigs normally reared by farmers are bred indiscriminately without much choice of male. Moreover, during the process of



News... National...

CSWRI scientists comes up with new sheep insemination technique



Scientists at Central Sheep and Wool Research Institute (CSWRI), Avikanagar, Rajasthan have come up with new laparoscope-assisted insemination technique for sheep breeding. It is minor invasive laparoscopic technique involves passing rigid fibre-optic laparoscope into abdomen through small incision. Using it, reproductive tract of sheep is located through camera and frozen semen is deposited into uterus.

Significance of new technique

The new technique has resolved difficulties involved in freezing of semen and inability to transit tortuous

reproductive tract of sheep kept as livestock. Earlier, success with frozen semen in sheep was very low because of its poor freezability.

The new technique will also help achieve up to 60% survival in birth of lambs. Moreover, it will have immense potential for rapid multiplication of elite germplasm. Using this technique, as many as 40 females can be inseminated from a single ejaculate. It will also be of great help in the breed improvement programmes.

IIT-Hyderabad team develops sensors to detect milk adulteration

HYDERABAD: Ever wished you could find out if the milk your family consumes is free of adulteration? Well, soon you may be able to do just that with the help of your smartphone as researches at the Indian Institute of Technology Hyderabad (IIT-H) are working on developing smartphone-based sensors to detect milk adulteration.

To begin with, they have developed a sensor-chip based detector system to measure the pH levels of the milk through an indicator paper that changes colour according to the acidity of the milk.

The researchers used a process called 'electrospinning' to produce halochromic paper-like material made of nanosized nylon fibres and loaded it with a combination of three dyes.

The team, led by Prof. Shiv Govind Singh of IIT-H's department of electrical engineering, also developed algorithms that can be incorporated on to a mobile phone to accurately detect the colour change.

The algorithm, in which the colours of the sensor strip after dipping in milk, are captured using the phone camera and the data is transformed into pH (acidity) ranges.



On testing with milk spiked with various combinations of contaminants, they found near-perfect classification with accuracy of 99.71%, IIT-H said. The research paper was published in the November 2018 issue of the Food Analytical Methods journal.

According to Prof. Singh, while techniques such as chromatography and spectroscopy can be used to detect adulteration, "they generally require an expensive setup and are not amenable to miniaturization into low-cost easy-to-use devices, which is why they do not appeal to the vast majority of milk consumers in the developing world".

The team will now study the effects of mobile phone cameras and lighting on detection efficiency and, in the run, hopes to develop sensors for other physical properties such as conductivity and refractive index, and integrate it with the pH detection unit to obtain comprehensive milk quality check systems that can be easily deployed by consumers using mobile phones and other hand-held devices.

INDIA - Novel packaging made from mango peels could extend the shelf life of poultry meat



A report from The Hindu details the research of the Bhabha Atomic Research Centre (BARC) in Mumbai. BARC's researchers have used mango peels along with three other biodegradable polymers to develop a packaging film which, "showed good antimicrobial properties against common food microbes and also exhibited high antioxidant characteristics," report The Hindu.

The film showed high puncture and tensile strength and, when storing at 2-4 degrees celsius, keep the meat fresh for 12 days, compared with conventional polythene

packaging which only did so for 3 days.

The film preserved the meat from both microbial spoilage and oxidative rancidity

"Meat has [a] high lipid content that is prone to oxidation on storage/processing. We wanted to check how the film preserved the meat from both microbial spoilage and oxidative rancidity," added Dr. Kanatt. "Increase in shelf life as well as safety of the meat will be a boon to the food processor as they can store this meat in chilled rather than frozen state. Film preparation methods are being fine-tuned for possible commercial applications."



Know the prestigious Institute



भा.कृ. अनु. प.- राष्ट्रीय शूकर अनुसंधान केन्द्र
ICAR- National Research Centre on Pig
 (An ISO 9001:2015 Certified Institute)
 Indian Council of Agricultural Research
 Rani, Guwahati - 781131



National Research Centre on Pig was established by Indian Council of Agricultural Research on recommendation of mid-term appraisal committee constituted by ICAR in 1990 after reviewing the work of the All India Coordinated Research Project (AICRP) on Pig. Accordingly, ICAR approved the institute to be established at Guwahati, Assam located in North-eastern part of country and foundation stone of the institute was laid on 4th September 2002.

Vision:

To bring in excellence in pig production, health and product processing through innovative

research in order to provide technology backstopping for enhanced pork production, employment generation and poverty reduction among socially and economically weaker sections through the medium of pig husbandry.

Mission:

Performance appraisal and genetic cataloguing of indigenous pigs, development of improved pig variety together with production, health, product processing and pig based integrated farming system technologies to facilitate the pig rearers of the country achieving household food, nutritional and economic security.

Mandate:

- To undertake basic and applied research for enhancing pig production
- To act as a repository of information on pig production
- Capacity building

Focus:

To accomplish vision and mission and to meet the challenges, the institute is giving highest priority to Pig and pig rearers of the country. To mitigate the deficit between demands and supply of quality pig germplasm and pork products the focus will be on the basic and applied research output through the following approaches that would help for adoption of strategies for sustainable development in the sector.

- Genetic improvement of indigenous pigs through molecular means; selective breeding and crossbreeding
- Improvement of physiological and reproductive efficiency of pig production
- Development of suitable techniques for early pregnancy diagnosis using biological fluids
- Assessment of local/regional feed resources and improvement of nutrient utilization for enhancing pig production

- Development of pig health management protocols
- Post harvest management and value addition of pork
- Institute-stakeholder linkage and skill developments for improved pig seed production

Salient Research Contribution and achievements of ICAR-NRC on Pig:

Cross bred pig varieties for augmenting pork production:

ICAR-NRC on Pig and other centers of AICRP on Pig developed nine crossbred pig varieties. These varieties are characterized with a higher litter size at birth and weaning (9-10 vs 5-6 piglets), higher litter weight at birth and weaning (70-80 kg vs 40-50 kg), promising growth rate and better adaptability leading to the increased farmers' income.

Characterization and registration of indigenous pig breeds:

The institute along with its associated centers has characterized and registered eight indigenous pig breeds (viz. Ghungroo, Niang-Megha, Agonda Goan, Tenyi Vo, Nicobari, Doom, Zovawk and Ghurrah). Most of the indigenous breeds are conserved through AICRP on Pig projects in their native states.



Rani



Asha



Mannuthy White



Lumsniang



HD K75



Jharsuk



SVVU T-17



TANUVAS KPM Gold



Landlly

Crossbred Pig variety developed by ICAR-NRC on Pig and AICRP on Pig centers

Artificial insemination for upgradation pig germplasm:

The institute has standardized the method for artificial insemination in pigs using chilled semen and for better preservation of boar semen developed novel herbal based semen extender as an alternative of antibiotics.

The development of the unique extender (GEPS) allowed the preservation of high-quality boar liquid semen up to 7-8 days without losing the fertilizing capacity. This cost-effective method resulted in the wider adoption of AI by rural farming communities. So far more than 9485 AIs have been carried out with 55-60% success rate and 1837 farmers have registered for AI services in 200 different villages. Since the inception of AI, the institute has produced more than 40000 piglets in the farmers' field. The increase in litter size and litter weight of piglets through AI has resulted in a substantial increase in the income (@Rs. 12500/- per pig) of tribal farmers.

Development of technique for non-surgical embryo transfer in pigs:

The institute has developed a cost-effective non-surgical method of embryo transfer leading to the first successful birth of piglets "Rani C-I".

Development of cost-effective diagnostic assay for rapid diagnosis of important Swine diseases:

The institute has developed a cost-effective diagnostic assay for rapid diagnosis of important swine diseases like classical swine fever (CSF), porcine cirovirus (PCV) infection, porcine parvovirus (PPV) infection and Streptococcus suis infection.

Development of shelf-stable and value added pork products:

Considering the high perish ability of pork products, lack of refrigeration facility and non-availability of uninterrupted power supply



Artificial insemination in field

technology for the production of pork products which can be stored in room temperature was developed by utilization of Retort processing technology and the technology is being popularized among entrepreneurs.

The institute has standardized technologies for processing different comminuted pork products with consumer acceptability viz. Frankfurter sausage, Cocktail sausage, Ham slices, Salami, Pork nuggets, Burger patties and Ham block. Technologies for a variety of restructured pork products, enrobed pork products and cured and smoked pork were also standardized. Also, the institute has standardized a variety of Traditional pork products viz. Momo, Seekh kababs, Pork balls/ Kofta, Pork pickle, Pork samosa, Pork soup, Pork snacks etc. and Pork products with local ingredients viz. Bamboo shoot extract, Fermented bamboo shoot mince, Kordoi fruit juice, Curry leaf, etc. The unit has also developed shelf-stable pork curry products using Retort processing technology viz. Pork curry with Thekera, Pork curry with fermented bamboo shoot, Pork curry with Outenga, Pork curry with Vedailata and curry leaves, Chilli Pork curry and Pork Vindaloo.

Public-private partnership (PPP) for promoting clean pork production:

Under PPP mode in the area of pork processing, the institute has facilitated the creation of two start-ups (M/s Arohan Foods Pvt. Ltd and M/s Sayuri Farms) and developed a better marketing linkage of the value-added pork products at the Institute processing unit. The PPP arrangement has already brought out different ready-to-eat value added pork products into the retail markets of NER under the brand names 'CHOICE PORK NATURAL' and 'PIGZEES'.

Capacity building of stakeholders:

The institute has imparted more than 150 trainings for the farmers and stakeholders associated with pig production during the last 5 years. In addition, Krishi Vigyan Kendra (under the institute) located at Goalpara district has conducted over 55 in-house training programs and 398 OFTs/FLDs and trained over 14800 farmers. the

Technical consultancy/inputs in the area of pig production and health:

Along with DADF, the institute is actively involved in the implementation of Innovative Pig



Development Project for Northeast (IPDPNE). The institute is actively associated in the

development of state-specific pig breeding policies of different states of the country.

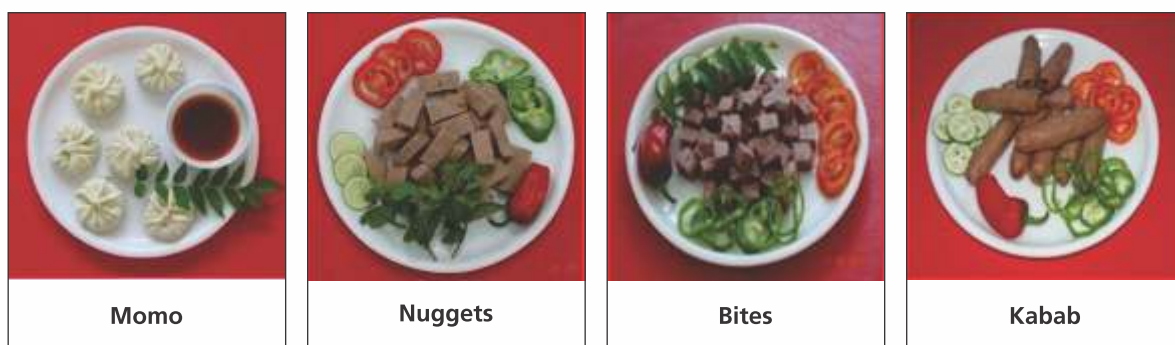
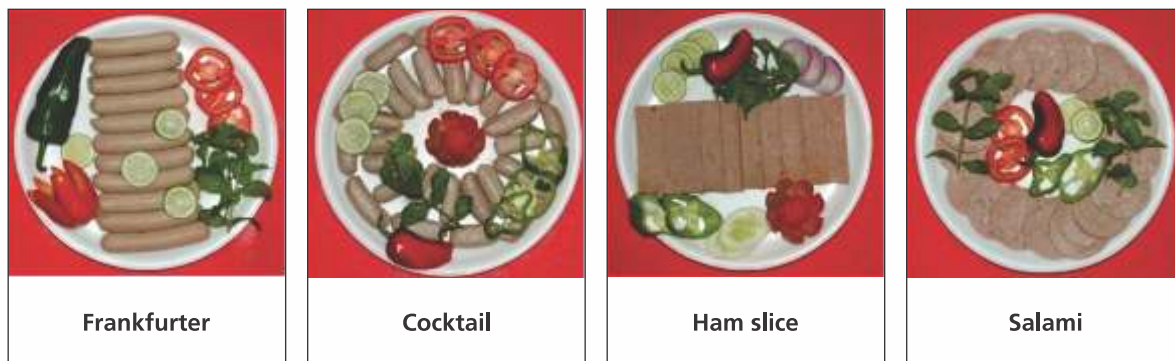


Fig. Glimpses of value added pork products processed at ICAR-NRC Pig



Fig: Glimpses of commercialized products under 'Choice pork natural' brand

Pioneer's Profile



Dr. Abdul Samad

(Ex Dean, Bombay Veterinary College and Former Director of Instructions, MAFSU, Nagpur)

Born in Aurangabad in a primary school teacher's family, Dr. Samad completed school and college education in Aurangabad and then joined Bombay Veterinary College to complete B. V.Sc. and A. H. He was awarded ICAR junior Fellowship in Veterinary Medicine to complete M.V.Sc. degree in veterinary medicine from the same college. He first joined the Department of Animal Husbandry and served at Aurangabad Polyclinic for one year and subsequently joined College of Veterinary and Animal Sciences, Parbhani as Assistant Professor, where he was elevated to post of Associate Professor in just over three years. In the year 1986, he was selected for award of Canadian Commonwealth Fellowship to join Ontario Veterinary College, University of Guelph, Canada. He was selected for a program, wherein he was required to work for his research jointly with Department of Chemistry and Biochemistry of the University. His research over there was to understand how trypanosomes acquire and modulate lipids especially in the context of unique lipid anchoring of variant surface

glycoprotein. He served briefly at College of Veterinary and Animal Sciences Udgir and ultimately joined his alma mater as Professor in the Department of Medicine. He was elevated to the post of Dean of the Bombay Veterinary College and subsequently, Dean Faculty and Director of Instructions in the Maharashtra Animal and Fishery Sciences University at Nagpur, from where he superannuated in January, 2013.

Contribution to veterinary profession:

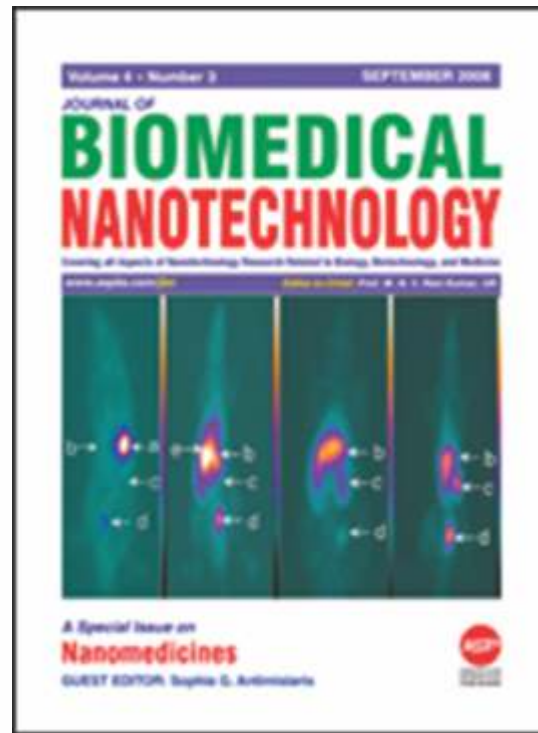
Buffered phosphorus to elevate cellular phosphates : Dr. Samad is one of those rare academicians who had strong connection to field, farmers and practicing veterinarians. His core competence was to pick up research problems from field, do research to find out a solution, scale it up to take the same to mass or commercial levels. His first research project was on phosphorus deficiency hemoglobinuria in buffaloes, especially to understand how phosphorous deficiency leads to extra vascular hemolysis. Using ³²P-phosphates and ¹⁴C-glucose he studied in



depth Embden Meyerhoff pathway in buffalo erythrocytes and reported that the erythrocytes in this disease become deficient in ATP and ADP because of which shape transformation is affected leading to rigid cells. He first introduced the concept of buffered phosphate to achieve maximum ionization of P to enhance its utilization. He developed a formulation consisting of buffered phosphorus, inosine and sodium pyruvate which corrected EM pathway instantly leading to rapid recovery. This formulation then was modified by Intas and the product is now available in the market under the brand name 'Novizac'. This is probably the first injection custom-developed to correct metabolic damage in phosphorus-deficient cells.

Nuclear Medicine : Dr. Samad was trained during his Ph.D. in radiosynthesis of compound using isotopes such as ¹⁴C, ³H and ³²S and use them in understanding molecular metabolism. When he joined BVC, he took an opportunity to submit a proposal to Board of Research in Nuclear Sciences of Department of Atomic Energy with a proposal to set up Country's first Veterinary Nuclear Medicine Centre. The Centre was established in year 2000, which had facility of single head gamma camera with required software to do scintigraphy studies. His idea was to use the Centre to develop collaboration in the area of novel drug development.

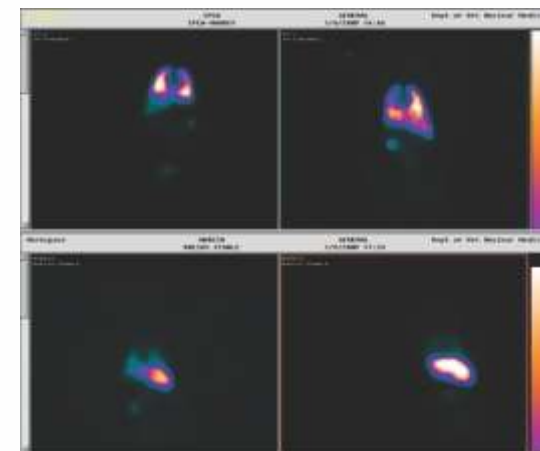
Targeted nanotechnology based veterinary drug development : In animals, chronic infections like brucellosis, tuberculosis, para-tuberculosis and protozoan diseases like theilariasis, ehrlichiosis are caused by organism that hide inside the cell using



receptor mediated endocytosis process and reside in organelle not accessible to drugs that are otherwise potent due to membrane uptake barriers. His group developed a novel concept that by using targeting approaches drugs can be delivered inside the cell and if the concept of membrane receptors is enjoined the drug could be targeted to only infected cells. His first work was on developing nanotechnology-based drug against Theileriaannulata. The concept was neat and simple, fool the lymphoid cells by entrapping known potent drug (buparvaquone) in nanoparticles of definite size and shape. The technique of radiolabeling nanoparticles with ^{99m}Tc was developed and with the help of gamma camera the biodistribution of the nano drug in animal body could be studied. The camera could take thousands of dynamic

images per second, which was collated using software program. The concept that shape of the drug-loaded nano-particles along with size determines disposition of the drug was mentioned in the Biomedical Nanotechnology journal editorial.

His second project was to develop nano-drug for brucellosis and ehrlichiosis. The literature clearly pointed out that these infections are difficult to eliminate because these organisms hide inside the macrophage / neutrophils / lymphoid cells (immune cells) by not allowing phagosome to coalesce with lysosome. He used the same concept wherein effective drugs like doxycycline and rifampicin was entrapped in separate nano-sized formulations. The nano-drugs proved to be quite effective in eliminating the infection totally. In case of brucellosis he found out a novel approach. In experimental animal studies in brucella infected mice it was found that after administration of nano-rifampicin, infection reappeared after 14-21 days. He found out that it was due to extracellular phase of bacteria. He therefore developed a concept of hybrid nano drug wherein a part of the drug is in nascent non-entrapped form.



Preliminary studies in ehrlichiosis showed very rapid and total recovery with only five injections. In both the case the dose could be reduced to ten times of the normal dose as total drug load was being internalized and not wasted by distribution to unwanted organs. The research led to filing of several patents. Even after leaving the University he continued to be active researcher as a result scale up technology for manufacturing of these nano-drugs have been developed and would be available in the market soon as the technologies have been assigned to pharma industry.

Dr. Samad believes that to do useful research understanding problems should emanate from field, the researcher should understand problem's molecular economical and logistic dimensions and then tackled by multi-faculty team. He is opinion products copied from human might not be effective unless the formulation is developed considering the animal specific requirements. During last two years he has been focusing on using sol-gel barrier technology wherein there is gel formation once the polymers come in contact with tissues. The objective is to induce barrier film to prevent entry of bacteria, such as in teat dip, dry cow formulation and wound healing. These products have been validated using in vitro as well as clinical trials will soon be in global market.

Information technology products : He has keen interest in information technology and has recently filed two patents on animal identification devices using encrypted QR coded technology and High Frequency-RFID that can be scanned by cell phone. He has been a pioneer in developing software



neighboring countries. He has 15 patents to his credits and most of these are in commercialization pipeline.

He is recipient of a number of awards, notably, eINDIA 2010 Award under the category ICT Enabled Agricultural Initiative of the Year, India Country Development Marketplace Award of World Bank–2004 for his e-livestock farming applications, Dr. Arun Sangani First Prize 2009 for nanotechnology drug against tuberculosis in monkeys, Distinguished Veterinarian Award of the IAAVR for his contribution in the field of veterinary research and Canadian Merck – Sharp and Dohme Award of the University of Guelph.

Dr. Samad has continued his involvement in research and development activities for benefit of profession. His credentials will definitely provide many solutions and protocols in the field of Veterinary Sciences.

applications for small-hold livestock sector that are now available commercially. Herdman-Mobivet software platform consisting of App and intelligent cloud server software and dashboard is popular with close to 5 lakh animals registered for data services. Similar software for sheep / goat and poultry has also been developed and commercially marketed not only in India but also

Guidelines To Contributors

The contributions to the journal are accepted in the form of review articles, research articles (clinical / field studies), case reports, other information pertaining to animal health and production. The decision of the Editorial Board members will be final regarding acceptance of the article for publication. The manuscript should be typed on one side of the paper with double spacing except for footnotes and references for which single spacing be used. The style of reference citing should be followed as shown below.

The manuscript should be arranged in the following order:

- Title:** Capitalize proper nouns.
- Name/s of author/s:** Initials necessary for all authors, avoid extra names.
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- Abstract :** Just 01 per cent words of total script.
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- Tables and Figures:** Tables are to be numbered in Roman numbers (I II and so on). Each table should have a clear title. Figures should be of good quality and numbered in Arabic numbers (1,2,3 and so on).
- Clinical articles and short communications:** Not exceeding 3 to 4 typed pages. In case reports, history, observation, tentative and confirmatory diagnosis, line of treatment and follow up on the case should be given. Trade names of drugs should be given in the Material & Methods and their details like composition, manufacturer etc. as a footnote.

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FOLLIGON®				
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION	
 <p>Each vial contains Pregnant Mare Serum Gonadotrophin injection (Freeze dried) 1000 IU</p>	Females: <ul style="list-style-type: none"> • Anoestrus • Super ovulation • Increase of fertility rate after progestagen pre-treatment 	Cow/Bufalo Anoestrus : 500 - 1000 IU IM Super ovulation: 1,500-3,000 IU, IM between day 8-13 of cycle 300-750 IU, IM, at the end of a progestagen treatment	Box containing 5 vials (1000 IU each) with 5 vials of solvent WITHDRAWAL PERIOD Milk : 0 (Zero) days Meat : 0 (Zero) days	



Estrumate™				
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION	
 <p>Each ml of Estrumate contains 263 mcg of Cloprostenol sodium, equivalent to 250 mcg of Cloprostenol.</p>	Induction of luteolysis in dairy cattle and horses- <ul style="list-style-type: none"> • Anestrus • Luteal Cyst • Persistent Corpus Luteum (PCL) • Chronic Endometritis • Expulsion of Mummified Foetus • Termination of Pregnancy • Induction of parturition • Synchronization of Estrous • Subestrus • Pyometra 	Cattle : 2.0 ml by IM route Ponies : 0.5-1.0 ml by IM route Thoroughbreds, hunters and heavy horses 1.0-2.0 ml by IM route	Available in 20 ml vial	





ANTI-INFECTIVE

COBACTAN [®] 2.5%				
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION	
 <p>Each ml of suspension contains 29.64 mg Cefquinome Sulphate (equivalent to 25 mg Cefquinome).</p>	Cattle <ul style="list-style-type: none"> Respiratory disease caused by <i>Pasteurella multocida</i> and <i>Mannheimia haemolytica</i> Digital dermatitis, infectious bulbar necrosis and acute interdigital necrobacillosis (foul in the foot) Mastitis 	1 mg cefquinome/kg bw IM (2ml/50 kg bw)	50 ml multidose vial. WITHDRAWAL PERIOD Cattle : Meat : 5 days, Pig : Meat : 3 days Milk : 1 day	
	Calf <ul style="list-style-type: none"> <i>E. coli</i> septicaemia 	1 mg cefquinome/kg bw IM (2ml/50 kg bw)		
		1 mg cefquinome/kg bw IM (2ml/50 kg bw)		
		2 mg cefquinome/kg bw IM (4ml/50 kg bw)		

COBACTAN [®] LC				
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION	
 <p>Each syringe of 8 gm contains 75 mg Cefquinome sulphate as active ingredient.</p>	For the treatment of clinical mastitis in lactating cows caused by <i>Staphylococcus aureus</i> , <i>Streptococcus uberis</i> , <i>Streptococcus dysgalactiae</i> , <i>Escherichia coli</i> & other enterobacteria susceptible to cefquinome.	Gently infuse the contents of one syringe into the teat canal of the infected quarter every 12 hours after each of 3 successive milkings. Milk out the affected quarter (s). After thoroughly cleaning & disinfecting the teat & teat orifice, gently infuse the contents of one syringe into affected quarter. Disperse the product by gently massaging the teat & udder of the affected animal.	Box of 3 injectors with 3 isopropyl alcohol soaked towels WITHDRAWAL PERIOD Milk : 84 hours (7 milkings) Meat : 2 days	


Floxin [™] VET				
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION	
 <p>Floxidin 10% injection : Each ml contains - Enrofloxacin I.P. 100 mg</p>	<ul style="list-style-type: none"> Alimentary canal e.g. Enteritis, calf scours. Respiratory tract e.g. Pneumonia Urogenital system e.g. Metritis, cystitis Skin e.g. Bacterial dermatitis, pyoderma. Mastitis, & Haemorrhagic Septicaemia. 	Floxin can be given once daily, for 3-5 days. Cattle, Sheep & Goat 2.5-5 mg/kg body weight IM Dog/Cat (adult) 5 mg/kg body weight IM Camel 2.5 mg/kg body weight IM	15 ml, 50 ml  WITHDRAWAL PERIOD Milk : 3.5 days Meat : 14 days	


Tetracycline WSP VET				
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION	
 <p>Each gm contains Tetracycline Hydrochloride I.P. 50 mg</p>	In Sheep & Goat : Pneumonia, Joint ill, Anthrax, Septicaemia, Contagious Caprine Pleuro-Pneumonia, Scours, Acute Mastitis, Acute Metritis,	Sheep & Goat : 1 gm/kg body weight	Sachet of 100 grams WITHDRAWAL PERIOD Milk : 7 days Meat : Cattle:22 days Poultry : 5 days Pig, Sheep & Goat : 28 days	
	In Cattle : Infectious diseases like Haemorrhagic septicaemia, Anthrax, Black Quarter, Leptospirosis, Foot Rot & Contagious Bovine Pleuro-Pneumonia, Calf Scours, Calf Diphtheria, Pneumonia, Septicaemia, Acute Metritis, Acute Mastitis.	Cattle : 2.5-5 gm/15kg body weight for 5 days		

METRICEF [™]				
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION	
 <p>Each single dose syringe of 19 g contains: Cephapirine Benzathine intrauterine suspension in pre filled syringe-500 mg</p>	<ul style="list-style-type: none"> Subacute/chronic endometritis in cows over 14 days postpartum Repeat breeders (3 or more unsuccessful inseminations). 	Single dose syringe to be administered intra-uterinely	Single dose (19 g) syringe provided with a separate disposable catheter and a glove. WITHDRAWAL PERIOD Meat & offals : 24 hours Milk : 0 (Zero) hours	




ANTI-INFECTIVE


Floxin™ LA (Vet)			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each ml contains: Enrofloxacin IP (Vet) : 100 mg Benzyl Alcohol : 2% w/v</p>	<ul style="list-style-type: none"> • Systemic Infections - Mastitis, Metritis, Pneumonia, Gastro-intestinal infections • Soft Tissue infections - Wounds, Post Surgical recovery, supportive treatment in cases of FMD 	Administer at the dose rate of 7.5-12.5 mg per Kg bw (1 ml per 8-13 Kg bw) IM or SC as a single dose. If required repeat after 48-72 hrs.	Available in 50 ml WITHDRAWAL PERIOD: Milk : 84 hrs. Meat : 14 days

YELINTRA™			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Per syringe of 8 gm contains : Tetracycline HCL 200 mg Neomycin base (as sulphate) 250 mg Bacitracin 2000 IU Prednisolone 10 mg</p>	Intramammary administration to lactating cows for therapeutic treatment of clinical mastitis caused by sensitive microorganisms (<i>S. aureus</i> , <i>Streptococci</i> , <i>E.coli</i> , <i>Klebsiella spp.</i> , <i>A. pyogenes</i>)	Intramammary administration of one syringe per infected quarter every 12 hours. Maximum treatment is four administrations.	Box of 1 sachet of 4 intramammary syringes & cleaning towel WITHDRAWAL PERIOD Meat and offal : 14 days, Milk : 96 hours (8 milkings)

*TM under registration

Cepavin®			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each 3 gm syringe contains 250 mg Cefalonium dihydrate as active ingredient</p>	<ul style="list-style-type: none"> • For routine dry cow therapy to treat existing sub-clinical infections • Prevent new infections during dry period 	One syringe should be infused into the teat canal of each quarter immediately after the last milking of lactation	3 gm syringe and each box contains 20 units WITHDRAWAL PERIOD: Milk : 54 days after last treatment plus 96 hours after calving. Meat & offals : Zero days

PARASITE CONTROL


OUT LINE™ POUR ON			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Amitraz I.P. 2.0% w/v, Deltamethrin 0.5% w/v, Piperonyl Butoxide (PBO) 2.0% w/v</p>	For the control of Ticks, Mites, Flies and Lice.	Cattle : For control of Ticks, Mites, Flies and Lice- 1 ml / 10 Kg B. wt.	40 ml HDPE bottle with measuring cup and hand glove WITHDRAWAL PERIOD Milk : 2 days, Meat : 20 days



PARASITE CONTROL


butox[®] Vet

Highly effective & safe ectoparasiticide only for external use.
Ideally suited for control of ticks, mites, lice & flies of livestock, poultry, dogs & farm houses.


COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each ml contains : Deltamethrin I.P. 12.5mg</p>	To control the ectoparasites in cattle, sheep, goats, horses, camels, dogs & farm houses.	Spray or dip : Ticks : 2 ml/lit Mites : 4 ml/lit Flies : 2 ml/lit Lice : 1 ml/lit	Aluminium container of 5 ml, 15ml, 50 ml, 250 ml and 1 lit with plastic measuring cup WITHDRAWAL PERIOD Milk : 0 (Zero) day Meat : 20 days

Tactic[®] 12.5% EC


Broad spectrum ectoparasiticide effective against ticks, mites, lice & keds

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each ml contains : Amitraz I.P. (Vet) 125 mg</p>	1. For prevention & control of ectoparasitic infestation like ticks, mites, lice & keds in cattle, sheep, goat, camel & pig. 2. Tactic kills organochlorine, organophosphate & pyrethroid resistant strains of ectoparasites.	Tactic 12.5%/lit of water for ticks : Cattle/Bufaloes/Camel: 2.0 ml Sheep/Goat : 4.0 ml Pigs : 4.0 ml Tactic 12.5%/L of water for mites and keds : Cattle / Camel : 2.0 ml Sheep/Goat : 4.0 ml Pigs : 4.0 ml	Tin Container of 6 ml, 15 ml, 50 ml & 250 ml with plastic measuring cup. WITHDRAWAL PERIOD : Milk : 4 milking/2 days Meat : 1 day for cattle & goat 7 days for sheep & pig

Panacur[®] VET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>The active ingredient of Panacur is Fenbendazole which is the research molecule of Intervet/Schering-Plough Animal Health.</p> <p>Each 1.5 g Bolus contains 1.5 g of active Fenbendazole. I.P.</p> <p>Each 150 mg tablet contains 150 mg of active Fenbendazole. I.P.</p>	Infestation of cattle, buffaloes, sheep, goat & horses with gastro-intestinal nematodes, lungworms & tapeworms such as <i>Haemonchus spp.</i> , <i>Ostertagia spp.</i> , <i>Trichostrongylus spp.</i> , <i>Cooperia spp.</i> and <i>Nematodirus spp.</i>	Recommended for cattle, sheep, goat, horses & pigs. Panacur 150 mg tablet per 30 kg body weight & Panacur 1.5 gm bolus per 300 kg body weight (5 mg Fenbendazole per kg body weight). Dose for horses : 7.5mg/kg bw	Box of 15x2'-1.5 gm bolus Box of 10's - 3 gm bolus Box of 5 x 10' - 150 mg tablets. WITHDRAWAL PERIOD Milk : 4 days Meat : 8 days for large animals 14 days for sheep & Goat

Panacur[®] 25% Wettable powder (vet)

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each gram contains Fenbendazole I.P. 250 mg</p>	Infestations of cattle, buffaloes, Sheep & goats with gastro-intestinal nematodes, lungworms & tapeworms such as <i>Haemonchus spp.</i> , <i>Ostertagia spp.</i> , <i>Trichostrongylus spp.</i> , <i>Cooperia spp.</i> , <i>Nematodirus spp.</i> , <i>Neoascaris vitulorum</i> , <i>Oesophagostomum spp.</i> , <i>Chabertia spp.</i> , <i>Bunostomum spp.</i> , <i>Gaigeria pachyscelis</i> , <i>Capillaria</i> , <i>Trichuris spp.</i> , <i>Strongyloides spp.</i> , <i>Dictyocaulus filaria</i> , <i>Dictyocaulus viviparus</i> , <i>Moniezia spp.</i> , Infestation of dogs with <i>Ancylostoma spp.</i> , Infestation of horses with <i>strongyles</i> , <i>Ascarids</i> , <i>Ascarids (Parascaris)</i> , <i>Oxyuris</i> & <i>Strongyloides</i> Infestation of pigs with <i>Hyostrongylus rubidus</i> , <i>Oesophagostomum spp.</i> , <i>Ascaris suum</i> , <i>Trichuris suis</i> & <i>Metastrongylus spp.</i>	Recommended for cattle, sheep, goat & pigs. Infestation with gastrointestinal nematodes & lungworms : (5 mg Fenbendazole per kg body weight) Suspension to be made by mixing clean water as: 6 g with 100 ml 60 g with 1 lit. 120 g with 2 lit.	6 g sachet, 60 g & 120 g container WITHDRAWAL PERIOD Milk : 4 days Meat : 8 days for large animals 14 days for sheep & Goat



PARASITE CONTROL

Panacur® 2.5% Suspension (VET)



COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains 25 mg of Fenbendazole I.P.	Infestation of cattle, buffaloes, sheep & goats with gastrointestinal nematodes lungworms & tape worms such as <i>Haemonchus spp.</i> , <i>Ostertagia spp.</i> , <i>Trichostrongylus spp.</i> , <i>Cooperia spp.</i> , <i>Nematodyrus spp.</i>	Dose recommended for cattle, buffaloes, sheep, goats & pigs' infestation with gastrointestinal nematodes & lungworms: (5 mg Fenbendazole per kg body weight)	450 ml and 1 lit HDPE bottle pack of Panacur 2.5% suspension. WITHDRAWAL PERIOD Milk : 4 days Meat : 8 days for large animals 14 days for sheep & Goat

Tolzan® Plus -L



COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Oxyclozanide I.P. - 3.4% w/v Levamisole Hydrochloride I.P. - 2.5% w/v	<ul style="list-style-type: none"> Tolzan Plus-L treats the round worms and liver flukes in cattle, sheep and goats Tolzan Plus-L controls adult and immature stages of conical flukes also (Paramphistomum spp.) <p>Tolzan Plus-L can be used safely in pregnant animals during all stages of pregnancy.</p> <ul style="list-style-type: none"> Tolzan Plus-L can be safely given to all cattle, sheep and goats without any pre-dosing, starving or change of diet. 	<p>Cattle: 90 ml for 300 kg live mass PO</p> <p>Sheep and goats: 9 ml for 30 kg live mass PO</p>	<p>120 ml HDPE bottle, 1 Ltr can</p> <p>WITHDRAWAL PERIOD Milk : 7 days Meat : 14 days</p>

Tolzan® F VET



COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml of suspension contains Oxyclozanide I.P suspension of 3.4% w/v	<p>1) Tolzan -F is used in the treatment of acute & chronic Fascioliasis in cattle, buffaloes, sheep & goats. The important species are :</p> <p>a) <i>Fasciola hepatica</i> b) <i>Fasciola gigantica</i></p> <p>2) Tolzan -F is also used to treat paramphistomiasis. The species involved are :</p> <p><i>P. microbrothriodes</i>, <i>P. microbrothridium</i>, <i>P. gotal</i>, <i>P. orthocoelium</i></p> <p>3) Tolzan -F also acts on <i>Monezia</i> tapeworm in sheep.</p>	<p>Cattle & Buffalo : Orally 10-15 mg/kg body weight</p> <p>Sheep & Goat: Orally 15 mg/kg body weight</p>	<p>90 ml HDPE bottle & 1 Ltr jerry can.</p> <p>WITHDRAWAL PERIOD Milk : 7 days Meat : 14 days</p>

Berenil® VET 7% RTU

As treatment & control therapy of Babesiosis, Trypanosomiasis and Theileriosis



COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Diminazine Aceturate 70 mg Phenazone B. P. 375 mg	Babesiosis & Trypanosomiasis, Tenacious Trypanosomiasis, Theileriosis & mixed infections, Pyrexia of Unknown Origin	<p>Babesiosis and Trypanosomiasis at 5-10 ml per 100 kg b.w.</p> <p>Resistant strains of Trypanosomiasis at 10 ml per 100 kg b.w.</p> <p>Theileriosis & Mixed infections at 5 -10 per ml 100 kg b.w. along with antibiotic (3-4 antibiotic injections on alternate days)</p>	<p>Amber coloured vials of 20 ml, 30 ml and 90 ml</p> <p>WITHDRAWAL PERIOD Milk : 3 days Meat : 20 days</p>



SUPPORTIVES

Tonophosphan® VET

Injectable phosphorus preparation for improving metabolism, milk production & fertility in livestock. Its content of organically bound phosphorus is 20%.



COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Sodium salt of 4-dimethylamine, 2-methylphenyl-phosphinic acid 0.2 g	As a tonic in general metabolic disorders, debility, exhaustion, repeat breeding & infertility due to phosphorus deficiency. For disorders of bone formation as in rickets & osteomalacia. To promote callus formation in fractures in combination with calcium & vitamin D. For treatment of tetany & paresis resulting from calcium, magnesium & phosphorus imbalance (as in milk fever).	Large Animals : 5-20 ml. Small Animals : 1-3 ml. In chronic conditions- Large Animals : 2.5-5 ml Small Animals : 1-2 ml.	Vial of 10 ml and 30 ml Now also available 100 ml vial

VM^{all}



CONTENTS PER KG	BENEFITS	DIRECTIONS FOR USE	PRESENTATION
Each Kg contains a nutritional value of : Cobalt 120mg, Copper 1000mg, Magnesium 5000mg, Iron 2500mg, Potassium 100mg, Manganese 2000mg, Flourine 60mg, Calcium 150g, Selenium 10mg, Vit A 1200000 IU, Vit D3 120000 IU, Sulphur 0.70%, Vit E 1200 IU, Iodine 300mg, Zinc 5000mg, Phosphorus 60g, Niacinamide 4g, Vit K 200mg, Sodium 8mg.	To improve on fertility. To safeguard health and growth. To optimize milk yield and fat.	Ruminants Mix 100-200 g per 10 kg of feed depending on the availability of other fodder/feed. For direct feeding, Cow and Buffalo: 25-30 g/head/day Calf, Sheep and Goat: 15-20 g/head/day Aqua: Mix 100g to 10 kg of fish feed.	1 kg Zip-Locked pouch with measuring spoon. 5 Kg & 25 Kg bag


VM^{all} - P





CONTENTS PER KG	BENEFITS	DIRECTIONS FOR USE	PRESENTATION
Each KG contains a nutritional value of (When packed): Cobalt 150 mg Vit A 1200000 IU Copper 2200 mg Vit D3 120000 IU Iodine 325 mg Vit K 200 mg Iron 2500 mg Vit E 500 IU Magnesium 6000 mg Calcium 225 g Manganese 2200 mg Phosphorus 90 g Potassium 100 mg Niacinamide 1000 mg Sodium 8 mg Biotin 2% 500 mg Sulphur 1% Bioactive Zinc 9000 mg chromium 65 mg	<ul style="list-style-type: none"> To improve on fertility To safeguard health and growth. To optimize milk yield and fat. 	Ruminants Mix 100-200 g per 10 kg of feed depending on the availability of other fodder/feed. For direct feeding, Cow and Buffalo: 25-30 g/head/day Calf, Sheep and Goat: 15-20 g/head/day Aqua: Mix 100g to 10 kg of fish feed.	25 kg Sealed bag Now also available 5 Kg bag




SUPPORTIVES

Rumicare® (Vet)			
Normalises milk production by restoring ruminal activity.			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each gm powder contains : Calcium Propionate 480.00 mg Methionine 40.00 mg Picrorhiza Dry Extract 2.00 mg Cobalt Gluconate 0.32 mg Vitamin B₆ IP 0.32 mg Dextrose Anhydrous IP 428.00 mg</p>	<p>Bloat, digestive disorders caused by decreased activity of reticulum & rumen or sudden dietary changes &/ or intoxication. As a supportive therapy in diseases caused by foreign bodies & hypo-glycaemic conditions in cattle, calves, sheep & goats.</p>	<p>Adult Cattle : 125 gm sachet twice daily, (once in 12 hours)</p> <p>Young Animals : 65 gm (approx) once or twice daily</p> <p>Sheep & Goat : 32 gm once or twice daily</p>	125 g sachet


Avilin® vet			
For quick relief from allergic manifestations.			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each ml contains: Pheniramine maleate IP 22.75 mg.</p>	<p>Itching due to eczema, dermatitis, urticaria, skin oedema, insect bites, photo-dermatitis, rhinitis, tail eczema in horses, stomatitis & inflammation of the hooves of cattle, serum sickness, paresis during pregnancy, toxæmia & retention of placenta, pulmonary oedema in cattle, pulmonary emphysema in horses.</p>	<p>Large animals : 5-10 ml. Small animals : 0.5-1 ml. or more. By IM or IV route</p>	<p>Amber coloured vial of Avil 10 ml and 33 ml</p> <p>WITHDRAWAL PERIOD Milk : 2 days Meat : 7 days</p>


Prednisolone Acetate Injection			
For quick relief from ketosis.			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each ml contains : Prednisolone acetate I.P. 10 mg</p>	<p>Prednisolone is indicated in ketosis in dairy cattle, shock, inflammations (especially rheumatic arthritis, dermatitis, bursitis) and allergic conditions of livestock</p>	<p>Cattle, horses : 5-20 ml. Calves, pigs : 2.5-5ml. Piglets, dogs, cats : 1-3 ml. or as recommended by Veterinarian.</p>	<p>Vial of 10 ml</p> <p>WITHDRAWAL PERIOD Milk : 3 days Meat : Cattle Sheep & Goat : 5 days Pig : 28 days</p>


Vetalgin® VET			
Highly effective analgesic, antispasmodic, antirheumatic & antipyretic agent.			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each ml contains : Analgin I.P. 0.5 g Chlorbutol (as bacteriostat) 0.4% w/v</p>	<p>For relief from pain, fever, labour, spastic condition of cervix during parturition, rheumatic conditions, neuritis, neuralgia, retention of placenta, dysentery, bloat & gastritis in domestic animals.</p>	<p>Preferably intravenous, otherwise intramuscular or combination of IV/IM injection.</p> <p>Horse : 20-60 ml Cattle : 20-40 ml Foal, Calf : 5-15 ml Sheep, Goat : 2-8 ml Pig : 10-30 ml Dog : 1-5 ml</p>	<p>Vial of 33 ml</p> <p>WITHDRAWAL PERIOD Milk : 2 days Meat : Cattle 12 days/Pig 3 days & Horse IV 5 days</p>




SUPPORTIVES

	Transmix™			
	COMPOSITION	BENEFITS	DIRECTIONS FOR USE	PRESENTATION
	<p>Gluconeogenic precursors fortified with vital organic substances and essential elements.</p> <p>Contains highly bio-available calcium.</p>	<ul style="list-style-type: none"> Eases the calving stress Improve immunity and waning the chances of retained placenta and metritis Optimises milk production 	<p>Drench 500 ml after parturition & repeat same quantity 48-72 hours after first drench</p>	<p>Available in 500 ml bottle</p>


	VM ^{all} ™ Chelated			
	COMPOSITION	BENEFITS	DIRECTIONS FOR USE	PRESENTATION
	<p>Nutritional value per kg :</p> <p>Vit A 20,00,000 IU, Vit D₃ 2,00,000 IU, Vit E 50% 3,000 IU, Vit B₃ (Niacin) 1,000 mg, Calcium 230 mg, Phosphorus 115 g, Zinc 9,600 mg, Manganese 3,900 mg, Iron 1,500 mg, Iodine 500 mg, Cobalt 200 mg, Selenium 20 mg</p>	<ul style="list-style-type: none"> Timely uterine involution Timely onset of estrus Showing proper signs of estrus Proper follicular development & timely ovulation Improving conception rates 	<p>After calving : from day 5 to day 60</p> <p>Feed VM^{all}™ Chelated 25g to 50g/day/cow</p> <p>Or mix 100g VM^{all}™ Chelated per 10kg feed</p>	<p>Available in 1 kg & 5 kg</p>

	Finadyne®			
	COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
	<p>Each ml contains:</p> <p>Flunixin Meglumine IP 83 mg, Equivalent to Flunixin 50 mg</p>	<ul style="list-style-type: none"> In Cattle, Sheep, Goat, Camel: For the control of inflammation and pyrexia associated with mastitis, respiratory disease and metritis. In Horse: For the alleviate of inflammation and pain associated with musculo-skeletal disorders. In Dogs: For use to alleviate Fever, Inflammation, endotoxemia or Sepsis. 	<p>Cattle, Sheep, Goat and Camel: 1.1 mg to 2.2 mg Flunixin per kg body weight or 1 to 2 ml of Finadyne injection per 45 kg body weight given by slow intravenous or intramuscular administration.</p> <p>Horses: by slow intravenous injection for Musculo-skeletal disorder at rate of 1 ml per 45 kg bodyweight (1.1 mg Flunixin/kg) one daily for up to 5 days.</p> <p>Dog: by Intramuscular or slow intravenous at dose of 0.5-1 mg/kg body weight as a single dose or necessary once a day for not more than 3 days.</p>	<p>Available in 20 ml & 100 ml bottle</p> <p>WITHDRAWAL PERIOD Cattle - Milk: 24 hours after last treatment Meat: 5 days from the last treatment Horse - Meat: 7 days from last treatment Pig - Meat 22 days from last treatment</p>


	Chelated LactAid® Forte			
	COMPOSITION	BENEFITS	DIRECTIONS FOR USE	PRESENTATION
	<p>Nutritional value per 100 ml :</p> <p>Calcium 3500 mg.</p> <p>Phosphorus 1750 mg.</p> <p>Vit D₃ 15000 I.U.</p> <p>Vitamin B₁₂ 200 mcg.</p> <p>Carbohydrates 20000 mg.</p> <p>Chelated Zinc 320 mg.</p> <p>Chelated Copper 150 mg.</p> <p>Chelated Manganese 130 mg.</p> <p>Biotin 2 mg.</p> <p>Chelated Chromium 9 mg.</p> <p>Enriched with herbal galactogogues.</p>	<ul style="list-style-type: none"> Helps in strengthening udder defense system Helps in maintaining good health and optimum performance Helps in Bone development Helps in improving milk production 	<p>For Large animals : 25 ml to 40 ml twice</p> <p>For Small animals : 10 ml to 20 ml twice</p>	<p>Available in 1 Lit., 5 Lit. and 20 Lit.</p>





SUPPORTIVES

TEFROCEF™			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Ceftiofur Sodium sterile powder equivalent to Ceftiofur.....1g One ampoule of sterile water for Inj. IP20ml</p>	<ul style="list-style-type: none"> Genital infections of cattle & buffalo (acute metritis, cervicitis, vaginitis, prolapse related to ROP cases etc) associated with <i>Arcanobacterium pyogens</i>, <i>Fusobacterium necrophorum</i> and <i>Bacteroides spp.</i> Respiratory diseases of cattle, buffalo, sheep and goat (shipping fever, pneumonia) associated with <i>Pasteurella haemolytica</i>, <i>Pasteurella multocida</i> and <i>Haemophilussomnus spp.</i> Acute interdigital necrobacillosis (Foot rot, Pododermatitis) caused by <i>Fusobacterium</i> & <i>Bacteroides</i>. 	Cattle, Buffalo, Sheep & Goat : 1.1 to 2.2 mg ceftiofur per kg body weight by IM route for 3 to 5 days.	Available in 1 g vial with 20 ml sterile water for injection, disposable syringe and needle.

COMPANION ANIMAL


Nobivac®KC			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each (0.4 ml) dose Contains Brodetella bronchiseptica strain B-C2 $\geq 10^{8.0}$ CFU and canine para influenza virus stain Cornell $\geq 10^{3.0}$ TCID₅₀</p>	Active immunization of dogs against Kennel Cough.	Nobivac KC aims to make administration as easy as possible: ● Low 0.4 ml dose ● Single nostril only Can be used with or without applicator	One box contains 5 vials of dose and 5 vials of diluent along with one applicator


Nobivac®:Puppy DP			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each 1 ml dose contains : Live infectious canine distemper virus strain Onderstepoort minimum 5.0 log₁₀ TCID₅₀ Live infectious canine parvo virus strain 154 minimum 7.0 log₁₀ TCID₅₀</p>	Active immunization of dog against CDV and CPV.	Reconstitute one vial of Nobivac®Puppy DP in one vial of Nobivac®Solvent & inject subcutaneously.	One box contains 10 vials of 1 dose.


Nobivac®:DHPPi			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each 0.5 ml dose contains : Live infectious canine distemper virus (CDV) strain Onderstepoort at least 4.0 log₁₀ TCID₅₀ Live infectious canine adeno virus type 2 (CAV₂) strain Manhattan LPV₃ at least 4.0 log₁₀ TCID₅₀ Live infectious canine parvo virus (CPV) strain 154, at least 7.0 log₁₀ TCID₅₀ Live infectious canine para-influenza virus (CPI) strain cornell at least 5.5 log₁₀ TCID₅₀</p>	Vaccination against CDV, CAV2, CPV & CPI. Besides providing protection against CAV2 disease entities such as respiratory tract infections, the vaccine also protects against infectious canine hepatitis (ICH) caused by CAV1.	Reconstitute the contents of one vial of Nobivac DHPPi in one vial of Nobivac Solvent, Nobivac Lepto, Nobivac Rabies or Nobivac RL immediately prior to use & inject subcutaneously.	One box contains 10 vials of 1 dose.




COMPANION ANIMAL

Nobivac®:Lepto			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each dose contains inactivated strain of: <i>Leptospira interrogans</i> serotype canicola strain Ca-12-000\geq957units/ml and <i>Leptospira interrogans</i> serotype icterohaemorrhagiae strain 820K\geq625 units/ml</p>	<p>Active immunisation against Leptospirosis caused by <i>L.icterohaemorrhagiae</i> & <i>L.canicola</i> of <i>Leptospira interrogans</i>. Animals are protected against clinical disease, & also against becoming renal carriers after challenge.</p>	<p>Inject 1 ml of Nobivac Lepto subcutaneously. Nobivac Lepto can also be used to reconstitute Intervet's freeze dried vaccines Nobivac Puppy DP & Nobivac DHPI.</p>	<p>One box contains 10 vials of 1 dose</p>


Nobivac®:Rabies			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each 1 ml dose contains rabies virus (Pasteur R1VM Strain) inactivated \geq 2 IU</p>	<p>For the active immunisation of healthy dogs, cats, cattle, sheep, goats, horses and in principle all healthy mammals against Rabies & can be used for both (prophylactic immunisation & post bite therapy.</p>	<p>1 ml by subcutaneous or intramuscular injection. Shake well before use.</p>	<p>One box contains 1 ml x 10 vials or one box contains 10 ml x 10 vials</p>


Nobivac®:RL			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each 1 ml dose contains : Rabies virus inactivated antigen suspension \geq 3.0 IU <i>Leptospira interrogans</i> sero group Canicola \geq 40 hamster PD₈₀ <i>Leptospira interrogans</i> sero group icterohaemorrhagiae \geq 40 hamster PD₈₀</p>	<p>For the active immunisation of dogs against rabies, and canine leptospirosis caused by <i>L.interrogans</i> serogroups <i>canicola</i> and <i>icterohaemorrhagiae</i>.</p>	<p>1 ml by subcutaneous injection. Can be used to reconstitute Nobivac DHPI. Intended for dogs from 8 weeks of age onwards.</p>	<p>One box contains 1 ml x 10 vials.</p>


BRAVECTO®			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each chewable tablet contains: Fluralaner 250/500/1000/1400 mg</p>	<ul style="list-style-type: none"> • Treatment and prevention of tick and flea infestation on dogs for 3 months. • Treatment of Demodicosis caused by <i>Demodex</i> spp. mites, Sarcoptic mange and <i>Otodectes</i> spp. mite infestation in dogs. 	<ul style="list-style-type: none"> • for small dogs (>4.5-10 kg)- 250 mg • for medium sized dogs (>10-20 kg)- 500 mg • for large dogs (>20-40 kg)- 1000 mg • for very large dogs (>40-56 kg)- 1400 mg 	<p>Fluralaner- 250 mg, 500 mg, 1000 mg, 1400 mg</p>




COMPANION ANIMAL

Scalibor			
COMPOSITION	BENEFITS	DOSAGE	PRESENTATION
 <p>Scalibor® protective band 65 cm contains 1 g of deltamethrin Scalibor® protective band 48 cm contains 0.76 g of deltamethrin</p>	<p>Scalibor® protection band has unique release technology to ensure sustained release and continuous efficacy against Ticks, Fleas and Sand flies. It is effective through its anti-feeding effect repellent effect, knockdown effect and lethal effect. Duration of efficacy is six months against ticks and four months against fleas</p>	<p>The collar with the length of 48 cm is to be used on small and medium sized dogs, The collar with the length of 65 cm is to be used on large sized dogs.</p>	<p>One collar is packed into a sachet made of polyethylene-aluminum-Kraft paper</p>


Taktic® 5% EC			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each ml contains : Amitraz I.P. 50 mg</p>	<p>It is indicated for the topical treatment of Demodectic & Sarcoptic Mange, ticks & lice in dogs.</p>	<p>Mixing Rate / lit of water: Ticks & lice - 6 ml Mites - 10 ml 3-5 applications for mange and 2 applications for ticks & lice at weekly intervals. Taktic to be used as dip or spray</p>	<p>Glass bottle of 25 ml with plastic measuring cup</p>


Taktic® 12.5% EC			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each ml contains : Amitraz I.P. 125 mg</p>	<p>It is indicated for the topical treatment of Demodectic & sarcoptic Mange, ticks & lice in dogs</p>	<p>Mixing Rate/ lit of water Demodectic Mange - 4 ml Sarcoptic Mange - 2 ml Ticks & Lice - 2 ml In severe cases of infestation a second treatment is recommended 5-10 days after the first.</p>	<p>Glass bottle of 25 ml with plastic measuring cup</p>


San ^{Coat} ®			
NUTRITIONAL VALUE	BENEFITS	DIRECTIONS FOR USE	PRESENTATION
 <p>Essential Fatty Acids (Linoleic Acid, Alpha Linolenic Acid, Gamma Linolenic Acid, Eicosapentaenoic Acid and Docosahexaenoic Acid) Vitamins (Vitamin A and E, Biotin and Pyridoxine) Zinc and Inositol Omega 6 and Omega 3 fatty acids in 6:1 ratio</p>	<p>San Coat is indicated as an aid in the management of allergic and inflammatory skin conditions like alopecia, dull and dry hair coat, pruritis, atopic dermatitis, <i>Malassezia pachydermatis</i>, pyoderma, mange etc. in dogs.</p>	<p>Pour measured dose on food once daily according to the following schedule. 0.3 to 1.0 ml per kg body weight. Under 7 kg - 3.75 ml 7 - 23 kg - 7.5 ml Over 23 kg - 15.0 ml</p>	<p>Container of 150 ml (bottle shape)</p>



COMPANION ANIMAL


DELVOSTERON®					
COMPOSITION		INDICATIONS	DOSAGE		PRESENTATION
	Each ml contains proligestone Injection 100 mg	Suppression & postponement of oestrus in the bitch, treatment of pseudo pregnancy in the bitch, suppression and postponement of oestrus in the queen and suppression and postponement of oestrus in the ferret.	Dogs	Dosage	20 ml Vials
			< 3 kg	1.0 ml	
			3-5 kg	1.0-1.5 ml	
			5-10 kg	1.5-2.5 ml	
			10-20 kg	2.5-3.5 ml	
			20-30 kg	3.5-4.5 ml	
			30-45 kg	4.5-5.5 ml	
			45-60 kg	5.5-6.0 ml	
			> 60 kg	1 ml/ 10 kg	


DERMA STRENGTH					
NUTRITIONAL VALUE PER TABLET		BENEFITS	DIRECTIONS FOR USE	PRESENTATION	
	Methylsulfonylmethane (MSM)	75 mg	<ul style="list-style-type: none"> • Collagen production • Skin texture • Circulation • Immune system response and circulation • Tissue recovery • Normal histamine levels • Provides support during allergy season 	Directions for use or as directed by a veterinarian : Give 1 tablet per 10 kg of body weight daily. If giving more than 1 tablet daily, divide between AM and PM.	30 tablet
	N, N-Dimethylglycine Hcl (DMG)	50 mg			
	DL-Methionine	50 mg			
	L-Cysteine	50 mg			
	Grape Seed (Vitis vinifera) Extract	30 mg			
	Ascorbic Acid (Vitamin C)	25 mg			
	L-Proline	25 mg			
	Perilla (Perilla frutescens) seed Extract	20 mg			
	dl-alpha Tocopheryl Acetate (VitaminE)	10 IU			
	Zinc (Zinc Citrate)	5 mg			
	Hyaluronic Acid (HA)	5 mg			
	Niacinamide (Vitamin B3)	4 mg			
	Retinyl Acetate (Vitamin A)	37 IU			

CARDIO STRENGTH					
NUTRITIONAL VALUE PER CAPSULE		BENEFITS	DIRECTIONS FOR USE	PRESENTATION	
	L-Carnitine HCl	125 mg	<ul style="list-style-type: none"> • Dogs and cats with pre-existing sub-optimal cardiovascular functions • Breeds of dogs and cats that are predisposed to cardiovascular stress • Support of geriatric patients 	Directions for use or as directed by a veterinarian : Cat : Give 1 capsule daily. Dogs : Give 1 capsule, per 10 kg of body weight, daily. If giving more than 1 capsule, divide between AM and PM.	30 and 60 tablet
	L-Taurine	125 mg			
	N, N-Dimethylglycine HCl	25 mg			
	d-alpha Tocopheryl Succinate (Vitamin E)	30 IU			
	Coenzyme Q10	10 mg			
	Folic Acid	0.9 mg			
	Magnesium (as Magnesium Citrate)	0.5 mg			
	Potassium (as Citrate/Malate)	.01 mg			
	Selenium (as Sodium Selenite)	0.007 mg			



COMPANION ANIMAL

GLYCOFLEX					
NUTRITIONAL VALUE PER TABLET		BENEFITS	DIRECTIONS FOR USE	PRESENTATION	
	Glucosamine HCl (Shrimp and Crab)	375 mg	<ul style="list-style-type: none"> • Glyco FLEX Canine represents our comprehensive support for dogs needing moderate joint support. • These delicious chewable tablets are also recommended for adult and maturing dogs, sporting and working breeds as well as support normal recovery after orthopedic surgery. 	Directions for use or as directed by a veterinarian : Up to 15 kg : ½ tablet daily 15.5 kg-30 kg : 1 tablet daily 30.5 kg-45 kg : 2 tablet daily 45.5 kg & over : 2 ½ tablets daily If giving more than 1 tablet, divide between AM and PM.	30 and 60 tablet presentation
	Pena Canalicus (Glycomega™ brand Green Lipped Mussel)	300 mg			
	Methylsulfonylmethane (MSM)	250 mg			
	N, N-Dimethylglycine HCl (DMG)	50 mg			
	Manganese (as Mn Proteinate)	5 mg			

RENAL ESSENTIALS					
NUTRITIONAL VALUE PER TABLET		BENEFITS	DIRECTIONS FOR USE	PRESENTATION	
	Astragalus Root Powder	60 mg	<ul style="list-style-type: none"> • Renal circulation • Immune and antioxidant defense system function • Homocysteine balance • Normal fluid retention • Stress management • Kidney and liver function • Normal detoxification 	Directions for use or as directed by a veterinarian : Give 1 tablet per 10 kg of body weight, day For dogs less than 7 kg, give 1/2 tablet daily If giving more than 1 tablet, divide between AM and PM.	45 tablets presentation
	Rehmannia glutinosa Root Extract	50 mg			
	Nettle (Urtica dioica) Seed Extract	50 mg			
	Cordyceps sinensis Extract	50 mg			
	Lecithin	50 mg			
	L-Arginine	50 mg			
	N, N-Dimethylglycine HCl (DMG)	25 mg			
	Potassium (K Gluconate)	8.25 mg			
	Inositol	8 mg			
	Pyridoxal 5-Phosphate (Vitamin B6)	8 mg			
	Thiamine (Vitamin B1)	4 mg			
	Riboflavin (Vitamin B2)	4 mg			
	Choline	4 mg			
	Folic Acid	0.15 mg			
Methylcobalamin (Vitamin B12)	0.05 mg				




MSD


Animal Health





POULTRY PRODUCTS


Live Vaccine


	Nobilis® Gumboro 228E			
	COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
	Each dose contains : Live Gumboro disease virus strain 228E at least 2.0 log ₁₀ TCID ₅₀	The vaccine is recommended for active immunization of chicken against Gumboro Disease (IBD)	One dose per bird through drinking water	1000 ds 2500 ds


	Nobilis® Gumboro D78			
	COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
	Each dose contains : Live Gumboro disease virus strain D78 at least 4.0 log ₁₀ TCID ₅₀	The vaccine is recommended for active immunization of chicken against Gumboro Disease (IBD)	One dose per bird through drinking water	1000 ds 2500 ds

	Nobilis® ND Clone 30			
	COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
	Each dose contains : Live Newcastle Disease strain Clone 30 at least 10 ^{6.0} ELD ₅₀	The vaccine is recommended for active immunization of chicken against Newcastle Disease	One dose per bird through drinking water, spray, intranasal/intra ocular	1000 ds 2500 ds 5000 ds

	Nobilis® Ma5 + Clone 30			
	COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
	Each vial contains per dose at least 3,0 log ₁₀ EID ₅₀ live Avian Infectious Bronchitis Virus strain Ma5 and at least 6,0 log ₁₀ ELD ₅₀ of live Newcastle Disease Virus strain Clone 30 in stabilizer	Vaccination of chickens against infectious Bronchitis and Newcastle Disease. Vaccine can be used for primary as well as secondary vaccination.	Compatible with inactivated NDV vaccines (e.g. ND Broiler). Further, an extensive vaccination program has been tested involving live vaccines against Marek's disease, NDV, IBDV and IBV. The use of these vaccines did not affect the safety and efficacy of the individual products.	1000 ds 2500 ds 5000 ds

	Nobilis® MG 6/85			
	COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
	Each dose contains : Live Mycoplasma gallisepticum strain MG 6/85 minimum 10 ^{6.5} CFU	The vaccine is recommended for active immunization of chicken to reduce the clinical signs of Mycoplasma gallisepticum infection.	One dose per bird through intraocular	1000 ds

	Nobilis® IB Ma5			
	COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
	Vaccine contains per dose at least 3,0 log ₁₀ EID ₅₀ of live Avian Infectious Bronchitis Virus strain Ma5 in stabilizer.	Nobilis IB Ma5 is used against Infectious bronchitis virus infection in Broiler, Breeder and Layers.	One dose per bird through Drinking water, spray or Occulonasal route	1000 ds 2500 ds 5000 ds

	Nobilis® AE + Pox			
	COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
	<i>Active components per dose:</i> Live AE virus strain Calnek 1143 at least 2.5 log ₁₀ EID ₅₀ Live Fowl Pox virus strain Gibbs at least 2.8 log ₁₀ EID ₅₀	Prevention again Avian Encephalomyelitis and Fowl Pox	One Dose per bird through wing web route	1000 ds



Cell Associated Vaccine



innovax™ ND-SB1

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each lyophilised ampoule per dose (1 ml) contains : Live Turkey Herpes virus strain HVT/NDV-F at least 1534 PFU/bird Marek's disease virus serotype 2 strain SB-1 at least 1514 PFU per bird dose	The vaccine is recommended for active immunization of chicken against Marek's Disease (MD) and Newcastle Disease (ND)	0.2 ml injection subcutaneously per chick in the neck	2000 ds 4000 ds

Inactivated Vaccine



Nobilis® MG inac

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Inactivated Mycoplasma gallisepticum strain MG 6/85 NLT 0.23 units	The vaccine is recommended for active immunization of chicken against infections caused by Mycoplasma gallisepticum.	0.5 ml S/C	500 ml (1000 ds)



Nobilis® E. coli inac

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each 0.5 ml dose contains : F11-antigen Suspension containing 100 µg F11-68.3 mg FT-antigen Suspension containing 100 µg FT-68.3 mg	The vaccine is recommended for passive immunization of broilers against colibacillosis by vaccination of broiler breeders	0.5 ml S/C or I/M	500 ml (1000 ds)



Nobilis® Salenvac T

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each ml contains, Formalin killed cells of Salmonella Enteritidis (phage type 4 strain 109) : 2×10^9 cells inducing ≥ 2 RP*, Formalin killed cells of Salmonella Typhimurium DT104 : 2×10^9 cells inducing ≥ 2 RP* (*relative potency)	The vaccine is recommended for active immunization of chickens against S. enteritidis and S. typhimurium and to give passive immunity against these agents in the progeny	0.1 ml for day-old chicks and 0.5 ml for older birds I/M	500 ml (1000 ds)



Nobilis® Newcavac

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each 0.5 ml dose contains: Inactivated ND virus (Clone 30) inducing ≥ 4 log, HI Unit per 1/50 th of a dose or ≥ 50 PD ₅₀ units/dose	The vaccine is recommended for booster vaccination of layers and breeding stock for protection against Newcastle Disease throughout the laying period	0.5 ml S/C or I/M	500 ml (1000 ds)



Nobilis® ND Broiler


COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each 0.1 ml dose contains: Inactivated Newcastle Disease virus (Strain Clone 30) cantoning ≥ 20 PD ₅₀ units/dose or inducing ≥ 4 log ₂ HI Unit per 1/50 dose	The vaccine is recommended for the vaccination of Newcastle Disease in day-old chicks in areas where ND is endemic	0.1 ml S/C or I/M	200 ml (2000 ds)





MSD


Animal Health





Nobilis® Corvac				
COMPOSITION		INDICATIONS	DOSE & ROUTE	PRESENTATION
	Each 0.5 ml dose contains: Inactivated Avibacterium paragallinarum Strain 083 (serotype A), at least 1 CPD ₇₀ *, Strain Spross (serotype B), at least 1 CPD ₇₀ , Strain H-18 (serotype C) at least 1 CPD ₇₀ . (*CPD ₇₀ : 70% chicken protective dose)	The vaccine is recommended for protection against Avibacterium paragallinarum infections in chicken	0.5 ml S/C	500 ml (1000 ds)

Nobilis® Coryza				
COMPOSITION		INDICATIONS	DOSE & ROUTE	PRESENTATION
	Each 0.25 ml dose contains : Inactivated Avibacterium paragallinarum Strain 083 (serotype A) at least 1 CPD ₇₀ , Strain Spross (serotype B) at least 1 CPD ₇₀ , Strain H-18 (serotype C) at least 1 CPD ₇₀	The vaccine is recommended for protection against Avibacterium paragallinarum infections in chicken.	0.25 ml I/M or S/C	250 ml (1000 ds)


Nobilis® Reo inac				
COMPOSITION		INDICATIONS	DOSE & ROUTE	PRESENTATION
	Each dose contains : Inactivated Reovirus strains 1733 and 2408, inducing ≥ 7.4 log ₂ ELISA units/dose per 1/50 th dose	The vaccine is recommended for booster vaccination of breeding stock against Avian Reovirus to protect their offspring against Avian Reovirus infections	0.5 ml S/C or I/M	500 ml (1000 ds)


Nobilis® G + ND				
COMPOSITION		INDICATIONS	DOSE & ROUTE	PRESENTATION
	Each dose contains : Inactivated infectious Bursal Disease virus (Strain D78) inducing ≥ 14.5 log ₂ VN units/dose, Inactivated Newcastle disease virus (Strain Clone 30) inducing ≥ 4 log ₂ HI units per 1/50 th of a dose or containing ≥ 50 PD ₅₀ Units/dose	The vaccine is recommended for booster vaccination of future breeders to protect against Newcastle Disease throughout the laying period, and to induce high maternal antibody levels against infectious Bursal Disease in their offspring.	0.5 ml S/C or I/M	500 ml (1000 ds)

Nobilis® IB + ND				
COMPOSITION		INDICATIONS	DOSE & ROUTE	PRESENTATION
	Each dose contains: Inactivated Infectious Bronchitis virus (strain M41) inducing ≥ 6.0 log ₂ HI units/dose, Inactivated Newcastle Disease Virus (Clone 30) inducing 4 log ₂ HI units per 1/50 th of dose or ≥ 50 PD ₅₀ units/dose	The vaccine is recommended for the booster vaccination of layers and breeding stock for protection against Newcastle Disease and the Massachusetts type of Infectious Bronchitis.	0.5 ml S/C or I/M	500 ml (1000 ds)


Nobilis® IB multi + ND				
COMPOSITION		INDICATIONS	DOSE & ROUTE	PRESENTATION
	Each dose contains : Inactivated Infectious Bronchitis virus (Strain M41) inducing ≥ 4.0 log ₂ VN units/dose, IB virus (Strain D249G) inducing ≥ 4.0 log ₂ VN units/dose, Inactivated Newcastle Disease virus (Strain Clone 30) inducing ≥ 4.0 log ₂ HI units per 1/50 th dose or containing ≥ 50 PD ₅₀ units/dose	The vaccine is recommended for booster vaccination of layers and breeding stock for protection against the Massachusetts and D207/D274 (and related nephropathic) serotype of Infectious Bronchitis and Newcastle Disease.	0.5 ml S/C or I/M	500 ml (1000 ds)




Nobilis® IB + G + ND			
COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
 <p>Each dose contains : Inactivated Injections Bronchitis virus (strain M41) inducing $\geq 6.0 \log_2$ HI units, Inactivated Injections Bursal Disease virus (Strain D78) inducing $\geq 14.5 \log_2$ VN units, Inactivated Newcastle Disease Virus (Strain Clone 30) inducing $\geq 4 \log_2$ HI units per $1/50^{\text{th}}$ of a dose or Containing $\geq 50 \text{ PD}_{50}$ units/dose</p>	The vaccine is recommended for breeding stock: as a booster vaccination to protect against Newcastle Disease and the Massachusetts serotype of Infectious Bronchitis, and to induce high maternal antibody levels against Infectious Bursal Disease in their offspring	0.5 ml S/C or I/M	500 ml (1000 ds)

Nobilis® Reo + IB + G + ND			
COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
 <p>Each dose contains : Inactivated Injections Bronchitis virus (Strain M41) inducing $> 6.0 \log_2$ HI units Inactivated Injections Bursal Disease virus (strain D78) inducing $> 14.5 \log_2$ VN units Inactivated NDV (Strain Clone 30) $> 4 \log_2$ HI units per $1/50^{\text{th}}$ of dose containing $> 50 \text{ PD}_{50}$ units/dose Inactivated Reo virus (Strain 1733 & 2308) inducing $> 7.4 \log_2$ ELISA.</p>	For vaccine of Chicken against disease caused by Reo-virus, infectious Bronchitis virus of Massachusetts type Newcastle Disease virus & injections bursal disease virus.	0.5 ml S/C or I/M	500 ml (1000 ds)

Feed Supplement


Enradin®			
CONTENTS PER KG	BENEFITS	INCLUSION RATE	PRESENTATION
 <p>Each 1 Kg of Enradin contains 80 gm of Enramycine HCL</p>	Helps in ease the incidence of sub-clinical necrotic enteritis in chicken	5-10 ppm (63-125 gm) per ton of feed	20 Kg Withdrawal period - 7 days Avoid use in laying hens


Amnovit®			
CONTENTS PER KG	BENEFITS	INCLUSION RATE	PRESENTATION
 <p>Scientifically Balance formulation of vitamins and amino acids</p>	Helps in relieving the stress conditions by supporting vitamins and minerals	Through water 1gm/lit for 5-7 days Through feed 500gm/ton for 5-7 days	1 Kg

CHIKVIT Liquid			
COMPOSITION	BENEFITS	DOSE & ROUTE	PRESENTATION
 <p>Consists of Vitamin A, Vitamin B complex and Vitamin D along with Essential Trace minerals. It also contains sorbitol as an instant energy source</p>	Helps in relieving the stress during transport	Regular Supplementation 0.5ml/lit for 3 to 7 days through drinking water In stress condition 1 ml/lit through drinking water	1 lt





Pharma Product

Floxidin™			
COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
 Enrofloxacin 10% oral solution	The product is recommended for treatment of the common infections caused by gram-positive, gram-negative, anaerobes and mycoplasma species	10 mg per kg BW for 3-5 days	5 Lt Withdrawal period - Meat - 8 days Eggs - Stop using 14 days before laying

VAC-SAFE®			
CONTENTS	BENEFITS	INCLUSION RATE	PRESENTATION
 An effervescent tablet that dilutes easily and neutralizes the chlorine in the water	Helps in improving the quality of drinking water during vaccination	1 tablet /100 Lt water	Box of 30 tablet

Disinfectant

FARMQUAT®			
COMPOSITION	INDICATION	DOSE & ROUTE	PRESENTATION
 Didecyl dimethyl ammonium chloride.....9.2% w/v Alkyl Dimethyl benzyl ammonium chloride.....9.2% w/v Alkyl Dimethyl Benzyl ammonium chloride.....4.6% w/v Bis-n-Tributyltin oxide.....1.0% w/v	<ul style="list-style-type: none"> • For Disinfection in presence of Bird. Effective against Bacteria, Virus and Fungus. • Effective under Hard water condition also. • EPA Registered Product 	4 ml/l - General disinfection 8 ml/l - Foot bath disinfection	Pack of 1 L and 5 L.

FARMPHENE®			
COMPOSITION	INDICATION	DOSE & ROUTE	PRESENTATION
 Combination of Natural and Synthetic Phenol along with Cresylic acid	<ul style="list-style-type: none"> • Terminal Disinfection • Also works under presence of high Organic matter conditions • Spore killing action and excellent fumigating agent. 	0.5% or 5 ml/L of water	Pack of 1 L and 5 L.