The Blue Cross Book

For the advancement of the veterinary profession

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From Editor's Desk

The Editorial Board of Blue Cross Book wishes all its esteemed readers a "Happy New Year - 2014" and gladly places before them the 29th volume of this professional publication of MSD Animal Health.

As is being practiced since its 25th volume, Blue Cross Book has endeavored in this volume to enlighten the professional fraternity on various issues of livestock health care, management and disease control. With a view to inculcate confidence in field Veterinarians to use general anaesthesia in large ruminant surgery, Blue Cross Book had published in the 28th volume, the first part of this topic, based on pre-anaesthetic medication. The present volume deals with the use injectable anaesthetics in large ruminants.

Successful antimicrobial therapy of bovine mastitis is still a matter of concern among dairy owners and Veterinarians alike. The pharmacokinetic and pharmacodynamic considerations of antimicrobial mastitis therapy explained in this issue, shall help Veterinarians in selecting and using proper antibiotics at proper dosage regimen to come closer to the successful therapy of this disease.

Brucellosis among dairy herd is one of the impediments in dairy development in India. In the absence of effective therapeutic management, prevention of brucellosis through calf-hood vaccination is being tried the world over. The disease, though prevalent in India on a big scale, Veterinarians and dairy owners are still apprehensive about the success of calf-hood vaccination by using the available vaccine. The use of this vaccine and its success in a big commercial herd, as narrated in this issue, may help in removing the fears in the mind of Veterinarians about the calf-hood vaccination and its subsequent implications.

Certain new zoonotic diseases like Kyasanur Forest Disease are arising on Indian horizon along with re-imergance of earlier known zoonotic diseases like brucellosis, leptospirosis and anthrax. "One World-One Health" concept of WHO-OIE, introduced last year, needs active implementation with the involvement of medical, veterinary and environmental science professionals together, to protect the human and livestock population in India. The readers may obtain the latest information about the new zoonotic approach in the 29th volume.

Infertility among cattle and buffaloes due to variety of causative factors is a perpetual problem which finds a place in every issue of Blue Cross Book. The series of articles being published regularly in Blue Cross Book shall be of immense help to those who handle infertility problems.

Lastly, the editorial board appeals all Veterinary/Animal Science researchers, academicians and field workers to share their expertise, experience and observations with other professionals through the Blue Cross Book.

Dr. Yash Goyal
Managing Director,
MSD Animal Health

Dear Professional Colleagues,

It gives me immense pleasure to release the 29th edition of Blue Cross Book. With this I would like to first extend thanks to all the readers and well-wishers for their immense support which has helped us to update this journal dedicated to veterinary profession.

A special thanks to all the contributors for useful technical articles for the field veterinarians, without which the successful running of this journal would not be possible.

We are pleased to inform you that now the book has become Global as now we are uploading the Blue cross books on our India site which can be accessed on the link http://www.msd-animal-health.co.in

On the site, additionally, you will also find our product portfolio of all the species which will work as reference point for the field veterinary professionals.

I am sure it will extend our reader group and the interactions with our professional partners.

MSD-Animal Health in India has become a strong player in the animal health products with an outstanding reputation. With a more balanced product portfolio, we will continue to serve our customers in the best possible way in the years to come.

With this, I would also request for your participation by forwarding the technical articles, case reports for publication for the benefit of field veterinarians in their day to day veterinary practice.

Lastly, on behalf of MSD Animal Health Team, I wish all our readers a very happy and prosperous New Year-2014

Best wishes,

Yash Goyal

LOOKING AFTER TOMORROW



ENSURING THE SAFETY AND SUSTAINABILITY OF ANIMAL STOCKS BENEFITS EVERYONE. BUT MERCK ANIMAL HEALTH SOMETIMES HAS THE OPPORTUNITY TO IMPROVE ANIMAL AND HUMAN WELFARE IN OTHER WAYS.

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Today, rabies can be controlled through immunization. Which is why we believe every country in the world should be free of this fatal disease. Each year Merck Animal Health donates over 200,000 doses of rabies vaccine to the Afya Serengeti Project. By tackling rabies in Tanzanias domestic dog population, weve helped dramatically reduce dog bites, and helped protect the countrys fragile wild dog population. In India we sponsor two similar pilot projects in the villages surrounding Bangalore and Pune.

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Through our partnership with the Shire Highlands Milk Producers Association (SHMPA), Merck Animal Health lends financial and in-kind support to Malawian dairy smallholders. By providing funds, equipment and medicines were helping farmers improve the quantity and quality of milk supplies.

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In recent years, the US has seen an increase in its number of unwanted horses. With no national fund in place, Merck Animal Health and the American Association of Equine Practitioners (AAEP) have created the Unwanted Horse Veterinary Relief Campaign. We donate thousands of doses of vaccines to rescue homes, helping them look after as many animals as possible.

Reducing Animals in Research

To develop life-saving medicines we believe laboratory animal research remains indispensable. But we are dedicated to approaches that reduce the use of animals in science. We award the Dieter Lütticken Award to researchers who have discovered ways to replace animal testing.

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Partnerships are how we generate truly useful, innovative products. So were always ready to begin a new one. If you think Merck Animal Health could help shape the growth and productivity of your business, please contact us.

Review Articles

Clinical Trials

Clinical Reports

The information on 'Bovine Mastitis' has been accessed through internet.

General Anaesthesia: considerations and monitoring for Large Ruminants - Part II

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Injectable anaesthetics

Injectable anesthetics are the most used agents for induction of anesthesia in bovines. They are preferred over inhalant anesthetics because of ease of administration, lack of environmental waste-gases, minimal equipment requirement and cost efficacy.

Thiopentone sodium

Thiopentone sodium is widely used agent to induce general anesthesia in bovines, although respiratory and cardiovascular system depressant effects of thiopentone sodium are well known. The properties of quick induction, rapid and smooth recovery along with low cost has led to its wide use in bovine surgery. It has been recommended at a dose rate of 5 to 8 mg/kg in bovines. Various combinations of preanesthetic agents with thiopentone sodium have been carried out to develop safer and better anesthetic regimen for bovine anesthesia.

Ketamine

Ketamine produces dissociative anaesthesia characterized by profound analgesia, poor muscle relaxation or increased muscle tone which may be associated with tremors. It provides mild cardiovascular stimulation and is safer general anesthetic in bovines than thiopentone sodium. Vital reflexes are minimally affected and tracheal intubation can be accomplished successfully under ketamine in bovine. Due to its excitatory effects, ketamine is not recommended as a sole anesthetic in bovines. It is used usually in combination with xylazine, detomidine, medetomidine or other agents in bovines. The dose recommended in cattle is 2-5 mg/kg body weight. Various combinations have been suggested:

- Ketamine alone @ 2 mg/kg in saline given @ l0 ml/min
- Ketamine @ 2 mg/kg and Xylazine @ 0.1 mg.kg
- Diazepam @ 1 mg/kg and Ketamine @ 10 mg/kg
- Ketamine @5mg/kg, Diazepam 1 mg/kg and Guaifenesin @ 115 mg/kg
- Medelomidine @ 0.02mg/kg and Ketamine @ 0.5 mg /kg
- Midazolam @ 0.15 mg/kg, Ketamine@ 2mg/kg and Thiopentone sodium @ 5 mg/kg

Guaifenesin

It is a centrally acting skeletal muscle relaxant and can be used alone to induce recumbency in cattle. Addition of ketamine or thiopental to guaifenesin improves induction quality and decreases the volume required for induction and improves muscle relaxation when compared lo induction with ketamine or the thiobarbiturates given alone.

Xylazine may also be added to ketamine-guaifenesin solutions for induction and maintenance of anesthesia in cattle. Final concentrations are guaifenesin (50 mg/ml), ketamine (1-2 mg/ml), and xylazine (0.1 mg/ml). This solution is infused at 0.5 - 1 ml/kg IV for induction.

Tiletamine-zolazepam (Telazol)

Telazol is a 50:50 combination of tiletamine and zolazepam. Tiletamine is a dissociative anesthetic much like ketamine, but it is 2-3 times as potent. Zolazepam is a benzodiazepine, and like diazepam is an effective muscle relaxant. The average duration of surgical anesthesia usually ranges from 20-30 minutes. As an anesthetic induction agent in the bovine, an intravenous dose of 1.1 mg/kg is usually adequate. Tiletamine-zolazepam can be used successfully with or without xylazine in cattle. However, addition of xylazine to tiletamine-zolazepam lengthens duration of effect. Another alternative is to use detomidine followed by Telazol® (1.1 mg/kg IV). Telazol has a longer duration of effect than ketamine and so is better "matched" to detomidine for recovery purposes. Tiletamine-zolazepam has been given at 4.0 mg/kg IV to healthy non tranquilized calves and found to cause minimal cardiovascular effects and provided anesthesia of 45-60 minutes duration.

Propofol

Propofol is a nonbarbiturate, nonsteroidal hypnotic agent used to provide short duration of anesthesia characterized by smooth, rapid and uneventful recovery. The drug can be used safely with wide range of premedicants, inhalation agents and neuromuscular blocking drugs. Although propofol is widely accepted as induction and maintainence agent in smaller ruminants, dogs, cats and horses, its cost precludes its widespread use in bovines. However, ongoing studies at institutional level suggest propofol to be better than thiopentone sodium for induction in bovines. Recommended dose is 4-6mg/kg in cattle.

Inhalant anaesthetics

Complex surgical procedures in bovines require maintenance with an inhalant anesthetic. Inhalation anesthesia has been used widely in number of species but in bovine patients, inhalant anesthesia is not as much in use as it is in equines and small animals. Inhalation anaesthetics provide control over the depth and duration of anaesthesia and facilitate rapid recovery which is highly desirable in large ruminants. Inhalation anaesthetics provide control over the depth and duration of anaesthesia and facilitate rapid recovery.

Anesthesia in cattle can be maintained with halothane, isoflurane, or sevoflurane. Economic issues often dictate which agent to be used. Anesthesia is usually maintained with halothane at 1.5- 2.5% or isoflurane at 1.5 - 3% or sevoflurane at 2.5 -4%. Halothane and isoflurane are used routinely for maintenance of general anaesthesia in bovines. Sevoflurane and desflurane being costlier, are not used routinely in bovines.

Monitoring of bovine patients during anesthesia

Monitoring of anesthesia in ruminants is equally important as giving anesthesia, so as to maintain a proper plane of anesthesia and to prevent excessive insult to the cardiovascular, respiratory, and central nervous systems. The depth of anesthesia can be measured by

observing physical movement or jaw chewing in response to stimulation, eye position, degree of muscle tone, and presence or absence of palpebral reflexes etc. In ruminants, eye position differs with different stages of anesthesia. As the anesthesia deepens, the eye rotates ventrally and only the sclera is seen; and during deep anesthesia it rotates centrally.

Variables used to monitor the cardiovascular system include heart rate, pulse pressure, mucous membrane color, and capillary refill time. Ocular reflexes are used to monitor the central nervous system. The palpebral reflex is lost at light planes of anesthesia in ruminants, so it is of little value during anesthesia of these species. Body temperature is an important parameter to monitor during anesthesia.

Monitoring in bovines under general anesthesia has not been limited to 'tapping the eye' these days. Good anesthetic technique requires monitoring to allow drug administration to meet the animal's requirement and to prevent excessive insult to the cardiovascular, respiratory and central nervous system.

Pulse Oximetry

Pulse oximeter can be used to monitor oxygen saturation during anesthesia. The sensors can be placed on tongue, lips, ear, prepuce and vulva to monitor intraoperative, postoperative hypoxemia and pneumothorax .

Blood gas analysis

Periodic information of blood gas status is an asset to anesthetist for monitoring ventilation during anesthesia. Pao2, PaCo2 must be examined at every 15 minutes even when change is made in ongoing IPPV as hypoxemia is the main cause of death during anesthesia.

Capnography

A capnogram measurers end tidal CO_2 during IPPV and general anesthesia. Capnograph work on the principle that CO_2 is holding similar tension in exhaled gas as in venous blood. Capnograph is also able to detect mechanical fault in the gas supply.

Mean Arterial Pressure (MAP)

MAP value helps in assessing risk of anesthesia, as low MAP during anesthesia indicates that animal is at risk for developing complications during anesthesia.

Electrocardiography (ECG)

Electrocardiography has been used as a monitoring aid during anesthesia in human and small animals with great accuracy, but it does not hold true for bovines. Precise information about heart rate, rhythm, alterations in myocardial oxygenation and altered electrolyte balance can be obtained with electrocardiogram. It is worth to mention that ECG does not give any information about blood pressure or pulse strength.

Central Venous Pressure (CVP)

CVP is used to assess the venous return, myocardial function and need for fluid replacement. Normal CVP values range from 0 to 5 cm of water in cattle.

Complications During Anesthesia

- Regurgitation : mainly obstructs airway which leads to hypoxia. It can be reduced by keeping animal on 24- 48 hr of fasting and complete withholding of water for 24 hours. Endotracheal intubation is a must in bovines during general anesthesia to prevent airway obstruction.

- Salivation and tympany : are major complications encountered during general anesthesia in bovines. Whenever possible, cattle should be placed in a head-down, rumen-down position (ie. left lateral recumbency), and position the head so that the larynx is higher than the nose, facilitating drainage of saliva and ruminal contents from the mouth.
- Cardiac arrhythmias : including premature ventricular complex, arterial fibrillation can develop during anesthesia in large ruminants.

Things to keep in mind during general anesthesia in large ruminants

- Use endotracheal tube in all bovines receiving general anesthesia
- Try to reduce pressure on diaphragm due to abdominal viscera by raising cranial side of animal by 8-10 degrees.
- Provision of IPPV should be available and there should be minimal use of α-2 agonist drugs in bovine anesthesia.
- Give sufficient fluids and electrolytes during general anesthesia to maintain normal cardiac output.
- Dorsal recumbency should be for shortest duration.

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Pharmacological considerations in antimicrobial therapy of Mastitis

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Introduction:

Mastitis results after bacteria penetrate teat duct keratin, overcome the defenses in milk, and multiply within the gland. The interaction of bacteria with milk leukocytes greatly influences the establishment of infections. These leukocytes function by phagocytosing bacteria and killing the organisms intracellularly. However, phagocytosis is inefficient in the udder due to the lack of an energy source, low opsonic activity, and interference caused by casein and butterfat. Thus, antibiotics continue to be relied upon in attempts to treat clinical quarters during lactation.

The goals of antimicrobial therapy in the treatment of clinical mastitis include the return of the cow to normal milk production and composition, prevention of mortality in peracute cases, elimination of infectious microorganisms, and elimination of practices that may lead to drug residues in milk or meat. The implementation of mastitis control programs, judicious use of antibiotics and other medications, and appropriate record keeping practices will ensure that these goals are met.

The aim in selecting the best antimicrobial treatment regimen for an intramammary infection is simple; administering the drug at a dose and site that will allow accumulation in the mammary gland (pharmacokinetics), and identifying the pathogen and minimal inhibitory concentration (susceptibility) so that it can maintain effective drug concentrations (pharmacodynamics).

The use and effectiveness of antimicrobials for acute mastitis is still being debated. In many instances of acute mastitis, the infection has been cleared by the host by the time the infection has been detected. In these cases, it is argued that intervention with antibiotics is unnecessary, that the signs observed are due to endotoxemia and not due to infection. In these cases, treatment should concentrate on supportive therapy such as fluid replacement and countering the inflammation associated with endotoxemia. Septicemia is the potential complication of acute coliform mastitis; the development of chronic infection in those cases being another complication.

Pharmacokinetic and pharmacodynamic considerations

The extent to which a drug has access into milk when given systemically or is absorbed and distributes throughout the udder when given intramammarily, depends on its main pharmacokinetic (PK) properties like lipid solubility, degree of ionization, and extent of binding to serum and udder proteins.. More lipid solubility equates with better passage across biological membranes; poorly ionized

drugs enter milk better and less protein bound meaning better transfer in to milk. With intramammary preparations, the type of vehicle is also important . Weak organic bases like macrolides, aminoglycosides, sulfonamides, polymixin tend to accumulate in milk in the ionized form after parenteral administration, and attain concentrations higher than those in blood. On the contrary, concentrations of weak acids like penicillins and cephalosporins in milk are much less than those in blood . Despite the long history of the use of antimicrobials to treat infections in dairy cows, knowledge of pharmacokinetics of many substances is still limited. In addition to PK considerations, attention should be paid to pharmacodynamics (PD), which studies the interaction between the bacteria and the drug, and should support PK studies in determining the optimum dosages of the antimicrobials. Very little is known about PD aspects of antimicrobials used in mastitis therapy, because these studies have appeared quite late in veterinary science. Antimicrobials can be divided into concentration-dependent and time-dependent drugs. In the first group (e.g. aminoglycosides and fluoroquinolones), concentration of several times the minimum inhibitory concentration (MIC) for the target organisms at the infection site increases the efficacy. In the latter group (e.g. penicillins, cephalosporins and macrolides) the efficacy depends on the time during which the concentration of the drug exceeds the MIC, but high concentrations do not increase efficacy

An ideal drug for mastitis therapy should have a low MIC for mastitis pathogens. As treatment should be efficient and targeted towards specific infections, Gram-negative and Gram-positive infections in fact would require different antimicrobials . Anti-mastitis drugs should preferably have bactericidal action, as phagocytosis is impaired in the mammary gland The activity of antimicrobial substances should not be reduced by the presence of milk, but this has been shown for many including macrolides, tetracyclines and trimethoprim-sulphonamides .

Choice of route of administration

This may depend on the infection: mastitis streptococci are known to stay in the milk compartment, but *Staphylococcus aureus* can penetrate into udder tissue and cause a deep infection. Coliforms generally are eliminated spontaneously from the udder, and though antibiotics are not required at all ; in serious cases, however, there can be a risk for bacteriaemia, which supports the use of systemic administration of antibiotics .

In mastitis caused by penicillin-susceptible *S. aureus* strains, best results were achieved using a combination of systemic and Intramammary treatment with penicillin G. In infections of the milk compartment such as streptococcal mastitis, there is probably no advantage of systemic administration, indeed the concentration of penicillin G in milk remains 100-1000 fold lower than when given intramammarily. Based on the results from different studies, cure rates in streptococcal mastitis using IMM treatment are equal or even better than using systemic administration .

In coliform mastitis, parenteral administration of antimicrobials has been suggested in severe cases, due to the risk of bacteriaemia . Generally, the efficacy of the antimicrobial treatment in coliform mastitis has been questioned, as cure rates have been as high with or without antimicrobials or with drugs inefficient *in vitro* . Frequent milking with

oxytocin has often been recommended for treatment of coliform mastitis . This treatment has been reported to give equal or better results than treatment with antimicrobials. In serious *Escherichia coli* mastitis, with heavy growth of bacteria in the udder, use of systemic antimicrobial treatment may be beneficial

Intramammary route

The most common route of administration of antimicrobials in mastitis is the intramammary (IMM) route . The advantages of this route are high concentrations of antibiotics achieved in the milk compartment of the mammary gland and low consumption of the antimicrobial substances as the drug is administered straight to the infection site.

Disadvantages could be the uneven distribution of many substances throughout the udder, risk for contamination when infusing the drug via the teat canal, and possible irritation of the mammary tissue caused by the drug . In addition, some *in vitro* studies have shown that antibiotics may disturb phagocytosis when given IMM . Clinical relevance of this finding has not been shown. Numerous intramammary products seem to have appeared in the market without supportive scientific data on their efficacy. Although all mastitis tubes carry a label claim for staphylococcal mastitis, the cure rates can be negligible, especially in chronic infections.

Intramammary preparations with combinations of two or even three antibiotics were introduced to mastitis therapy due to suggested synergistic action and to cover all pathogens, Gram-negative bacteria included. The evidence of their efficacy against coliform mastitis is still lacking, and synergistic action was never proven *in vivo* . The idea of fixed combination tubes is outdated; they could be removed from the market, as they have shown no superiority over single components in controlled clinical trials . Broad-spectrum intramammaries such as 3rd or 4th generation cephalosporins are in some countries marketed for all mastitis treatment. This does not agree with prudent use guidelines and may enhance emergence of wide-spectrum beta-lactamase production among bacteria. These substances are less efficient than narrow-spectrum preparations against Gram-positive mastitis pathogens, as they are more targeted towards Gram-negative bacteria. In streptococcal mastitis (enterococci excluded) and mastitis due to penicillin-susceptible staphylococci, penicillin G should be the drug of first choice.

For administering the intramammary formulations, the following points are to be followed to avoid the further introduction of infection in to udder.

- The udder should be milked out completely and the teats and udder washed with warm water and a disinfectant. Care should be taken to avoid washing excess dirt down from the udder onto the teat ends.
- The area should be dried thoroughly and each teat wiped with a separate cotton ball soaked with an antiseptic such as 70% isopropyl alcohol.
- Persons performing the treatment should wash and dry their hands before each treatment.
- The tip of the syringe should be inserted into the teat end as little as possible and the contents of the syringe should be injected into each streak canal while the teat is held

firmly. The medication should then be gently massaged up the teat canal into the udder.

Parenteral route

It is difficult to achieve and maintain therapeutic concentrations in milk or udder tissue via systemic administration of antimicrobials in ruminants as they eliminate xenobiotics very fast and half-lives of many antibiotics are short . Intravenous administration would in general produce higher concentrations in milk, but it is often unpractical in field conditions, and not possible for preparations in oily vehicles. The slowly absorbed antibiotic preparations for intramuscular use are the worst choice in mastitis, because they do not generally produce therapeutic concentrations in milk or tissues . One additional problem is that dosage recommendations of many antibiotic preparations for adult cattle are too low with regard to the MIC of the target bacteria. Repeated intramuscular injections of large volumes of antibiotics are not ideal from the animal welfare point of view.

There are very few substances, which from both the PK and PD point of view, would be ideal for systemic mastitis treatment. Even if the drug has ideal characteristics in theory, the treatment results from clinical trials may still be disappointing, as in the case of fluoroquinolones, oxytetracycline cephlaosporins or florfenicol. Many broad-spectrum antibiotics, such as oxytetracycline and ceftiofur, have been tested for systemic mastitis treatment or prevention with no effect At least in the latter case, the PK is not suitable for mastitis treatment. Macrolides, which are narrow spectrum drugs with activity against Gram-positive bacteria only, are bacteriostatic and strongly interfere with their activity. Good penetration into cells does guarantee intracellular killing of bacteria. These may be the reasons for the reported poor efficacy of macrolides in mastitis treatment.

One of the most commonly used drugs for systemic treatment is penicillin G, but as a weak acid it penetrates poorly into the mammary gland . However, as the MIC values of susceptible organisms are low, efficient concentrations can be achieved and maintained in milk using reasonable dosing regimens. Milk does not interfere with the activity of penicillin G . Penethamate is a more liphophilic penicillin G formulation and diffuses better than penicillin G procaine into milk .

A novel approach has been to apply parenteral (systemic) administration as an adjunct to intramammary therapy. Systemic use of antimicrobials has been successful for increasing cure rates for chronic *S. aureus* intramammary infections in dry cows and lactating cows. Antimicrobials such as fluorquinolones, macrolides, and tetracyclines which were selected as good pharmacokinetic candidates because of good volume of distribution (lipophilic), relatively long half-life, and high bioavailability (low serum protein binding). Because of a high degree of resistance to antimicrobials in commercial intramammary products, systemic antimicrobial therapy for the treatment of acute Gram-negative mastitis has been attempted.

Antimicrobial agents : Currently approved antimicrobials for bovine mastitis treatment include pirlimycin, hetacillin, cloxacillin, amoxicillin, novobiocin, penicillin G, dihydrostreptomycin, cephapirin, erythromycin, novobiocin, and sulfamethazine (nonlactating dairy cows only) preparations. Other agents

used on extralabel use are fluoroquinolones, aminopenicillins, cephalosporins, chloramphenicol, tetracyclines, aminoglycosides and other macrolides.

Macrolides, florfenicol, oxytetracycline, some fluoroquinolones and rifampin have good distribution in the udder following systemic administration. Trimethoprim has good distribution in udder, is rapidly inactivated by rumen microflora, even when given IV to adult cattle. Sulfa drugs, penicillin G, ampicillin, ticarcillin and cephalosporins have intermediate or limited distribution following systemic administration .Ceftiofur, aminoglycosides, spectinomycin, colistin and polymixin B have poor distribution in the udder on systemic use. The dosage of beta- lactam drugs, but not the aminoglycosides, may be greatly increased without the fear of toxicity to force a higher blood/mammary concentration gradient.

Cephapirin is a first -generation cephalosporin that has a wide spectrum of activity against gram-positive and gram-negative organisms. Cephapirin is more resistant to beta-lactamases than are the penicillins and is indicated (300mg/quarter, b.i.d) in the treatment of mastitis caused by susceptible bacteria, such as *Staphylococcus aureus* and *Streptococcus agalactiae*. However, cows with acute or peracute mastitis are often given other medications, such as systemic antibiotics and/or supportive therapy, concurrently with intramammary therapy.

Intramuscular administration of ceftiofur, a structural analog of cefotaxime, significantly reduces the bacteremia associated with coliform mastitis, though may not completely eliminate the udder infection. Cefquinome, 1 mg/kg,IM, treatment was significantly more efficacious compared to ampicillin, amoxicillin-clavulanic acid, tetracycline treatment. Tilmicosin, a macrolide closely related to tylosin, is a narrow spectrum (gram positive) antibiotic, administered intramammarily (300mg) is effective in staphylococcal and streptococcal infections. Pirlimycin, a lincosamide antibiotic, active only against gram positive bacteria, is effective in eliminating prepartum infections. Erythromycin is active primarily against gram positive bacteria, such as *Staphylococcus* and *Streptococcus* species, including penicillin resistant ones. Intramammary therapy (300mg/quarter,b.i.d. in lactating animals; 600mg/quarter, b.i.d in nonlactating animals)alone is indicated only in the treatment of subacute or subclinical mastitis manifested by mild changes in the milk or udder. Cows with acute or peracute mastitis, should be administered systemic antibiotics and supportive therapy.

Therapy strategies

It is well established that cows that have concurrent metabolic disease, inadequate nutrition, or that are subjugated to stress, including calving, are more likely to be affected by infectious agents. . Anti-oxidant supplementation in dietary rations improves anti-bacterial function of neutrophils and decreases incidence and severity of clinical mastitis . Thus, preventive measures to establish optimum cow immunity are desirable. However, cow immune response to even the best of preventive programs is highly variable. At the time of clinical mastitis treatment, our ability to manipulate immune function is limited, and learning to assess immune function, even on a crude scale may offer some insight to therapeutic success. This is based on the

premise that no antibiotic can clear an infection without a functional immune system and learning to read what a cow's defences are telling us may help in deciding our options or at least expectations. We need to support basic research that will allow us to gain recognition of cows with impaired immunity that pose a higher risk of unsuccessful therapy. Mammary quarters with infections of longer duration, that more consistently shed pathogens over time, and from cows that have multiple quarters with infections are a poorer therapeutic risk .These are somewhat crude predictors of therapeutic success, but suggest that we should explore genetic markers in dairy cattle that may allow us in the future to identify potentially immune impaired breeding lines as well as target our therapeutic efforts and expectations of treated animals.

Combination Therapy : The general lack of therapeutic success against clinical mastitis has prompted a re-evaluation of treatment strategies. Despite the availability of several antibiotics with good in vitro activity, cure rates are poor, suggesting that inadequate concentrations of active antibiotic are coming into contact with the infecting bacteria for sufficient time to be effective. Antibiotic concentrations exceeding the MIC in milk have been accepted to be effective therapeutic concentrations . The most effective therapeutic method for treating intramammary infections may be via systemic administration of antibiotic combined with intramammary infusion. Combination of multiple intramuscular injections with intramammary infusions over a three-day period result in highest tissue antibiotic concentrations.

Therapy of subacute clinical mastitis

Most cases of clinical mastitis fall into this category. The intensity of treatment is reduced in comparison to acute toxic mastitis. Intramammary infusion with an approved product for a minimum of three days, accompanied by frequent hand stripping to remove secretion and debris, is often adequate. Treatments should be continued until at least 24 hours after the disappearance of clinical symptoms. Otherwise, the infection may only be suppressed back to the subclinical level. A true cure, whereby all infecting microorganisms are eliminated from the affected quarter, occurs in only 10 to 50% of cases. The cure rate is dependent on how long the infection has been present, age of the cow, type of organism involved, and other factors.

Therapy of acute mastitis

Acute, or systemic, mastitis is most often caused by coliform and other Gram-negative organisms. However, numerous other pathogens including Gram-positive cocci and mycotic organisms can all result in severe mastitis. The case can be life threatening to the cow, and is often accompanied by marked production loss. If survival occurs, affected cows often perform poorly and may undergo premature culling. Supportive care in the case of coliform mastitis may be the most beneficial component of the therapeutic regimen . Typically, intramammary therapy to inhibit Gram-positive growth in addition to parenteral (systemic) antimicrobials that have broad spectrums of activity are administered. Although the drug may be available for distribution in the mammary gland, maintaining effective MIC can be more difficult due to increased resistance of many of these

organisms. Caution should be employed in extending therapy for cows that have demonstrated marked clinical improvement, especially for cases of coliform mastitis, as recovering cows affected by these organisms have cleared the infection, and generally do not need antimoicrobials to complete recovery. Unnecessary extension of therapy in these instances results in increased discarded milk expense for the dairy producer and risk of antimicrobials in marketed milk. In selecting antibiotics for use in treating such cases, one has to rely on previous experience in the herd and on clinical signs and environmental circumstances. The selection is made easier if milk samples are collected from all clinical cases before initiating therapy for culture in a laboratory to identify the microorganisms The treatment recommended for coliform mastitis can be as follows.

- Macrolides such as erythromycin and tilmicosin are not effective against coliform bacteria.. Penicillin, oxytetracycline(IV), ceftiofur, cephapirin and florfenicol offer some choices, although penicillin and ceftiofur do not penetrate udder tissue well. Ceftiofur sodium, a third generation cephalosporin, has been reported to have excellent activity against gram-negative pathogens, is approved for use in lactating dairy cattle, at the dose of 1 to 2.2 mg/kg/ 24 hr IM for 5 days. However, it is not approved, nor should it be used, for intramammary infusions due to potential problems with extended withdrawal periods of milk. Thus, the efficacy of systemic ceftiofur as a treatment of clinical mastitis remains unproven, and relies on the benefits gained from systemic use. Caution should be exercised in continuing antimicrobial therapy in cows with grossly abnormal milk, but with improved appetite, attitude, and milk production.
- Milking out the affected quarter every two to three hours. Oxytocin may be used to facilitate milk evacuation and remove toxic materials and debris. The recommendation of frequent striping of the affected quarter with the aid of oxytocin to enhance milk let-down. , is based on the fact that many mild cases of clinical mastitis are self-limiting and that the animals own defense mechanisms can successfully clear the infection. . However the oxytocin treated cows had more relapses and additional infections due to environmental streptococci.
- Choice of anti-inflammatory agents will depend on the severity of the disease. Currently only the corticosteriod drugs dexamethasone and isoflupredone are approved for use in lactating dairy cattle. Their use systemically or directly in the mammary gland may be indicated in initial treatment of acute coliform mastitis. Systemic effects of the drugs and potential consequences in pregnant animals (dexamethasone) must be considered before administration.
- Administer corticosteroids in peracute toxic cases, but it should be emphasized that these drugs should never be used in other mastitis cases. Aqueous dexamethasone sodium sulfate is preferred. A single dose one time treatment is recommended and high dose or continued treatment is contraindicated. They suppress the natural defense mechanisms of the cow and administration during the last three months of pregnancy may also induce premature calving, followed by retained placenta and infection of the

uterus. They do, however, aid in reducing swelling and pain and enhance the removal of toxic secretions as well as promote better diffusion of intramammary infusions

- Non-steroidal anti-inflammatory drugs (NSAIDS) such as flunixin meglumine, aspirin, phenylbutazone, and ketoprofen have also been used extensively to treat the signs of inflammation and endotoxemia. Their use in acute clinical mastitis is warranted to relieve the pain and swelling of infection., and they have been shown to return near normal appetites in affected cows. Flunixin meglumine is the logical drug of choice in most cases. It is approved for use in cattle as an adjunct treatment for pneumonia but not for use in lactating cattle.
- Fluid replacement is necessary for those animals showing signs of dehydration A severely affected cow may require 40 to 60 litres of fluid intravenously in the first 24 hr. Large volumes of balanced electrolyte solutions are administered intravenously (oral fluids are not absorbed in such cases.) 20 litres in the first one to two hours, and up to 60 litres over a 12-hour period. Although this is admittedly difficult and time consuming in a practical situation, convenient methods of fluid therapy administration should be developed. Commercial distilled water can be bought in large economical quantities and mixed with pre-weighed amounts of salt to provide the fluids needed. Alternatively,treatment with hypertonic(7.5%) saline solution (4ml/kg) will provide immediate expansion of extracellular fluid volume and temporarily counter some of the effects associated with endotoxemia. Cows should either voluntarily drink or be administered per os 5 to 10 gallons of water following hypersaline use.
- Additionally, caution should be exercised in administering hypersaline to cows with marked dehydration (diarrhoea, heat stress) or shock precipitated by causes other than endotoxin. The state of hydration of affected animals should be assessed several times daily.
- If the cow cannot stand, administering 150 to 250 grams of sodium bicarbonate with the first three to 5 liters of electrolyte solution and adding 500 mL of 50% glucose to the first few liters of electrolyte restores vital body fluids, dilutes toxins, and counteracts acidosis.
- Because of the likelihood of clinical or subclinical hypocalcemia and hypokalemia associated with acute coliform mastitis , it needs administration of calcium ; more safely administered subcutaneously or diluted in 5-10 litres of IV fluids or or orally and oral administration of potassium chloride in anorexic cattle.
- Dietary vitamin E and selenium reduce the severity and frequency of coliform mastitis . Thus, herd dietary selenium and vitamin E supplementation, particularly that for dry cows and heifers, should be reviewed periodically

Therapy of chronic mastitis

Many intramammary infections that are chronic or are observed as mild clinical cases offer a more voluntary approach to therapy. Elimination of infections can result in increased production and, in the case of contagious pathogens, remove the reservoir of infection for non-infected cows. However, many of these infections are of long duration, frequently recur

with mild clinical mastitis despite previous therapy, and can add substantial costs and risks associated with treatment. Given the slow onset of infection, identification of the pathogen should be performed before any extensive therapy is instituted. Drug distribution, although theoretically available in the mammary gland, may not be efficacious because of extensive fibrosis and micro-abscess formation in the gland.

In herds with a high prevalence of *S. aureus* infections, the emphasis should be placed on teat dipping, culling, milking machine maintenance, milking hygiene, and segregation of infected cows to gradually reduce prevalence of infection. Antibiotic treatment may reduce shedding of bacteria by clinical cows, and thus help reduce the spread, but it will not reduce overall prevalence in the herd

One of the newest identified problems on many well managed dairies is heifers calving with mastitis, which is a huge economic problem on many farms. Heifers can be dry treated 50 to 60 days with approved dry cow Therapy. The teats need to be sealed with an external or internal sealant after treatment. This approach works however, the danger to the person treating the heifers may outweigh the benefits. . Heifers can be treated 7 to 14 days prior to calving with one lactating tube per quarter. The quarters should not be stripped out prior to treatment. The teats should be sealed with an external teat sealant after treatment. This system has worked extremely well on most farms. Another management program that reduces new infections and calms heifers down significantly after calving is to run the heifers through the parlor once a day and dip their teats for approximately 7 days prior to calving. The dairies that are doing this are seeing much better performance results on these heifers.

Reasons for treatment failure:. Reasons for treatment failure include lack of contact between bacteria and antibiotics due to scar tissue formation, protection within leukocytes, poor drug diffusion, and inactivation by milk and tissue proteins; microbial resistance to antibiotics; development of bacterial L-forms; metabolically inactive organisms; and improper treatment procedures like stopping the therapy too soon. Infections are frequently refractory to intramammary therapy because of the inaccessibility of bacteria due to deep tissue lesions, swelling, and reduced patency of milk ducts. Studies have shown that distribution of infused antibiotics is poor in mastitic quarters because of the above host responses to infection. The frequent therapy failures during acute mastitis are due, in part, to poor or uneven distribution of the drug throughout the intensely swollen udder parenchyma in which the duct system is either compressed or blocked by inflammatory products

Non antibiotic approaches

Hypertonic saline (7.5%; 2 mL/ 45 kg BW,IV or 500 to 1000 mL, intramammarily) has been used in some cases(50-60% success rate), once after each milking for two to three days to alleviate clinical symptoms. *Lactobacillus* (probiotic) intramammary infusions have been tried with poor success rates (21%). Many herbal medicines have been also considered to be quite effective in treatment of mastitis.. The formulated herbal products with antibacterial, anti inflammatory, analgesic and immunostimulatory properties and plants which boost the mammary gland health have been

tried as mastitis therapeutic agents .Clay mixed with water or oil (pine or thyme oil), made in to a paste adhering to the udder, has proved efficient as poultice to treat inflammation caused by mastitis.

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Bovine Mastitis in India (contd) - hurdle in dairy development

Mastitis : Effects on Reproduction

Mastitis not only affects the mammary system, but also has deleterious effects on reproductive ability of the affected animal.

- Bacterial toxins released during mastitis stimulate the production of PGF2α which subsequently regresses developed CL during conception, thereby terminating the established pregnancy.
- Clinical mastitis, through its toxins induces hormonal alterations like decreased pulsatile secretion of LH, decreased ovulatory LH surge and decreased oestradiol production leading to decreased oestrus expression and ovulation failure.
- The probability of conception decreases by 44% when mastitis occurs the week before insemination, by 73% when mastitis occur during the week of insemination and by 52% when mastitis occurs the week after insemination.
- If the animal suffers from mastitis during pregnancy, the daughter born to this dam has been shown to have reduced reproductive efficiency.
- Mastitis in pregnant cows could decrease the number of healthy follicles in the developing foetus, reducing its future fertility.
- A reliable bio-marker for potential fertility, Anti-Mullerium Hormone, is severely decreased in the developing foetuses as the number of mastitis events during gestation of their dams increase.

Leptospirosis : A water-borne zoonotic disease of Global importance

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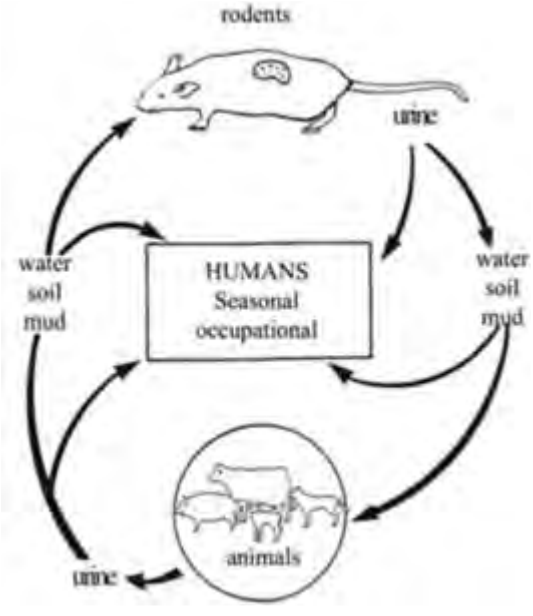
Introduction:

Leptospirosis also known as Cane-cutter's fever, Canicola fever, Haemorrhagic jaundice, Mud fever, Rice field fever, Swamp fever and Weil's disease is considered as one of the most common zoonotic diseases globally. It is reported among those participating in recreational water activities (Center for Disease Control and Prevention - CDC, 1998 and 2001) and sporadic cases are also often diagnosed with the onset of warm temperatures, increased outdoor activities, and travel (Pal, 1997).

Etio-Pathology:

Leptospirosis is a zoonosis caused by infection with the bacterium *Leptospira interrogans.* The disease occurs worldwide, but it is most common in temperate regions in the late summer and early fall and in tropical regions during rainy seasons. It is not surprising that Hawaii has the highest incidence of leptospirosis in the United States (Levett, 2005). The reservoir of pathogenic leptospires is the renal tubules of wild and domestic animals. Leptospires are usually shed in the urine of infected animals for about a month after infection. However, following acute illness, leptospiruria in infected animals can last for months to years. Infection in humans occurs following exposure to contaminated water sources or the urine or tissue of infected animals (Heymann, 2004).



Human infection occurs through exposure to Leptospira spp. via cuts and scrapes, passage across the conjunctiva and mucous membranes. Inhalation of microscopic droplets or passage across the mucous membranes in the mouth and gut via ingestion are other possible, though less likely, routes of exposure to leptospires (Levett, 2005).

Human disease caused by Leptospira spp. can be an occupational hazard for veterinarians, those working in animal husbandry or meat processing, wastewater treatment employees, and military troops (Heymann, 2004). In recreational settings, leptospirosis is a hazard

for those who come into direct contact with contaminated water such as travelers to tropical countries (e.g., ecotourism), campers, hikers, swimmers, and hunters (Levett, 2005; Heymann, 2004).

Leptospirosis has been recently classified as emerging water borne disease (Bharti and Nally, 2003). Leptospirosis is commonly diagnosed in animals including cattle, pigs, and dogs. Human infections are caused by *L. interrogans*, of which there are over 200 known pathogenic serovars (Levett, 2005). For most serovars, the epidemiology is poorly understood, as there are more serovars than known animal reservoir species, but certain serovars have been linked strongly to specific animal reservoirs. A few of the more common serovar-reservoir relationships are *L. interrogans* serovars *pomona* (swine), *bratislava* (swine), *canicola* (dogs), *bovis* (cattle), *autumnalis* (raccoons), and *icterohemorrhagiae* and *copenhageni* (rats) (Heymann, 2004).

Symptoms

In humans, the incubation period of leptospirosis ranges from 2 to 21 days with a mean of 10 days. Leptospira infections can be asymptomatic or symptomatic depending on host susceptibility and the serovar involved (Cachy and Vintez, 2005). Of the symptomatic illnesses, 90% are self-limited, flu-like illnesses, but 5-10% of infections can result in multi-organ damage, including liver failure, renal failure, and hemorrhagic pneumonitis. Men seem to be more likely to manifest severe disease than women (Cachy and Vintez, 2005). Mortality among those with severe disease can range from 5% to 25%.

Phase 1 and Phase 2 Leptospirosis

Leptospiral infections consist of two phases: septicemic and immune phases. The septicemic phase lasts for five to seven days, followed by a temporary decline in fever. The immune phase, consisting of more severe symptoms, lasts for four to thirty days. Because of the flu-like nature of symptoms during the septicemic phase, many patients may not seek healthcare unless the more severe signs of the immune phase become evident.

The most common symptoms of the septicemic phase (Phase 1) are high remittent fever, headache, chills and rigors, myalgia, particularly in calves and lumbar back, conjunctival suffusion, abdominal pain, anorexia, nausea, vomiting, diarrhoea, cough etc. The less common symptoms of the septicemic phase are lymphadenopathy, spleenomegaly and hepatomegaly.

The common symptoms of the immune phase (Phase 2) include Weil's syndrome (symptoms include but not limited to fever, hepatic and renal failure, jaundice, and pulmonary hemorrhage), cardiac arrhythmias, aseptic meningitis, conjunctival suffusion, photophobia, eye pain, muscle tenderness, adenopathy, hepatosplenomegaly etc. Death is more common in the immune phase and generally results from renal failure, cardiopulmonary failure, or widespread hemorrhage (Heymann, 2004; Levett, 2005).

Diagnosis

- Depends on clinical signs and history of patient (hepatitis and nephritis)
- Detecting serum antibodies against leptospira

- Microscopic Agglutination Titers (MAT)
- Paired sera samples which show a four-fold rise in titer confirm the diagnosis; single high titer in a person clinically suspected to have leptospirosis is highly suggestive.
- Antigens from different leptospiral serogroups are reacted with each sample of serum and inspected using dark field microscopy for agglutination.
- Direct detection of leptospires in clinical specimens with Giemsa, Silver impregnation and immunoperoxidase techniques.
- DNA hybridization: Confirmed diagnosis requires a 4-fold rise in titer to one or more serovars (Levett, 2004).
- IgM Enzyme Linked Immunosorbent Assay (ELISA): Acute and recently infected individuals are identified with this test by the presence of specific IgM antibodies (Ooteman et al., 2006; Bajani, 2003).
- Use of Lepto Dipstick: A simple dipstick method that rapidly detects leptospira-specific IgM antibodies in human serum or whole blood samples (KIT Biomedical Research, 2000).
- By Isolating leptospires:

  1. From the blood within the first 7 days of an acute infection
  2. From cerebrospinal fluid between the 4th and 10th day of an infection
  3. From urine after the 10th day (Heymann, 2004).

Treatment

Antibiotic treatment early in the illness may shorten the duration of fever and hospitalization. However, health care is often not sought until the immune phase of the disease and antibiotic therapy at this stage is somewhat controversial because of uncertain benefits of antimicrobial therapy given in the immune phase of the illness (Guidugli et al., 2006). For severe cases, penicillin is the preferred drug. For allergic patients or less severe cases, doxycycline, ampicillin or erythromycin can be given (Heymann, 2004). Kidney failure patient may be kept on renal dialysis (Pal, 1997).

Control

- Prevention of environmental contamination by animal excreta.
- Rodent control in human habitation and agriculture fields.
- Provision of protective clothings to occupational workers.
- Mechanization of agriculture.
- Personal hygiene and avoiding swimming in contaminated water.
- Disinfection of swimming pool with chlorine and agriculture field with copper sulphate.
- Regular immunization / vaccination of animals.
- Infected bulls should not be used for breeding purpose.
- Maintenance of hygienic conditions in animal sheds, pens etc.
- Thorough disinfection of animals premises.
- Health education to various occupational groups about the source of infection, mode of transmission and environmental hygiene.

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Bovine Mastitis in India (contd) - hurdle in dairy development

Mastitis : Zoonotic considerations

Mastitis is a problem not only of milch animal health or economic loss to the animal owner, but also of public health importance. It represents the inflammation of mammary gland parenchyma due to presence of bacteria and their toxins in the udder tissue. The bacterial contaminated milk from affected cows renders it unfit for human consumption and provides a mechanism for the spread of diseases like sore throat, tuberculosis, Q fever, brucellosis and leptospirosis. Thus, mastitis has a zoonotic importance also and therefore needs immediate attention when observed in a milking animal.

Kyasanur Forest Disease- a threat in Karnataka

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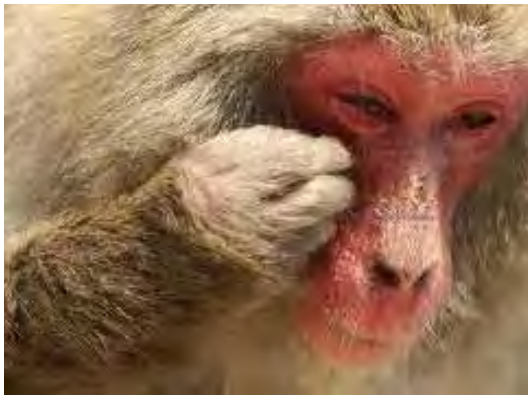
Introduction:

Kyasanur Forest Disease (KFD) also referred to as monkey fever is an infectious bleeding disease in monkey and human, caused by a highly pathogenic virus called KFD virus (KFDV). KFDV is of zoonotic origin (originating from animals), belongs to family Flaviviridae and it is transmitted primarily by infective tick, *Haemaphysalis spinigera*. KFDV is an enveloped spherical virion particle and the genome is made of single-stranded, positive sense RNA (Banerjee, 1988). KFDV is ranked as a high risk category pathogen requiring Biosafety Level-4 handling.

Semnopithecus entellus (langur)

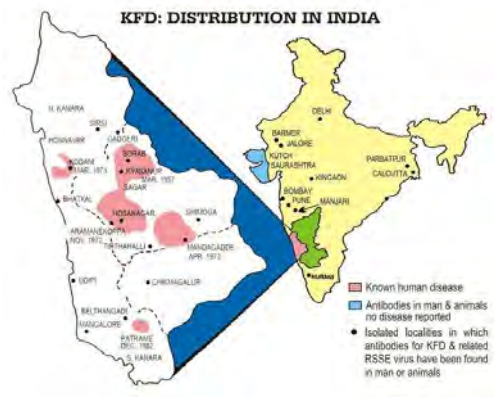
Epidemiology:

KFDV is enzootic to India and maintained in ticks, mammals, and birds. It causes severe febrile illness in humans and was first recognized in 1957 in the Kyasanur Forest of



Macaca radiata (bonnet monkey)

Shimoga District, Karnataka State, India (Upadhyaya et al., 1975). The virus has been isolated from naturally infected *Semnopithecus entellus* (langur), *Macaca radiata* (bonnet monkey), *Rattus blanfordi, Rattus rattus wroughtani* (rat), *Suncus murinus* (shrew) and a bat *Rhinolophus rouxi*. Neutralizing antibodies have been found in cattle, buffaloes, goats, wild boars, porcupines, squirrels, rats, mice and a number of bird species. The first epidemic season of KFD in human was observed in Jan - May, 1956 when four villages were affected. In 1957, KFD spread to more than 20 villages and



by 2003 it had affected more than 70 villages in four districts adjacent to Shimoga in Western Karnataka. KFD infection and death rate in human are varying. Approximately 400-500 of annual KFD cases for certain large epidemic years with a 3 – 5% of fatality rate are identified (Pattnaik, 2006).

Transmission:

Large species of animals are thought to be reservoir hosts for the disease. Rodents, shrews, monkeys and birds upon tick bite become reservoir for this virus. The vector for disease transmission is *Haemaphysalis spinigera*, a forest tick (Varma, 2001). Humans get infection from the bite of nymphs of the tick. Human is the dead end in the natural cycle of the virus.

Deforestation, subsequent cattle grazing in those areas and the low susceptibility of cattle for KFDV lead to conclude that cattle is the large mammal reservoir for vector maintenance and propagation. It has been observed that around 50% of those affected by KFD were cattle tenders. However, KFD is not directly transmitted by human-human contact.

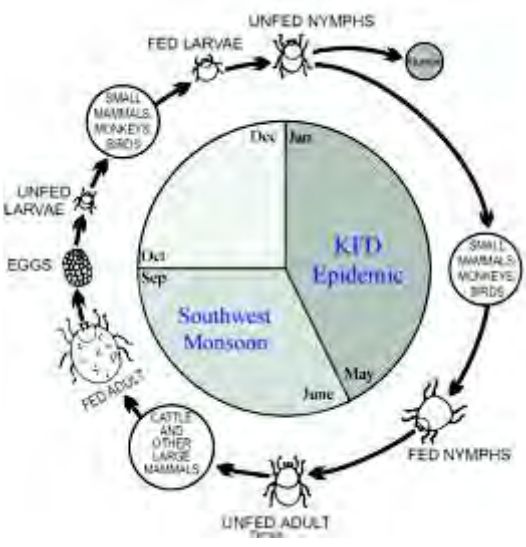
Tick-Haemaphysalis spinigera

Clinical Symptoms:

In monkeys: KFDV infection causes severe febrile illness in some monkeys. When infected monkeys die, ticks drop from the body, thereby generating hot spots of infectious ticks that further spread the virus. In the enzootic areas, KFDV circulates through small mammals (e.g., rodents, shrews, ground birds) and ticks. In natural infections, large numbers of monkeys are found dead, some with anal haemorrhages (Pavri, 1989).

In experimental infections: Monkeys inoculated with KFD virus developed biphasic illness, erythrocytopenia, leukocytopenia, thrombocytopenia followed by encephalitic symptoms, epistaxis, diarrhea, bradycardia and hypotension. Those monkeys with bradycardia and hypotension died. The symptoms of the disease included a high fever followed by hemorrhagic symptoms, such as bleeding from the nasal cavity, throat, and gums, as well as gastrointestinal bleeding.

In Humans, cases were found among persons



Life cycle of Haemaphysalis spinigera in spreading of disease

who visited forests to collect firewood, grass, other forest products and cattle grazers.

Clinically, Human disease is characterized by an incubation period of 3–8 days, followed by sudden chills, high fever, frontal headache, heightened sensitivity to light and continuous fever for 12 days or longer often associated with diarrhea, vomiting, cough, severe pain in the neck, low back and extremities, accompanied by severe prostration. Papulo-vesicular eruption on the soft palate (blisters on the upper, inner mouth) is an important diagnostic sign in some patients. Bleeding signs such as in the gum, nose (epistasis), cough (hemoptysis), gastrointestinal bleeding resulting in dark feces (melena), and fresh blood in the stools are common. The convalescent phase constituting the recovery after KFD's onset is generally prolonged, maybe up to 4 weeks. Relapse of the symptoms, often observed after 1 to 2 weeks of the first febrile period, last for 2 to 12 days and a case-fatality rate ≥30%. During infection by KFDV, virus titer remains high for 10 days after onset of symptoms, as reported by Bhat et al. (1991). However, Upadhyaya et al. (1975) found that viremia in patients lasted for 12–13 days of illness and unlike most other flavi viruses, remains high during the first 3–6 days. Leucopenia and accompanying thrombocytopenia are constant hematological features in KFD. Intra-alveolar haemorrhage, resulting into secondary infection and massive gastrointestinal haemorrhages are terminal complications that could lead to death (Devendra et al., 2013).

Post mortem findings

In monkeys, gross findings are blood clots in the anus, haemorrhage in lungs, moderate swelling and pallor of the renal cortex in kidneys, brain, and adrenals. Non purulent encephalitis with focal microgliosis, perivascular cuffings are the common lesions in brain. Anal haemorrhage, pallor of the adrenal cortex, focal liver necrosis with cytoplasmic inclusion bodies, necrosis in small and large intestines are common (Adhikari et al., 1993). Histologically, the liver shows focal hepatocellular degeneration, fatty changes, necrosis, degenerative changes in central and midzonal cells, including vacuoles and pigments with the presence of eosinophil cyto-plasmic inclusions. In the kidneys, there were marked degenerative changes in the tubules. Pulmonary hemorrhage, depletion of malpighian follicles, sinus histiocytosis, erythrophagocytosis, mild myocarditis, and encephalitis are the prominent lesions. Phagocytosis of nuclear material and red blood cells are present in the peripheral blood. An increase in nuclear debris is seen also in the lymph glands of some infected monkeys. In humans, gross findings are pallor of the liver, kidneys, brain, and adrenals with degenerative changes in liver, kidney with mild myocarditis

and encephalitis (Pattnaik, 2006).

Diagnosis

Diagnosis is primarily syndromic and serological. Being a very stable virus in the blood, the diagnosis is made by virus isolation from blood or by serologic testing using ELISA, (Mourya et al., 2012). Others urological tests include haemagglutination inhibition, complement fixation and neutralization tests and mass tag PCR.

Treatment:

There is no specific treatment for KFD, but supportive therapy is important. Supportive therapy, includes analgesics and antipyretics, intravenous fluids for those with hypotension, blood transfusion or fresh-frozen plasma and platelets for those with haemorrhagic symptoms, antibiotics for bronchopneumonia, and corticosteroids and anticonvulsants for neurological symptoms (Shellaberger, 1991). A formalin inactivated KFDV vaccine produced in chick embryo fibroblasts has been licensed and is currently in use in the endemic areas in Karnataka state of India and shows effective protection (Gudadappa et al., 2013).

Prevention and control

A timely supportive therapy, such as careful precautions for patients with bleeding disorder and maintenance of hydration is important and reduces KFD mortality in human. Prophylaxis by vaccination, as well as preventive measures like protective clothing, tick control, and mosquito control are advised. An attenuated live vaccine is now available.

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Anthrax: a dreadful zoonotic disease of public health importance

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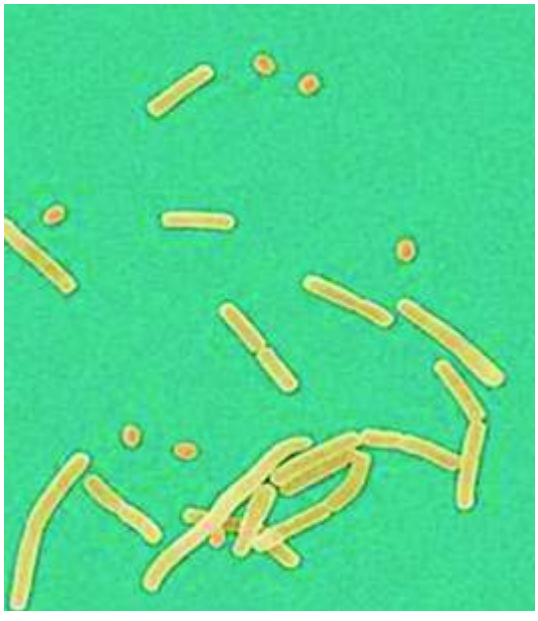


Introduction:

Anthrax, also called Splenic fever, Siberian ulcer, is a deadly zoonotic disease caused by the spore forming bacterium *Bacillus anthracis*, and has been known since antiquity. Naturally occurring anthrax in humans is acquired from contact with anthrax-infected animals or anthrax-contaminated animal products, which allow one to distinguish agricultural anthrax, a most significant problem in developing countries especially among veterinarians, agricultural workers and butchers, and industrial anthrax, resulting from exposure to contaminated sheep wool or goat hair that are processed into yarns used in the textile and carpet industry, as well as cattle hides that are processed into leather goods, or bones used for the manufacture of gelatin and/or fertilizer (Brachman et al., 2008).

Occurrence:

Anthrax is most common in wild and domestic herbivores (eg. cattle, sheep, goats, camels, antelopes) but can also be seen in humans exposed to tissue from infected animals, contaminated animal products or directly to B. anthracis spores under certain conditions. Depending on the route of infection, host factors, and potentially strain-specific factors, anthrax can have several different clinical presentations. In ruminants, anthrax commonly presents as an acute septicemia with a high fatality rate, often accompanied by hemorrhagic lymphadenitis. In dogs, humans, horses, and pigs, it is usually less acute. *B. anthracis* spores can remain infective in soil for many years. Grazing animals may become infected when they ingest sufficient quantities of these spores from the soil. In addition to direct transmission, biting flies may mechanically transmit *B. anthracis* spores from one animal to another. Feed contaminated with bone or other meal from infected animals can serve as a source of infection for livestock, as can hay that is heavily contaminated with infected

soil. Raw or poorly cooked contaminated meat is a source of infection for carnivores and omnivores; anthrax resulting from contaminated meat consumption has been reported in pigs, dogs, cats, mink, wild carnivores, and humans.

Bacteriology

B. anthracis, the agent of anthrax, is a large gram-positive, spore-forming, nonmotile bacillus. In tissues, the bacteria are encapsulated and appear singly or in short chains of a few bacilli. The spores are extremely resistant in the environment and may survive for decades in certain soil conditions. They eventually are ingested by cattle or wild animals such as deer when grazing on contaminated land (Fasanella et al., 2007).

The Worldwide Spread of Anthrax

Although only a few people have gotten sick from anthrax in the last several years worldwide, countries all around the world are investing huge amounts of money to find a cure and treatment for the disease. The reason for this is the bioterrorist threat that is imposed by the anthrax. When used as a terrorist weapon, two forms of the disease occur: Cutaneous (through the skin) and inhalation. Inhalation anthrax is a fatal disease and results in a 95% death rate without treatment. An estimated 2,000 to 20,000 human cases of anthrax occur globally each year: A major outbreak involving nearly 10,000 cases (most of them cutaneous infections) occurred in Zimbabwe during the late 1970s and early 1980s (Passalacqua and Bergman, 2006).

Clinical Forms and Findings:

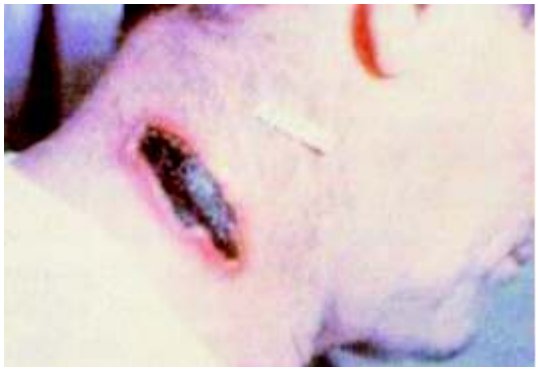
Typically, the incubation period is 3-7 days (range 1-14 days). The clinical course ranges from peracute to chronic. The peracute form (common in cattle and sheep) is characterized by sudden onset and a rapidly fatal course. Staggering, dyspnea, trembling, collapse, a few convulsive movements, and death may occur in cattle, sheep, or goats with only a brief evidence of illness. In acute anthrax of cattle and sheep, there is an abrupt fever and a period of excitement followed by depression, stupor, respiratory or cardiac distress, staggering, convulsions, and death. Often, the course of disease is so rapid that illness is not observed and animals are found dead. The body temperature may reach 107°F (41.5°C), rumination ceases, milk production is materially reduced, and pregnant animals may abort. There may be bloody discharges from the natural body openings. Death usually occurs within 2-3 days of onset. Pigs show systemic signs of illness and gradually recover with treatment. Some later show evidence of anthrax infection in the cervical lymph nodes and tonsils when slaughtered as apparently healthy animals. Intestinal involvement is seldom recognized and has nonspecific clinical characteristics of anorexia, vomiting, diarrhea (sometimes bloody), or constipation. Bacilli shed by the dying or dead animal will sporulate on contact with air. Sporulation requires the presence of free oxygen, and the efficiency of the process is influenced by the environmental conditions.

Anthrax infection in humans occurs by three major routes, the skin, the respiratory tract or the gastro-intestinal tract, generating three

different primary forms of the disease, the cutaneous, the inhalational and the gastro-intestinal forms (Acharya and Panda, 2006).

(a) Cutaneous Anthrax

The cutaneous (skin) form of anthrax starts as a red-brown raised spot that enlarges with considerable redness around it, blistering, and hardening. The center of the spot then shows an ulcer crater with blood-tinged drainage and the formation of a black crust called an eschar.



Deaths may occur if patients do not receive appropriate antibiotics.

(b) Inhalation Anthrax

The first symptoms are subtle, gradual and flu-like (influenza). Shock, coma, and death follow. Inhalation anthrax does not cause a true pneumonia. In fact, the spores get picked in the lungs up by scavenger cells called macrophages. Unfortunately, some survive and are transported to glands in the chest lymph nodes. In the lymph nodes, the spores that survive multiply, produce deadly toxins, and spread throughout the body. Severe hemorrhage and tissue death (necrosis) occurs in these lymph nodes in the chest. Inhalation anthrax is a very serious disease, and unfortunately, most affected individuals die even if they get appropriate antibiotics because the antibiotics

There are swollen glands (lymph nodes) in the area. Symptoms include muscle aches and pain, headache, fever, nausea, and vomiting. Oedema and erythema often develop around the lesion.

The vesicle eventually ruptures, revealing a depressed ulcer crater that develops into a black eschar. The case fatality rate of cutaneous anthrax usually is about 20% if untreated. The illness usually resolves in about six weeks, but

are effective in killing the bacteria, but they do not destroy the deadly toxins that have already been released by the anthrax bacteria. Inhalational anthrax presents within one to five days with nonspecific symptoms, fatigue, myalgia and slight fever, which are followed by a sudden severe respiratory distress with dyspnea, cyanosis, and stridor leading to a lethal shock syndrome associated with pulmonary haemorrhage and mediastinal edema.

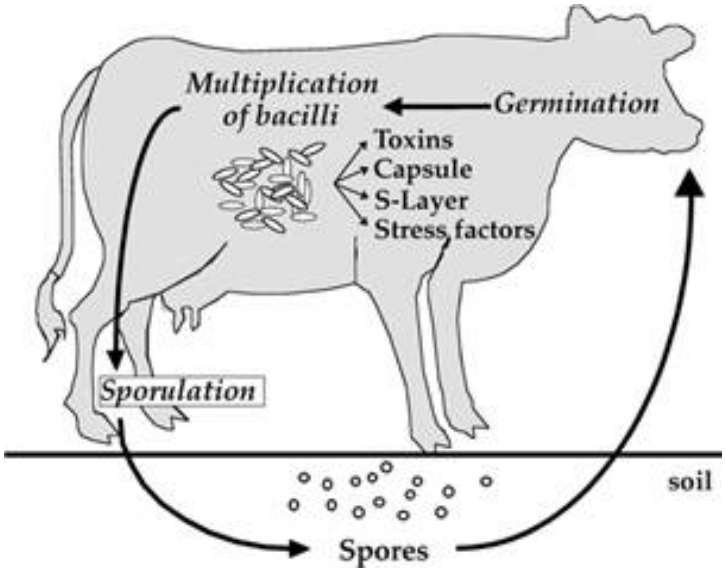
(c) Gastrointestinal Anthrax

Anthrax of the bowels (gastrointestinal anthrax) is the result of eating undercooked, contaminated meat. It develops within 2 to 5 days following ingestion of contaminated meat with nausea, vomiting, fever, abdominal pain and diarrhoea, eventually leading to toxemia, shock and death in 25% to 75% of cases (Dixon

et al., 1999; Schwartz, 2001).

Epidemiology:

The anthrax has been reported from nearly every continent and is most common in agricultural regions with neutral or alkaline, calcareous soils. In these regions, anthrax periodically emerges as epizootics among susceptible domestic and wild animals. These epizootics are usually associated with drought, flooding, or soil disturbance, and many years may pass between outbreaks. During inter-epidemic periods, sporadic cases may help maintain soil contamination. Human cases may follow contact with contaminated animals or animal products. The risk of human disease in these settings is comparatively small in developed countries, partly because humans are relatively resistant to infection and less likely to be exposed to virulent spores. However, in Africa each affected cow can result in up to 10 human cases for a variety of cultural, economic, and epidemiologic reasons. In cases of natural transmission, humans exhibit primarily cutaneous disease (>95% of all cases). GI anthrax (including pharyngeal anthrax) may be seen among human populations following consumption of contaminated raw or undercooked meat. Under certain artificial conditions (eg, laboratories, animal hair processing facilities, exposure to weaponized spore products), humans may develop a highly fatal form of disease known as inhalational anthrax or woolsorter's disease. Inhalational anthrax is an acute hemorrhagic lymphadenitis of the mediastinal lymph nodes, often accompanied by hemorrhagic pleural effusions, severe septicemia, meningitis, and a high mortality rate. In addition to causing naturally

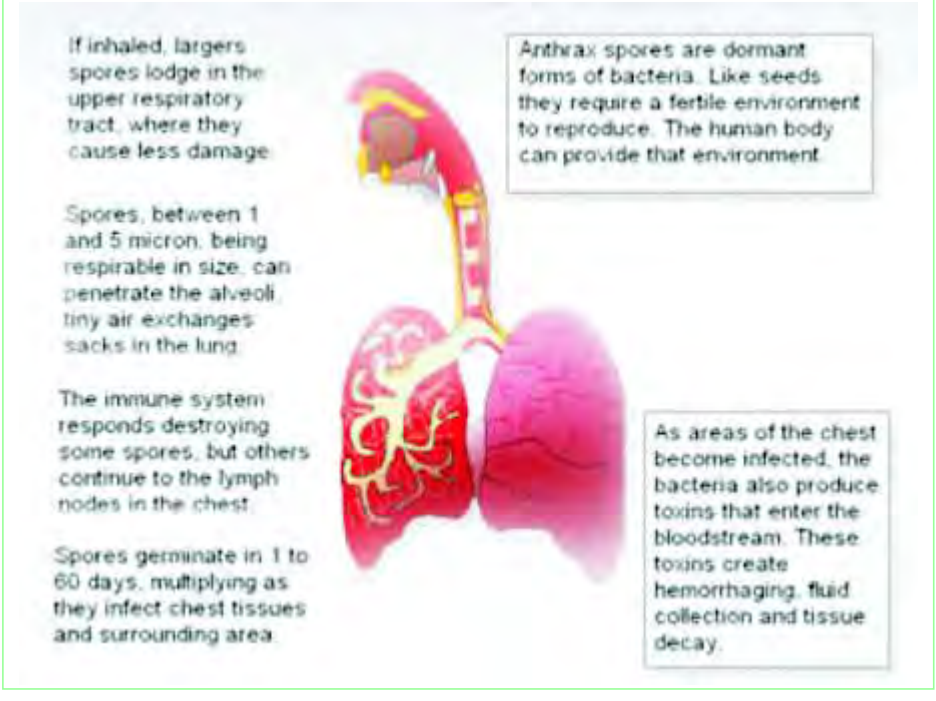


occurring anthrax, *B. anthracis* has been manufactured as a biologic warfare agent.

Probably due to the method of delivery (via mail), no known animal disease resulted from this attack. Historically, *B. anthracis* was selected for production as a weapon because of its respiratory route of infection, the high mortality of inhalational anthrax, and the greater stability of *B. anthracis* spores compared with other potential biologic warfare agents. Weaponized spores represent a threat to both human and animal populations. The effect on animal populations has not been estimated, but because livestock are more susceptible to *B. anthracis* infection than primates, the outcome of an attack with *B. anthracis* spores against livestock would result in higher and earlier mortality and morbidity rates than among a human population. Thus, livestock could serve as sentinels for a bioterrorism event (Acharya and Panda, 2006).

Pathogenesis:

Bacillus anthracis spores have a high affinity for macrophages. After wound inoculation, ingestion, or inhalation, spores infect macrophages, germinate, and proliferate. In cutaneous and GI infection, proliferation can occur at the site of infection and the lymph nodes draining the site of infection. Lethal toxin and edema toxin are produced by *B. anthracis* and respectively cause local necrosis and extensive edema, which is a frequent characteristic of the disease. As the bacteria multiply in the lymph nodes, toxemia progresses and bacteremia may ensue. With the increase in toxin production, the potential for disseminated tissue destruction and organ failure increases.



After vegetative bacilli are discharged from an animal following death (by carcass bloating, scavengers, or postmortem examination), the oxygen content of air induces sporulation. Spores are relatively resistant to extremes of temperature, chemical disinfection, and desiccation.

Necropsy is discouraged because of the potential for vegetative cells to be exposed to air, resulting in large numbers of spores being produced. Because of the rapid pH change following death and decomposition, vegetative cells in an unopened carcass quickly die without sporulating.

Diagnosis:

The history, including the occupation of the person, is important. The bacteria may be found in cultures or smears in cutaneous (skin) anthrax and in throat swabs and sputum in pulmonary anthrax. Chest X-rays may also show characteristic changes in and between the lungs. Once the anthrax is disseminated, bacteria can be seen in the blood using a microscope.

Specific diagnostic tests include bacterial culture, PCR tests, and fluorescent antibody stains to demonstrate the agent in blood films or tissues. Western blot and ELISA tests for antibody detection are available in some reference laboratories. Lacking other tests, fixed blood smears stained with Loeffler's or MacFadean stains can be used and the capsule visualized; however, it can result in some 20% false positives.

In livestock, anthrax must be differentiated from other conditions that cause sudden death. In cattle and sheep, clostridial infections, bloat, and lightning strike may be confused with anthrax. Also, acute leptospirosis, bacillary hemoglobinuria, anaplasmosis, and acute poisonings by bracken fern, sweet clover, and lead must be considered in cattle. In horses, acute infectious anemia, purpura, colic, lead poisoning, lightning strike, and sunstroke may resemble anthrax. In pigs, acute classical swine fever, African swine fever, and pharyngeal malignant edema are diagnostic considerations. In dogs, acute systemic infections and pharyngeal swellings due to other causes must be considered (Acharya and Panda, 2006).

Treatment and Prevention/Vaccination:

The cutaneous (skin) form of anthrax can be treated with common antibiotics such as penicillin, tetracycline, erythromycin, and ciprofloxacin. The pulmonary form of anthrax is a medical emergency. Early and continuous intravenous therapy with antibiotics may be life saving. In a bioterrorism attack, individuals exposed to anthrax are given antibiotics before they become sick (Passalacqua and Bergman, 2006).

Anthrax vaccines are available for both animals and humans. However, in humans, their use has been confined to high-risk groups such as occupationally exposed workers and military personnel (Wright alum treated vaccine). The human anthrax vaccine licensed in the USA is made from cell-free filtrates of bacterial cultures of an unencapsulated, nonvirulent strain of *B. anthracis* adsorbed to aluminium hydroxide (Anthrax Vaccine Adsorbed/BioThrax, Emergent BioSolutions Inc). To develop and maintain protective immunity in humans, these vaccines must be administered subcutaneously six times over 18 months, followed by yearly booster

injections.

An attenuated anthrax spore vaccine for livestock is available and is used annually only in areas where anthrax is a common livestock disease. Animals suspected of dying from anthrax should be examined by a veterinarian immediately. Animals that have died of anthrax should never be cut-open/post-mortemed, but be burned or buried deeply and covered with lime. The area should be thoroughly decontaminated with lime, as anthrax spores can survive in the soil for decades. Anthrax is prevented by avoiding contact with animals that are suspected to have anthrax (Brey, 2005).

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Bovine Mastitis in India (contd.) - hurdle in dairy development

Mastitis : Importance of Somatic Cell Count

Presence of somatic cells in the milk beyond certain numbers (above 100,000 cells/ml of milk) indicates the arrival of leucocytes in large number in udder tissue to combat the bacterial invasion. Somatic Cell Count is, therefore, used as a useful indicator of initial bacterial invasion as in sub-clinical mastitis. Somatic cells are basically milk secreting epithelial cells those have been shed from the lining of the secretory tissue and few leucocytes. Entry of infection changes the composition and number of somatic cells, making it 75% leucocytes (neutrophiles, macrophages, lymphocytes and erythrocytes) and 25% epithelial cells.

Somatic Cell Count above 200,000 cells/ml suggest the possibility of future infection, above 500,000 cells/ml indicates sub-clinical mastitis and above 1000,000 cells/ml is an alarming situation.

Control of Bovine Brucellosis in an organized dairy herd with an effective vaccination program

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Manchar
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Introduction

Brucellosis is highly contagious, zoonotic and economically important disease of livestock worldwide, caused by the bacterium *Brucella abortus*. Active surveillance program for the last 20 years revealed that 9.3% positive reactors were found out of 13,396 cattle tested both in the organized as well as unorganized dairy herds throughout the country (Kollannur et al., 2007). In India, screening of cattle and buffalo serum samples collected from various states (1994-2001) revealed that the disease is highly prevalent in Delhi followed by Andaman, West Bengal, Tamilnadu, Kerala, Gujarat, Maharashtra and Punjab. The seroprevalence studies carried out annually show increasing trend of the disease. The prevalence rate has increased from 34.15% of the samples in 2006-07 to 67.28% in the year 2010-2011 (PD_ADMAS Vision 2030). Principal signs of the disease in cattle and buffaloes are reproductive failure such as abortions (in the third trimester of pregnancy) in females and orchitis with sterility in males (Radostits et al., 2004). Other manifestations of the disease include still-births, reduced milk yield, high frequency of retained placenta and prolonged calving interval. Brucellosis is reported to cause abortion, retention of placenta, repeat breeding, infertility and prolonged inter-calving period due to early embryonic deaths (Roberts 1999).

Mostly the organized dairy farms suffer heavy losses due to the brucellosis every year. These losses are due to poor management practices and irregular preventive vaccination schemes against the brucellosis at the farm. The incidents of abortions, retention of placenta (ROP), metritis, repeat breeding etc in cattle farm and systematic vaccination practices followed over the period of last two years was evaluated to assess the effectiveness of vaccination and status of brucella related clinical signs in the herd.

Materials and Methods

The Dairy farm is professionally managed and farm practices are one of the best in India. In house breeding practice and calf management at farm ensures good health of calf and uniformity in heifer population. Brucella vaccine, Brucella abortus Strain 19 Vaccine, Live, from Intervet India Pvt Ltd, Pune (MSD Animal Health) was used in the farm. Vaccination dose of 2-ml (equivalent to $40x10^9$ CFU) was inoculated by subcutaneous injection following the recommended safety precautions. This vaccine contains highly immunogenic live Brucella abortus strain 19 in a lyophilized form.

Total 158 female cattle calves (heifers) were used for evaluation of brucella vaccine. All these animals were divided into different groups as per age for evaluation (Table-1). The farm had a

history of abortions, retention of placenta, repeat breeding etc. Incidence of abortions before undertaking this systematic vaccination program was suspected due to brucella infection at the farm, though one can't rule out other reproductive infections too. Because main suspicion was about brucella infection, it was decided by farm management to vaccinate all heifer calves in dairy farm before its breeding season starts.

Table-1 Age-wise distribution of animals used for vaccination

Age group (Months)	No of animals vaccinated
3.1-6.0	10
9.1-12.0	51
12.1-15.0	71
15.1-18.0	26
Total	**158**

After vaccination, all young and heifer calves were observed initially for local reactions at the site of injection as well as systemic reactions including body temperature, feed intake, the general behavior etc., if any. Later on, all the vaccinated animals were monitored after breeding, for the incidences of repeat insemination, abortions, any other clinical observations till their first offspring was born.

Result and Discussion

No local reaction, like swelling or redness, at the site of injection was noticed upon vaccination. There was a slight rise in body temperature in some calves but it subsided soon after, which is not uncommon in the animals following any vaccination.

The clinical observations of all 158 vaccinated animals were summarized into different groups based on the age group at the time of vaccination and the details of the observations are recorded in the Table-2.

Table-2: Clinical observations of vaccinated animals till parturition

Sr. No.	Age Group (Months)	Average Age at the time of first insemination (months)	Repeat breeding cases	Clinical observations after parturition	
				ROP/metritis	Abortions
1	3.1-6.0	14.8	None	2(20%)	None
2	9.1-12.0	14.8	3(5.9%)	4(7.8%)	1(first trimester)
3	12.1-15.0	17.6	4(5.6%)	5(7.0%)	None
4	15.1-18.0	19.0	2(7.7%)	2(7.7%)	None

After vaccination against brucella, in an age group of 3.1-6.0 months, none of the animal showed incidence of repeat breeding and abortion. After parturition, two animals showed the retention of placenta (ROP) and metritis but none of other clinical signs of repeat breeding or abortion. This is the recommended age group for calf-hood vaccination with Brucella S-19 vaccine (3.1-6.0 months) by the manufacturer, which has showed the optimum immunization efficacy in cattle to minimize economic losses due to clinical signs of brucellosis.

In 9.1-12.0 months age group, 4 animals out of 51 animals had retention of placenta and metritis after parturition. All 4 animals showed the incident of repeat insemination up to 2 times. In these repeat breeding animals, one animal showed abortion in first trimester of pregnancy. The clinical observations of this group reveal that 2% of the animals have incidences of abortion whereas, 8% of the animals had retention of placenta and metritis.

Out of 71 animals in an age group of 12.1-15.0 months, 5 animals suffered from retention of placenta and metritis (7%) and no abortion occurred in this group of animals. In an age group of 15.1- 18.0 months, two animals out of 26 animals, showed metritis and retention of placenta (7.7%) after parturition.

Overall, the number of repeat inseminations at this organized farm has been reduced considerably after introducing systematic calf-hood vaccination program of heifer calves. There was no serious problem like abortion, metritis and retention of placenta.

Before the start of this regular and systematic vaccination program against brucellosis, the incidence of abortions on the farm was on higher side. Later on, after implementation of routine vaccination scheme, only one out of 158 animals showed abortion in early period of gestation. Overall milk production of this herd has been maintained well. Current management practices of routine calf-hood vaccination with Brucella S19 vaccine in our organized farm, most of the reproductive issues suggestive of Brucellosis could be addressed, though there are still some minor issues which are attributable to other reproductive infections. Organized dairy herds, to be more productive with minimal clinical losses due to brucellosis, systematic vaccination of heifer calves at recommended age is an ideal preventive measure. To conclude, brucellosis-free dairy herds are most economical to maintain in a commercially viable way and also contribute to minimize the spread of this zoonotic infection amongst farmers, animal handlers, Veterinarians and consumers to a great extent.

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A step forward towards the Brucellosis control in dairy herds.

Introducing

BRUCELLA ABORTUS
STRAIN 19 VACCINE
LIVE IP VET (FREEZE DRIED)

Immunization of young female Cattle and Buffalo calves for prevention and control of infertility and abortions due to *Brucella abortus organism*

MSD Animal Health

Neurological manifestation and hypothyroidism in dog

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Introduction

Classical dermatologic features are the most commonly presented complaints in 60-80 % of dogs (Beale, 1993) in later stages of the disease, while obesity occurs in approximately 40% of dogs suffering from hypothyroidism (Catharine, 2010). However, Satish et al., (2007) recorded obesity in 88% and generalized weakness, lethargy, dullness, listlessness, exercise intolerance and dyspnoea in 55% of dogs with this syndrome. Many dogs appear active and alert and thin without exhibiting heat-seeking behaviour (Scott et al., 2001). In addition to the most commonly occurring symptoms such as dermatological changes and signs of general metabolic disturbances, a number of neurological manifestations have been reported to occur in hypothyroidism in dogs (Fors, 2006). Neurological symptoms of hypothyroidism can originate from the central and peripheral nervous systems as well as from the muscles. Nunez et al., (2008) had reported it to occur in 7.5% of dogs with hypothyroidism (Blois, 2008), but Satish et al., (2007) do not find any neurological and behavioral changes in hypothyroid dogs in their study on 18 dogs. In neurological form of hypothyroidism, the dog may not show any of the classical symptoms such as lethargy and dermatological changes (Budsberg et al., 1993), However, in contrast to this, Indrieri et al., (1987) reported dermatological changes, weight gain and hypercholesterolaemia (Cuddon, 2002) in dogs with peripheral neuropathies.

Pathogenesis

Thyroxine appears to increase the activity of both ATPase and the ATP-dependent sodium potassium pump. Diminished ATPase activity during hypothyroidism impairs sodium-potassium pump activity, with a change in pump dependant axonal transport (Fors, 2006), which ultimately causes axonal degeneration and peripheral neuropathy. Thyroxine also influences the expression of axonal transport proteins i.e. dynein and tubulin, deficiency of which decreases the axonal transport. Both of these mechanisms lead to slowing of axonal transport and even degeneration along with impaired regeneration (Abigail, 2013). Most signs of central nervous system but less

frequently of peripheral nervous system occur due to ischemic and secondary infarction in response to atherosclerosis due to hyperlipidemia (Hess, 2003). Hyperlipidemia also increases the blood viscosity and associated risk for thromboembolic events (MacPhail, 2001), which were detected on postmortem in many dogs (Vitale, 2007). Other factors for development of neurological signs include secondary immune mediated demyelination of nerves (Cuddon, 2002), primary inherited Schwnan cell degeneration (Fors, 2007) and nerve compression by myxedematous deposit as they exit through os temporale (Cuddon, 2002) or through myxoedematous tissue of the head and neck (Jaggy and Oliver, 1994).

A. Peripheral neuropathy

Polynerupathies associated with hypothyroidism occur mostly in middle aged to older dogs (Jaggy et al., 1994) of large and giant-breed (Rossmeisl, 2010), with primary manifestation of pelvic limb paresis to tetraparesis, deficits of conscious proprioception and hyporeflexia of spinal nerves, hypotonia and muscle atrophy (Budsburg, 1993). Course of development is usually slow and progressive (Cizinauskas et al., 2000) with duration of 1 to 2 months (Catharine, 2010). Affected dogs showed improvement in 24 hours, with complete resolution occurring within 1 to 2 months of thyroxine supplementation (Panciera, 1994).

Hypothyroidism has also been observed in dogs with acquired myasthenia gravis (Dewey, 1995 and Fors, 2006), which is supposed to be due to auto- antibodies for acetylcholine receptor, which cross-react with self antigens present in the thyroid gland (Dewey, 1995). But occurrence of hypothyroidism before development of myasthenia gravis or vice versa is still unclear.

Single or multiple cranial neuropathies involving the vestibular branch of the vestibule-cochlear nerve, the facial nerve, (McKeown, 2002), sensory branch of the trigeminal nerve (Fors, 2006), and facial nerve paralysis has been reported in dogs with hypothyroidism. Proprioceptive positioning deficits and decreased spinal reflexes either intermittent or constant, more evident in the hind limbs was reported by Budsberg et al. (1993)., but reduced spinal reflexes in all four limbs is reported by Jaggy et al., (1994). Facial nerve paralysis is reported to occur in 70% of dogs with hypothyroidism (Patterson, 1985), which may be unilateral or bilateral (Panciera, 1994). Suggested causes for facial nerve paralysis include myxedamatous deposit surrounding the nerve as they passe through internal acoustic meatus and decreased vascular perfusion of the inner ear (Vitale, 2007). Neurologic abnormalities with facial nerve paralysis may include decreased or absent palpebral reflexes, lip droop, ear droop or decreased tear production, which may improve within 2 weeks of thyroid supplementation (Cizinauskas et al., 2000 and Abigail, 2013), in contrast to this, Cuddon, (2002) reported that facial nerve

dysfunction seldom improves with thyroxine treatment.

Peripheral vestibular syndrome is seen primarily in older dogs, which can occur alone or as a part of generalized neuropathy (Cuddon, 2002). Peripheral vestibular syndrome can be ipsilateral (Cuddon, 2002) or bilateral (Panciera, 1994) with signs of head tilt, vestibular ataxia/ asymmetrical ataxia (hypertonia on the side opposite to the head tilt, hypotonia on the same side), circling, ipsilateral ventral strabismus and horizontal or rotary nystagmus with fast phase away from the affected side (Jaggy and Oliver, 1994) with normal postural reactions and spinal reflexes (Kren and Erb, 1987). Vestibular dysfunction as the only clinical sign of hypothyroidism was reported by Bischel, (1988).

Cricopharyngeal achalasia with symptoms of dysphagia and pytalism, is also described in hypothyroidism of dog, which resolved after 6 days of treatment with synthetic thyroxine (Bruchim, 2005). Laryngeal dysfunction has been reported in dogs with hypothyroidisrn (Gaber et al., 1985 and Cauzinille, 2005) with prevalence rate of 3.03 % (Panciera, 1994) to 46.67% (MacPhail, 2001), but these dogs did not respond to thyroxine supplementation (Panciera, 1994) but Jaggy et al., (1994) found good result of thyroxine in laryngeal dysfunction. Recent evidence did not show an association between acquired megaesophagus and hypothyroidism (Gaynor, 1997, Panciera, 2001, Bruchim, 2005). Abigail, (2013) suggested that dogs with megaesophagus may have euthyroid sick syndrome rather than hypothyroidism, but in 25% cases of megaoesophogus with hypothyroidism clinical improvement was recorded (Jaggy et al., 1994) and recurrence was not reported after three months of levothyroxine supplementation (Panciera, 1994). Concurrent paraparesis, laryngeal paralysis and megaoesophagus was also reported in hypothyroidism but only the paraparesis responded to levothyroxine (Cizinauskas et al., 2000).

B- Central neuropathies

Cerebral dysfunction can sometime occur in both primary hypothyroidism due to myxedema coma, atherosclerosis (Hess et al., 2003) and secondary hypothyroidism due to pituitary tumor. In later cases, the compressive effects of the tumor on surrounding structures can cause ataxia, seizures, depression and head pressing (Patterson, 1985), also rarely compresses the overlying diencephalon and associated ascending reticular activating system and are often associated with extreme mental dullness (Wood, 2007).

Clinical signs include mental dullness, circling, seizures (Gaikwad, 2002) and central vestibular signs as well as cognitive dysfunction (Vitale, 2007). A small number of thyroid hormone-induced genes are present in the adult canine brain, and it has been shown that the brain increases thyroid hormone uptake via an active transport process within the blood-brain barrier in times of deficiency of thyroid hormone (Dewey, 1995). In addition, activities of deiodinases that catalyze the conversion of T4 to T3 are increased, and degradation of thyroid hormone is decreased. This allows the CNS to function at a relatively normal metabolic rate compared with peripheral tissues, even when hypothyroidism is chronic. Central nervous system being more resilient to the metabolic effects of hypothyroidism, rarely represented in hypothyroid dogs. Although uncommonly reported in the literature, pituitary neoplasms that cause secondary hypothyroidism can also lead to signs of mental dullness (Fyfe, 2003).

Central vestibular signs in hypothyroidism include abnormal nystagmus, postural reaction deficits, tetraparesis/hemiparesis, and paradoxical central vestibular dysfunction (Higgins, 2006)

Rarely, dogs may display prosencephalic signs, characterized as propulsive circling, seizures, and changes in mentation viz. aggression and dementia (Scoot-Moncrieff, 2007). Although there is little definitive evidence to confirm that hypothyroidism causes seizures (Cathrine, 2010), atherosclerosis and hyperlipidemia are potential underlying mechanisms of prosencephalic signs. Stupor and coma, referred to as myxedema coma, may be a result of altered neurotransmitter release and reuptake or failure of thyroid hormone transport locally within the brain. Myxedema results in the accumulation of acidic and neutral mucopolysaccharides and hyaluronic acids, which bind water and result in increased thickness of the skin and other tissues.

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Management of idioventricular rhythm associated with lung odema in a Dobermann dog

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Introduction :

Idioventricular rhythm is one of the subclass of ventricular arrhythmias in dogs. Prevalence of these arrhythmias have been reported to the tune of 11.67% among arrhythmias (Varshney et al.,2013) . These may occur in association with a variety of cardiac and non-cardiac disorders. Idioventricular rhythm (IVR) is an ectopic ventricular rhythm faster than a ventricular escape rhythm yet slower than accelerated idioventricular rhythms (70-160 bpm).The present report describes a clinical case of idioventricular rhythm associated with lung odema in a dog along with its management .

History and Detailed Examinations

An adult (11 years old) Dobermann bitch weighing 28 kg was brought at the hospital with labored open mouth breathing, from Kakarapara Atomic Power Station, Kakarapara (Gujarat). History revealed that the bitch was ill with fever (103.6 0F) for 3 days and had not responded to routine treatment. Detailed clinical examination revealed anorexia, dullness, normal temperature (101.2 0) , shortness of breath, marked weakness ,lethargy, gasping, fatigue and semiconciousness with bluish discoloration of tongue, increased area of heart auscultation and congested mucus membranes. Per rectal examination did not reveal any abnormality.

Blood smear was negative for haemoprotozoan and rickettsial parasites. Total leucocytes (7700/mm3), total erythrocytes (7.31 millions/mm3), haemoglobin (19.5 g/dl), packed cell volume (53.7%),, MCV (73.5fl), MCH (26.7 pg), MCHC (36.3 g/dl), thrombocytes (312000/mm3), lymphocytes (9%), monocytes (3%),eosinophills (2%) and neutrophils(86%) were well within normal ranges.

Chest X-rays, both lateral and ventro-dorsal views, showed lung odema, enlarged liver and spleen.

Initial electrocardiogram (recorded employing hexaxial lead system at 1 mV = 10 mm, with paper speed of 25 mm/s) revealed single, double or triple ventricular premature complexes of various configurations without any definite order to the tune of 60 per minute (Fig.1) .The animal was kept attached with ECG monitor all through treatment period for 6 hr till VPC were vanished .Electrocardiograms were further repeated after 24 hr and 30 hr post therapy.

Qualitative estimation of cardiac Troponin –I , done by employing the kit, was negative .

Diagnosis

Based on clinical symptoms, radiographic examination, electrocardiographic tracing and negative status of qualitative cardiac Troponin-I,

the diagnosis of multifocal idioventricular rhythm with lung odema was arrived at.

Treatment :

The dog was kept in the intensive care unit and treatment was initiated with prednesolone (1.0 mg/kg I/M BID for 4 days), clindamycin (5 mg/kg I/M BID for 4 days), deriphylline (2.0 ml I/M BID for 3 days), furesemide (2.0 mg/kg I/M BID followed by 30 mg PO for 3 days), Lidocaine (2.0 mg/kg I/V over 3 minutes as a bolus, followed by 50 microgram/kg/minute as constant rate infusion in 5% dextrose saline till reduction or complete absence of ventricular premature complexes and repeated next day morning followed by sotalol 2 mg/kg PO BID daily for 7 days) and a combination of omega 3 and 6 fatty acids orally and vitamin B-complex with zinc orally BID for 15 days .

Discussion

Clinical signs of shortness of breath, gasping, marked weakness, lethargy and semiconciousness with tongue cyanosis were suggestive of compromised cardiovascular system. Electrocardiogram (Fig1) revealed single, double or triple ectopic ventricular beats to the tune of 60 per minutes (Bolton,1975 ; Tilley,1985).These ectopic ventricular complexes had abnormal morphology; and were wide (QRS complex > 60 ms) and bizarre in shape, with a large T wave opposite in polarity from the major deflection of the QRS complex. These ectopic ventricular QRS complexes were dissociated from atrial activity. Since these ectopic complexes (60 bpm) were faster than VPC (ventricular premature complex) and yet slower than accelerated idio-ventricular rhythm (70-160 bpm), were termed as idioventricular rhythm (Ettinger and Feldman, 2000) . Idioventricular rhythm is a specific subset of ventricular tachycardia having ectopic beats less than 70 bpm (Ettinger and Feldman, 2000). Since haemogram was non-committal and qualitative cardiac Troponin-I was negative, idioventricular rhythm in the present case seems to be of non-cardiac origin. The causes of non-cardiac origin include hypoxaemic states, electrolyte imbalance, metabolic acidosis, neurological disorders, hyperthyroidism, gastric torsion and volvulus, renal failure or pancreatitis or systemic inflammatory disorders (Rush and Atkins, 1991). Ventricular arrhythmias are one of the most serious and potentially life threatening arrhythmias necessitating emergency management. It is indicated that if there a is presence of double , triplets ventricular premature complexes, or VPC more than 20 /minute, immediate treatment is warranted to avoid conversion of VPC to ventricular fibrillation or flutters or ventricular tachycardia (Ettinger and Feldman,2000).Emergency treatment was started with intravenous

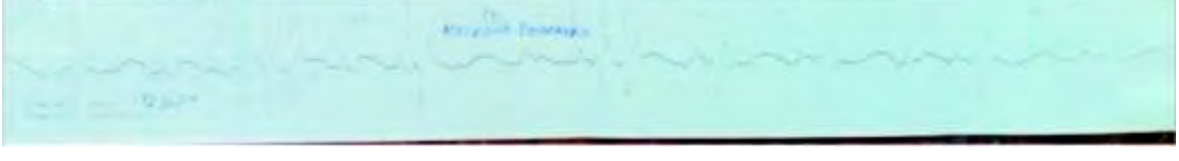

Fig.1. Initial ECG of Kalapana , female Dobermann,showing single, double or triple ventricular premature complexes with no definite order @ 60 complexes per minute associated with severe dyspnoea and lung odema.

Fig.2. ECG of the Kalpana, 6hrs post Xylocaine therapy, showing no ventricular premature complex.

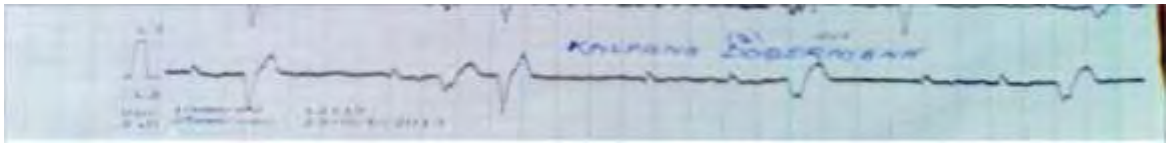

Fig.3. ECG of the Kalpana,next day, showing VPCs and Bundle branch blocks @ 24 per minute each.

lidocaine (sodium channel blocker) as a bolus and followed by a constant rate infusion ,as described under treatment, that resulted in reduction of VPCs (Fig.2) in 6 hrs. Next day ECG revealed VPC at the rate of 24 per minute and bundle branch blocks at the rate of 24 per minute (Fig.3). Lidocaine was again given as constant rate infusion at the same dose rate and the dog was switched on to sotalol therapy orally . At the time of discharge, VPCs reduced to 10 per minute and bundle branch block to 20 per minute (Fig.4).

Signs of respiratory distress vanished and the dog was almost normal with resumption of appetite. Since VPCs came down to < 20 /min , no further xylocaine was administered and the dog was switched on to oral sotalol. Sotalol was continued orally twice daily for a week along with other medications as detailed under treatment. Varshney et al (2013) have also reported beneficial effect of lidocaine or xylocaine in the management of ventricular arrhythmias.

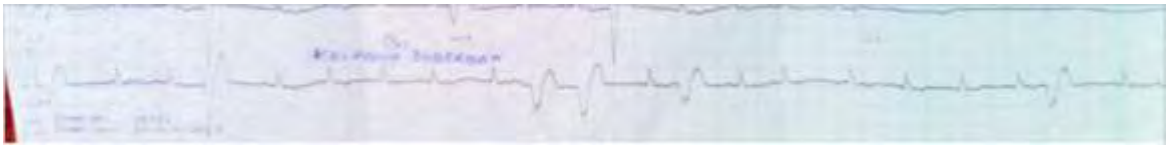

Fig.4. ECG of the Kalpana, at the time of discharge 30 hr post admission, showing VPCs < 10/min. and Bundle branch blocks 20 /min.

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Canine Transmissible Venereal Granuloma (CTVG) affecting prepuce

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Introduction:

Among the commonly encountered affections of dogs, transmissible venereal tumor is a naturally occurring, coitally-transmitted (Calvet, 1983)neoplastic disorder that affects the external genitalia, viz. vulva and vagina in females; penis and prepuce in male dogs (Vermooten, 1987). As it is usually transmitted during coitus, it mainly occurs in young, sexually mature animals that exhibit unrestrained sexual activity (Rogers, 1997).Tumor is located most frequently on the external genitalia of male and female dogs(Moulton, 1978). Presence of venereal tumors in extra genital sites of the skin has also been reported (Adams and Slaughter, 1970;Barronet al., 1963; Jackson, 1936; Ndiritu et al., 1977; Weir, 1978). Present case describes occurrence of canine transmissible venereal tumor on preputial mucosa.

Case history and observations

A 9-year old, Doberman male dog, with a history of an abnormal mass affecting prepuce with occasional bleeding was presented to the Department of Surgery & Radiology, Veterinary College, Anand. Clinical examination revealed egg sized mass above the dorsum of penis. No other abnormalities were detected. Histo-pathological examination confirmed diagnosis of CTVG.

Treatment and discussion:

Owing to its large size, tumor was treated surgically. Preoperatively, prepuce and penis were lavaged with diluted povidone iodine solution. Antibiotic Ceftriaxone + Tazobactum 562 mg was given IV. The ventral abdomen, ventral perineum and medial thighs were clipped and prepared for aseptic surgery. Atropine sulphate @0.04mg/kg bw SC was given as a preanaesthetic. Induction and maintenance of anaesthesia was performed with Ketamine (5 mg/kg bw)-Diazepam (0.25mg/kg bw) mixture (2:1, IV). Animal was positioned in dorsal recumbency. Subtotal penile amputation and scrotal urethrostomy

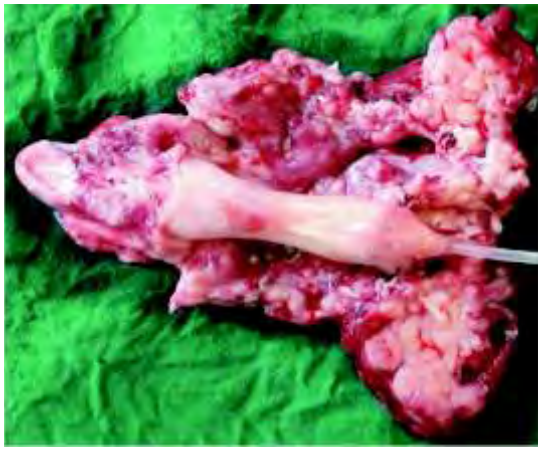

Fig. 1 Surgically excised tumor mass along withpenis

was performed. Postoperatively, antibiotics and analgesics were given. Indwelling catheter (Ryles tube no. 8) was placed in urethra for 15 days. After three weeks, mild urethral stenosis was observed, and this was corrected with surgical enlargement of urethral opening. Animal was again catherized for a week. The patient recovered uneventfully.

The prepuce is affected by the same tumor types as the skin (Johnston and Archibald, 1984; O'Keefe, 1995). Mast cell tumors are most common. O'Keefe (1995), has reported tumor of the external genitalia, but transmissible venereal tumors, melanomas, perianal gland tumors have also been reported (Hobson, 1993; Ladds, 1993; O'Keefe, 1995).Complete surgical excision and chemotherapy with vincristine sulfate (0.5 mg/m2) IV onceweekly for 3 – 6 weeks is effective treatment for CTVG (Johnson, 2005).

In the present case, since whole predisposing site was surgically excised (Subtotal penile amputation) chemotherapy was not instituted. The present report records an uncommon case of preputial CTVG and its successful surgical management.

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Dermatomycosis in Canines - a general view

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Introduction

Dermatomycosis is an important and common skin disease of dogs caused by keratinophilic fungi, namely Microsporum and Trichophyton. Dermatomycosis is called as ringworm , since it produces classical ring-like lesions, but the classical lesions cannot be expected in all the cases of dermatomycosis and symptoms are extremely variable and non-specific.However, the common complaint reported in the current study was pruritus. Diagnosis by direct microscopic and cultural examination of the skin scrapings is an important way for the confirmation of the organism and to select the correct drug for treatment. The dermatomycosis usually requires a long course of treatment and it often creates annoyance to pet owners .In the present study, ketoconazole at 5mg per kg b.wt orally twice a day for 2 weeks proved effective without recurrence.

Materials and Methods

A study was conducted on 94 dogs which were presented to the University Veterinary Hospitals at Kokkalai and Mannuthy with different skin problems. Various lesions such as alopecia, scales, exfoliation (shedding of scales), hyperkeratosis (increased thickness) crusts (dried exudates), erythema and hyperpigmentation (excessive colouration) were observed among 94 animals in different combinations. Hairs and scales were plucked from the periphery of the lesions aseptically, after cleaning the area with 70 per cent alcohol and drying as described by Muller and Kirk (1969) and Quinn et al. (1994). The hairs from several sites were collected into a paper envelope by grasping the hair shafts close to the skin, as suggested by Jungerman and Schwartzman (1972) and Foil (1990) for cultural examination. Sabouraud's dextrose agar and dermatophyte test medium were used for isolation of dermatophytes from clinical material. Chloramphenicol0.05 g per liter and Cycloheximide (Acti-dione) 0.5 per liter were added to mediums to inhibit some faster growing saprophytic fungi. A light inoculum of sample was scattered over the surface of the agar and gently pressed down on the medium with a swab or sterile forceps. The plates were sealed with parafilm to prevent dessication and incubated aerobically at room temperature. They were examined daily for the presence of growth

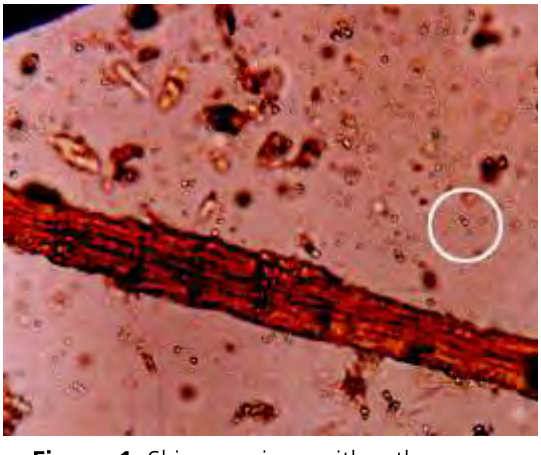

Figure.1. Skin scrapings with arthrospores under direct microscopic examination.

and not discarded as negative for three weeks (Quinn et al., 1994). Among these 94 animals, a group consisting of 9 animals was treated with ketoconazole (Fungicide-Tab 200mg, Torrent Pharmaceuticals, Ahmedabad.) at the dose rate of 5 mg per kg body weight orally daily for 14 days (Kumar et al., 2002).

Results and Discussion

Majority of the animals (67 out of 94) were presented with a history of pruritus. It varied in intensity from mild occasional itching to severe constant itching. Alopecia with scales was noticed in 39 animals (41.48 per cent), alopecia combined with exfoliation (shedding of scales) was found in 30 animals (31.92 per cent).Cobenaset al. (1972) pointed out that pruritus was common clinical finding observed in animals with Trichophyton infection. Beale (2000) mentioned the pruritus was variable in canine dermatophytosis infection. In contrast, Medleau and Ristic (1992) pointed out that dermatophytosis was usually non-pruritic, but occasionally it was intensely pruritic.

Skin scrapings collected from 94 dogs were found to be positive for the presence of arthrospores. On direct microscopic examination of skin scrapings, 80 per cent of samples in infected group revealed the presence of ectothrix small spores, arranged in masses around the infected hair shaft and 20 per cent animals of the infected group showed the presence of endothrix spores within the infected hair shafts. All spores appeared as a clear round translucent pearl like beads. Skin scrapings with arthrospores is shown in figure 1. Thomsett (1986) suggested that arthrospores in small groups or in chains around the infected hair, along with fungal hyphae, could be identified if the spore mass was not dense. Moriello (2001) reported that veterinary dermatophytes produce ectothrix spores, where as human dermatophytes produce endothrix spores.

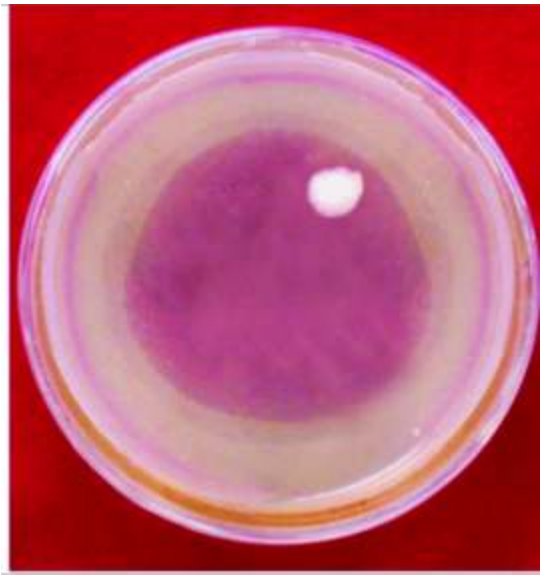

Figure.2. Obverse side of Trichophyton spp

Figure.3. Reverse side of Trichophyton spp

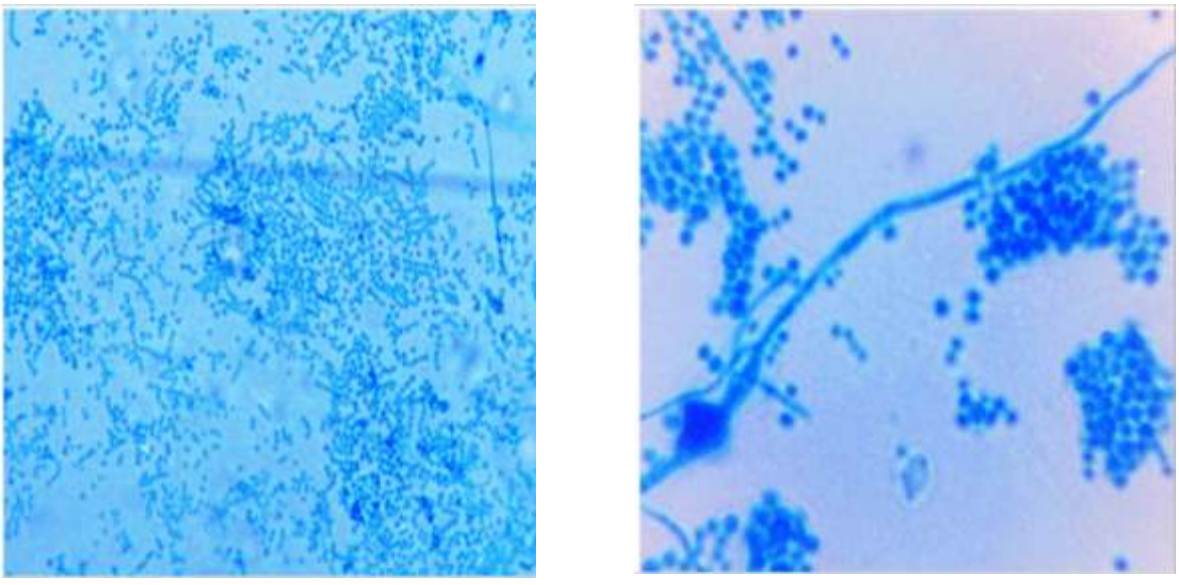

Figure.4 Microconidia of Trichophyton look like cluster of grapes under 10x and 40x

About 40 per cent of the cultured plates showed no growth for more than three weeks of time. Altogether three isolates of Trichophyton spp and four isolates of Microsporum spp were identified from samples of 94 animals.Weiss et al. (1979) examined a total of 4790 skin scrapings mycologically and isolated 887 strains of dermatophytes over a period of 13 years. Wright (1989) pointed that very large number of negative samples (92 per cent) received from ringworm-like lesions made the diagnosis of *M.canis* very difficult. Obverse side of the cultured plate showed whitish fluffy as in Fig.2 and the reverse side showed yellowish orange pigmentation (Fig.3). Under the microscopic examination of culture sample, septate hyphae with microconidia (grape like clusters) were observed by cellotape method using lactophenol cotton blue staining (Fig.4). Quinn et al. (1994)stated that macroconidia are often absent for Trichophytonsps and microconidia produced by species of Trichophytonare usually numerous and borne singly along the hyphae or in grape like clusters.

The clinical signs, including erythema and alopecia subsided in all the animals by7 days post treatment of ketoconazole. But complete remission of lesions and regrowth of hairs in all the infected areas were noticed only by day 14. However, two animals had mild itching at the end of the treatment (day 14) without any lesions, so the therapy was continued for one more week for the complete cure of the two dogs and owners reported that the animals were free from itching after the one-week treatment. Skin scrapings taken from healed lesions, which were noticed in the treated animals were negative for the arthrospores on day 14 of post-treatment. Hence ketoconazole was considered to be consistently effective against dermatomycosis. Similar results have been reported by Kumar et al. (2002) and Patterson and Frank (2002) where they used 5-10 mg per

kg body weight of ketoconazole once daily for two weeks in the treatment of Malassezia infection in canine. On the other hand, Foil (1990), and Carlotti and Bensignor (1999) noted that administration of 5 to 15 mg per kg body weight of ketoconazole orally considered to be effective in treating canine dermatomycosis. Furthermore, use of ketoconazole at the dose of 5 mg per kg body weight is considerably economical and reduces the risk of liver disorders.

Summary

The present study was carried out to get an understanding on the clinical signs, diagnostic techniques and assessment of the efficacy of ketoconazole at low dose level in dermatophyte infected dogs.

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Feline Panleucopenia – An overview

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Introduction

Feline Panleucopenia is a highly infectious diseases found worldwide in domestic and big cats, so also in some other species such as mink and racoon. In domestic cats, disease has now largely been controlled by vaccination in many parts of the world. The clinical disease tends to occur only in animals from where vaccination may not have been carried out .

Feline panleucopenia is caused by a parvovirus, a small, single-stranded DNA virus. Parvoviruses are very hardy and can survive outside their host. They are easily transmitted by personel or on fomites and are resistant to many disinfectants. They may persist in infected premises for up to a year.

Clinical signs

Classic Feline Panleucopenia is primarily a diseases of kittens, characterized by profound depression, pyrexia, anorexia, vomiting, dehydration, diarrhoea and often death. Diarrhoea may be a late sign and kittens may die before it becomes clinically apparent. Cats may be described as 'very depressed and sitting over a bowl but drinking'.

Sometimes the diseases is much milder, with transient fever and leucopenia. In many cases, infection is sub clinical. Feline ataxia, caused by infection of neonatal cerebellum, is a non progressive symmetrical ataxia often associated with an intension tremor. It is usually first recognized when kittens start to walk but in some cases may not be apparent until weaning .

The severity varies according to the degree of cerebellar damage and not all the kittens in a litter are necessarily affected. The signs are non progressive, and in many cases kittens learn to compensate and are able to live relatively normal lives. Such cats may be chronic virus excretors, Overt abortion in cats is uncommon and embryonic death is usually apparent as reproductive failure.

Diagnosis

- Diagnosis is often based on clinical signs , history, environment and vaccination history.
- Demonstration of leucopenia is useful but a definite diagnosis is often only made at necropsy by histological examination of spleen, mesenteric lymph node, jejunum and ileum or by virus detection .
- Virus is most often readily isolated from faeces early in the diseases or from spleen mesenteric lymph nodes and intestinal mucosa collected at necropsy.
- The virus can be detected either by electron microscopy or by isolation in cell culture, however, the virus is difficult to isolate, ELISA based kits designed to detect canine parvovirus in feaces appear to work well for feline parvovirus.
- In cats which survive, demonstration of a rising antibody titre may also help to confirm the diagnosis.

Treatment

- The treatment of enteric diseases is largely supportive and includes the administration of fluids and use of antibiotics to control secondary bacterial infections. Affected kitten may be kept warm because of vomiting , impaired gut absorption and the immunosuppressive effects of the virus. A parenteral, bactericidal, broad spectrum antibiotic such as ampicillin or cephalosporin should be given.
- Antiemetics (eg-acetylpromazine) may be useful in reducing fluid loss, but anticholinergic drugs (eg- Atropine) are not advisiable because they can cause ileus .
- Nutritional supplements such as vitamins are sometimes given and hyperimmune antiserum may be useful .
- A blood transfusion may be considered in severely panleucopenic individuals .If the clinical signs are severe, however , the prognosis is poor.
- During the later stages of the diseases , if the cat appears to be recovering and gastroenteric signs have diminished , orals fluids and liquidized foods may be given.
- Oral or parental Diazepam can also be used just before feeding to stimulate appetite .

Cats are often best nursed at home, but if hospitalized. scrupulous attention should be paid to hygiene and disinfection to avoid cross-infection.

Control

- Both modified live and inactivated vaccines are available, and both have been very successful in controlling the diseases.
- Modified live vaccines probably induce slightly better immunity and more rapid protection, but inactivated vaccines are entirely satisfactory and have the advantage that they can be used in pregnant queens.
- Immunity probably lasts for several years following the use of modified live vaccines and for at least one year with inactivated vaccines .
- It is usually recommended that kittens are vaccinated initially at 12 weeks of age, when maternally derived antibodies have declined to non- interfering levels in most cats, with first booster at one year of age and further doses at 1-2 year intervals depending on the type of vaccine used and the likelihood of exposure.
- Management in the face of disease is based on vaccination and good hygiene. The virus is very resistant to many disinfectants and only hypochlorite (household bleach, diluted 1 in 32) or formaldehyde- or glutaraldehyde-based preprations are effective. Hypochlorite is best used with washing-up liquid to improve its cleaning properties. Thorough disinfection of the premises and all utensils is necessary. Persistence in the environment can still be a problem.
- Ideally, the premises should be completely depopulated for several months. Failing this, cats should at least not be moved onto or from the premises and all breeding should stop.
- Live vaccines should be used to ensure rapid and strong immunity in the face of disease, except in pregnant queens, where inactivated vaccines should be given.

Surgical management of Nasal Polyps in a Khillar Bull.

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Introduction:

Granulomas and polyps are conditions that take place in the ethmoid sinuses, which arise due to a chronic inflammatory process associated with chronic irritation. This can be caused by infectious diseases (Nasal scistosomiasis, rhinosporidiasis, tuberculosis, actinomycosis and actinobacilosis) or inanimate foreign bodies. These growths are commonly attached to the lateral wall of nostrils and rarely to the nasal septum. They may be found unilaterally in one nostril or bilaterally in both.

Case history and Diagnosis:

A Khillar bull with nasal polyps in both the nostrils was brought to the Teaching Veterinary Clinical Complex of KNP College of Veterinary Science-Shirval. The animal was showing clinical signs such as nasal discharge, inspiratory dyspnea and frequent sneezing. It was restless and kept rubbing its nose against the ground.

Diagnosis was made on the evidence of soft, non-ulcerated masses in the left nostril, accompanied by a mucopurulent discharge.

Treatment

Surgical excision of the growth was carried out at the external nares from the base of attachment. The procedure was carried out under local anesthesia with the employment of 2% lignocaine HCL infiltrated around the base of the growth. An incision was taken through the skin and cartilage on dorsolateral aspect of the nostril. The base of the growth was debrided and cauterized. Hemorrhage was controlled by plugging a gauze bandage impregnated with Tincture Benzoine. The gauze was changed after 24 hours. Postoperative care, carried out for a period of 5 days, included antibiotic coverage with an injection of Dicrysticin total dose: 2.5 gms I/M and analgesic coverage with Meloxicam at the dose rate of 0.5 mg/kg intramuscularly.

Discussion

Nasal polyps are considered to be inflammatory in nature. Nasal polyposis as the condition is termed is a non IgE mediated condition associated with non-allergic rhinitis and

asthama (Holmberg et al, 2006). Polyps, when found in only one nostril that is unilaterally must be examined histopathologically to rule out the possibility of a neoplastic growth (Drake-Lee, 1994). Polyps, if untreated can result in the blockage and obstruction of the nasal passage and therefore should be given immediate attention. Local administration of corticosteroids can be used to control further occurrence of these growths (Holmberg et al, 2006).

In the present case the recovery of the bull was uneventful and it was discharged on the 5th day post-surgery. No reoccurrence was reported.

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Bovine Mastitis in India (contd.) - hurdle in dairy development

Mastitis : Importance of Dry Cow Therapy

The dry period of the lactation cycle is the critical time for udder health, as the mammary gland undergoes marked cellular, biochemical and immunological changes during this period. Involution of the mammary paren chyma begins 24-48 hr after the end of lactation and continuous upto 10-14 days. It is during this period, the gland is most vulnerable to new intramammary infections. The involuted mammary parenchyma, however, offers the most hostile immune environment for bacterial pathogens. Constituently, dry period is an ideal time to attain synergy between antibacterial therapy and immune function of the mammary gland, without increasing the expensive costs typical of lactating cow therapy . One tube of intramammary antibacterial (s) per quarter immediately after the last milking of lactation is sufficient. This intramammary infusion should not be repeated.

Most of the commercial dry cow antibacterials have no activity against gram negative pathogens and their administration at the start of the dry period will not be effective against new infections that begin during the periparturient period.

Generalized subcutaneous emphysema in a draft bullock

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Introduction:

Generalized subcutaneous emphysema is very uncommon in large animals. Emphysema in the subcutaneous tissue occurs when air or gas accumulates in the subcutaneous tissue as a result of accidental entry of air through cutaneous wounds. (Chakrabarthy, 1998). The present paper describes a case of generalized subcutaneous emphysema associated with endo parasitic infestation in a work bullock and its management.

Case History And Observations:

Five years old Ongole cross bullock was referred to the Teaching Veterinary Clinical Complex, College of Veterinary Science, Proddatur with history of loss of appetite, decrease in water intake, diarrhea and swelling over the body with abnormal gait. Treatment was carried out at local veterinary dispensaries with different group of drugs without much recovery. History revealed that animal was utilized for draft purpose especially for local weight bearing competitions. It had recent history of beaten by charnacolas by the workers. Complete clinical and physical examination was carried to know about the condition. Bull had slight rise in body temperature (103.4°F), pale mucus membranes with normal respiratory (20/minute) and pulse rates (72/minute). There was no enlargement of lymph nodes. Physical examination of rumen showed normal movements, but presence of soft, painless, fluctuating and grossly crepitating swellings were observed over the dorsum region of the body (Fig.1). No apparent visible external skin damage was found, but presence of hemorrhagic spots were observed on the dorsum and hump region. Dung sample, peripheral blood, whole blood with EDTA and serum were collected for laboratory examination. Swabs from the lesions could not be collected for antibiotic sensitivity test, because while sampling, only air was found under the cutaneous layer of the skin.

Peripheral blood smear revealed no haemoprotozoans. Dung sample found positive for strongyle and amphistome ova along with mild infestation with balantidium cysts by the faecal sedimentation techniques. Bull had mild anemia (Hb:9.8g/dL), with normal total leucocyte count and with normal differential leucocyte count. Serum biochemical analysis revealed normal levels of total protein (6.36 g/dl), albumin (3.65 g/dl), and globulin (2.71 g/dl). On the basis of the typical history and

Fig. 1: Subcutaneous emphysema in a draft bullock

clinical signs with laboratory results, the case was confirmed as generalized subcutaneous exogenous emphysema of traumatic origin.

Treatment And Discussion:

The animal was treated with injections of streptopenicillin @ 10, 000 IU/kg body weight deep I/M, BID and injection of metronidazole @ 20 mg kg body weight IV, BID to reduce the secondary bacterial infections. Fenbedazole (Panacur vet) was administered @ 10 mg / kg body orally for two consequent days. Supportive therapy was initiated with oral administration of vitamins (VM all) as per product information. Inj. Prednisalone (Prednisolone Acetate injection) @ 0.2 mg kg body weight IM, Chlorphenaramine maleate (Avilin vet) @ 0.5 mg kg body weight IM was continued for 5 days along with antibiotics. Intravenous electrolytes (inj. Intalyte @ 1 litre per day) and multivitamins (Inj. Nurobion forte @ 6 ml per day) was given for first two days of therapy. Advice was given to the owner that the bullock should not be used for drought purpose for two more months and to be fed the mineral mixture. Recovery from the swelling was observed from third day of the therapy. Complete clinical recovery with normal appetite was observed after completion of nine days of therapy.

Subcutaneous emphysema occurs when air or gas accumulates in the subcutaneous tissue as a result of surgical or accidental cutaneous wounds, due to discontinuity of the respiratory tract lining, rumen gas migrated from a rumenotomy, extension from a pulmonary emphysema and due to gas gangrene infections (Radostits et al.2000). History of beating of the animal with hard and pointed objects, no history of rumenotomy, no abnormal sounds on auscultation of respiratory system and normal laboratory findings suggested that the animal was suffering with subcutaneous emphysema of traumatic origin. Generalized subcutaneous emphysema is rare in cattle. It is the accumulation of free gas in the subcutaneous tissue. It is mainly due to any break in the continuity of the skin and air entering through a cutaneous wound either surgical or accidentally. Lung punctures by the end of fractured rib and extension from the pulmonary emphysema or penetration by a foreign body are the reasons. Another classification is based on the organisms, exogenous emphysema and septic emphysema. In the present study, exogenous emphysema was due to insult to the skin as a sharp beating object was used by the owner while working. According to the Chakrabarti (2006), emphysema is prominently observed in loose skin of the neck region or post scapular thoracic region. Besides these regions, the emphysema was also present on the dorsum region of the animal in this case. Localized circumscribed pockets of air with crackling sounds on palpation differentiated them from edema in the present case.

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An outbreak of Haemorrhagic Septicaemia in cattle and its management

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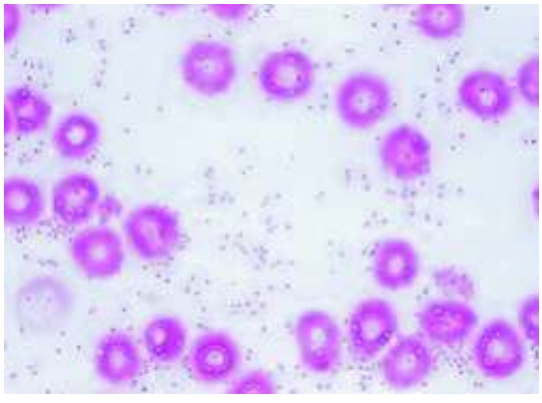

Introduction

Haemorrhagic Septicaemia (HS) is one of the most important infectious bacterial diseases of bovines, caused by gram negative coccobacilli, *Pasteurella multocida*. It causes high morbidity and mortality in unvaccinated population. HS has proved to cause highest mortality and the second highest morbidity in bovines as compared to foot and mouth disease, anthrax and black leg (Mondal et al., 2013). Occurrence of the disease has been reported throughout the year (Dutta et al., 1990). The present article places on record a HS outbreak investigation in cattle of Rewa district of Madhya Pradesh in the month of April 2013.

History and clinical observations

A village of Rewa district reported mortality in cattle. A total of 5 cattle aged 1 to 3 years died out of 110 during 4 days after showing the symptoms of sudden onset of high fever, profuse salivation, bloat and varying degree of respiratory distress. Clinically ailing animals revealed high fever, congested conjunctival mucous membrane, salivation and frothy mouth, severe respiratory distress, open mouth breathing and bloat. Lungs exhibited consolidation and abnormal lung sound on auscultation. Blood samples and nasal swabs were collected. Postmortem examination of a cattle aged 2 years was conducted, gross lesions recorded and morbid samples of lungs, liver, kidneys, heart, spleen and lymph nodes were collected in 10% formal saline. The tissue samples were processed conventionally and stained with Haematoxylin and Eosin. Peripheral blood smears prepared from ailing animals and impression smears of liver, kidneys, spleen and lungs were taken for bacteriological examination. Methylene blue and Giemsa stains were used to demonstrate the micro-organisms in tissue impressions and blood smears. Peripheral blood smear and tissue impressions revealed presence of large number of Gram negative, bipolar coccobacilli organisms indistinguishable from *Pasteurella* spp.

Gross and histopathological changes

At necropsy, affected cattle revealed congestion, haemorrhages, consolidation of lungs and accumulation of serosanguinus fluid with fibrinous exudates in the abdominal and

thoracic cavity. Small intestine had congestion and haemorrhages. Heart revealed petechiae on epicardium and endocardium. Lymph nodes were juicy, swollen and haemorrhagic. Microscopically, affected animals showed congestion, haemorrhages and necrosis with severe neutrophilic infiltration in pleura and interlobular septa and gray hepatization in lungs. Alveoli were packed with serosanguineous mass and bronchioles revealed degeneration in lining epithelial cells. Severe congestion and haemorrhages were recorded in cortex and medulla of lymph node, epicardium and myocardium. Other organs like liver, kidneys and spleen showed degenerative and vascular changes of toxaemia. The gross and histopathological observations corroborated with the findings of previous workers (Singh et al., 2007 and Mondal et al., 2013).

Diagnosis and treatment

On the basis of clinical observation, bacteriological examination and pathomorphological alterations, the cause of death in cattle was confirmed as Haemorrhagic Septicaemia. During investigation, it was observed that affected animals were not vaccinated against HS and kept with healthy animals in same place which might have prompted the spread of the disease. All the ailing animals were treated with enrofloxacin, Meloxicam and corticosteroid for 3 days accompanied with mineral mixture as supportive therapy for seven days. This therapy showed complete recovery of the ailing animals without any mortality. The results of present investigation on the efficacy of enrofloxacin for controlling Haemorrhagic Septicaemia after outbreak are in agreement with the findings of previous studies (Mondal et al., 2013). The present study suggested disposing the carcasses properly by using deep burial method with lime powder, spraying potent disinfectant including formalin in the sheds and restricting the animal movements

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Studies on clinico-therapeutic management of Paratuberculosis in bovines

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Paratuberculosis, a worldwide disease of major economic importance, occurs commonly in cattle (Fincher et al., 2001 and Radostits et al., 2003). The clinical disease in an infected herd is very low at any one time and it rarely exceeds 5 % of adult animals. The eradication/control of paratuberculosis disease seems to be difficult for want of reliable diagnostic tests and detection of the clinical and carriers cases (Merkel, 1970; Gilmour, 1976). The allergic test and microscopic examination of faeces and rectal pinch have been widely used and recommended for the diagnosis of paratuberculosis disease (Hole and Mcclay, 1959; Kamalupur and Patil, 1967). The present study records the clinical cases of paratuberculosis in bovines of Kashmir valley and is the first report of its kind from this region.

Materials and Methods

Four animals comprising of one bullock and three crossbred cows presented for treatment included a crossbred bullock aged 6 years with the history of profuse and odorless diarrhea since last six months, two crossbred cows aged 4 and 8 years had diarrhea for the last 20 and 26 days respectively and a crossbred cow of 8 years suffering from chronic pipe stream watering feaces since last 3 months.

All the animals had normal appetite, temperature, heart rate and respiration rate. They were emaciated and in hide bound condition. There was a reduction in milk yield in cows. These animals had not responded to the treatment given by local Veterinarians.

The animals were screened for gastrointestinal parasitic infestations. The faecal samples were subjected to culture and antibiotic sensitivity test. The rectal pinch from the animals was subjected to Zeil-Neelsen Staining for demonstration of Acid Fast Bacillus, if any. The animals were treated with streptomycin sulphate @ 50 mg/kg body weight intramuscular, sulphadimidines bolus @ 100 mg/kg body weight oral and metronidazole @ 20mg/kg intravenous for one week and injection 5% DNS for 3 days by intravenous route .

Result and Discussion

Rectal pinch was positive for Acid Fast Bacillus suggestive of paratuberculosis. Antibiotic sensitivity test suggested administration of streptomycin, sulphadimidines and metronidazole. The animals were positive for strongyle parasitic infestation. Paratuberculosis confirmed by rectal pinch and antibiotic sensitivity test of faecal samples is in agreement with the earlier workers (Paliwal *et al*., 1985). The clinical symptoms were similar to as reported by Radostits *et al., loc. cit*. and Paliwal *et al., loc. cit*. Nutritional deficiencies and the

poor housing management in the valley are the favorable condition for the disease. The animals did not recover in spite of the treatment and the owner was advised to cull the animals. The disease is in alarming rate in the region and needs further investigation for latest diagnostic and therapeutic measures.

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Bovine Mastitis in India (contd.) - hurdle in dairy development

Mastitis control : Alternative approach

The prevention, control and treatment measures for mastitis are followed traditionally by applying proven control methods like pre and post-milking teat dipping, dry cow therapy and appropriate use of available antibiotics. In spite of all these efforts, the prevalence of mastitis is increasing at a rapid rate, particularly in high yielding animals. Some alternative approaches, which enhance the immune status of the animals are being thought over presently in addition to conventional practices.

Use of antioxidants like Vit. E, Vit. C, Selenium, Copper and Zinc in mastitis therapeutics is one such approach.

Management of watery uterine discharge in dairy cattle

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Introduction :

Calf a year is a basic need of today's dairy industry, Variety of hindrances are responsible for the failure of this program. Repeat breeding, managemental practices, improper nutrition, pathological problems of uterus and ovaries, hormonal imbalance, uterine infections, postpartum anestrous, hidden hunger etc. are responsible factors for failure of calf in a year program. Presence of watery uterine discharge for prolonged period is one of the common findings in the repeat breeder cows. This article reports management of such discharge in dairy cattle.

Material and methods:

50 cases of watery uterine discharge were presented to Laboratory for the detailed investigation. Almost all the cases were having complaint of repeat breeding for a period of last 4 - 6 months. Many routine treatments were carried out but with no success. Treatment was carried out with 15 - 20 ml of Tonophosphon at interval of 2 days for the period of 10 days: besides this specific treatment was carried out after antibiotic sensitivity of uterine discharge. Powder VM [all] (Intervet) was given, 60 gram twice a day, for a period of 1 month and followed by 50 gram per day thereafter

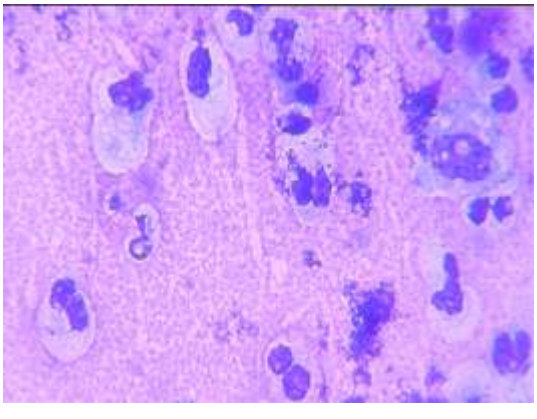

Figure 1. Uterine discharge showing epithelial cell, neutrophils and macrophages (Leishman's stain)

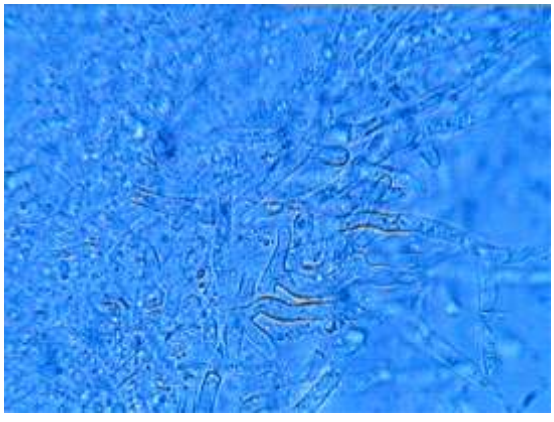

Figure 2. Fungal hypahe in utrine discharge

Results:

Antibiotic sensitivity and microscopic examination of uterine discharge was carried out, all the animals showed uneven types of fern pattern. The basic treatment of Inj. Tonophosphon and powder VM [all] was followed by the appropriate antibiotic intrauterine as given in table 1.

Table 1.: Microscopic findings, antibiotic sensitivity and intrauterine treatment in watery uterine discharge management

Sr. No.	No of cases	Microscopic findings	Sensitivity	Intrauterine Treatment
1	16	Trichomoniasis, epithelial cells, neutrophils, macrophages	Gentamicin, amikacin, ciprofloxacin	Metronidazole 100 ml and Gentamicin 10 ml
2	12	Epithelial cells, neutrophils, macrophages	Enrofloxacin	Enrofloxacin IU 60 ml
3	10	Epithelial cells, neutrophils, macrophages	Oxytetracyclin	Topical oxytetracyclin IU 60 ml
4	6	Fungal spores and hypahe, epithelial cells, neutrophils, macrophages	Levofloxacin	Flucanazole 1 gm orally repeated after a week & 60 ml levofloxacin topical liquid IU
5	6	Neutrophils, macrophages	Amikacin, ciprofloxacin	Ciprofloxacin topical liquid 60 ml IU

Out of 50 cases, 48 cases showed normal heat along with better quality of uterine discharge with regular fern pattern; two cases were not available for the follow-up. All the cows were conceived and found positive for pregnancy.

Conclusions:

Hidden hunger, nutritional deficiency, infectious causes and hormonal imbalance are responsible for the repeat breeding. Such type of repeat breeding cases showing watery uterine discharges can be treated with comprehensive treatment with Inj. Tonophosphon, VM all powder, Suitable intrauterine antibiotics subsequent to antibiotic sensitivity test is useful.

Regular fern pattern after treatment

Therapeutic management of footrot like disease in sheep and goats

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Introduction

Footrot is a highly contagious, painful, debilitating bacterial infection of the feet of sheep, goats and cattle. It is characterized by severe lameness due to inflamation of skin horn junction with ulceration and necrosis of the interdigital cleft. A systemic infection is manifested by fever, emaciation, recumbency and death due to starvation (Radaostits *et al*., 2010, Mahajan and Tarun Kumar, 2011).The footrot is caused by a bacterium called *Dichelobacter nodusus* (previously called Bacteroides nodusus). The maceration of the interdigital skin due to prolonged wet condition leads to infection with *Fusobacterium necrophorum* (ubiquitous soil and faecal bacterium) which causes local dermatitis (interdigital dermatitis) and hyperkeratosis of the skin horn junction. This infection further facilitates infection by *D. nodusus,* which thrives in moist and warm conditions (Asif Iqbal *et al*., 2011). Moisture on the pasture and environmental temperature are major determinants for the transmission of footrot. The present report describes successful treatment of footrot like infection in sheep and goats.

Case History and observations

During the month of August 2013, an outbreak of footrot like infection in sheep and goats was attended by the clinical staff of Post Graduate Institute of Veterinary and Animal Sciences, Akola at village Hiwarkhed, Dist. Buldhana (Maharashtra State). All these animals belonged to a pastoral community (*Dhangar*). There were 8 shephards having around 1980 sheep and goats. About 70% animals were affected and exhibited signs of lameness with moist, swollen, hyperaemic and macerated interdigital foul smelling skin (Glynn, 2009, Tweedie, 2004). All the age groups (adult and young) of animals were affected. In some affected animals, fever was the prominent sign. Most of the affected animals were grazing on their knees due to severe pain in their hooves. Some animals were recumbent, weak and emaciated. All these clinical symptoms, foot lesions and history were suggestive of footrot like infection in affected sheep and goats (Fig. 1 - 4).

Fig. 1: Ulceration and necrosis of interdigital cleft

Fig. 2 : Moist swollen soft interdigital skin

Treatment and discussion

The main objective of treating footrot is to control the infection and reduce the painful symptoms of the disease by using the effective antibiotics, anti-inflammatory and analgesic drugs. In the present outbreak, 33 affected animals were treated with parenteral administration of antibiotic (Inj. Enrogyle (Enrofloxacin) @ 10 mg/kg body weight), anti-inflammatory and analgesics (Inj. Melonex plus (Meloxicam and paracetamol) @ 0.2 mg/kg body weight) and antihistamine (Inj. Avil (Pheniramine maleate) @ 1 - 1.5 ml) intramascularly.The foot lesions were cleaned with antiseptic lotion (Betadine) and were applied Himax ointment. The Shepherds were advised to isolate the affected animals and continue the treatment for 3 to 5 days and keep their animals in dry areas. Most of the animals responded well to the given treatment and recovered within 5 days. The morbidity and mortality was reduced in the flocks who followed the recommended treatment regimen. Many workers have reported the successful therapeutic management of footrot in sheep and goat with parenteral antibiotics and anti-inflammatory drugs with local application within 4-5 days (Mahajan and Tarun Kumar, 2011, Hagaware, 2012).

During the month of August 2013, there were continuous and persistent heavy rains over several weeks, resulting in water logging and moistness on the ground and pasture with damp environmental condition. It was noted that the shepherds had only wet areas / pastures for grazing their animals. This prolonged wet condition might have facilitated the occurrence of footrot infection in the animals. Whiltington (1995) described that the causative organism of footrot survives best in a wet and warm damp environment. The conditions of wetness and warmth might have favoured persistence of the bacteria in pasture and increased the susceptibility of the feet to injury and dermatitis. This might have facilitated the spread of the disease from carrier animals in this area.

From the present report, it is concluded that the wetness and warmth conditions favor the incidences of footrot like lesions in sheep and goats. If not treated at initial stage, it may lead to death of the animals. The disease can be treated successfully with broad spectrum antibiotics , anti-inflammatory, analgesics and

Fig. 3 : Macerated interdigital skin horn junction

antihistaminic drugs along with topical application. The disease can be controlled by taking proper managemental practices during the rainy season.

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Fig. 4 : The flock affected with footrot like disease.

Coccidiosis in Goats : its therapeutic and preventive strategies

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Introduction:

Coccidiosis is one of the important protozoan diseases of goats and can be a costly affair to livestock farmer due to high treatment cost and mortality rate. The disease is caused by one or more of approximately 12 different species of protozoa, *Eimeria*, among which *E. airlongi* and *E. ninakohlyakimouae* are considered to be most pathogenic species in goats. Although the goats of any age are susceptible, kids of 2-4 weeks of age are most commonly and severely affected. Further, coccidia are host specific and coccidia of cattle or chicken do not infect goats. However, coccidia of goat can infect sheep.

Transmission:

Eimeria are unicellular organisms naturally found in soil. Though kids are born without cocidia in intestine, they acquire infection by ingesting sporulated oocysts. The oocysts are resistant forms of parasite and remain in soil over a long period until favourable conditions for sporulation occur. The warm and moist environment favours the sporulation of oocysts. Once ingested, the wall of oocysts rupture and sporozoites are released which penetrate the wall of intestine and undergo several stages of development to become mature. The mature stages releases large number of oocysts. It takes around 2-3 weeks to pass the egg in faeces of goat after ingestion of sporulated oocysts.

Pathogenesis:

The pathogenesis of the disease is dependent on various factors such as stresses due to post weaning, shipping or when animal are relocated, sudden change in climate, heavy worm burden or any other concurrent disease. It also depends on the number of oocysts ingested, species of *Eimeria* present, age and immune status of the host, location of the parasite in tissues and number of host cells destroyed (Soulsby, 1982; Urquhart et al, 1996). The severe damage to the intestinal mucosa is caused by the second generation merozoites and sexual stages of Eimeria. This leads to severe damage to capillaries in the intestinal mucosa which results into loss of blood and leakage of

Fig. 1: Intestine showing small, grayish white nodule on intestine

proteins leading to anaemia and hypoproteinaemia. The damage to intestinal mucosa can also lead to development of secondary bacterial infection causing severe enteritis leading to increased rate of peristalsis, malabsorption, diarrhea, dehydration, weakness and emaciation. Diarrhoea and anaemia, if not treated early, can lead to severe anaemia, dehydration, acidosis, shock and death (Kusiluka and Kambarage, 1996).

- If kids are naturally exposed to low dose of coccidial oocysts, they develop strong immunity and successive infections may cause animals to excrete large numbers of oocysts. Moreover, the adult goat may be mildly infected and continue to shed large number of oocysts which would be a source of infection to young kids. The oocysts excreted by infected kid as well as adult subsequently contaminate the sheds, pastures or watering places.

Development of immunity

Coccidiosis is self limiting disease and if kids are naturally exposed to low dose of coccidial oocysts, can develop strong immunity. Coccidiosis is said to be disease of young kids and resistance to coccidiosis develop as age advances.

Clinical signs:

Clinical signs of coccidiosis are often observed 2-3 weeks after the kids are weaned, because the lactic acid produced by the digestion of milk during suckling helps to inhibit coccidia in the nursing kids. The prominent signs seen in coccidiosis in kids are mucoid or pasty diarrhea which later becomes watery. Occasionally, there is bloody diarrhea. Kid shows inappetance, pale mucus membrane, loss of body condition, dehydration and death due to severe attack of coccidiosis. Some times, the death of the kids occurs suddenly without any pronounced clinical signs. Anaemia is also prominent finding in these kids which survives for few days. However, secondary bacterial infection usually causes severe enteritis and heavy mortality in kids.

Kids that survive the attack develop subclinical to chronic disease causing reduced feed intake, poor growth, intermittent diarrhea and poor feed utilization. Such kids are stunted and can not compete for food, when kept with other kids (Nourani, et al., 2006; Jones et al., 1997; Soulsby, 1982).

Gross and histopathological changes:

Gross pathological lesions of coccidiosis include multiple greyish-white raised plaque/ nodules on mucosal surface of intestine particularly, the jejunum (Fig 1). Intestine may be thickened, edematous and haemorrhagic. The intestinal contents are generally watery and brown coloured.

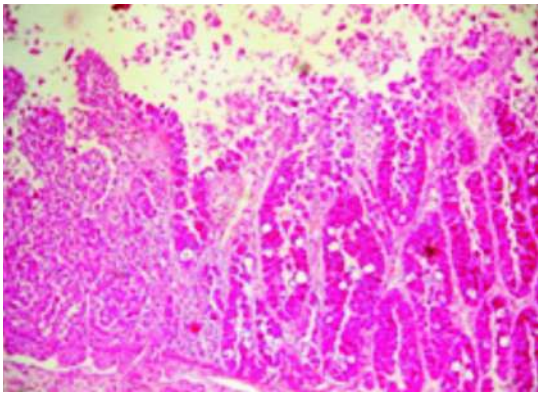

Fig 2: Section of intestine showing different stages of coccidian and infiltration by inflammatory cells (HE x 100 X)

Occasionally, mucosa of intestine show polypoid like (papilloma like)growth (Fig. 2). The liver, kidneys and lung are generally pale in colour (Sawaleet al, 2012a & b; Soulsby, 1982; Urquhart et al, 1996; Nourani, et al., 2006).

Microscopic examination of intestine (duodenum, jejunum and ileum) shows denudation of mucosa due to shortening or disappearance of villi. The epithelial cells of the villi and the crypts are hypertrophied, hyperplastic and contain different stages of coccidia, especially the gametogonal stages and oocyst (Fig 2). Stages of coccidia are generally seen throughout the villus, but the crypts of Lieberkuhnare more severely affected. Severe infiltration of inflammatory cells like lymphocytes, plasma cells, eosinophils and macrophages are also observed in the lamina propria (Sawaleat al., 2012a & b; Nourani, et al., 2006; Jones et al., 1997; Soulsby, 1982)

Diagnosis

Diagnosis is based on clinical signs, necropsy findings and microscopic examination of intestine and faeces. The intestinal mucosal scrapping/ smears can be stained with Leishman/ Giemsa stain and histological section with haematoxylin eosin stain for demonstration of developmental stages of Eimeria spp. The demonstration of oocysts in faeces and various developmental stages of Eimeria spp in intestine in dead animals is considered to be a positive diagnosis for coccidiosis. Faecal oocyst count alone can support the diagnosis but it is usually not very reliable because most animals will excrete the oocysts in the absence of the disease.

The coccidiosis should be differentiated from cryptosporidiosis, lamb dysentery and helminthosis, salmonellosis and colibacillosis(Kusiluka and Kambarage, 1996; Smith,1992).

Treatment:

Coccidiosis can be treated by giving oral medication with drugs like sulphadimidine, sulphamerazine, sulphamethazine and sulphaquinoxaline at dosage rates of 50-100 mg/kg for 4 days. However, while treating with sulfa drugs, goat should be given adequate drinking water as these are nephrotoxic if kid is dehydrated. Amprolium @ 100 mg/ kg feed is also used to treat the disease in goats. However, very high level of amprolium can cause nervous disorder (Polioencephalomalacia) as amprolium competes with thiamine and lead to deficiency of thiamine. The drugs like tetracycline can also be given in coccidiosis. Decoquinate (0.3-4.0 mg/kg) in feed is a safe and very effective coccidiostat in goats. Monensinat 10-30 mg per ton of feed provides prophylaxis to control shedding of oocysts and increases feed conversion. However, high levels of monensin make feed unpalatable and can be toxic (Kusiluka and Kambarage, 1996; Smith,1992).

Prevention:

1. Raise the kids separately from adults.
2. Maintain proper hygiene and cleanliness with dry pen or house.
3. Ensure good immune system of goats by providing adequate nutrients and vitamins (especially vitamin E and selenium) to enhance the resistance of animals to fight coccidiosis.
4. Minimize the predisposing factors such as post weaning stress.

5. Allow ample sunlight in shed as it kills the oocysts.
6. Prevent faecal contamination of feed and water.
7. Continuous preventing medication to healthy goat is necessary on the farm, which has the history of coccidiosis

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Bovine Mastitis in India (contd.) - hurdle in dairy development

Mastitis control : Alternative approach

Vitamin E and Selenium, singly or for better results, in combination, are being used as antioxidants to prevent oxidative cell damage to cell membranes of sub-cellular organelles by free radicals. Together, they appear to enhance host defenses against the infections by improving cellular phagocytic activity. Selenium also reduces Vitamin E requirement by enhancing its absorption and also helps in retention of Vitamin E in blood plasma.

Various studies undertaken suggest that supplementation of Vitamin E (1000 IU/animal/day) and Selenium (3 mg/animal/day), 2 weeks prior to 2 weeks post-parturation, considerably (up to 71%) reduces the chances of subclinical mastitis after calving.

Infertility problems in dairy cows and buffaloes – systematic troubleshooting approach

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Introduction:

Reproductive problems when occur, they often affect reproductive performance and have a major economic impact. The root cause of infertility is probably a combination of a variety of physiological and management factors that have an additive effect on reproductive efficiency. Although, the relative contribution of individual factors leading to infertility can be debated, the cumulative effect (infertile cows) impairs the normal reproductive function resulting into infertility and sterility leading to economic losses due to widening of dry period, reduced calving rate and lactations during the life span of the animal. The use of good records keeping, adequate use of human resource and a systematic troubleshooting approach have been successful while tackling infertility problems.

The major infertility problems, possible causes and suggestions for their prevention and control are described below:

Anestrus:

Anestrus is defined as absence of periodic manifestation of estrus, with absence of palpable follicular or luteal structure (true anestrus), or absence of normal physiological signs of estrus (subestrus). Anestrum due to persistent CL is mostly associated with uterine pathology (pyometra, fetal resorption, and mummification), early embryonic motility, pregnancy, subestrum and unobserved estrum.

Broadly speaking, anestrus may either follow parturition (post-partum anestrus) or following service (post-service anestrus).

Possible causes:

1. Silent estrus with normal ovarian activity may result from:
   A. Inadequate estrus detection at an appropriate time.
   B. Inadequate animal identification and / or inadequate records
   C. Lack of a sufficient secretion of estradiol from the mature and secondary follicles or due to a need for a higher threshold of estrogen in central nervous system to produce nervous symptoms characteristic of estrus and acceptance of the bull.
2. True anestrus (lack of ovarian activity) is caused by:
   A. Failure of follicular growth through lack of endocrine stimulus and/ or failure through non-regression of corpus luteum.
   B. Inadequate LH pulse frequency due to negative energy balance, malnutrition, environmental stress, lameness, endogenous opioid peptide, lactational stress, suckling and lower insulin concentration.
   C. A lesser number of primordial follicles, higher rate of atresia and lower levels of

circulating gonadotropins are some of the inherent causes of ovarian inactivity in buffaloes.

Troubleshooting and Control suggestions:

1. Silent estrus/ subestrus
   A. Closely observe animals for estrus at least twice and preferably 3 times a day for at least 20 to 30 minutes at each detection time.
   B. Provide non-slippery floor.
   C. Adopt procedures to tackle heat stress.
   D. Improve management practices.
2. True anestrus
   A. Check problem animals for parasites and treat accordingly.
   B. Examine blood for macro and micro-mineral status. In case of deficiencies, provide mineral mixture supplementation.
   C. Submit forage samples for standard and mineral tests.
   D. Examine animals at least once between 15 and 45 days after calving to ensure proper uterine health, cystic ovaries and, for resumption of ovarian activity.
   E. Provide round the year access to fresh forage.
   F. Animals should be in a good body condition at the time of breeding.
   G. Keep hormonal therapy as last resort in case herbal therapy and supplementation of mineral mixture fail to yield results.

Repeat breeding

Repeat breeder animal is usually defined as sub-fertile animal which mated three or more times during the proper period and does not become pregnant and continually return to service in the absence of any obvious pathological disorder in the genital tract and normal estrous cycles.

Possible causes:

1. Genetic factors including chromosomal aberrations as well as autosomal recessive genes.
2. Anatomical defects like congenital abnormalities of uterus, cervix and vagina are infantilism, segmental aplasia, uterus unicornis, double cervixes, vaginal constriction and septum.
3. Hormonal imbalances such as abnormal endocrine status during folliculogenesis and ovulation. Repeat breeding has been associated with ovulatory disturbances like delayed ovulation, anovulation and follicular cysts.
4. Managemental factors including improper heat stress, poor nutrition, and improper insemination techniques. Repeat breeder cows have lower levels of Zn, Cu, P and inorganic I compared to normal animals.
5. Infectious causes including trichomoniasis, vibriosis and endometritis due to *E. coli, Archanobacterium pyogenes* and *Staphylococcus aureus.*

Troubleshooting and Control procedures:

1. Regular check up of old bulls and newly purchased bulls for vibriosis and trichomoniasis.
2. Inseminate cows 12 hours after initial observation. In case of long estrus cows (more than 24 hours), a second insemination 12 hours later should be performed.

3. Examine repeat breeder cows for presence of endometritis, delayed ovulation or other abnormalities and treat accordingly.
4. Use high fertility bulls.
5. Adopt fixed time insemination (FTAI) and embryo transfer procedures in large herds.

Retained fetal membranes

When a cow fails to expel afterbirth (fetal membranes) within 12 hours after calving, the condition is known as retained fetal membranes (RFM).

Possible causes:

1. Specific infections associated with abortion like contagious abortion, leptospira, infectious bovine rhinotracheitis (IBR) etc.
2. Twin births and abnormal deliveries, including prolonged or difficult ones that require manual handling or caesarean section.
3. Deficiency of selenium, vitamin A and or vitamin E.
4. Deficiency of collagenase enzyme.
5. Inadequate rise of estradiol during last stage of gestation due to oxidative stress
6. Over conditioning of dry cows due to excess energy intake.

Troubleshooting and control suggestion:

1. Periodic tests against specific infections.
2. Keep calving area clean and well bedded.
3. Breed heifers to bulls of appropriate size and with a record of calving ease.
4. Perform manual removal after 96 hours of fetal birth and avoid manual removal in case of fever.
5. After correction, advise for anti-microbial and anti-inflammatory drug therapy.
6. Give calcium borogluconate etc to treat uterine inertia.
7. Provide supplemental selenium in deficient areas.

Metritis

Infection of uterus that extends into deeper layers of uterine wall and is associated with serious systemic signs, discharge of sero-sanguinous and foul smelling fluids from the uterus. Metritis generally occurs within days to weeks of parturition and hence termed as puerperal metritis.

Possible causes:

1. Prolonged dystocia that requires manual handling resulting in contamination of uterus.
2. Retained fetal membranes and injury to reproductive tract due to difficult calving or use of excessive force during handling.
3. Selenium and vitamin E deficiency.
4. Over conditioning at the time of calving or during early lactation.

Troubleshooting and control:

1. Allow animals to calve in a clean place. Follow maximum antiseptic procedures during handling of dystocia.
2. Avoid over-conditioning during late lactation and dry period, while maintaining adequate, balanced vitamin and mineral intake.
3. Treat RFM cows judiciously.

4. Stabilize animal using intravenous fluids and also by drenching.
5. Give anti-inflammatory drugs like Flunixin meglumine that have additional anti endotoxic effect.
6. Give broad spectrum antibiotics that provide sufficient MIC inside uterus via systemic route.
7. Treat animals for secondary hypocalcaemia.

Cystic Ovarian disease

Ovarian cysts are structures, usually greater than one inch in diameter, which persist on one or both ovaries for 10 days or more in absence of CL. Major categories of cysts include follicular cysts, luteal cysts and cystic corpora lutea. Follicular cysts result from failure of ovulation and luteinization. Follicular cysts are blister-like structures, flaccid to the touch. Luteinized cysts apparently fail to ovulate, but some luteinization occurs. Because of the varying degree of luteinisation, luteinized cysts are firmer to the touch than follicular cysts though not as solid as CL. Cystic CL is CL with a fluid filled centre and is considered non-pathological. Ovarian cysts seriously affect the herd fertility by increasing days to first service; prolonging calving interval and reducing conception rates at first service.

Possible causes:

1. Neuro-endocrine imbalance involving the hypothalamic-hypophyseal-gonadal-axis including defects in response of the hypothalamus to the positive feedback of estradiol, lack of receptors for LH, inadequate pituitary LH to induce ovulation, partial failure of the mechanism controlling LH release, deficiency in the synthesis or release of gonadotropinreleasing hormone.
2. Excessive calcium intake or wide calcium phosphorus ratio.
3. Genetic predisposition.
4. Stressful conditions at calving or early postpartum.
5. Ingestion of estrogenic fodders or some mould toxins.

Troubleshooting and control suggestions:

1. Remove predisposing causes.
2. Use progesterone releasing devices to reset HPG axis.
3. Use of luteinizing agents like hCG and GnRH at the time of breeding.
4. Give single dose of hCG or GnRH 12-14 days postpartum.
5. Give prostaglandins in case of luteal cyst.
6. Fixed time insemination using GPG programme.

Abortions

It is the expulsion of a living fetus or more specifically of a dead fetus of recognisable size at any stage of gestation prior to completion of term. In case of abortion of a living fetus it is generally non-viable. Causes of abortion can be either infectious or non-infectious.

Possible causes:

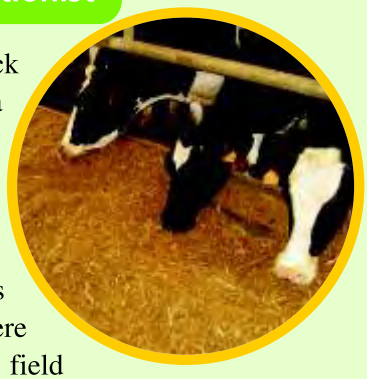
1. Specific infections like brucellosis, leptospirosis, IBR, BVD, listeriosis, vibriosis, trichomoniasis, fungal infections etc.
2. Genetic defects resulting in severely abnormal embryo or fetus.

3. Multiple-fetus pregnancies like twins, triplets etc
4. Toxicities due to nitrate, cyanide, chlorinated naphthalenes or some weeds.
5. Drug-induced abortions due to Dexamethasone, Prostaglandins etc.
6. Injuries like accidental removal of CL, excessive manipulation of reproductive tract and violent injuries during late pregnancy.

Troubleshooting and control procedures:

1. Avoid injuries and use extreme care during handling of reproductive tract of possibly pregnant animals. Provide non-slippery floor.
2. Submit suspected feed and water samples for laboratory analysis.
3. When abortion occurs, submit required samples for serological and microbiological testing
4. Isolate aborting animals from rest of the herd.
5. Follow strict quarantine procedures.
6. Vaccinate animals for specific infectious diseases at proper time intervals.

Role of Veterinary Clinician as Animal Nutritionist



Field Veterinary Clinician is the most vital link between livestock scientist and livestock owner, and therefore, it is important for a field Veterinarian to be aware regarding newer diversified role of animal nutrition in livestock therapeutics. Defining nutrition principles in terms of health has attracted interest of Veterinarians leading to a new discipline, that is, Clinical Animal Nutrition. It describes broadly regarding application of principles of animal nutrition for attaining sound health of animals where nutrients work as prophylactic and therapeutic tools for the field Veterinarian.

Role of animal nutrition in veterinary clinical practice includes :

- awareness of Veterinarian regarding conventional feed resources in the area.
- non-conventional feed resources
- nutritive values of offered rations
- nutrient composition of ration
- ration formulation principles
- feed quality awareness
- feed technology awareness
- understanding role of nutrition in animal production

Effect of individual feeding in Frieswal heifers on their reproductive performance reared under farm conditions.

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Introduction :

Frieswal is a strain developed by crossing Holestin Friesian with Sahiwal and stabilizing the exotic blood at 62.5%. During rearing under farm conditions, it was reported that these heifers remain anoestrus and took longer time for the exhibition of oestrus which ultimately affects their production performance. Accordingly, this experiment was designed to study the performance of Frieswal heifers on the basis of individual feeding instead of group feeding, a routine practice followed under farm conditions.

Material & Methods :

Fifteen Freiswal heifers having age 259 to 311 days and body weight 134 to 169 kg were taken for the study. These animals were maintained at Military Farm, Meerut, tied individually and were fed dry roughage (3.0 to 5.0 kg), green fodder (8-12 kg) and concentrate mixture (2.2-3.5 kg) per day as per the stage of their growth. The weighed quantity of dry and concentrate feed was offered in the morning hours and green was offered in the evening hours. The left over dry and green was weighed every day before offering fresh feed. Their body weights were recorded at fortnightly interval. The data obtained was compared with 10 heifers of similar age group maintained at MF under routine feeding and management system.

The oestrus was observed daily in the morning and evening hours in all the heifers. All the heifers exhibited oestrus and having body weight of more than 300 kg were inseminated with frozen semen.

Result & Discussion :

The mean age and body weight of heifers at the start of the experiment were 279.06±21.26 days and 148.46±15.24 kg (Table-I). The values of body weight in control animals of similar age were 171.2± 4.7 kg.

It was observed that after 12 months of feeding as per the scheduled mentioned above, body weight was 362.00± 6.40 kg and average daily gain (ADG) was 468.5±12.03 grams/day. Girdhar & Singh (2000) and Girdhar et al (2006) have reported ADG of 570 grams in Frieswal male calves under experimental feeding during active phase of growth.

The Frieswal heifers exhibited their first oestrus at 520.53±16.34 days and their mean body weight at the time of first oestrus was 266.20 kg. These values in control group heifers were 569.6±20.91 days and 296.0±12.47 kg respectively. In the present study, the age at first oestrus was lowest as compared to the reports of other workers. 920 days in HF x Desi (Nahar et al 1992), 618.42±6.78 days in HF X Sahiwal, (Rafique et al 2000); 755.67±63.41 days and

Table I : Performance of Frieswal heifers adopted to individual feeding .

Parameters	Experimental heifers
No. of animals	15
Initial BW (kg)	148.46±15.24
Mean age (Days)	279.06±21.26
Initial B.W (kg)	148.46 ±15.24
Body weight after 12 month of feeding (Kg)	362.00± 6.40
Total gain (kg)	213.64 ±5.48
ADG (g)	468.51± 12.03
BW at first oestrus (Kg)	266.20
No. of days taken for oestrus exhibition	520.53± 16.34
BW of heifers at AI (Kg)	302.2± 4.40
No. of oestrus exhibited before reaching BW of 300 kg	2.93± 0.358 cycles
No. of heifers confirmed pregnant	14

662.44±2.52 days in Friesian corsses (Sultana et al, 2001 and Uddin et al 2008) respectively. However, Laishram Sunitibala (2013), has reported age at first oestrus 608.3±27.1 days in Frieswal heifers maintained at farmers herds. The major factor controlling the onset of oestrus is body weight and growth. Until heifers reach a particular weight, oestrus is unlikely to occur (McDonaland, 1980). It was also reported that there was high pregnancy losses and low milk production in heifers that were fed poorly prior to exhibition of first oestrus (Short & Bellows, 1971). The higher body weight in control animals at the time of oestrus may be attributed to the initial body weight which was higher (171.2 kg) as compared to experimental animals (148.46 kg). These animals were inseminated once they reached the body weight of 300 kg. Accordingly, their mean body weight at the time of insemination was 302.2±4.40 kg. Further it was observed that during the period heifers reached the body weight of 300 kg, they exhibited 2.93±0.358 oestrus cycles. It was reported earlier that after first oestrus, the ability of heifers to conceive improves with age, reaching optimum levels at sexual maturity. (Macfarlane and Worrall 1970). In this experiment first service was delayed till the animal reaches the body weight of 300 kg. Similar findings have been reported by Ronningen et al (1972) in Boran cattle. In all 14 heifers were pregnant after inseminated with frozen semen.

These results indicate that individual feeding of Frieswal heifers resulted into early exhibition of oestrus which will ultimately improve the production performance of these animals.

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Enhancing Reproductive Efficiency of Dairy Animals

Reproductive efficiency signifies regularity in reproduction to produce a viable and healthy calf.

Cow to give calf every 12-30 months, buffalo every 15 months. This will ensure milk production for 9 months and a calf a year.

If these intervals become more, reproductive herd life and lifetime production gets reduced. Long term economic returns from dairy farming is affected.

Reproductive efficiency can be enhanced by :

- timely detection of heat
- AI/NS at right time with quality semen / bull of right quality
- timely pregnancy diagnosis
- adequate health and nutritional care during pregnancy and parturition
- post-partum heat within 90 days of parturition
- proper management of heifers for replacement

Improved economics of milk production in crossbred cows with different neutraceutical regimens : A comparative evaluation

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Introduction:

Hypogalactia is a prolonged nutritional deficiency state, where the lactating cow or buffalo gives sub-optimal milk production, mainly because of macro-mineral imbalance, hypocalcaemia (Waghmare et al., 2000, Patel and Jadhav, 2003), hypophosphataemia (Rajora and Pachauri, 1998; Guff, 2000; Das et al., 2003), and hypomagnesaemia, (Radostits et al., 2007), often coupled with negative energy balance (Underwood and Suttle, 2001). In India, nearly 75 million marginal farming households (70% < 1 hectre in size) - with an average of 1.5 cows or buffaloes produce only about 4 litres milk per day (FAO 2010). Nutrition is the major constraint (Singh et al., 2009).

Lepidium sativum, Linn. (Chandrasur) Plant

The galactagogue-cum-therapeutic propensity of coarsely powdered indigenous herbal preparations: chandrasur or garden cress GC (*Lepidium sativum* Linn.) dry seeds (Avinash Chandra, 2010; Sanjeev Kumar, 2010), shatavari (*Asparagus racemosus*) dry rhizomes (Kumar et al., 2008; Kumar et al., 2010), methi (*Trigonella foenum-graceum*) dry seeds (Tomar et al., 1996) is well-established. Efficacy of Area Specific Mineral Mixture (ASMM) in different agro-climatic regions is also well-documented (Rogers et al., 1982; Prasad et al., 1999; Sharma et al., 2002; Joshi et al., 2007). Potentials of direct-fed microbials (probiotics) such as live yeast culture on improved lactation performance in ruminants are on record (Dutta et al., 2009). However, possible synergistic effect of herbal galactagogues in combination with ASMM and probiotics remained to be investigated.

In perspective, the present investigation was

Lepidium sativum, Linn. (Chandrasur) Seeds

designed primarily to delineate the prevalence of hypogalactia in crossbred cows in the selected organized and unorganized periurban dairy farms in Jabalpur, in relation to the environmental and managerial conditions and the relative efficacy of different holistic neutraceutical remedial regimens.

Materials and Methods

The present study was conducted in Jabalpur, M.P., India (23.10 N latitude and 79.50 E longitude, 410.9 meters above the mean sea level) The climate, typically subtropical, witnesses an average annual precipitation of ~1240 mm, mainly during the monsoons (June-September).

Total 1200 crossbred cows, irrespective of genotype and parity status, belonging to different dairy farms in the vicinity of Jabalpur city (large units in the organized sector, and medium sized/small-holder units in the unorganized sector) were included for detection of hypogalactia. The data on lactational yields of individual cows were collected from the dairy unit owners and marginal farmers with the help of well-structured questionnaire in the local language Hindi and through personal observations. This part of the study was completed with the co-operation and active participation the local field Veterinarians.

Following epidemiological studies, 150 hypogalactic crossbred cows, free from any detectable clinical signs of disease were short-listed. Spot modified California mastitis test (MCMT) was conducted on aseptically collected milk samples to rule out mastitis. Rothera's test for detection of ketone bodies in the urine samples was applied to eliminate metabolic ketoacidosis.

Total 42 hypogalactic cows belonging to the Livestock Farm at Adhartal and a privately owned Dairy Farm, in periurban areas of Jabalpur were randomized into seven equal groups: T1 to T7, each comprising six animals. Control group T1 - without herbal galactagogue (s) - received adequate amount of the I.C.A.R. (1998) standard basal ration, BR (DCP 15, TDN 70), area-specific mineral mixture, ASMM 25 g, and probiotics (YC) 15 g/animal/day. The six treatment groups received, in addition in the morning hours, the specified coarsely ground dry herbal galactagogue (s), singly (T2 - T4) or in combination (T5 - T7) @ total 100 g/animal/day, uniformly mixed in the concentrate mixture.

Jugular blood and milk samples were collected at the specified intervals. Daily milk record of each individual experimental cow was also kept as part of the improved managerial protocol.

Table I. Composition of the Area-specific mineral mixture, 'Jawahar'

Macro-minerals (%)		Micro-minerals (mg/kg composite mineral mixture)	
Dicalcium sulphate	31.34	Cobalt chloride	40
Limestone powder	21.18	Copper sulphate	240
Common salt	21.66	Ferrous sulphate	740
Mangenese sulphate	7.80	Sodium selenite	8
Urea	4.26	Potassium iodide	24
Filler	9.67		

Results and Discussion

Table 2. Prevalence of hypogalactia in crossbred cows in some periurban dairy farms in Jabalpur, MP

S No.	Criteria Employed	Organized Sector (n= 220)	Unorganized Sector (n=980)
1	Adherence to the vaccination schedule against endemic diseases (%)	91.0	21.3
2	Observance of the deworming protocol (%)	89.2	11.0
3	Prevalence of hypogalactia (%)	8.0	66.5

n = number of cows

Data summarized in Table 2 clearly indicate skew distribution of hypogalactia in total 1200 crossbred cows belonging to dairy farms (8 % in the organized vs. 66.5 % in the unorganized sector) within the same micro-environment in periurban areas in the vicinity of Jabalpur city in central India.

Environment factors like heat stress in the tropics cause accelerated accumulation of deleterious reactive oxygen species, ROS in vivo (Sunil Kumar et al., 2011). High ambient temperature, often compounded with enhanced relative humidity induces panting with accelerated expulsion of CO2 in the exhaled air. This leads to marked depletion of buffering capacity of the salivary inflow. Further, reduced DMI suppresses rumination. Importance of measures to minimize heat stress is, therefore, self evident.

In this study, the over-all effect of environmental and prevailing managerial conditions in the selected periurban dairy farms in Jabalpur,

M.P. was evaluated - subject to further validation - with the help of an arbitrary 50 points (10 x 5) score card (Table 3), designed to take into account the 10 major factors that are stated to constitute the micro-environment which importantly influences the herd milk production performance.

Table 3. Evaluation of the environmental and managerial conditions affecting herd milk production

Points scored under each parameter / Parameter of assessment	Name and location of the dairy unit			
	Organized Sector			Unorganized Sector
	University Dairy Farm Adhartal	Military Dairy Farm, Jabalpur Cantonment	Reliable Dairy Farm (private) Gwarighat	Chouhan Dairy Farm (private) Gwarighat
1. Topography and drainage system	4.0	4.5	4.0	3.5
2. Maintenance: Floor roof, paddocks	3.5	4.0	3.5	3.0
3. Personal hygiene: milkers / attendants	4.0	4.5	4.0	3.0
4. Milking technique: stripping/ knuckling	4.0	4.5	3.5	3.5
5. Disease history/ prophylaxis	4.0	4.0	3.5	3.5
6. Assured fresh water supply: actual status	4.0	4.0	4.0	4.0
7. Waste disposal system	4.0	4.5	4.0	3.5
8. Insect / pests intensity	4.0	4.5	3.5	3.0
9. Herd health status	4.0	4.0	3.5	3.5
Total score (out of 50)	**39.5**	**42.5**	**37.0**	**34.0**

Computation of the economy of milk production/ cost-benefit ratio is an important criterion of successful dairy farm management in a given micro-environment. It also provides valuable cues to pinpoint the deficiencies and plan appropriate remedial measures. Table 4 summarizes the pertinent data in the present study.

Table 3: Comparative efficacy of different herbal galactogogues in combination with ASMM* and probiotics in relation to the economics of milk production at the University LSF**

Parameters (Animal/day)	Groups						
	Control	Treated					
	T_1	T_2	T_3	T_4	T_5	T_6	T_7
Av. milk production (Lit)	8.9	9.8	10.2	9.3	9.6	10.0	10.2
Sale price of milk (Rs./Lit)	34.0	34.0	34.0	34.0	34.0	34.0	34.0
Proceeds from the sale of milk (Rs.)	302.6	333.2	346.8	316.2	326.5	340.0	346.8
Proceeds from the sale of manure/ vermicompost (Rs.)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Total income (Rs.)	307.6	338.2	351.8	321.2	331.5	345.0	349.8
Feed cost: Basal ration (Rs.)	133.0	133.0	133.0	133.0	133.0	133.0	133.0
Cost: ASMM (Rs.)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Cost: probiotics (Rs.)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Herbal galactogogues (Rs.)	0	4.0	20.0	3.5	3.8	15.0	8.8
Total cost: feed additives (Rs)	15.0	19.0	35.0	18.5	18.8	30.0	23.8
Total cost of complete feed (Basal ration + FA) (Rs.)	148.0	152.0	168.0	151.5	151.8	163.0	156.8
Labour cost (Rs.)	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Miscellaneous expenses (Rs.)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Total cost of milk production (Rs.)	177.0	181.0	197.0	180.5	180.8	192.0	185.8
Net profit (Total income-Total expenditure) (Rs.)	130.6	157.2	154.8	140.7	150.7	153.0	164.0
Economic benefit (Treatment vs. Control (%)	-	20.4	18.5	7.7	15.4	17.2	27.1

* Specified area-specific mineral mixture 'Jawahar'; T_1 = Basal ration, BR; T_2 = BR+Chandrasur 100g; T_3 = BR+Shatavari 100g; T_4 = BR+Methi 100g; T_5 = BR+Chandrasur 70g+Methi 30g; T_6 = BR+Shatavari 70g+Methi 30g; T_7 = BR+Chandrasur 70g+Shatavari 30g. ASMM @ 25g+Probiotics (YC) @15 g animal^{-1}d^{-1} offered uniformly in all groups (Control T_1 and Treatments T_2-T_7)

** Based on the recurring expenditure and commodity prices prevailing during the trial period: January-March 2012 in Jabalpur, M.P.

Asparagus racemosus (Shatavari) Roots

In the control gr. T_1 without any added herbal galactagogue but with ASMM and probiotic (live yeast culture) supplementation, average per cow per day milk production was 8.9 litres, total income from the sale of fluid milk and organic manure (vermicompost) Rs/- 307.60, total cost of milk production Rs/- 177.00, and the net profit was Rs/- 130.60. The over-all economic benefit from different holistic neutraceutical regimens varied from 7.7% to 27.1%, the best response coming from treatment T_7 (chandrasur 70 g + shatavari 30 g), followed by treatment T_2 (chandrasur alone 100 g). Use of hard-boiled dry seeds of chandrasur (garden cress, GC), also named 'halia' is gaining increasing popularity amongst the progressive dairy farmers in Jabalpur area because of potent galactagogue effect, combined with traditional medicinal values.

Trigonella foenum-graceum (Methi) Plant & Seeds

Shatavari can improve the milk production and reproductive capacity of dairy animals, boost the immune system and prevent infection of the udder leading to mastitis, and also serve as adaptogen by reducing the level of heat stress (Kumar et al., 2008). However, the only constraint in the use of shatavari per se is the cost factor (dry root powder is available locally @ Rs/- 150- 200/kg as against Rs/- 35-40/kg of chandrasur dry seeds.

Conclusions

On the basis of the above observations, chandrasur-shatavari (total 100g mixed in the ratio of 7: 3), or chandrasur alone (100 g) in synergistic combination with ASMM (25g) and probiotics, live yeast culture (15g) - as composite feed additive package in the daily ration offered to lactating dairy cows - is highly recommended.

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Zinc Deficiency (Parakeratosis) : treatment and control in domestic animals

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Introduction

Zinc is essential for more than 300 enzymes, structural proteins and hormones in the mammalian body. It is needed for diverse physiological processes and metabolic functions including DNA and protein synthesis, free radical protection, RBC synthesis, heme, immune function, wound healing, reproduction, growth and development

Etiology

Pigs

The Zinc deficiency in young, growing pigs can cause parakeratosis, but it is not due to a simple zinc deficiency. The availability of zinc in the diet is adversely affected by the presence of phytic acid, a constituent of plant protein sources such as soybean meal. Much of the zinc in plant protein is in the bound form and unavailable to the monogastric animal such as the pigs.

Ruminants

The primary zinc deficiency due to low dietary zinc in ruminants is rare, but does occur. Many factors influence the availability of zinc from soils, including the nitrogen and phosphorus concentration. The risk of zinc deficiency increases when soil pH rises above 6.5 and as fertilization with nitrogen and phosphorus increases.

Several factors may deleteriously affect the availability of zinc to ruminants and cause a secondary zinc deficiency. These include the consumption of immature grass (which affects digestibility) the feeding of late-cut hay (which may be poorly digestible) and the presence of excessive dietary sulfur.

Pathogenesis

The pathogenesis of zinc deficiency is not well-understood. However, the disturbance in following physiological processes can be attributed to Zinc deficiency.

- Zinc is a component of the enzyme carbonic anhydrase, which is located in the red blood cells and parietal cells of the stomach, and is related to the transport of respiratory carbon dioxide and the secretion of hydrochloric acid by the gastric mucosa.
- Zinc is also associated with RNA function and related to insulin, glucagon, and other hormones.
- It also has a role in keratinisation, calcification and wound healing,
- Because it has a critical role in nucleic acid and protein metabolism, a deficiency may adversely affect the cell mediated immune system.
- Zinc deficiency results in decreased feed intake in all species and is probably the reason for the depression of growth rate in growing

animals and body weight in mature animals.

- Failure of keratinization resulting in parakeratosis, loss and failure of growth of wool and hair and lesions of the coronary bands probably reflect the importance of zinc in protein synthesis.
- There are lesions of the arteriolar walls of the dermis. The bones of zinc deficient ruminants reveal abnormal mineralization.

Clinical Findings

Pigs

A reduced rate and efficiency of body weight gain is characteristic. Circumscribed areas of erythema appear on the skin on the ventral abdomen and inside the thigh. These areas develop into papules, 3-5 mm in diameter, which are soon covered with scales followed by thick crusts. These crusts are most visible in areas above the limb joints, ears and tail and are distributed symmetrically in all cases. Diarrhoea of moderate degree is common. Secondary subcutaneous abscesses occur frequently, but in uncomplicated cases, the skin lesions disappear spontaneously in 10-45 days if the ration is corrected.

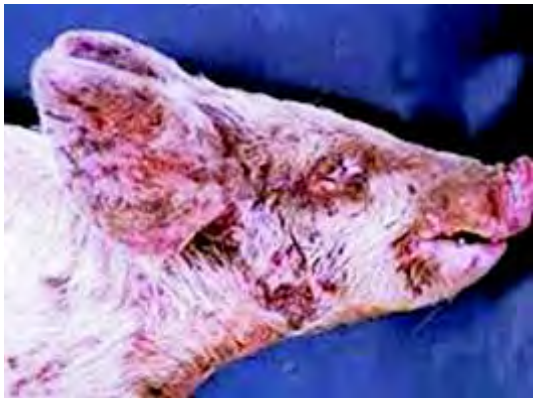

Fig. 1 Crusts near ear, eye and mouth

Ruminants

In naturally occurring disease in cattle, parakeratosis and alopecia may affect about 40% of the skin area. The lesions are most marked on the muzzle, vulva, anus, tailhead, ears, backs of the hindlegs, kneefolds, flank, and neck. Most animals are below average body condition and are stunted in growth. After treatment with zinc, improvement is apparent in one week and complete in three weeks.

Experimentally produced cases exhibit the a stiff gait, swelling of the coronets, hocks, and knees, alopecia, wrinkling of the skin of the legs, scrotum, neck and head, especially around the nostrils and haemorrhages around the teeth.

Fig. 2 Parakeratosis, erythema and allopacia

Sheep

The natural disease in sheep is characterized by loss of wool and the development of thick, wrinkled skin. Wool-eating also occurs in sheep and may be one of the earliest signs noticed in lambs after being on a zinc-deficient diet for 4 weeks.

Infertility in ewes and a dietary deficiency of zinc have not been scientifically linked, but a zinc-responsive infertility has been described in ewes. Again, attention is drawn to the need for response trials when soil and pasture levels of an

Fig. 3 Loss of wool

element are marginal.

An experimental zinc deficiency in pregnant ewes results in a decrease in the birth weight of the lambs and a reduced concentration of zinc in the tissues of the lambs; these effects are due to the reduced feed intake characteristic of zinc deficiency.

Canines

There are basically three syndromes of zinc-related dermatoses in dogs.

The first type occurs in Alaskan breeds including the Siberian Husky and Alaskan Malamute and also been reported in Doberman and Great Danes. The affected dogs were all on a well-

Fig. 4 Crusts near eye and mouth

Fig. 5 Crusts at the pressure points

balanced commercial dog food that was sufficiently supplemented with zinc. The disease is primarily related to a genetic defect in intestinal absorption.

Lesions start relatively early in age and include thick crusts, erythema, scaling and occasional purulent exudation symmetrically around the eyes, mouth, pressure points, muco-cutaneous junctions (vulva, prepuce) and scrotum. Also, the planum and the paw pad epithelium may also display similar changes as seen on the haired skin.

The second type of zinc-related dermatosis in the dog is seen in large to giant breeds that are fast growing during the juvenile period. It has been reported in the Great Dane, German Shepherd, Labradors, Standard Poodles and Dobermans. It is directly related to alterations in the diet or to supplements that may interfere with zinc absorption and the diets those are high in phytate or calcium.

The third type of zinc-related dermatosis has been classically described as generic dog food disease. In early reports, some dogs (particularly puppies) developed scaling and crusting as early as two to four weeks after being fed a commercial generic dog food as generic dog food disease.

Clinical Pathology:

Skin scraping/Biopsy - Laboratory examination of skin scrapings yields negative results, but skin biopsy will confirm the diagnosis of parakeratosis.

Zinc in serum;- Serum zinc levels may have good diagnostic value. Normal levels are 80-120 µg/dL (12.2-18.2 µmol/L) in sheep and cattle. Calves and lambs on deficient diets may have levels as low as 18 µg/dL (3.0 µmol/L). Normal serum zinc levels in sheep are above 78 µg/dL (12 µmol/L), and values below 39 µg/dL (6 µmollL) or less are considered as evidence of deficiency.

Treatment:

- In outbreaks of parakeratosis in swine, zinc should be added to diet immediately at the rate of 50 mg/kg DM (200 mg of zinc sulfate or carbonate per kg of feed.
- The calcium level of the diet should be maintained at between 0.65 and 0.75 % .
- The injection of zinc at a rate of 2-4 mg/kg BW daily for 10 days is also effective.
- Zinc oxide suspended in olive oil and given IM at a dose of 200 mg of zinc for adult sheep and 50 mg of zinc for lambs will result in a clinical cure within 2 months.

DOGS

Zinc is available in many forms for oral supplementation and include zinc sulfate (oral and IV), zinc methionine, and zinc gluconate.

Zinc sulfate oral: 10 mg/kg once daily IV: 10-15 mg/kg weekly for four treatments.

Zinc methionine: 1.7 mg /kg/day

Zinc gluconate: 1.5 mg/kg/day of elemental zinc.

Control:

Pigs - The calcium content of diets for growing pigs should be restricted to 0.5-0.6%. Supplementation with zinc (to 50 mg/kg DM) as sulfate or carbonate has been found to be highly effective as a preventive and there appears to be a wide margin of safety in its use, diets containing 1000 mg/kg DM added zinc having no apparent toxic effect

Ruminants - For cattle, the feeding of zinc sulfate (2-4 g daily) is recommended as an emergency measure followed by the application of a zinc- containing fertilizer. As an alternative to dietary supplementation for ruminants, an intra-ruminal pellet has been demonstrated in sheep. It was effective for 7 weeks only and would not be satisfactory for long-term use. The creation of subcutaneous depots of zinc by the injection of zinc oxide or zinc metal dust has been demonstrated. The zinc dust offered a greater delayed effect. Several other methods are available but they are under experimental stages.

Fig. 6 Crusts and scaling around eyes

Buffaloes worldwide

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Introduction:

Buffalo is the animal of choice among milk produces and therefore it holds the greatest promise for rural development opportunities. Milch buffalo is generally looked upon as a prestigious possession of the family. The present paper describes the 'Buffalo scenario' in Afro-Asian region.

A. African buffalo or Cape buffalo (*Syncerus caffer*).

It is a large African bovine (Grubb, 2005). Owing to its unpredictable nature, which makes it highly dangerous to humans, the African buffalo has never been domesticated unlike its Asian counterpart, the water buffalo. They are large in size than Asian water buffaloes. There are five sub-species of African buffaloes.

1. ***Syncerus caffer caffer***, also called Cape buffalo, is the largest one, with males weighing up to 910 kilograms. It is peculiar to South and East Africa. Colour of this subspecies is the darkest, almost black. The Cape buffalo is susceptible to many diseases, including bovine tuberculosis, corridor disease, and foot and mouth disease. Cape buffalo is of Bovidae family. They can defend themselves also against lions. Cape Buffalo live on the open pastures, close to jungle and swampy ground where they can wallow. They are found in Ethiopia, Somalia, Zambia, Zimbabwe, Namibia, Botswana, Mozambique, South Africa, Kenya and Tanzania. The gestation period of buffaloes is 11.5 months and they first calve at fifth year. Bulls mature at eight years.

2. ***Syncerus caffer nanus,*** also known as forest buffalo, is the smallest subspecies; the height at the withers is less than 120 cm and average weight is about 270 kilograms. Their color is red, with darker patches on the head and shoulders in the ears forming a brush. The dwarf buffalo is common in forest areas of Central and West Africa (Nowak, 1991; Kingdon, 1997). This subspecies is so different from the standard model that some researchers consider it still a separate species, *S. Nanus*. Hybrids between the typical subspecies and dwarf hybrids are not uncommon.

3. ***Syncerus caffer brachyceros*** is third subspecies from West Africa, also known as Sudanese buffalo, intermediate between those two subspecies. Its body weight and size is relatively small than those in the South African. Bulls weigh about 600 kilograms.

4. ***Syncerus. caffer aequinoctialis*** is also known as Nile buffalo, is confined to the savannas of Central Africa. It is similar to the

Cape buffalo, but somewhat smaller, and its color is lighter. This subspecies is sometimes included in the Sudanese buffalo (Groves and Leslie, 2011). The average male body weight is 700Kilograms. They are broadly distributed along the Nile river, although not limited to its bank. From Northeastern Congo and Uganda along the Albert Nile Northwards into the southern savannah regions the Sudan and the west parts of Ethiopia.

5. ***Syncerus caffer mathewsi*** is also called mountain buffalo that is not universally recognized. It lives in mountainous areas of East Africa.

Behaviour

The African Buffalo is widely regarded as a very dangerous animal and known as Black death, as it gores and kills over 200 people every year. Buffaloes are sometimes reported to kill more people in Africa than by any other animal.

Cytogenetics of African buffalo

Chromosome numbers of these two subspecies of African buffalo, *Syncerus caffer caffer* (East African) have 52 chromosomes whereas *Syncerus caffer nanus* (Dwarf Forest) have 54, (Wurster & Benirschke, 1967; Ulbrich and Fischer, 1967; Heck et al., 1968 Cribiu and Popescu, 1980).

B. The water buffalo or domestic Asian water buffalo (*Bubalus*)

It is a large buffalo found in the Indian subcontinent to Vietnam and Peninsular Malaysia, in Sri Lanka and in Borneo. The Asian water buffalo holds the greatest promise and potential for production. The buffalo had been severely neglected until 1974, when the Food and Agriculture Organization (FAO) first signposted the water buffalo as the most neglected animal. The majority of Asian water buffaloes are of two types.

1. ***Wild water buffalo*** (*Bubalus arnee*): These buffaloes are native to Southeast Asia and considered as Endangered since 1986, as the remaining population totals less than 4,000. The population decline is at least 50% over the last 30 years and believed to continue (Hegde et al., 2008). Of most of the global population, 91% is present in India, mostly in Assam (Chaudhury, 2010). The wild water buffalo represents most likely the ancestor of the domestic water buffalo (Lau et al., 1998). Wild buffaloes are heavier than domestic buffaloes. Wild water buffalos are presently found in India, Nepal, Bhutan, Thailand, and Cambodia, with an unconfirmed population in Myanmar.

2. ***Water buffalo or domestic Asian water buffalo*** (*Bubalus bubalis*). It is a large buffalo found in the Indian subcontinent to Vietnam and Peninsular Malaysia, in Sri Lanka and in Borneo. Water buffaloes were domesticated in China and India some 5000 and 4000 years ago respectively. Two types are recognized, based on phenotypes and behaviour; the river buffalo of the Indian subcontinent and further west to the Balkans and Italy, and the swamp buffalo, found from Assam in the west through Southeast Asia to the Yangtze valley of China in the east. The genetic studies indicate that the swamp water buffalo may

have originated in China, while the river water buffalo originated from India (Yang et al. 2008). Though, the ancestry of African buffaloes is not clear but they are not close to water buffaloes (Grubb, 2005).

Swamp buffaloes have a grey skin at birth but become slate blue later. Albinoids are present in some populations. The swamp buffalo has 48 chromosomes; the river buffalo has 50 chromosomes. Swamp buffaloes are mostly available in south east countries. The two types do not readily interbreed, but they may produce fertile offspring. River buffaloes like deep water whereas swamp buffaloes like mudholes.

The popular breeds of river buffaloes are as under:

a) **Murrah** buffalo is the most important and well-known water buffalo breed in the world. It is one of the best breeds for milk production and found all over Asia, and from Bulgaria to South America. Murrah buffaloes originate in Haryana, and dispersed to the Punjab in India, to the Punjab province of Pakistan, to the Ravi and Sutley valleys in northern Sind, and to Uttar Pradesh.

b) **Nili-Ravi** buffalo is a milk type of buffalo breed. They are found mainly in Lahore, Sheikhupura, Faisalabad, Sahiwal, Multan and Bahawal Nagar districts in Punjab Province of Pakistan.

c) **Jaffarabadi** buffaloes are heavy, available in Kutch, Junagarh and Jamnagar districts of Gujarat, India.

d) **Mehsana** buffaloes belong to Mehsana, Sabarkantha and Banaskantha districts of Gujarat, India. This is supposed to have been evolved out of crossbreeding between the Surti and the Murrah.

e) **Nagpuri** buffalo's breeding tract of this breed is Nagpur, Akola and Amrawati districts of Maharashtra. This is also called as Ellichpuri or Berari.

f) **Pandharpuri** are found in Solapur, Kolhapur and Sangli districts of Maharashtra state of India.

g) **Bhadawari** is found in Agra and Etawah districts of Uttar Pradesh and Gwalior district of Madhya Pradesh. The body is of medium size.

h) **Surti** is a popular breed found in the Charottar tract of Gujarat between Mahi and Sabarmati rivers. The best animals of this breed are found in Anand, Nadiad and Baroda districts of Gujarat.

i) **Toda** belong to Nilgiri district of Tamil Nadu, India

j) **Banni** buffalo is a native of Sindh, Pakistan

k) **Chilika** belong to Orissa, India

Besides these, there are many local breeds available in India. Of all the domestic animals, the Asian water buffalo holds the greatest promise and potential for production.

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African buffalo or Cape buffalo *(Syncerus caffer)*

Syncerus caffer caffer

Syncerus caffer nanus

Syncerus caffer brachyceros

Syncerus caffer aequinoctialis

Syncerus caffer mathewsi

Water buffaloes or Asian water buffaloes

Pandharpuri

Bhadawari

Surti

Toda

Banni

Chilka

Wild Asian water buffalo
(Bubalus arnee)

Swamp

Murrah

Nili Ravi

Jaffarabadi

Nagpuri

News...National...

"Purnima' cloned calf born from elite buffalo at NDRI Karnal

An elite buffalo reborn through cloning

Karnal : In a unique experiment, the scientists at NDRI Karnal, have successfully produced another clone buffalo calf 'Poornima' from the somatic cell (from the ear) of an adult elite buffalo, which has a lactational yield of 3812 kg/305 days and the peak yield of 25 kg/day.

The calf (wt. 44 kg) was born normally and though died after 20 days, the scientists at NDRI are encouraged, as for the first time, the new and advanced Hand - guided Cloning Technique has paved the way for developing clone animals from the adult of the known pedigree.

Though India possesses World's largest buffalo population and 55% of total milk production in India comes from buffaloes, the population of elite buffaloes is very less. There is a need to enhance the population are the elite buffaloes to meet India's growing milk demand. The technology developed at NDRI shall go a long way in achieving the targeted population of elite milch buffaloes.

- NDRI News 2013, 18(2)

A new hope in the treatment of Fluorosis

New Delhi : Chronic fluorosis is a debilitating disease in cattle and buffaloes, characterized by mottling, staining; and rapid irregular teeth ware, lameness, reduced feed intake and loss of productivity (milk and work capacity). The disease is prevalent in arid and semi-arid areas of India.

Tamarindus indica (Imli) pulp and *Moringa oleifera* (Sheoga) pods together have been validated scientifically at the dose rate of 200 mg/kg/day, orally for 90 days for their ameliorating effect on fluorosis. The efficacy of the test drug was assessed based on fluorine concentration in blood (normally 0.2 ppm) and urine (normally upto 6 ppm). Sixteen cattle and buffaloes in Chitoragarh district of Rajasthan, showing visible clinical signs of fluorosis and elevated blood (more than 0.4 ppm) and urine (31-36 ppm) fluorine levels, were given a test drug Fluoricure (Coded, above pulp) at the dose rate of 200 mg/kg/day of the above pulp for 90 days. At the end of 90 days, fluoride content in blood (0.17 ppm) and urine (less than 25 ppm) were significantly reduced, along with overall improvement in general health and performance (milk production and work efficiency).

- ICAR Reeporter 2013:19(2)

Know the prestigious institute

Bharatiya Agro Industries Foundation, Pune (BAIF)

BAIF Development Research Foundation is a Non-Government organization (NGO) established on 24th August 1967 and is registered under Public Trust act of 1950 with an objective to using natural resources like land, water, livestock and vegetation for developing programs leading to economic and qualitative improvement in economically disadvantaged sections of the rural society. The spheres of activities include watershed management, agriculture, livestock, sericulture, horticulture and other vocational programs aimed at sustainable rural development. From the inception, livestock based activities were the prime instruments used by BAIF to uplift the livelihoods of rural poor. BAIF is committed to a holistic livestock development, particularly to improve the milk production and provide sustainable livelihood to the rural poor. Gainful self-employment through maintenance of dairy animals is one of the prime activities amongst various development programmes run by BAIF.

BAIF is committed to livestock development particularly to improve the milk production potential of the cattle and buffalo resources and provide sustainable livelihood to the rural poor. Over 4.93 million small and marginal farmers from 90,556 villages in 12 states are participating in the programme. The milk produced by the cows & buffalos under BAIF's programme was worth Rs.48000 million during 2012-2013. The Institution has pioneered the introduction of frozen semen technology for artificial insemination (AI) of cattle at the doorstep of farmers in rural India. BAIF started its AI program in 1971-72 with 3 Cattle Development Centres (CDC) by using frozen Semen technology and doorstep AI

service delivery. The appropriate training of the AI technicians, timely supply of inputs and the efficiency and effectiveness of the program has resulted into production of high genetic potential crossbred / upgraded cows and upgraded buffalo population at farmers' house. Around 4076 cattle breeding centres spread out in 255 districts are providing breeding service at door step of farmer in 12 states of rural India. Around 3.4 million AI have been performed every year through these centres with about 10% annual increase. The conception rate is ranging from 45to 50%. The entire frozen semen need of the BAIF' AI operations are met from its own frozen semen laboratory. The salient features of the programme are as follows.

- Efficient breeding services using quality frozen semen for Artificial Insemination (AI) at the doorsteps of farmers;
- Cluster approach to cover the block of villages to create greater impact;
- Close follow-up, technical guidance and monitoring;
- Conservation and improvement of native breeds and crossbreeding of non-descript animals with exotic and crossbred bulls frozen semen;
- Comprehensive package of breeding, feeding, health care and management advisory services.
- Frequent trainings of programme participants on breeding, feeding, health care and management aspects.
- Targeting of the underprivileged and sensitivity to social and gender issues.
- Formation and capacity building of village level users groups to make them vibrant enough to run the project sustainably with minimal external support.
- Establish linkages with various development agencies at the local level for efficient forward linkages.
- Organization of regular health care and infertility management camps.

Blending Development with Research and Training:

For effective implementation of various development programmes, the development programmes are supported by applied research and training activities. It has been realized that any development programme without research back up is outdated and any research programme without development and extension outlets is academic. BAIF has developed state-of-the-art technology and is ready to undertake field application of the technology for the benefit of the farmers.

BAIF has developed expertise in the following fields.

Frozen Semen Laboratory

Since 1975, frozen semen laboratory is engaged in producing and supplying excellent quality of semen required for the livestock improvement programme. The laboratory freezes semen of purebred exotics (Holstein and Jersey), Crossbred (bulls resulting from crosses between local and exotic), Indigenous (Sahiwal, Gir, Khillar, AmritMahal, Hallikar etc.), Buffalo (Murrah, Surti and Jafarabadi) and Goat (Osmanabadi, Sirohi) species of livestock. BAIF's frozen semen laboratory which is the first

laboratory to have ISO certification and ranked "A" by GOI in the country has produced over 8 million doses of frozen semen from 236 elite bulls of purebred HF and Jersey, crossbred, indigenous breeds of cattle and buffaloes in 2011-12, out of which 51% doses were used for BAIF field programme in 12 states while the rest is sold to other Government and Non-Government Organisations engaged in livestock development.

The Semen Freezing Laboratory is equipped with ultramodern equipments. A separate Quality Control Laboratory is taking care of the quality control measures for semen production as defined by MSP. The laboratory is also engaged in research in semenology, besides its pivotal role in production of pathogen free frozen semen of purebred exotic and crossbred cattle and buffalo bulls.

Embryo Transfer Laboratory

The embryo transfer laboratory which produces embryos from elite pure bred Holstein, Jersey, crossbred and buffalo females to produce genetically superior bulls for semen production and future bull mothers. The Embryo Transfer activity is also used for breed conservation and improvement of indigenous breeds. BAIF established an ET lab in April 2001 with the funding from TIFAC (Technology Information Forecasting and assessment council) under the project titled "Genetic Improvement of Rural Dairy Livestock for Sustainable Livelihood". Under this project, 232 viable embryos were recovered from station animals and 80 from field donors. 52 calves were born at station and 22 were born at field. Out of the ET calves born, 27 males became breeding bulls after passing all quality parameters and produced around 37 lakhs of frozen semen doses. They continue to produce FSD for the field genetic improvement program. BAIF implemented the Dangi cattle improvement program titled "To Study Feasibility of Conservation and Improvement of Dangi Cattle Using Embryo Transfer" during the period July 2003- 2005 under the sponsorship of DBT. 164 embryos were recovered out of 43 flushing. BAIF in collaboration with JOP Group of Brazil (a research project titled "Studying male and female reproduction aspects in Ongole and Gir cattle using ET and semen freezing technology") produced and supplied a total number of 964 Ongole embryos to Brazil.

Animal Genetics and Breeding

Indigenous Breed Conservation: Using the latest breeding technology, BAIF has taken up conservation and improvement of Gir and Jaffarabadi breeds in its native breeding tract. Similarly BAIF also undertook Krishna Valley breed conservation project under the sponsorship of National Bureau of Animal Genetic Resources (NBAGR, Karnal). Exploring the milk production potential of Indian dairy cattle and buffalo is paramount for sustainable dairy production. BAIF is also involved in breed characterization of Dangi, Khillar cattle, Deccani sheep sponsored by NBAGR, Karnal.

Field Progeny Testing Program in crossbred cattle is operated with the sponsorship of ICAR since last 30years. Improvement in the performance necessitates desirable genetic potential of the individual. The department has facilities for assessing genetic potential of individual animals and research projects under which field recording of observations can be undertaken to generate data on genetic parameters to ensure livestock improvement.

The department is fully equipped with electronic data processing (EDP) facilities and computer software packages.

Molecular Genetics Laboratory

BAIF has a molecular genetics laboratory equipped with Sequencer and RT-PCR equipment and facilities for DNA extraction. This laboratory is being viewed as a common facility centre which will undertake molecular researches in the field of livestock, agriculture, sericulture and other related fields. The working of the laboratory will lead to handling field problems like identification of genetic diseases, Karyotyping, genetic improvement for resistance to mastitis, identifying fertility genes, molecular marker approach to attain genetic progress in milk quantity and quality parameters. At present, this laboratory is catering services of Karyotyping to other states like Punjab, Kerala, M.P. and Karnataka. Combining with the PT programs implemented by Genetics department, the final goal will be to establish a genomic selection unit for the desired traits especially in cattle, buffalo and small ruminants. Also the laboratory is planning to undertake breed and genetic diversity studies for the various indigenous breeds of livestock. The laboratory also has a DNA bank and presently possesses about 2600 DNA samples of large ruminants.

Animal Nutrition Laboratory

Exploitation of the genetic potential of an animal is based on the level of nutrition it receives. The Animal Nutrition Laboratory has necessary facilities to undertake proximate analysis besides other chemical and biochemical analysis needed for assessing feed value of the sample received. Availability of a Nutrition Stall permits effective conduction of digestibility experiments. Various types of feeds can be manufactured in the feed production unit, which is equipped with feed processing equipments. The Laboratory is also a Research unit under the All India Coordinated Research undertaken by the Indian Council of Agricultural Research, New Delhi for evaluating non-traditional feed resources and for production of complete feed.

Utilization of agro-wastes and industrial by-products for production of feeds, development of complete feed, improving the quality of roughages, micro-nutrient research and feed analysis are the major activities with promising outcome. The Animal Feed Unit is engaged in production of superior quality cattle feed and mineral mixture required for the farm and for distribution to farmers.

Fodder development

BAIF initiated research programs on forage crops in the year 1978 as a voluntary centre and received recognition as a Coordinated Centre by ICAR, New Delhi in October 1982. Over a period of time, various technologies of intensive fodder production suited to varying climatic conditions were generated through this coordinated research project. Introduction of Salvodar type subabul, from Hawaii in 1976, now widely cultivated for fodder, fuel, pulp and rehabilitation of community wastelands is the significant achievement. Gliricidia, Sesbania and Stylo are the other forage legumes promoted through distribution of seeds.

Under the ICAR Coordinated Forage Research Programme, various forage crops and varieties are evaluated. Breeding of tropical grasses and

legumes, seed production and distribution of forage crops such as sorghum, bajra, maize, Hybrid Napier, Guinea grass, Anjan grass, Marvel grass, cow pea, oats and alfa alfa are the important activities. The mandate crops were revised to maize, pearl millet, lucerne, B x N Hybrid, Chenchrus and Stylosanthus.

Training

Training programme is an integral part of development programme of BAIF since inception. The main objective of conducting training programmes are creating opportunities of gainful self-employment to the rural families, educated unemployed youths, and ensuring sustainable livelihood in their own areas and secondly to refresh the technical knowledge and use of appropriate technologies in the field.

Regular training programmes have been conducted on land, water, agriculture, and livestock based activities. In addition, BAIF also conducts training programmes on Vermicomposting, Mushroom Production, Advance sericulture rearing, biofertilizer, women in development, community health, People's organizations & biotechnological aspects in livestock development. The emphasis of the training is on practical and demonstrations related to the problems faced under field conditions and how to tackle the situation by using available local resources and infrastructure.

Suitable training facilities have been created at CRS such as training herd for practical training in first aid and A.I., training hall, library, hostel-mess, training infrastructure with latest audio visual equipments and well experienced highly educated and experienced facilitators and faculty members. BAIF have produced numerous extension booklets (in English, Hindi & Marathi languages) for the trainees and farmers.

website : www.baif.org.in

Progenies born through BAIF Cattle Development Program

MSD
Animal Health

The Science of Healthier Animals™

For more information,
Please visit www.msd-animal-health.co.in

Estrumate™ *The Global Brand ...*

Available in 20 ml vial

WITHDRAWAL PERIOD
Milk : 0 (Zero) days
Meat : 0 (Zero) days

COMPOSITION

Each ml of Estrumate contains 263 mcg of cloprostenol sodium, equivalent to 250 mcg of cloprostenol.

INDICATIONS

Induction of luteolysis in dairy cattle and horses-

- Anestrous,
- Subestrous,
- Luteal Cyst,
- Pyometra,
- Persistant Corpus Luteum (PCL),
- Chronic Endometritis,
- Expulsion of Mummified Foetus,
- Termination of Pregnancy,
- Induction of parturition
- Synchronization of Estrous

DOSAGE AND ADMINSTRATION

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

TEFROCEF *A Solution to Many Problems...*

1g vial with 20ml sterile water for injection, disposable syringe and needle.

WITHDRAWAL PERIOD
Milk : 0 (Zero) days
Meat : 4 days

COMPOSITION

Ceftiofur Sodium sterile powder equivalent to Ceftiofur.....1g
One ampoule of sterile water for Inj. IP 20ml

INDICATIONS

- Genital infections of bovine (acute metritis, cervicitis, vaginitis, prolapse related to ROP cases ets) associated with *Arcanobacterium pyogens, Fusobacterium necrophorum and Bacteroides spp.*
- Respiratory diseases of cattle, buffalo, sheep and goat (shipping fever, pneumonia) associated with *Pasteurella haemolytica, Pasteurella multocida* and *Haemophilussomnus*.
- Acute interdigital necrobacillosis (Foot rot, Pododermatitis) caused by *Fusobacterium & Bacteroides.*

DOSAGE AND ADMINSTRATION

Cattle, Buffalo, Sheep & Goat : 1.1 to 2.2 mg ceftiofur per kg body weight by IM route for 3 to 5 days.

NEW INTRODUCTION

LactAid™ Oral POWER

The Powerful Health Tonic...

COMPOSITION

Each 100 ml oral solution contains ...

Calcium ... 3500mg Phosphorus...1750 mg Zinc...100 mg

Vitamin D3...15000... Vitamin B12...200 mcg Chromium...4 mg

Carbohydrate...40,000 mg

INDICATIONS

- Improved milk production
- Improvement in growth and performance
- Stronger bones and resistance to diseases

DOSAGE AND ADMINSTRATION

25-40 ml twice daily by Oral Route

PRESENTATION

1 ltr & 5 ltr jars

Ovilis® PPR

COMPOSITION

Live attenuated PPR virus with NLT $10^{2.5}$ $TCID_{50}$ per dose with suitable freeze drying stabilizer.

INDICATIONS

For the active immunization of sheep and goats in the control of PPR infection.

DOSAGE AND ADMINSTRATION

1 ml per animal by subcutaneous route.

PRESENTATION

Vials of 100/50/25 doses.

NEW INTRODUCTION

Nobivac® KC

COMPOSITION

Contains both Bordetella bronchiseptica (Bb) and canine parainfluenza virus (CPiV)

INDICATIONS

Vaccination against "Kennel Cough"

DOSAGE AND ADMINSTRATION

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

PRESENTATION

One box contains 5 vials of dose and 5 vials of diluent along with one applicator

Scalibor®

COMPOSITION

Scalibor P B 65cm contains 1 gm of deltamethrin
Scalibor P B 48 cm contains 0.76 gm of deltamethrin

INDICATIONS

- Anti tick, anti flea, anti sandfly and anti sandfly.

DOSAGE AND ADMINSTRATION

one collar for six months. 65 cm (medium to large dogs) and 48 cm (smaller dogs).

PRESENTATION

6x65 cm and 6x48 cm.

Cell Associated Vaccine

Innovax® ND-SB1

COMPOSITION

Each ampule contains per dose at least 1534 PFU of live Herpes virus of Turkey Strain HVT/NDV-F and 1514 PFU of live chicken Herpes virus strain SB-1 in the cell associated from

INDICATIONS

The active immunization of chickens against Marek's Disease (MD) and Newcastle Disease (ND)

DOSAGE AND ADMINSTRATION

0.2 ml injection subcutaneously per chick in the neck

PRESENTATION

2000ds & 4000ds ampoules

HORMONES

Receptal® VET.

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Buserelin acetate 0.0042 mg equivalent to 0.004 mg buserelin.	• True anoestrus • Improvement of conception rate (at the time of AI) • Ovarian cyst (Follicular), Irregular oestrus, Nymphomania • Delayed ovulation & Anovulation • Improvement of pregnancy rate (11-12 days post AI) • Improvement of post partum fertility (10-15 days post-calving)	5 ml, IM 2.5 ml, IM 5 ml, IM 2.5 ml, IM 2.5 ml, IM 5ml, IM	Vial of 10 ml and 2.5 ml WITHDRAWAL PERIOD Milk : 0 (Zero) days Meat : 0 (Zero) days

CHORULON®

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each vial contains human Chorionic Gonadotrophin (hCG) as a white freeze-dried crystalline powder (1500 IU)	• Improvement of conception rate (cows/buffaloes) • Enhancement of luteal function post AI • Cystic Ovarian Disease (anoestrus, prolonged estrus, nymphomania) • Induction of ovulation (mares)	1500 IU at AI or mating, IM or IV 1500 IU, 4-6 days post AI, IM 3000 IU, IV 1500-3000 IU, IM or IV, 24 hours before AI/mating	Box containing 5 vials (1500 IU each) with 5 vials of solvent WITHDRAWAL PERIOD Milk : 0 (Zero) days Meat : 0 (Zero) days

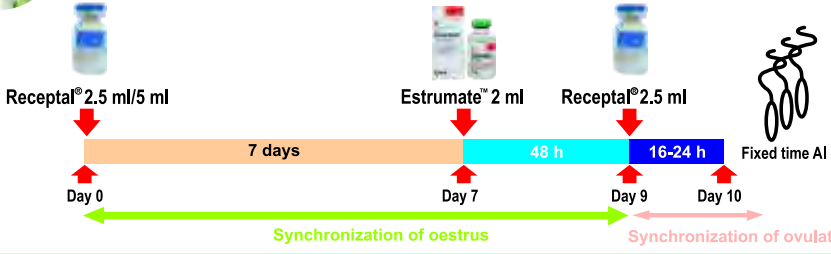
FOLLIGON®

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each vial contains Pregnant Mare Serum Gonadotrophin (PMSG) as a white freeze-dried crystalline powder (1000 IU)	Females: • Anoestrus • Super ovulation • Increase of fertility rate after progestagen pre-treatment	Cow/Buffalo 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

Making calf a year a reality

Oestrus Management in Dairy Cattle

Goal: One Calf per Cow per Year



MSD Animal Health

ANTI-INFECTIVE

COBACTAN 2.5%

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml of suspension contains 29.04 mg Cefquinome Sulphate (equivalent to 25 mg Cefquinome).	Cattle • Respiratory disease caused by *Pasteurella multocida* and *Mannheimia haemolytica* • Digital dermatitis, infectious bulbar necrosis and acute interdigital necrobacillosis (foul in the foot) • Acute *E. coli* mastitis with signs of systemic involvement Calf • *E. coli* septicaemia	1 mg cefquinome/kg bw MI (2ml/50 kg bw) 1 mg cefquinome/kg bw MI (2ml/50 kg bw) 1 mg cefquinome/kg bw MI (2ml/50 kg bw) 2 mg cefquinome/kg bw MI (4ml/50 kg bw)	50 ml multidose vial. WITHDRAWAL PERIOD Milk : 1 day Meat : 5 days

COBACTAN LC

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each syringe contains 75 mg Cefquinome sulphate as active ingredient.	For the treatment of clinical mastitis in lactating cows caused by *Staphylococcus aureus, Streptococcus uberis, Streptococcus dysgalactiae, Escherichia coli* & other entero-bacteria 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 Meat : 2 days

Floxidin™ VET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Floxidin 10% injection : Each ml contains - Enrofloxacin 100 mg	- Alimentary canal e.g. Enteritis, calf scours. - Respiratory tract e.g. Pneumonia - Urogenital system e.g. Metritis, cystitis - Skin e.g. Bacterial dermatitis, pyodemra. - Mastitis, & Haemorrhagic Septicaemia.	Floxidin 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 Now also available 100 ml WITHDRAWAL PERIOD Milk : 3.5 days Meat : 14 days

Tetracycline WSP VET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each gm contains Tetracycline Hydrochloride WS I.P. 50 mg	In Sheep & Goat : Pneumonia, Joint ill, Anthrax, Septicaemia, Contagious Caprine Pleuro-Pneumonia, Scours, Acute Mastitis, Acute Metritis, 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.	Sheep & Goat : 1 gm/kg body weight Cattle : 2.5-5 gm/15kg body weight for 5 days	Sachet of 100 grams WITHDRAWAL PERIOD Milk : 7 days Meat : Cattle-15-22 days, Poultry-5 Days

METRICEF™

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each single dose syringe of 19 g contains: Cephapirin - 500 mg (as benzathine) Excipient to - 19 g	• 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.

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
Each ml contains : Deltamethrin BP 12.5mg	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

Taktic® 12.5% EC

Broad spectrum ectoparasiticide against ticks, mites, lice & keds

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Amitraz I.P. (Vet) 125 mg	1. For prevention & control of ectoparasitic infestation like ticks, mites, lice & keds in cattle, sheep, goat, camel & pig. 2. Taktic kills tick, mite and lice. 3. Taktic kills organochlorine, organophosphate & pyrethroid resistant strains of ectoparasites.	Taktic 12.5%/lit of water for ticks : Cattle/Buffaloes/Camel: 2.0 ml Sheep/Goat : 4.0 ml Pigs : 4.0 ml Taktic 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 15 ml, 50 ml & 250 ml with plastic measuring cup WITHDRAWAL PERIOD Milk : 7 hrs after applications Meat : 1 day for Cattle & Goats & 7 days for Pigs & Sheep

Panacur® VET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The active ingredient of Panacur is Fenbendazole which is the research product of Intervet/Schering-Plough Animal Health. Each 1.5 g Bolus contains 1.5 g of active Fenbendazole. Each 150 mg tablet contains 150 mg of active Fenbendazole.	Infestation of cattle, buffaloes, sheep, goat & horses with gastro-intestinal nematodes, lungworms & tapeworms such as *Haemonchus spp., Ostertagia spp., Trichostrongylus spp., Cooperia spp.* and *Nematodirus spp.*	Recommended for cattle, sheep, goat, horses & pigs. Panacur 150 mg table 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 5 x 2'- 1.5 gm bolus Box of 5 x 2'- 3 gm bolus Box of 5 x 10'- 150 mg tablets. WITHDRAWAL PERIOD Milk : 0 (Zero) day Meat : 8 days

Panacur® VET Powder

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each gram contains Fenbendazole I.P (Vet) 250 mg	Infestations of cattle, buffaloes, Sheep & goats with gastro-intestinal nematodes, lungworms & tapeworms such as *Haemonchus spp., Ostertagia spp., Trichostrongylus spp., Cooperia spp., Nematodirus spp., Neoascaris vitulorum, Oesophagostomum spp., Chabertia spp., Bunostomum spp., Gaigeria pachyscelis, Capillaria, Trichuris spp., Strongyloides spp., Dictyocaulus filaria, Dictyocaulus viviparus, Moniezia spp., Infestation of dogs with Ancylostoma spp., Infestation of horses with strongyles, Ascarids, Ascarids (Parascaris), Oxyuris & Strongyloides Infestation of pigs with Hyostrongylus rubidus, Oesophagostomum spp., Ascaris suum, Trichuris suis & Metastrongylus spp.*	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 : 0 (Zero) day Meat : 8 days

MSD Animal Health

PARASITE CONTROL

Panacur® VET Suspension

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml of Panacur 2.5% suspension contains 25 mg Fenbendazole in 90 ml 450 ml and 1 lit pack.	Infestation of cattle, buffaloes, sheep & goats with gastrointestinal nematodes lungworms & tape worms such as *Hoemonchus spp., Ostertagia spp., Trichostrongylus spp., Cooperia spp., Nematodyrus spp.,*	Dose recommended for cattle, buffaloes, sheep, goats & pigs' infestation with gastrointestinal nematodes & lungworms: (5 mg Fenbendazole per kg body weight)	90 ml 450 ml and 1 lit HDPE bottle pack of Panacur 2.5% suspension. WITHDRAWAL PERIOD Milk : 0 (Zero) day Meat : 8 days

Tolzan® Plus-L

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Oxyclozanide .....3.4% Levamisole Hydrochloride.....2.5%	• 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.) • Tolzan Plus-L can be used safely in pregnant animals during all stages of pregnancy. • Tolzan Plus-L can safely be given to all cattle, sheep and goats without any pre-dosing, starving or change of diet.	Cattle: 90 ml for 300 kg live mass PO Sheep and goats: 9 ml for 30 kg live mass PO	120 ml HDPE bottle, 1 Ltr can WITHDRAWAL PERIOD Milk : 0 (Zero) days Meat : 14 days

Tolzan® F VET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml of suspension contains Oxyclozanide I.P (Vet) suspension of 34 mg	1) Tolzan -F is used in the treatment of acute & chronic Fascioliasis in cattle, buffaloes, sheep & goats. The important species are : a) *Fasciola hepatica* b) *Fasciola gigantica* 2) Tolzan -F is also used to treat paramphistomiasis. The species involved are : *P. microbrothriodes, P. microbrothridium, P. gotal, P. orthocoelium* 3) Tolzan -F also acts on *Monezia* tapeworm in sheep.	Cattle & Buffalo : Orally 10-15 mg/kg body weight Sheep & Goat: Orally 15 mg/kg body weight	90 ml HDPE bottle & 1 ltr jerry can. Also available as 1 gm bolus 1x3x10 strip pack. WITHDRAWAL PERIOD Milk : 0 (Zero) days Meat : 14 days

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	Babesiosis and Trypanosomiasis at 5-10 ml per 100 kg b.w. Resistant strains of Trypanosomiasis at 10 ml per 100 kg b.w. Theileriosis & Mixed infections at 5 -10 per ml 100 kg b.w. along with antibiotic (3-4 antibiotic injections on alternate days)	Amber coloured vials of 20 ml, 30 ml and 90 ml WITHDRAWAL PERIOD Milk : 3 days Meat : 20 days

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).	In acute conditions- 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}™

COMPOSITION	INDICATIONS	DOSAGE	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

COMPOSITION				INDICATIONS	DOSAGE	PRESENTATION
Each KG contains a nutritional value of (When packed):				• 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
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	2500 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			

SUPPORTIVES

Rumicare® Vet

Normalises milk production by restoring ruminal activity.

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
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	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.	Adult Cattle : 125 gm sachet twice daily, (once in 12 hours Young Animals : 65 gm (approx) once or twice daily Sheep & Goat : 32 gm once or twice daily	125 g & 500 g sachet

Avilin® VET

For quick relief from allergic manifestations.

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains: Pheniramine maleate IP 22.75 mg.	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, toxaemia & retention of placenta, pulmonary oedema in cattle, pulmonary emphysema in horses.	Large animals : 5-10 ml. Small animals : 0.5-1 ml. or more. By IM or IV route	Amber coloured vial 10 ml and 33 ml WITHDRAWAL PERIOD Milk : 2 days Meat : 7 days

Prednisolone Acetate Injection

For quick relief from ketosis.

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Prednisolone acetate I.P. 10 mg	Prednisolone is indicated in ketosis in dairy cattle, shock, inflammations (especially rheumatic arthritis, dermatitis, bursitis) and allergic conditions of livestock	Cattle, horses : 5-20 ml. Calves, pigs : 2.5-5ml. Piglets, dogs, cats :1-3 ml. or as recommended by Veterinarian.	Vial of 10 ml WITHDRAWAL PERIOD Milk : 3 days Meat : 5 days

Vetalgin® VET

Highly effective analgesic, antispasmodic, antirheumatic & antipyretic agent.

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Analgin I.P. Chlorbutal (as bacteriostat) 0.4% w/v	For relief from pain, fever, labour, spastic condition of cervix during parturition, rheumatic conditions, neuritis, neuralgia, retention of placenta, dysentry, bloat & gastritis in domestic animals.	Preferably intravenous, otherwise intramuscular or combination of IV/IM injection. 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	Vial of 33 ml WITHDRAWAL PERIOD Milk : 2 days Meat : Cattle 12 days/Pig 3 days & Horse IV 5 days

RUMINANT BIOLOGICALS

BOVILIS™ Clovax

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Trivalent FMD vaccine contains inactivated and concentrated antigens of Foot and Mouth Disease virus serotypes O, A and Asia 1, adjuvanted with mineral oil sufficient to elicit > 3 PD_{50} as per Indian Pharmacopoeia regulations.	For the active immunization of cattle, buffalo, sheep and goats against Foot and Mouth Disease.	Cattle, Buffalo & Calves: 2 ml, Sheep & Goat: 1 ml by deep intramuscular route	Vials of 25 doses (50 ml).

BOVILIS™ HSBQ

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each vaccine dose contains inactivated anacultures of Pasteurella multocida and Clostridium chauvoei as water in oil emulsion sufficient to induce protective levels of antibodies against HS and BQ diseases	For the prophylaxis against Haemorrhagic septicaemia and Black quarter disease in cattle and buffaloes	2 ml of vaccine per animal by deep intra-muscular route	Vials of 100 ml(50 dose)

BRUCELLA ABORTUS STRAIN 19 VACCINE LIVE IP

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each vaccine dose contains 40 X 10^9 of live attenuated Brucella abortus strain 19 organisms in freeze dried form	For the active immunization of female calves of cattle and buffaloes against Brucella abortus infection	2 ml of reconstituted vaccine per animal by subcutaneous route only	Vials of 5 doses with sterile diluent

BOVILIS™ ET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains highly immunogenic toxoids of *Clostridium perfringens* type D adsorbed on aluminium hydroxide gel as an adjuvant sufficient to induced protective levels of epsilon antitoxin titres in vaccinated animals.	For active immunization of sheep and goats against Pulpy kidney disease (Enterotoxaemia) caused by *Clostridium perfringens* type D	Sheep/Goats - 2 ml by subcutaneous injection only.	Vial of 50 doses (100 ml)

Clostridium Perfringens Vaccine Inactivated IP

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each vaccine dose contains inactivated anacultures of *Clostridium perfringens* types-B,C & D adsorbed on aluminium hydroxide gel sufficient to induce protective levels of beta and epsilon antitoxin titres in vaccinated animals.	For active immunization of sheep and goats against infections due to *Clostridium perfringens* types-B, C & D.	2 ml per animal by subcutaneous route	Vials of 25 doses (50 ml).

COMPANION ANIMAL

Nobivac®: Puppy DP

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each dose contains live attenuated strains of : Canine Parvo virus (strain CPV 154) $\geq 10^{7}$ $TCID_{50}$ Canine Distemper virus (strain Onderstepoort) $\geq 10^{5}$ $TCID_{50}$	Vaccination against CDV and CPV. Efficacious in puppies with maternal antibodies.	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
Each dose contains live attenuated strains of : Canine Parvo virus (strain CPV 154) $\geq 10^{7}$ $TCID_{50}$ Canine Distemper virus (strain Onderstepoort) $\geq 10^{4}$ $TCID_{50}$ Canine Adeno virus type 2 (strain Manhattan LPV3) $\geq 10^{4}$ $TCID_{50}$ Canine Para-influenza virus (strain Cornell) $\geq 10^{5.5}$ $TCID_{50}$	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.

Nobivac®: Lepto

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each dose contains inactivated strains of : *Leptospira canicola* (strain Ca-12-000) $\geq$40 hamster PD_{80} *Leptospira icterohaemorrhagiae* (strain 820k) $\geq$40 hamster PD_{80}	Active immunisation against Leptospirosis caused by *L.icterohaemorrhagiae* & *L.canicola of Leptospira interrogans.* Animals are protected against clinical disease, & also against becoming renal carriers after challenge.	Inject 1 ml of Nobivac Lepto subcutaneously. Nobivac Lepto can also be used to reconstitute Intervet's freeze dried vaccines Nobivac Puppy DP & Nobivac DHPPi.	One box contains 10 vials of 1 dose

Nobivac®: Rabies

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each 1 ml contains inactivated Rabies strain Pasteur RIVM with potency $\geq$ 2 IU. The virus is grown on the BHK-21 clone CT cell line inactivated with β-propiolactone, and adsorbed on aluminium phosphate.	For the active immunisation of healthy dogs, cats, cattle, sheep, goats, horses and in principle all healthy mammals against Rabies.	1 ml by subcutaneous or intramuscular injection. Shake well before use.	One box contains 1 ml x 10 vials or one box contains 10 ml x 10 vials

Nobivac®: RL

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each dose contains Rabies strain Pasteur RIV inducing more than 3 IU in the potency test, and inactivated strains of *Leptospira canicola* (strain Ca-12-000) $\geq$40 hamster PD_{80} and *Leptospira icterohaemorrhagiae* (strain 820k) $\geq$40 hamster PD_{80}	For the active immunisation of dogs against rabies, and canine leptospirosis caused by *L.interrogans* serogroups *canicola* and *icterohaemorrhagiae*.	1 ml by subcutaneous injection. Can be used to reconstitute Nobivac DHPPi. Intended for dogs from 8 weeks of age onwards.	One box contains 1 ml x 10 vials.

COMPANION ANIMAL

Taktic® 5% EC

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Amitraz I.P. (Vet) 50 mg	It is indicated for the topical treatment of Demodectic & Sarcoptic Mange, ticks & lice in dogs.	Mixing Rate / lit of water: Ticks & lice - 6 ml Mites - 10 ml 3-5 applications for mange and 2 applications for ticks and lice at weekly intervals. Taktic to be used as dip or spray	Glass bottle of 25 ml with plastic measuring cup

San Coat®

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
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	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, *Malassezia pachydermatis*, pyoderma, mange etc. in dogs.	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	Container of 150 ml (bettix shape)

VM 365®

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Vitamins and minerals	Beneficial for all dogs as a daily vitamin-mineral supplement, and especially during periods of stress, convalescence, growth, pregnancy and lactation.	For oral administration to dogs. Puppies and dogs under 10 lbs/4.54 kg – ½ tablet daily Dogs over 10 lbs/4.54 kg – 1 tablet daily	Container of 60 tablets

DELVOSTERON™

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains 100 mg proligestone	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 Body weight — Dosage < 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	20 ml Vials

4CYTE™

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Marine concentrates(NZ Green tipped mussel, Abalone, Marine cartilage), Epiitalis, Binders, Antioxidants.	Can be used in all dogs for joint management . It's a nutraceutical which works as an adjunct to therapy for early recovery.	4 gm per 5 kg of weight will be loading dose which will be given for 4 to 6 weeks. Maintenance dose will be half of it.	10 gm and 50 gm sachet.

POULTRY PRODUCTS

Live Vaccine

Nobilis® Gumboro 228E

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Live I.B.D. virus strain 228E: >= 2.0 $\log^{10}$ EID_{50}	Immunization of chickens against Gumboro Disease (IBD).	One dose per bird.	Vials each containing 1000 or 2500 doses in packs of 10 vials.

Nobilis® Gumboro D78

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Live I.B.D. virus strain D78: >= 4.0 $\log^{10}TCID_{50}$	Immunization of chickens against Gumboro Disease (IBD).	One dose per bird.	Vials each containing 1000 or 2500 doses in packs of 10 vials.

Nobilis® ND Clone 30

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Live ND strain Clone 30: >= 6.0 $\log^{10}$ EID_{50}	Immunization of healthy chickens and turkeys against Newcastle Disease.	One dose per bird.	Vials each containing 1000 or 2500, 5000 doses in packs of 10 vials.

Nobilis® IB H120

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Live IB strain H120: >= 3.0 $\log^{10}$ EID_{50}	Primary vaccination of chickens against Infectious Bronchitis, normal and emergency vaccination of broilers, future layers and breeding stock and emergency vaccination of laying birds.	One dose per bird.	Boxes of vials each containing 1000, 2500 or 5000 doses.

Nobilis® MG 6/85

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Live M. gallisepticum strain 6/85: >= $10^{6.9}$CFU	Active immunization of future layers to reduce the clinical signs of Mycoplasma gallisepticum infection.	One dose per bird.	Boxes of vials each containing 1000 doses

Inactivated Vaccine

Nobilis® MG inac

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Inactivated Mycoplasma gallisepticum cells.	Vaccination against infections caused by Mycoplasma gallisepticum in chickens.	0.5 ml per bird:	500 ml (1000 doses) bottles.

Nobilis® E. coli inac

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : - E. coli fimbrial antigen (F11). - E. coli flagellar antigen (FT).	Passive immunization of broilers against colibacillosis by vaccination of broiler breeders.	One dose per bird.	500 ml (1000 doses)

Nobilis® Salenvac T

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Inactivated Salmonella enteritidis PT4 and Inactivated Salmonella typhimurium Dt104.	For the active immunisation 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.	500 ml bottles.

Nobilis® Newcavac

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Inactivated ND Clone 30 virus.	The vaccine is recommended for the booster vaccination of layers and breeding stock for protection against Newcastle Disease throughout the laying period.	Each bird: 0.5 ml.	500 ml (1000 doses) bottles.

Nobilis® ND Broiler

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : ND virus Clone 30	The vaccine is recommended for the vaccination of day-old chicks against Newcastle Disease in areas where ND is endemic.	Each bird: 0.1 ml.	200 ml (2000 doses) bottles.

Nobilis® Corvac

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Inactivated Avibacterium paragallinarum strain 083 (serotype A), strain Spross (serotype B), strain H-18 (serotype C)	Protection against Haemophilus paragallinarum infections in chickens.	0.5 ml per bird.	500 ml (1000 doses) bottles.

Nobilis® Coryza

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : • Inactivated Avibacterium paragallinarum strain 083 (serotype A), strain Spross (serotype B), strain H-18 (serotype C)	Protection against Haemophilusparagallinarum infections in chickens. Chickens are vaccinated twice in order to stimulate (serotype-specific) homologous protection against the serotypes.	Each bird: 0.25 ml.	Vials of 1000 doses (250 ml) .

Nobilis® Reo inac

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Inactivated Reovirus strains 1733 and 2408.	The vaccine is recommended for the booster vaccination of breeding stock against Avian Reovirus to protect their offspring against Avian Reovirus infections.	Each bird: 0.5 ml.	500 ml (1000 doses) bottles.

Nobilis® G + ND

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : - Inactivated ND virus Clone 30. - Inactivated Gumboro virus strain D78.	The vaccine is recommended for the 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.	Each bird: 0.5 ml.	500 ml (1000 doses) bottles .

Nobilis® IB multi + ND

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : - Inactivated IB strain M41. - Inactivated IB strain D274. - Inactivated ND Clone 30	The vaccine is recommended for the booster vaccination of layers and breeding stock for protection against the Massachusetts serotype of Infectious Bronchitis and Newcastle Disease.	Each bird: 0.5 ml.	500 ml (1000 doses) bottles.

Nobilis® IB + G + ND

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : - Inactivated IB strain M41. - Inactivated Gumboro strain D78. - Inactivated ND Clone 30.	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.	Each bird: 0.5ml	500 ml (1000 doses) bottles.

Nobilis® Reo + IB + G + ND

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Inactivated IBV strain M41. Inactivated NDV virus Clone 30. Inactivated IBDV strain D78. Inactivated Reo virus strains 1733 and 2408.	The vaccine is recommended for the booster vaccination of breeding stock for protection against the Massachusetts serotype of Infectious Bronchitis and for protection against Newcastle Disease; and for immunisation against Reovirus infection and Infectious Bursal Disease virus, in order to protect the offspring of the vaccinated birds against Reovirus infections and Gumboro Disease by maternal antibodies for at least the first weeks of life.	Each bird: 0.5 ml.	500 ml (1000 doses) bottles.

Feed Supplement

Enradin®

COMPOSITION	APPLICATION	INCLUSION RATE	PRESENTATION
Each 1Kg of Enradin contains 80 gm of Enramycine HCL a polypeptide.	As a growth promoter	5-10 ppm	20 Kg

Amnovit®

COMPOSITION	APPLICATION	INCLUSION RATE	PRESENTATION
Scientifically Balance formulation of vitamins and amino acids	- As a growth promoter - Stress conditions - Supportive therapy	1gm/lit of water for 5-7 days or 500 gm for 5-7 days	1 Kg

Aviguard®

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Natural, Live Intestinal Microflora	Maintain or restore a Balanced and Normal gut flora	Package of 25 gm sufficient for 2000 birds	25 gm Sachet

Pharma Product

Floxidin™

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Enrofloxacin 10%	Broad Spectrum Bactericidal Antiobiotic	10 mg per kg BW for 3-5 days	1LT & 5 LT

Cell Associated Vaccine

Innovax®
ND-SB1

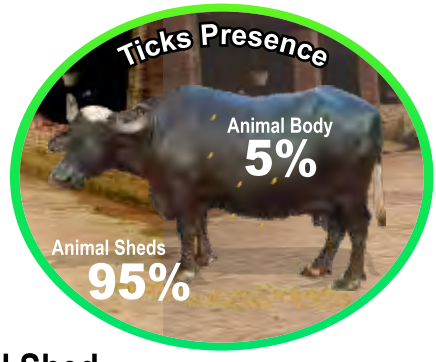
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ampoule contains per dose at least 1534 PFU of live Herpes virus of Turkey Strain HVT/NDV-F and 1514 PFU of live chicken Herpes virus strain SB-1 in the cell associated form	The active immunization of chickens against Marek's Disease (MD) and Newcastle Disease (ND)	0.2 ml injection subcutaneously per chick in the neck	2000ds ampoule

VAC-SAFE®

COMPOSITION	APPLICATION	INCLUSION RATE	PRESENTATION
An effervescent tablet that dilutes easily and neutralizes the chlorine in the water	Improving quality of drinking water vaccination	1 tablet /100 Ltr water	Box of 30 tablet

Tick Eradication Program

Do You Know ?



For Application on Animal Shed

butox® Vet Power

WITHDRAWAL PERIOD

Milk : 0 (Zero) day
Meat : 20 days

For Application on Animal Body

Taktic® 12.5% EC

WITHDRAWAL PERIOD

Milk : 7 hrs after applications
Meat : 1 day for Cattle & Goats & Goats & 7 days for Pigs & Sheep

Advantages

- Reduced tick load in animal shed
- Low incidences of tick born diseases
- Increased interval between two consecutive spray on animal body
- Better herd health

MSD Animal Health

A step forward in the treatment of Mastitis

COBACTAN® LC

(Intramammary)

Control Measures for Mastitis

- Wash the hands with soap and water before hand milking.
- Clean the udder with antiseptic solution before & after milking.
- Use full-hand milking instead of knuckling.
- Allow animals to stand for 30 minutes after milking by providing feed or grass.
- Identify the chronic mastitic cow and milk them at last.

Advantages of Using Cobactan LC in Early Stages:

- Stops the Progression of Mastitis.
- Faster Recovery.
- Symptoms disappear quickly.
- Quick return to normal Milk production.

Withdrawal Period:
Milk- 84 hrs. (7 milking)
Meat- 2 days

Administration of Cobactan LC

Infuse **COBACTAN® LC**
(Intramammary)

At 0 hr.	At 12 hr.	At 24 hr.
1st tube	2nd tube	3rd tube



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:

Name/s of author/s:

Place of work :

Introduction :

Material and Methods : In details

Results and Discussions :

Summary / Conclusions :

Acknowledgment : If necessary

References :

Periodical/s : Surname/s and initial/s of author/s, year of publication in parenthesis, title, abbreviated name of journal (italics), volume number, (Bold), Issue number first and last page number/s.

Books : Name/s of author/s., year of publication in parenthesis, title of the book, edition (Bold), name of publishers (Italics) and place.

Tables and Figures: Tables are to be numbered in Roman numbers (1 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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Authors are requested to confirm that the paper has not been published elsewhere and also to indicate details of postal address for communication with STD code, telephone/fax number, mobile & email.

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A trusted source for comprehensive animal health solutions

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