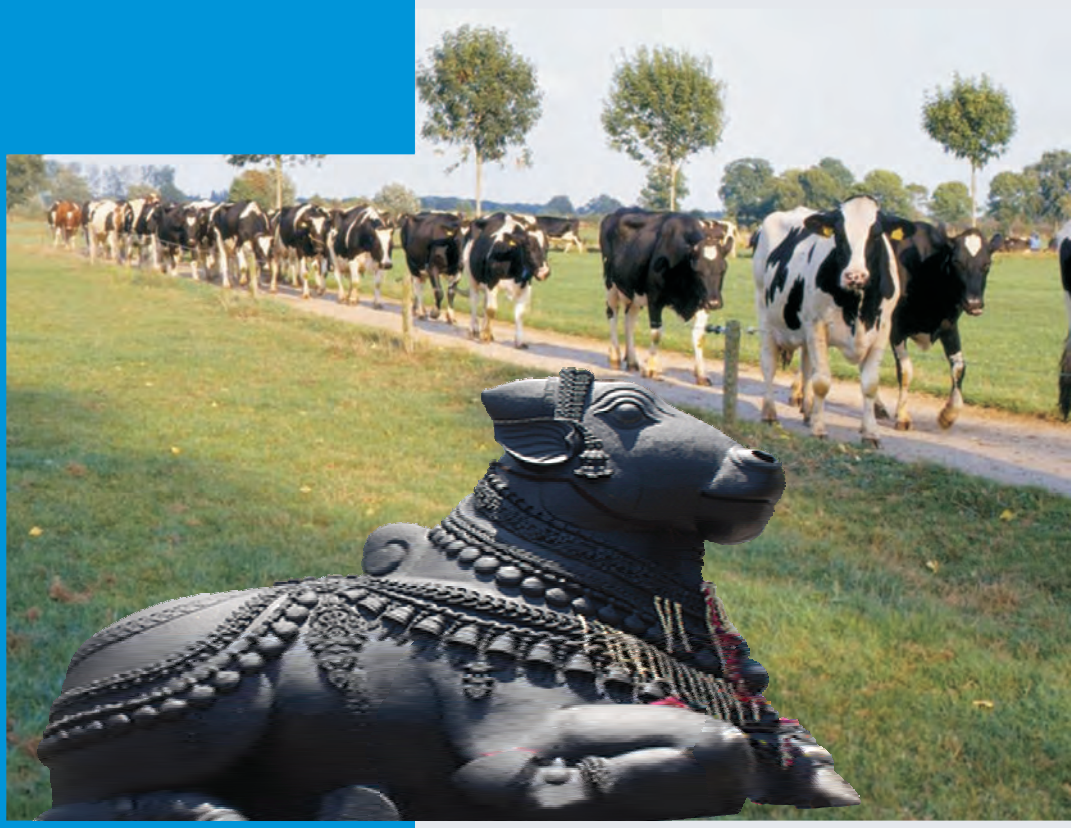
The Blue Cross Book

For the advancement of the veterinary profession



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From Editor's Desk

Bovine mastitis, infertility and emerging zoonosis are the perpetual problems faced by Veterinarians of the field level and the Blue Cross Book has been providing solutions to these problems regularly through its issues. The present volume is no exception to this. The present volume contains not only informative but educative articles on these issues.

Contagious ecthyma is a newly emerging zoonosis affecting not only the small ruminants but also those who care and handle these species. This disease bears special significance in India as large section of people are dependent on these species for their day to day livelihood. The shepherds, wool handlers and the butchers are at risk because of this disease.

The article in contagious ecthyma provides the preventive measures which the field veterinarian can use to educate the stake holders on this zoonosis.

Alternate medicine is equally important in Veterinary medicine as in the human medicine. Many plant species are continuously validated for their use in animal disease. The treatment of metritis and myiasis with herbal preparations provide new vision in the treatment of these diseases.

Acupuncture techniques are non accepted as supportive measures in the treatment of many human ailment. The use of acupuncture in animal disease, shall provide a new vision to treat conditions accompanied with pain. This is an entirely new area to be explored though in vogue from ancient times.

With the introduction of new members in the editorial board it is expected that the Blue Cross Book shall be published in new perspective during the time to come.

We wish all the readers a happy and healthy future.

Dr. Yash Goyal
Managing Director,
MSD Animal Health

Dear Veterinarians,

At the outset, I would like to inform all the readers and particularly the contributors of "The Blue Cross Book" that with our constant efforts and persuasion, the National Academy of Agricultural Sciences (NAAS) has given accreditation to our professional publication with the rating of 2.44, considering the professional and technical information "The Blue Cross Book" has been providing to Veterinary professional since last few years.

I congratulate the editorial board of "The Blue Cross Book" for its consistency, efforts and persuasion to achieve this goal.

The accreditation by NAAS has not only raised the standard of "The Blue Cross Book", but it has also confirmed the importance of this publication for Veterinary professionals.

MSD takes this accreditation as the pointer of increased responsibility on our selves and the editorial board.

We accept this challenge with the induction of new professionals in the editorial board and we would assure the readers and the contributors that "The Blue Cross Book" will progress further with the new challenge and addition of new features and by giving scope to new articles covering the emerging areas in the production and productivity sectors of Indian livestock.

In this regard further, I would like to appeal to all the readers and contributors to give their suggestions and comments to improvise the quality and contents of our publications. Any such suggestions would be highly appreciated and given due consideration.

MSD-AH, with a vision of **science for healthier animals** is continuously working to develop and introduce better solutions for combating the existing and emerging productive and health problems of animals in the form of new products.

India is poised for second white revolution during 2012 - 2020 with the launch of "National Dairy Plan". The milk production during 2021 - 22 is planned at 180 - 220 million tones per year and the milk availability of 190 gm per capita/day. The increase in milk production is planned through more systematic breeding, optimum nutrition and door to door Veterinary health services. With the consistent efforts of Veterinarians and dairy technologists, India would surely succeed in surpassing the desired targets of the National Dairy Plan. MSD Animal Health shall contribute its share in this National venture through introduction of new health care solutions. MSD Animal Health wishes India's National Dairy Plan a grand success.

We wish all the Veterinary professionals and our customers a happy future.

HORSES

Breeding and caring for horses is a complex and often expensive business. To maximize the value of their stock and the wellbeing of their animals, our customers need the best equine healthcare.

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As well as our vaccines, we help keep horses healthy with a range of leading pharmaceuticals. The anti-infective COBACTAN (cefquinome) is licensed for the treatment of foal septicemia and equine respiratory disease and can be administered intravenously or intramuscularly.

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SPOTLIGHT ON eyeD

THE TRADE AND MOVEMENT OF HORSES IS AN ESSENTIAL AND VALUABLE PART OF HORSE BREEDING. WE CAN HELP BREEDERS PROTECT THIS PART OF THEIR BUSINESS WITH EMERGING TECHNOLOGIES LIKE eyeD. eyeD IS THE WORLDS FIRST EQUINE IRIS SCANNING CAMERA. HORSES' IRISES ARE MORE UNIQUE THAN A FINGERPRINT, SO THE eyeD CAMERA AND ONLINE DATA STORAGE PROGRAM FORM THE MOST PRECISE, SECURE EQUINE IDENTIFICATION SYSTEM AVAILABLE.

Review Articles

Research Articles

General Articles

*The information on Fresh Cow Management of animals has been accessed through Internet, articles published in various journals and reports submitted by Government Institutes.

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Clinical Perspective of Acupuncture in Veterinary Practice - A Review

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Abstract

Acupuncture has gained the status of a scientific way of therapy owing to the research on it and approval by many world scientists, neuro-biologists and physicians. Author agrees that the therapy has been proven to be cost effective, safer and preventive tool, often it is used as a beneficial adjunct therapy with medication, surgery or post-operative management. However, many veterinarians in busy practice and social commitments may be unable to spend the time and energy needed to study and apply acupuncture therapy in-depth for the welfare of patients. Objective of this article is to review scope and various therapeutic applications of acupuncture as an adjunct therapy in veterinary practice.

Key words: Acupuncture, veterinary, clinical, therapy

Introduction

Acupuncture is an oriental method of curing disease by balancing the constitution or internal climate of the patients. It is a simple, drug-free modality to provide pain relief, reduce inflammation and ease muscle tension. Acupuncture in the narrowest sense, is the application of small-gauge needles to various points on the body for the purpose of eliciting physiological responses in the management of almost any disorders or condition, and it seems especially useful for relieving pain. In a broader sense, acupuncture is an ancient procedure used in Traditional Chinese Medicine (TCM) for the management of whole-body conditions. Concepts of TCM are based on a philosophy of Yin-Yang theory (balance of opposite forces) describes the principle underlying the laws governing the universe in its physical and metaphysical aspect. The basic principle of the Yin-Yang theory is that yin and yang constantly interact with and react to, each other in order to achieve a balance; thus one cannot exist without the other and each constantly affects the other. According to the theory, the universe is always in a dynamic state, trying to achieve equilibrium between Yin and Yang. The interaction and reactions of all the organs and functions of human and animals are thought of in the same way (Klide and Kung, 1977). The goal of TCM is to diagnose imbalances in the life force (Qi), determine their causes (etiology of the disease) and subsequently remove those causes from the patient's environment (treatment). TCM views disease as an imbalance between two polarities of Qi, Yin (-) and Yang (+). Within this conceptual framework, acupuncture is used to "communicate" with body organs and tissues through special channels or meridians. Health

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and healing in this context is the integration and restoration of balance or harmony of Qi. This view has been validated most recently by the discovery of the relationship between brain chemistry and the immune system. Some critics assert that Western medicine has a mechanistic view of health, reducing disease and illness to specific cellular and molecular systems. Outstanding medical advances have been made using the western viewpoint, but, according to the Eastern tradition, the sum of the whole body still is greater than its parts (Altman, 1998).

A primitive acupuncture like therapy was existed in India some 7000 years ago, and Stone Age humans used fishbone needles in China 5000 years ago. One of the earliest records of veterinary acupuncture was some 3000 years ago in India for the treatment of elephants; however, the father of veterinary acupuncture generally is considered to be Shun Yang (480 BC) from China. Interestingly, Sir William Osler, who taught at Harvard and Yale and who gave the world its current residency system of medical education, wrote of acupuncture in 1892. The procedure did not make it into the New England Journal of Medicine until 1926, but these references were positive, indicating that acupuncture could be an appropriate and useful medical technique. The procedure had been used for a variety of illnesses, but it began to fall into obscurity in the 1940s in the United States as people turned to newly emerging, potent, increasingly ailment-specific antibiotics to treat their health problems. In 1973, The American Medical Association Council of Scientific Affairs declared acupuncture an experimental medical procedure. The increased interest was due in no small part to Richard Nixon's efforts to improve relations with China, where acupuncture was and still is a common practice. In fact, James Reston, a member of Nixon's press corps in China, had surgery using acupuncture as an anesthesia, which later was widely reported in the press. By 1983, the American Osteopathic Association endorsed the use of acupuncture as a part of medical practice. Besides acupuncture courses that currently are available, there also are some popular textbooks including Veterinary Acupuncture by Klide and. Kung, 1997. A more recent book is Veterinary Acupuncture: Ancient Art of Modern Medicine (Schoen, 1994).

Technique of Acupuncture

The term acupuncture derived from its name from the Latin word "Acus "meaning the needle and "Punctura" meaning to prick. Current meaning is any type of stimulation (acupressure, moxibustion, cupping, heat, cold, ultrasound, aqua-puncture, electro-stimulation, implantation and laser) at specific acupuncture points. Moxibustion (the burning of moxa, a soft downy material, on the skin in the treatment of various disorders) has been used but is mostly restricted to treat chronic ailments. However, mechanical needling and electrical stimulation are most commonly used to produce anesthesia. Acupuncture has been used in bovine, equine, caprine, ovine, canine and feline to produce analgesia for surgery, to cure certain disorders and also as a therapy for various medicinal and surgical disorders. The procedure of acupuncture is a safe technique without risk of infection or nerve damage, no post anesthetic complications and can be used in poor surgical risk cases if used on principle (Tyagi and Singh, 1993).

The location of various specific acupuncture points (acupoints) in animals is similar to that in man. Various acupuncture points differ in their physiological behavior, electrical response and therapeutic role. These points reflect various Yang organs (hollow organs of the body) {ST = Stomach, 45 points}, {SI = Small intestine,19 points}, { LI = Large intestine, 20 points}, {GB = Gall bladder, 44 points}, {UB/BL= Urinary bladder,67 points}, {TH/TW = Triple heater, 23

points} and Yin organs (solid organs of the body) {LIV = Liver, 14 points}, {SP = Spleen, 25 points}, {K/KI = Kidney, 27 points}, {H/HT= Heart, 9 points}, (LU= Lungs, 11 points}, {P/PC = Pericardium or Heart constrictor. 9 points}, {GB= Gall bladder, 44 points}. There are two non-organ meridians, {GOV= governor vessel, 28 points} and {COV= conception vessel, 28 points}. The acupoints are located on the imaginary horizontal lines known as meridian or channel gets the name. More than 360 points exist in the body. The Chinese believe that the vital energy "chi" flows through these pathways.

Various acupoints useful from surgery point of view or otherwise one located with the help of a specially designed probe designed on the principles of low skin electrical resistance or impedence. The acupuncture search probe provides an audiovisual signal wherever it touches the point of least electrical impedence. A distinct sound of the visual indicator occurs whenever the search probe comes into contact with an acupoints. In goats, acupuncture points exhibit an electric impedence of 200 kiloOhms whereas a non-acupuncture point shows a skin constact resistance of one megaOhm. In buffalo calves the skin contact resistance for acupoints is lower i.e. in the range of 100 to 200 kiloOhms (Tyagi and Singh, 1993).

Acupuncture Needle

In acupuncture technique needling at specific acupoints (referred to areas of hypersensitivity and lowered electrical resistance to any pressure) and stimulation of needles form the basis of acupuncture. In Modern acupuncture technique, a stainless steel solid, filiform shafted needle with gold or silver plated spirally wound handle are available and commonly recommended. The needles length ranges between 1.3 and 14 cm long and diameter ranges from 26 to 36 gauges, having rounded tips, separate fibers than cutting tissues. All aseptic precautions must be observed when inserting acupuncture needle. For needling, the needles are twisted with the thumb and index finger in a lift thrust form and rotation movements, which should be made rhythmically at a steady frequency of 100 to 200 per minutes. The rotation of the needle is done to amplitude of 1800. In general treatment of disorders, it may take four to eight sessions to know if acupuncture therapy will be effective, although a response could be seen even after the first treatment, and improvements often are noticed after the third. Treatments may last from 10 seconds to 30 minutes and may be recommended once or twice weekly. The long-term goal is always to fix the number of therapies to the minimum required for effectiveness. This may be every six months for arthritis or could be as often as every two months for other conditions. Both frequency and duration of treatment depend on the animal and the ailment. Needling stimulates the nervous system encouraging body to release endorphins, the brain's natural pain-relieving hormones.

Electrical stimulation, a transistorized electro-acupuncture unit capable of delivering biphasic square, spike and dense disperse wave forms of pulses with a frequency range of 0 to 323 Hz along with a pulse width of 2.2 mm is used. Generally a current of 35 to 100 mA and a frequency of 120 to 200 Hz are sufficient for stimulation of acupoints. The optimum levels are judged by the animal's tolerance and initiation of local muscle twitch in the form of regular vibrations at the acupuncture points. The current is reduced to the level of tolerance once the animal shows symptoms of uneasiness by bellowing and rapid respirations. Perfect anesthesia develops within 20 to 30 minutes. The pulsatile waves of squares, spike and dense dispersal form produce least discomfort to the animal and provide a steady and prolonged output that can be controlled according to the

requirement of the individual patients (Tyagi and Singh, 1993).

Araujo and Puchi (1997) found that acupuncture enhanced the efficacy of antibiotic treatment for canine otitis cases. In studies conducted on both humans and dogs, acupuncture was found to be beneficial in cases where analgesics and anti-inflammatory medications had been ineffective or had demonstrated side effects and in cases where surgery was not recommended. For example, many practitioners are pleased with the results of acupuncture in treating arthritis in both humans and canines. Favorable acupuncture results have been reported in the treatment of many other canine conditions, including the following: cardiovascular disorders (Smith, 1992), chronic respiratory conditions (Schwartz, 1992), dermatological disorders (Waters, 1992), gastrointestinal disorders (Dill, 1992), gynecological disorders (Lin and Panzer (1992), immune-mediated disorders (Rogers et al., 1992), musculoskeletal disorders(Schoen,1994), neurological disorders (Joseph, 1992), thoraco-lumbar and cervical disc disease (Durkes, 1992; Janssens, 1992).

According to Schoen (1994), decision on any treatment approach, it is important to get a good diagnosis and then look at all the options, including acupuncture and those offered by conventional medicine. He suggests obtaining a traditional veterinarian's opinion and diagnosis before deciding if acupuncture should complement the treatment of veterinary disorders. For example, extremely anxious pets sometimes can be so excitable that the release of their own adrenaline counteracts acupuncture's benefits. Owners also should be aware of specific medical complications. Acupuncture normally does not interfere with other conventional approaches, but certain medications, such as corticosteroids, can decrease the effectiveness of acupuncture.

To understand how the theories of acupuncture translate to pain relief, it is necessary to know a little about how pain is transmitted and experienced by the body. Pain is a double-edged sword. On one hand it protects us from damage by warning of harmful situations, but in chronic conditions it is as debilitating as the disease process itself. Abnormal chronic pain states are thought to result from damage within the pain pathway itself, either in the peripheral nerves or the central nervous system. The normal protective pain mechanism, which warns of impending or actual damage, is activated by mechanical, heat or other noxious stimuli impinging on pain receptors that then transmit the pain impulse to the central nervous system through afferent nerve fibers. Unlike other sensory input, pain recognition is subjective, and previous experiences can influence one's perception of it. The body has its own pain-suppression mechanisms. This built-in analgesic system depends on the presence of endogenous opiates, which include endorphins. Most Western theories suggest acupuncture either instigates the production of these opiates or blocks pain transmission. Some Western theories have sought to explain the reported pain-relief benefits of acupuncture. One of those is the gate or inhibition theory, which proposes that pain, is blocked by stimulating sensory neurons that travel faster than those that transmit pain (Schoen, 1994). It hypothesized that acupuncture stimulates inhibitory interneurons to close the 'gate' of pain transmission within the spinal cord. Thus no perception of pain takes place. Several types of nerve fibers are involved in pain transmission. As mentioned before, there are three types of pain receptors. Stimuli received from the mechanical and thermal pain receptors are transmitted over large myelinated A-delta fibers at a speed close to 30 meters per second. Impulses received by the other type of receptors travel much more slowly on the C fibers at the rate of 12 meters per second. A-alpha fibers,

which are necessary for the proper perception in three-dimensional space, i.e., where our feet are located, are found in muscles and joints. Alpha-beta neurons are involved in feeling light touch and the bending of hairs. A-alpha and A-beta fibers transmit nerve impulses many times faster than A-delta or C fibers. Acupuncture stimulation may induce non-painful sensory information that travels along A-beta fibers. When the information reaches something called the inhibitory interneuron's, it shuts a nerve transmission "gate" that blocks the conduction of the slower travelling A-delta and C fibers. These factors are much better explained by the competing humoral theory, which states that acupuncture instigates the release of endogenous (developed from within) opiates that produce a self-induced analgesia (Altman, 1998). In other words, acupuncture may work by stimulating specific afferent nerves, which in turn activate a spinal cord center, a mid-brain center and the hypothalamus/anterior pituitary unit. All three of these have been shown to block pain transmission by means of endorphins and/or other analgesic neurotransmitters. Some believe that acupuncture's pain relief derives from a combination of the neurological and humoral explanations (Altman, 1998).

Another theory suggests acupuncture may have localized vasodilatation effects, which would explain the procedure's benefits specific to musculoskeletal disorders. Dilated blood vessels are better able to eliminate pain-producing substances such as bradykinin (a substance released from blood plasma by some snake venoms and certain other enzymes that lowers blood pressure and triggers pain), prostaglandins and other inflammatory products. Another explanation is the autonomic theory, which maintains that internal organs can be stimulated by external acupuncture points that selectively excite parasympathetic and sympathetic nerves regulating the autonomic nervous system (Altman, 1998).

In conclusion, some encouraging studies were already proved that acupuncture can be used in Veterinary practices. However, further studies should be carried out to reveal the full benefits of acupuncture practices.

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Contagious Ecthyma in Ruminants and its Zoonotic Implications

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Abstract

Contagious ecthyma (Orf), a viral disease mainly affecting small ruminants like sheep and goats is characterized by noxious cutaneous lesions culminating in scab formation. The zoonotic propensity poses serious occupational hazard to animal handlers and the field veterinarians. Clinical evaluation may be corroborated by the identification of viral genome in biopsy samples with the polymerase chain reaction (PCR). The disease is generally self-limiting. However, parenteral antibiotic therapy may be recommended incases of severe secondary bacterial infection. Well-planned preventive measures in the modern sheep and goat farms is highly recommended.

Key words: Contagious ecthyma, viral disease, sheep, goats, cutaneous lesions, zoonosis

Introduction

An enzootic disease of viral aetiology in sheep, goats and other domestic and wild ruminant species, contagious ecthyma (Orf in the farmer's parlance) is characterized by acute, non-systemic debilitating contagious eruptive skin lesions. From the perspective of zoonotic potential, it attracted serious public concerns over the years. In clinically subdued form, disease is reported in shepherds, sheep shearers and persons bottle feeding orphaned lambs, butchers, abattoir workers and veterinary surgeons. The first reported case of sore mouth (Orf) in the in-contact animal handlers in the USA aroused much biomedical interest across the world. Hands are apparently the most vulnerable organ, but occasionally other body areas like the face are also afflicted. Clinical manifestation is more severe in goats as compared to sheep, and is characterized by proliferative lesions on the mouth and muzzle. Infection is generally resolved spontaneously within 4 to 8 weeks (Kahn and Line, 2010).

Contemporary laboratory-based differential diagnosis corroborates clinical evaluation and facilitates dependable epidemiological studies. Skin lesions often adversely influence livestock productivity through markedly reduced market value of the affected animal meat, leather and wool, a matter of prime concern in India in view of the sizeable export market. In the current agro-economic scenario, sheep and goat husbandry has assumed added pertinence, especially for the marginal farmers. To circumvent the potent immune responses of the host animal the ingenious bio-evasive mechanisms evolved by the contagious ecthyma virus explain the marked propensity for re-

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infection. The apparent diversity in the antigenic structure/ targets of the different virus strains also serves as an important contributing factor. Exposure of animals to environmental stress or post-therapy immune-suppression may accentuate pathogenicity (Radostits *et al.,* 2010)

Aetiology

Contagious ecthyma disease mainly targets small ruminants like the sheep and goats. The pathogenic virus, the type species of the genus Parapoxvirus, namely Parapox ovis is cylindrical in shape (140-170 nm x 200-300 nm) with a double stranded DNA core. The G + C rich 138 kbh genome encodes 132 genes. Sequence analysis of the viral DNA fragments established that the genes acting as the most potent portals of virulence are concentrated in the terminal regions. The viruses of bovine papular stomatitis: Parapox bovis1, pseudo cowpox Parapoxvirus bovis, and parapox virus of the deer also belong to the same genus. Resistant to lipid solvents like ether, the contagious ecthyma virus is inactivated at 30° C (30 minutes), tolerates prolonged desiccation and is capable of surviving for 15 years, or even longer in the environment. Restriction endonuclease digests of DNA segments revealed marked heterogeneity among the different field isolates.

Epidemiology

The virus is transmitted through direct or indirect contact. It is stable and can survive in the scab material for several weeks. However, infectivity is reduced upon exposure to adverse micro-environmental conditions. In most sheep flocks, infection remains dormant with latent chronic lesions (McKeever and Reid, 1986).In sheep and goats, disease causes a varying degree of distress with the associated economic losses. Commonly, it occurs in lambs at pasture in the 3 to 6 months age group. However, lambs 10-12 days post-partum and adult sheep may also be severely affected. Outbreaks involving the lips and face of young lambs and the udders of ewes are frequently encountered. Infection with the virus is most common under dry conditions in the sheep at pasture, or in penned sheep fed from troughs.

In biomedical investigations, the virus may be passaged in rabbits by topical application of large test doses on the scarified skin or through intra-dermal injection. Mild lesions develop on the chorio-allantois of the 9 to 12-day post-hatch chick embryo.

Morbidity and Mortality

Outbreaks may occur periodically in some sheep and goat farms. The morbidity rate is usually high, often approaching 80% in the unvaccinated flocks. Mortality is often associated with rapid spread of lesions in the respiratory tract, and if the severely afflicted lambs are not provided timely veterinary medical care along with effective managerial support, the frequency may rise to as high as 15%.The problem may be aggravated if concurrent secondary bacterial infection and cutaneous myiasis are not controlled. In rare outbreaks with systemic invasion, the fatality rate may range from to 25 to 75%. Under the field conditions, recovered sheep remain immune for 2 to 3 years, but no antibodies appear in the colostrums, and the neonatal lambs remain susceptible to infection (Robinson and Balassll, 1981). The virus may be harboured by clinically normal as well as sick sheep. In cutaneous lesions and scabs the virus may enter the epidermis through cuts or abrasions. Infection may be transmitted through direct contact or the fomites. The virus remains viable in the wool and hides for about 4 weeks after the dermal lesions have healed. Highly resistant to inactivation in the microenvironment, virus particles have been recovered from the dried crusts even after 12 years.

Lesions in the mouth involve the tongue, gums, or the dental pad (Hawkins et al., 1991). Lesions in the buccal cavity are more commonly observed in outbreaks affecting lambs of less than 2 months age. In the oral mucosa, the lesions do not form scabs but appear as papular erosive areas, surrounded by an elevated hyperaemic zone. Extensive painful proliferative lesions may be detected on the gingival margins of the incisor teeth.

Pathogenicity

The remarkably epitheliotropic virus produces highly proliferative wart-like lesions upon entry through skin abrasions (Fig. 1).

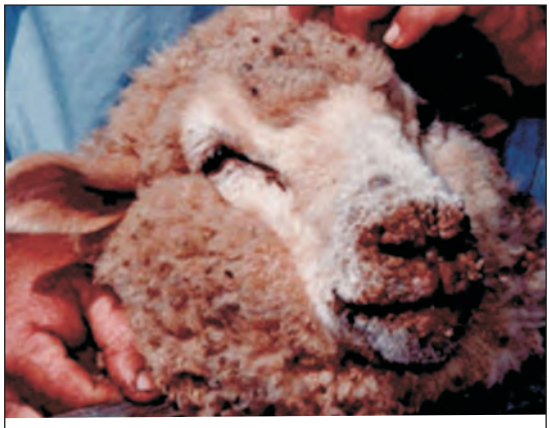

Fig1. Orf skin lesions in the sheep muzzle and face

The virus quickly replicates in the keratinocytes and the infected cells release an endothelial growth factor implicated in epithelial cell proliferation (Haig and Mercer, 1998). In course of time, the papular lesions progress to form vesicles, pustules and eventually scabs. The damaged skin is highly vulnerable to infection leading to the characteristic surface lesions. Following challenge of mildly abraded skin, the virus does not get established in the epidermis but replicates in the cells of the underlying epidermal layer originating from the walls of wool follicles. The skin reaction represents a necrobiotic cell response with the affected epidermis and the underlying stratum papillae of the dermis sloughing off. The cutaneous response to infection involves a delayed hypersensitivity reaction with the influx of inflammatory cells comprising neutrophils, basophils, and possibly also mast cells. Class II dendritic cells appear to suggest a highly integrated local dermal defense mechanism. The lesions evolve through the stages of macula, papule, vesicle, pustule and scab formation, followed by resolution. The pustules develop within a few days and rupture leading to ulcers. Thereafter, a thick overlying crust or scab is formed and is shed within 3 to 4 weeks without leaving scars. Immunity, although solid, lasts for only about 8 months. Though an antibody immune response is elicited, recovery is primarily the end result of cell-mediated mechanisms.

Clinical Signs

In sheep and goats, the incubation period is 2 to 3 days. The painful skin lesions induce anorexia/ starvation with mucopurulent discharge from nasal cavity, conjunctivitis and abnormal respiratory sounds (wheezing) with proliferative lesions on the gum and perceptible lesions on the tongue. The initial clinical profile is pyrexia (106^{0}-108^{0}F) followed by appearance of papules, pustules and vesicles on the lips, nose, ears and/ or eyelids, and occasionally on the feet or perineal region. Lesions may be seen also inside the mouth, particularly in the young lambs. Massive oral lesions have been described in the reindeer. Rarely, the lesions may extend into the oesophagus, stomach, intestines or the respiratory tract. Nursing lambs can transmit the virus to their dams resulting in lesions on the teats and udder. The skin lesions may eventually develop into thick, brown, rapidly growing scabs on areas of granulation tissue, inflammation and ulceration. The scabs are often friable and tend to bleed easily. Papillomatous growths may occur occasionally. Foot lesions

may cause lameness. Uncomplicated infections usually resolve spontaneously within 1 to 4 weeks. Secondary bacterial infection and maggot infestation may aggravate the clinical condition. Contagious ecthyma may predispose animals to bacterial mastitis. The environmental management protocols may influence the outcome of infection, substantially.

In humans, the incubation period is 3 to 7 days, and contagious ecthyma usually manifests as a single, or a few scattered skin lesions. Initially, the lesion appears as a small, firm, red to blue papule at the site of virus penetration, most often involving a finger, hand or any other exposed part of the body surface. The papule develops into a haemorrhagic pustule or bulla, which may contain a central crust and tends to bleed easily. In the later stages, the lesion develops into a nodule, which may extrude fluid and is sometimes covered initially by a thin and eventually by a thick crust. The skin lesions may be accompanied by a low grade fever, usually lasting for only a few days or by mild lymph adenopathy. In uncomplicated disease, the lesions heal spontaneously in 3 to 6 weeks without leaving any scars. Secondary infections can occur. Large lesions, refractory to treatment, can occur in immune-suppressed individuals.

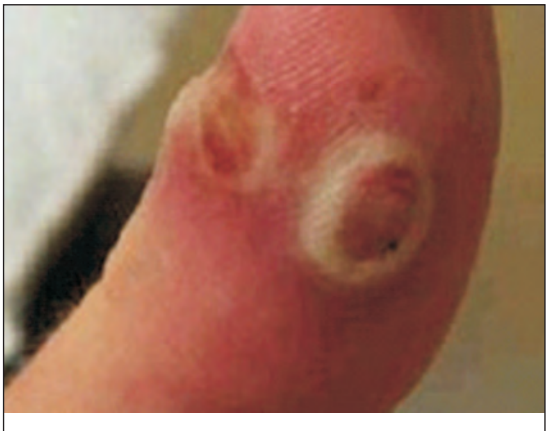

Fig 2. Skin lesions: milker's nodules

Possible complications include toxic erythema, erythema multiforme and bullous pemphigoid (CDC, 2006 Report). Eroded vesicles with an erythematous base and a white halo in the thumb are clearly discernible (Fig.2).

Necrobiosis

Papules, vesicles, pustules, ulcers, granulation tissue, inflammatory lesions or thick, friable brown scabs may be detected on the mouth, nose, ears, eyelids, feet, udder and or/ perineum in the affected small ruminants. Occasionally, lesions can be found inside the mouth. Rarely, lesions have been reported in the oesophagus, rumen, omasum, lungs, heart and the lower intestinal tract. On histopathology, the skin lesions include ballooning degeneration of keratinocytes and eosinophilic cytoplasmic inclusions bodies. Boer goats with severe infections also exhibited severe to moderate lymphadenopathy in patches of the affected skin. Suppurative arthritis, chronic fibrinous pneumonia and premature thymic involution were reported (McElroy and Bassett, 2007).

Diagnosis

Infection in the affected animals is usually diagnosed symptomatically during clinical evaluation and confirmed by pathological examination of an incised biopsy specimen(Uzelet al., 2005). The definitive diagnosis of contagious ecthyma is based on electron microscopic visualization of the characteristic virus in the cytoplasm of keratinocytes, or isolating the virus by culturing a biopsy specimen on lamb fibroblasts (Lo and Mathisen, 1996).Polymerase chain reaction is a more reliable method for identifying the viral genome in biopsy specimens, irrespective of the stage of disease. Virus isolation may be carried out in a variety of cell cultures or embryonated eggs with the limitation that the it grows slowly and the rate of recovery is variable. Serological tests include serum

neutralization, agar gel immuno-diffusion (AGID), complement fixation and agglutination. ELISA tests have been developed but are rarely used for diagnosis.

Treatment

The disease in sheep and goats is normally self-limiting, and clears without treatment within three to four weeks. Early manual removal of scabs will delay healing.

Parenteral antibiotics may be indicated in cases of severe secondary bacterial infection. Intramuscular injection of 200 mg/kg body weight procaine penicillin and 250 mg/kg body weight dihydrostreptomycin sulphate combined with 1,5 pentanedial in petroleum-based soft emollient cream once daily for three consecutive days is recommended. Penicillin-dihydrostreptomycin sulphate combination was suggested because of broad spectrum activity against a wide range of pathogenic microorganisms.

No specific treatment for contagious ecthyma is available at present. Diathermy and cryosurgery have been used to treat oral lesions in lambs but is not cost effective. Most infections clear up spontaneously in a few weeks. However, the use of topical antibiotic paint, powder or aerosol is recommended to prevent secondary bacterial infection. In endemic areas, appropriate insect repellents and larvicides should be applied to the lesions to prevent myiasis. Since the virus is transmissible to humans, veterinarians and animal handlers should exercise reasonable protective precautions and always use disposable gloves.

Control Measures

Sheep that have recovered from natural infection are highly resistant to re-infection. Despite multiplicity of immunogenic virus strains, the presently used commercial single-strain live vaccines have produced a fair degree of immunity in the USA with occasional exceptions in goats. Vaccine failure may be attributable more to high virulence of the infecting strain rather than to differences in antigenic configuration of the vaccine strains. The sheep immunized against contagious ecthyma remain susceptible to ulcerative dermatosis.

Live attenuated tissue culture vaccine has been found to be effective in reducing the severity of the disease (Nettleton et al.,1996b). Live vaccines should be used with caution to avoid contamination of the uninfected premises, and vaccinated sheep should be segregated from the unprotected stock until the scabs have fallen off. A small amount of the live vaccine is brushed over light scarifications of the skin, usually on the inside of the thigh or behind the elbow or caudal fold. Lambs should be vaccinated about 4 week post-partum. For best results, a booster dose of the vaccine, 8 to 12 week later is recommended. Non-immunized. Lambs should be vaccinated 4 to 8 weeks before entry into the infected feedlot lambs with severe lesions, or where their dams do not let them suck may have to be fed artificially to minimize weight loss. Ewes with affected teats or udder should receive special attention to ensure that they do not develop mastitis.

The most potent source of infection from one lambing season to the next is the scabs that are shed from infected animals. Although the virus in the scabs will not survive very low ambient temperatures in damp conditions, it can persist in the dry buildings for many years. Cleaning and disinfecting the entire premises, especially if they are used for lambing, is therefore important in the control of orf infection. The virus is susceptible to 3% iodophor or 1% formaldehyde solution and most disinfectants. Steam cleaning is effective.

Prevention

To effectively block the access of contagious ecthyma virus in an uninfected flock of sheep, incoming new animals should be scrupulously quarantined, since some carriers may not exhibit the clinical signs. Precautions should be taken to prevent virus introduction through equipments and other fomites. Rough, spiky vegetation should be removed from pastures or feed, to reduce the risk of cuts in the mouth or on the muzzle.

Vaccination of the small ruminants is practiced in some locations in the West. Contagious ecthyma vaccines contain live virus prepared from the dry scabs or propagated in tissue culture. Vaccines should be used only on premises where infections have occurred in the past. The recently vaccinated animals should be isolated from the unvaccinated lot.

The effective duration of post-vaccination immunity is controversial since outbreaks are recorded in vaccinated animals. Vaccine failures may be mainly attributable to inadequate attenuation of virulence of the strain. Isolation of infected animals prevents the spread of disease.

The Orf virus is difficult to eradicate once it has established a foot hold in a flock or herd. Hence the main focus should be on strict adherence to the preventive protocol to minimize the chances of Orf infection in the sheep and goat units. Contagious ecthyma infection is an endemic self-limiting infection. Prompt diagnosis of this disease is of paramount importance. Mass campaign to enhancepublic awareness with cognizance of the infection and prevention measuresis recommended.

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Urolith Analysis in Domestic Animals - a Review

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Abstract

Urolithiasis is a multifactorial disease of high economic importance and frustrating problem in domestic animals for owners and veterinarians over world-wide distribution. Effective treatment and prevention of urolithiasis depends on accurate determination of the chemical nature of uroliths, for which both in-vitro analysis of removed stones and in-vivo intact stone analysis are essential. The animal recovered completely after removal of the calculi and normal flow of the urine was re-established. Chemical composition and structure of the uroliths is of great value in the delineation of the pathogenesis, clinical management, preventive measures and choice of treatment modality. In the present review, we describe its different aspects like urolith formation, location and analysis techniques.

Key words: Animals, Urolithiasis, Uroliths, Stone analysis, Urinary calculi

Introduction

Uroliths also known as urinary calculi or stones are concretions of solid mineral and organic compounds that cause disease through direct trauma to the urinary tract and obstruction of urinary outflow. Urinary calculi formation usually results from a combination of physiologic, nutritional and management factors. It is mainly attributed to excessive or imbalanced intake of surgical procedure minerals (Larson 1996; Radostits *et al.,* 2000). Obstructive urolithiasis means the formation of calculi in the urinary tract with subsequent urinary blockage by uroliths (Payne 1989; Radostits *et al.,* 2000). Urolithiasis in countries like India presents an important economic repercussion where cattle based agriculture is strongly linked with the livelihood of an important segment of the population. It is a common and frustrating problem in small and large ruminants for owners and veterinarians. It appears to affect equally both sexes, but urinary blockage is an important problem only in males because of the anatomical conformation of their urinary tract (Larson, 1996). In cattle, urethral obstruction typically occurs at the level of the sigmoid flexure. Mortality rate of obstructive urolithiasis in suffering animals due to rupture of the urethra or urinary bladder is very high (Gasthuys *et al.,* 1993).

Chemical composition and structure of the stones is of great value in the delineation of the pathogenesis, clinical management, preventive measures and choice of treatment modality (Abdel-Halim and Abdel-Halim, 2006). For complete analysis of calculi, a combination of methods is adopted. Microscopic, spectroscopic, chemical and X-ray diffractometry are complementary for the analysis of calculi and no one method is sufficient, as quantitative analysis are best obtained by X-ray diffractometry, while qualitative identification of depositional

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sequence and the quantitative determination of minor constituents can be determined by microscopic and chemical methods (Otnes and Montgomery, 1980). The chemical composition of urinary calculi varies and depends largely on the dietary composition of individual elements, the geographical location and local management practices (Singh and Singh, 1990).

Obstructive urolithiasis is very common in ruminants of Kashmir valley, however the highest incidence is found in cow calves (Fazili and Ansari, 2007; Parrah *et al.,* 2010). Urolithiasis occurs especially in cattle receiving rations high in cereal grains, oil meals or grazed in pastures containing large quantities of oxalate, estrogen of silica (Radostits *et al.,* 2000). The management of obstructive urolithiasis is primarily surgical (Ansari, 2005; Ansari and Moulvi, 2010) which includes urethrotomy, cystotomy or urethrostomy. The animal recovered completely after removal of the calculi and normal flow of the urine was re- established. Keeping in view the high economic importance of the disease, present study place on record, various aspects of urolith formation and its analysis in this review.

1: Location of urolith

The urolith may be lodged in any part of the urinary tract i.e., starting from renal pelvis to glans penis. But the lodgement of the urolith in the bladder neck and urethra (Figure 1) may lead to complete obstruction to urine flow, thereby, enhancing the acuteness and severity of the condition. The longer length of urethra and presence of sigmoid flexure make the urethra more prone to the lodgement of calculi as compared to other parts of the urinary tract in ruminants. In one study cystic lumen and neck jointly was the commonest site of calculi retrieval, followed by cystic neck. Uroliths were retrieved from the sigmoid flexure of urethra in 60% of animals where cystotomy with

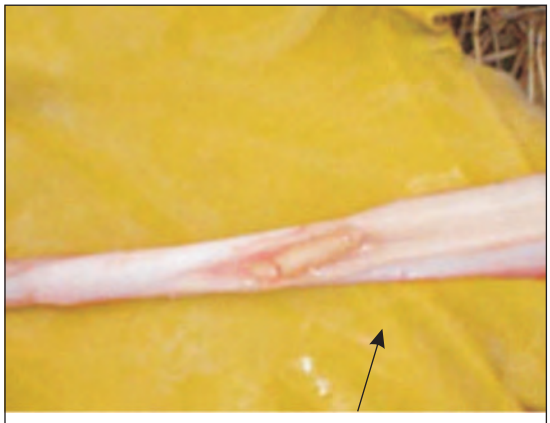

Figure 1: Single loop shaped urolith in urethra (arrow head).

indwelling urethral catheterisation (Parrah, 2009) and tube cystostomy (Ansari 2005; Ansari and Moulvi, 2010) were performed. Gera and Nigam (1979) also recovered about 68% of calculi in the sigmoid flexure of the bovines. Loretti *et al.* (2003) also found a high incidence of bovine urinary calculi in the distal portion of the sigmoid flexure. Tiruneh (2000) also reported distal sigmoid flexure in cattle and the urethral process in sheep, the commonest sites of urethral obstruction by urolith, as diameters of lumens at these sites are the narrowest in the urethral canal, thus calculi could easily be trapped at these sites.

Figure 2: Single urolith mass.

2: Number of urolith

In most of the cases (90%) multiple small urolith without any distinct morphology are seen (Figure 2), while in 3.33% cases single and in 6.66% cases two distinct calculi are found (Parrah, 2009). Generally a single distinct calculus is responsible for urethral obstruction in cattle (Radostits *et al.*, 2000)

3: Examination of urolith

As routine the analysis of calculi is conducted after its removal from the animal body for chalking out the preventive measures so that chances of recurrence of the disease are reduced to its minimum possible.

3.1: In-vitro analysis of removed urolith

For complete in-vitro analysis of removed uroliths a combination of analytical techniques is advocated to know the constituents of the stones both quantitatively as well as qualitatively.

3.1.1: Physical characteristics of urolith

Physical characteristics, including size, shape, colour and texture of uroliths, may serve as a preliminary and tentative indicator of the composition of the urolith and thereby assist in establishing the aetiological factors (Lavania and Angelo, 1977). It may be of various sizes, commonly described as sand, gravel or stone. Phosphate urolith e.g. calcium phosphate and triple phosphate are usually white, smooth, numerous, chalky and friable (Loretti et al., 2003). Struvite uroliths are often dendritic or staghorn shaped. Struvite may also occur as a single urocystolith with sharp facets traumatizing the bladder wall and causing the marked haematuria (Guthrie, 1987). Parrah et al. (2010) recorded all triple phosphate calculi in cow calves with most common type of calculi sandy (66.66%), pasty (23.33%) or assuming the shape of urethra. Brushite (calcium hydrogen phosphate dihydrate) and whitelockite (anhydrous tricalcium phosphate) in pure form are radially fibrous or bladed, often fern like in cross section. The physical appearance of oxalate stones varies widely depending on exactly which form of oxalate has precipitated. Calcium oxalate monohydrate, COM (whewellite) stones are small smooth "hempseed" large mulberry shape with irregularly rounded mammillary processes, which show rounded protuberances and are composed of radially striated aggregates or rarely jackstone shape consisting of dense mass with radiating spicules. Their colour varies from light brown to dark brown to reddish brown or black brown or occasionally blue (Hara, 1994). Calcium oxalate dihydrate, COD (Weddellite) ranges in colour from pale yellowish white to honey brown. Uric acid calculi are of oblate, flattened or rounded shape with smooth polished surface of yellow or brown colour, mixed with red or orange (Prien and Prien, 1968). Uric acid and urate stones are moderately hard. Cystine stones are the colour of old yellow brown soap and feel somewhat greasy. Silica calculi are irregular, grey, and dull, vary in compactness and have a typical jackstone appearance. Calcite calculi are mostly spherical, brown in colour, have golden pearly lustre and are compact. Calcite calculi have uniform concentric layering like onion skin, which forms spherical shells when broken (Nottle, 1976; Osborne *et al.*, 1986). Calculi with similar chemical composition can have different morphological structures, may be due to pH value of urine during the formation of uroliths, characteristics of other chemicals present in the urine, anatomical variations and conditions of blockade of urinary tract (Wang *et al.,* 1997).

3.1.2: Microscopic examination of urolith

The uroliths are first examined by a binocular magnifying glass, to detect its structural features like umbilication, Randall's plaque, bracketing faces and individual and non individual nucleus. Dihydrate crystals are bipyramidal, dodecahedral

and interpenetrant twins both in urine and stone. Monohydrate crystals are needle like, tending to orient toward a central point, resulting into formation of spheroid (dumb bells and rosette) in calculi, while in urine they may be of biconcave or oval shape (Elliot, 1973; Elliot et al., 1976; Elliot and Rabinowitz, 1980). Binocular stereoscopy is more rapid and reliable technique for determination of stone composition as compared to biochemical methods. It gives additional information about the nidus, the crystalline structure and order of deposition of the components (Nayir, 2002).

Microscopic examination clearly shows a central homogenous nidus (Figure 3) easily differentiated from the outer concentric laminae (Parrah *et al.,* 2009). Formation of nidus is usually the first phase in the formation of urolith. Any foreign material or cellular debris may act as nidus, however nidus may be formed spontaneously due to supersaturation and oversaturation of the urine with lithogenic crystalloids (Osborne *et al.,* 1995). Further precipitation of crystalloids around the central nidus lead to the formation of concentric laminae. There may be no clear demarcation between adjacent layers (Osborne and Clinton, 1986; Osborne *et al.,* 1999). Nidus need not be necessarily geometrically centrally located, though it represents the starting point of stone (Khan and Hacket, 1993). The calculus is not accessible to precipitating minerals equally from all sides at all times with the result the growth proceeds at variable rates around the calculus. Moreover, after formation of nidus, calculi may grow into a urolith of same or different composition depending on the condition of urine saturation. The presence of second eccentric nidus might be due to abrupt change in the conditions of super-saturation in urine thus resulting in precipitation of another nidus.

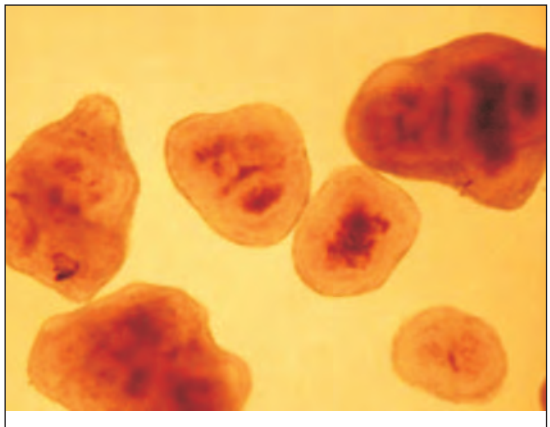

Figure 3: Urolith showing nidus in the centre.

3.1.3: Chemical analysis of calculi

Until the late eighties, urinary stone analysis relied more on chemical rather than physical analytical techniques. The chemical analytical techniques, consisting of wet and dry methods, detect the individual ions (Uldall, 1983). In the wet chemistry method, dissolved stone material is analysed using automated chemistry analysers, whereas, the dry method involves spot colour end point detection (Hashim and Zawawi, 1999). The semi-quantitative and semi-qualitative chemical analytic techniques only give arbitrary information on stone composition (Otnes, 1983). However a simpler classification of urinary stones based only on the percentage composition of constituting ions was offered, which successfully encompassed all the stone samples subjected to wet chemical analysis and various stone groups were specified with precision (Abdel-Halim and Abdel-Halim, 2006). The process gives rapid results, is inexpensive and will identify the major chemical constituents of a urinary calculus. It can also be very useful if the sample size is small. Adequate information is provided as regards the composition of the calculus but obviously no information is gained about the structure. This highlights a major disadvantage in that nothing is learned about the nature of the nidus. Other problems include the inability to identify matrix or certain organic materials that may be present.

Moreover chemical methods are destructive, and cannot distinguish between the compounds with similar constituents, and also these cannot identify unexpected stones (Vergauwe *et al.,* 1994).

3.1.4: Physical methods of urolith analysis

A progressive increase in the use of physical techniques with decrease in relying on chemical methods for urolith analysis was noticed in the nineties. Physical methods were expected to add more to the ease of procedures, revealing more detailed information on fine cellular structure. Physical methods need less sample and can distinguish the different minerals in the stone (Abdel-Halim and Abdel-Halim, 2006).

a) X-ray diffraction (XRD)/ X-ray crystallography

The x-ray diffraction photography and crystallographic techniques of polarisation microscopy are useful tools in the study of the crystalline structures, order of deposition of components and the nucleus (Quyang and LI, 2003; Ansari *et al.*, 2005). X-ray diffraction analytical technique involves bombarding crystalline structures of the calculus with a beam of monochromatic X-rays; the characteristic diffraction patterns obtained are the fingerprints which enable accurate identification of the crystalline components. Every substance has a unique X-ray diffraction pattern (Prien and Prien, 1968). X-ray crystallography can be used to distinguish various forms of phosphate, oxalate and urate e.g. mono and dihydrate of calcium oxalate (Scott *et al.,* 1980). It has a major clinical application as it can identify the composition of urinary tract stones in-vivo, and so can help to decide the best mode of lithotripsy (Holden *et al.,* 1990). However, X-ray diffraction is of limited use in identifying amorphous material and constituents present in very small quantities. But, XRD is useful for the identification of unexpected stones, as it can detect crystalline minerals in low concentration and quantity (Vergauwe *et al.,* 1994).

b) Scanning Electron Microscopy (SEM)

Electron probe analysis and scanning electron microscopy is useful tool for the study of different crystalline forms and organic matrix as well (Khan and Hacket, 1986). In scanning electron microscopy an electron beam is focused by an electromagnet onto a coil that scans the object. As a result of interaction between electrons and elements in the calculus, X-ray produced, is characteristics for each element (Ruby and Ling, 1986). The technique of SEM is most suitable for the study of surface phenomenon such as crystal growth, detection of organic matrix and minor components of the calculi (Kim, 1982). Determination of the composition of urinary calculi by SEM is based on the determination of morphology and habit of inorganic components i.e. crystals (Khan and Hackett, 1986). After recording physical characteristics, the calculi are washed with normal saline and stored at $4^{\circ}C$ in the refrigerator till their further analysis. Surface SEM morphology is first studied in intact calculus. The calculus is then transacted into two parts to study the internal composition and growth pattern. One part of the transacted calculus is studied as such and other part is decalcified with 0.25ml EDTA before it is subjected to SEM examination. Decalcified calculi are washed with distilled water. All calculi fragments are vacuum dried in desiccators. Fragmented and dried calculi samples are mounted separately on aluminium stabs, coated with gold using Jeol, JSM ion sputter at 9.5Kv potential and 7mA current for 5 minutes. These samples are then examined layer-wise using Jeol, JSM scanning electron microscope for their crystal size, crystal habit, details of crystal arrangement, porosity and laminations at different magnifications. Scanning electron microscopic photographs are taken to document the texture observations

(Singh, *et al.,* 2005). Structurally uroliths are polycrystalline concretions composed primarily of minerals (organic and inorganic) and smaller quantity of matrix (Osborne *et al.,* 1995). SEM has indicated the crystalline architecture of caprine struvite calculi with calcium as binding part in them (Singh *et al.,* 2005). SEM structure of the calculi recovered from canine (Osborne and Clinton, 1986; Escolar *et al.,* 1990; Osborne *et al.,* 1999; Neumon et al., 2001), equine (Neumon *et al.,* 1994) and feline (Neumon *et al.,* 1996) have been reported.

c) Infrared spectroscopy (IRS)

This technique allows for a rapid and semi-quantitative identification of all macro-components likely to be found in uroliths of domestic animals (Manning and Blancy, 1986). This technique is particularly useful when it comes to the identification of non-crystalline materials. Amorphous or fatty calculus constituents will be revealed, drug metabolites and artifacts which may be present can be readily identified. Infrared absorption pattern of different compounds are characteristic for that molecule. Infrared spectroscopy involves the use of a spectrophotometer that has an infrared light spectrum of 400 per cm to 4000 per cm (Ruby and Ling 1986). Infrared spectroscopy using a potassium bromide disc technique is single most useful technique, being fast, and simple to learn and utilizes small sample. And has equal sensitivity for oxalate and phosphate calculi (Corns, 1983). Though IRS is useful for detecting unexpected stones (Vergauwe et al., 1994), but it is unable to detect the absorption of carbonate in struvite stones, because NH4 absorption of both struvite and carbonate overlap at spectrum of 1420-1435cm-1 (Takasaki, 1996; Espineira *et al.,* 1997). If the urinary calculus is composed of more than 2 components, interpretation of the proportions of band intensities by visual inspection of the spectrum becomes rather complex. Expert knowledge is needed to interpret the ratios of the relevant spectral bands for ternary mixtures composed of whewellite, weddilite and carbonate apatite. At present most TR spectrophotometers are accompanied by software packages that offer possibilities to produce libraries of digitalized spectra and of searching for unknown compositions by matching the unknown spectra with those within the library (Volmer *et al.,* 1993).

d) Near Infrared Reflectance Spectroscopy (NIRR)

This technique is simplier, and identifies, with sufficient accuracy qualitatively and semi-quantitatively, mixed urinary stones with 2 or 3 components in short time (<1 minute) even when the stone powder is <100 micrograms (Peuchant *et al.,* 1992)

e) Fourier Transform Infrared Spectrophotometry (FT-IR)

Fourier transform infrared (FTIR) spectroscopy has demonstrated greater speed and sensitivity and is thus replacing IR dispersive spectroscopy in analytical laboratories. The most widely used sampling technique has been the KBr disc method, in which part of the calculus to be analysed is ground, mixed with some KBr, and compressed into a pellet for analysis by IR transmission. However, the use of pellets is now being replaced by diffuse reflectance, in which the detector collects the light reflected diffusely by a powder instead of that transmitted by a pellet (Fuller and Griffiths, 1987). This technique allows the identification of calculi components by detailed comparison with libraries of reference spectra. Its application pointed out to the presence of false calculi or artifacts and calculi containing drugs, metabolites or usual components around unusual nucleus (Abdel-Halim and Abdel-Halim, 2006).

f) Thermogravimetry (TG) technique and Differential Thermal analysis (DTA)

These techniques are considered as the best physical methods for the characterisation of the two hydrates of the calcium oxalate salt, mono- and dehydrate (Kaloustian *et al.,* 2003). It is believed that TG method may inform us about the age of the stone (Strates and Georgacopoulou, 1969; Rose and Woodfine, 1976) and activity of the disease (Koide *et al.,* 1982). The simultaneous thermal analysis method TG- DTA would be an alternative method to the use of x-ray diffraction or Fourier transform infrared techniques for the quantitative determination of each hydrate of the calcium oxalate when present together in the presence of uric acid or magnesium ammonium phosphate (Kaloustian *et al.,* 2003).

g) Raman microprobe analysis

It is a non-destructive spectroscopic technique for analyzing the stone composition. It is able to differentiate COM from COD. In this method 2-6µ thick cut sections of paraffin embedded specimens are mounted unstained on aluminum plated slides and are excited within 514.5 nm argon laser focused to a 1 µ spot size using high optical microscope (Pestaner *et al.,* 1996).

h) Nuclear Magnetic Resonance Spectroscopy (NMR)

Unlike XRD, NMR can quantify both crystalline and amorphous components of a urolith accurately (Bak *et al.,* 2000).

i) Densitometry

Though of little value, yet it provides information on the mineral and no-mineral phase of the calculus. Mineral densities of phosphate and carbonate calculi are highest while uric acid calculi have lowest density (Burgos *et al.,* 1993).

j) Polarizing Microscopy

It involves the transmission of polarizing light through the crystalline material to measure the internal crystalline structure of unknown substances by detecting the optical constants for that substance (Prien and Prien, 1968).

k) Coherent Scatter Analysis

Conventional X-ray and image intensifiers are used for the analysis of various powdered and fragmented stones, which show a circular symmetry and a series of broad rings of various intensities (Batchelar *et al.,* 2002).

Other techniques of urolith analysis which have been tried or are being used occasionally for specific purposes include: In-vivo neutron analysis (Scott *et al.,* 1980), X-ray micro-analysis, most sensitive for apatite calculi (XRM), (Kim *et al.,* 1985), Thermal analysis for quantitative analysis of the composition of urinary calculi (Vergauwe *et al.,* 1994), and Diffuse Reflectance Infrared Fourier Transform Spectroscopy (DRIFTS), (Berthelot *et al.,* 1987; Gould *et al.,* 1995).

3.2: In-vivo intact-stone analytic techniques

In-vivo intact-stone analysis is useful in selecting the therapeutic regimen and to determine the response to the dissolution therapy.

Plain X-ray is still very commonly used for the diagnosis of urolithiasis and at times for the identification of specific uroliths depending upon their radio dense characteristics. Radio-opacity of urinary calculi varies with its calcium and phosphorus content (Brodey, 1955). Calcium oxalate and struvite calculi are most radiodense while cystine and uric acid stones are least (Osborne et al., 1995). In one study, Kumar et al. (1999) obtained 39% correct diagnosis of the composition of the calculi using plain radiographic study.

Pulsed dye laser beam, resulting in a fluorescent emission, which appears related to

the stone composition, may have a practical in-vivo application (Holden *et al.,* 1990). In urolithiasis, the advent of non-invasive techniques of ultrasound and CT provided an advance especially in demonstrating non-opaque urinary calculi which may be uric acid, urates, xanthine, cystine or poorly mineralised matrix and differentiating them from blood clots and tumours (Stris, 1981; Borkowski *et al.,* 1985)

Sequential computed tomographic study is useful in the assessment of the position of the small calculi pre- and postoperatively especially in horseshoe or crossed fused ectopia where external and internal architectures are distorted, so helps in dissolution therapy to determine its response (Dunnick and Korobkin, 1984; Resnick *et al.,* 1984). Computed Tomography (CT) permits an accurate distinction of uric acid calculi from all others. Calcium-containing stones of various compositions, including struvite, cannot be distinguished reliably. CT analysis of stone density, therefore, is not likely to be more accurate than standard radiography in characterizing stone formation in vivo. Since CT is able to construct an image of a thin slice of each stone, the resulting heterogencity is much more apparent than it usually is when only plain radiographs are evaluated. However the order of density of urinary calculi is same both by CT attenuation or standard radiography from the least to the densest, they are uric acid, cystine, struvite, calcium oxalate, brushite and hydroxyapatite (Newhouse *et al.,* 1984).

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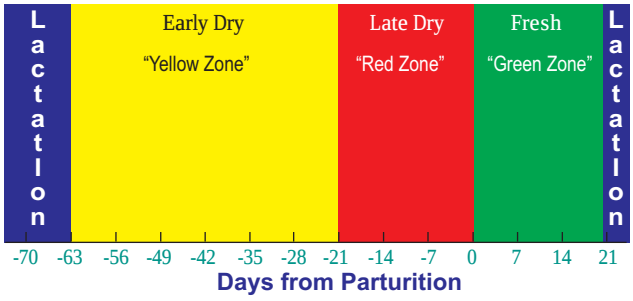
Fresh Cow Management

Peri-parturient Period (Transition period)

Transition period is defined as the first three weeks before and after calving. Transition period is critical because :

- Excessive energy requirement after parturition. (Production Stress)
- Ration nutrient & minerals concentration must increase.
- Palatability of ration is also important at this time.



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Integrated management on ticks of domestic animals

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Abstract : The problem with tick borne diseases is growing and getting more complicated and are transmitted via tick bite from animals to humans and are termed zoonotic. Till now, the use of acaricides is the most commonly used method of tick control, but in future use of an non chemical control and vaccination strategies should be integrated with the chemical control in order to develop a better way of tick control. Here, we review aspects of this initiative to use the principles of IPM to apply knowledge generated through hypothesis research with the ultimate goal of reducing the number of tick borne pathogens of domesticated animals.

Key words: Acaricides, Non-chemical Methods, ITM

Introduction

Phylum arthropoda is the largest phylum in animal kingdom, Among arthropods ticks rank second to mosquitoes as vector potentiality concern and rank first as diseases transmitting agents to non-human vertebrates. Ticks are obligatory blood feeders that parasitize on mammals, birds and reptiles. There are 899 tick species under the families Argasidae (185 species), Ixodidae (713 species) and Nuttalliellidae (1 species) (Barker and Murrell, 2004). Ticks are economically the most important pests of cattle and other domestic species in tropical and subtropical countries. They are the vectors for number of pathogenic microorganisms including protozoans *(T. annulata, B. bigemina, B. motasi, B. canis, B. ovis, B. equi* etc.), rickettsiae *(A. marginale, E. bovis, E. canis, Rickettsiaconorii),* viruses *(Flavi virus, Nairo virus),* bacteria (e.g., Pasteurella, Brucella, Listeria, Staphylococcus) and spirochaetes *(Borrilia anserine)* (Barnett, 1961; Jongejan and Uilenberg, 2004). The only food for the ticks is blood.

They are voracious blood suckers; loss of blood for their rapid development impoverishes the hosts. In heavy infestation cattle must have more feed merely to meet the demands of the parasites; the growth of young animals is retarded, and they may remain thin, weak and stunted. In dairy cows, milk production is greatly reduced. Ticks belonging to genus *Ixodes* and *Ornithodoruslahorensis* are associated with tick paralysis which is a specific type of intoxication, resulting from the injection of a toxin by certain In stars of ticks usually the adult females but sometimes by nymphs. Sweating sickness is a disease of cattle and other domestic species which occurs in South, Central and East Africa. It is associated with infestation by *Hyalomma truncatum* and has all characteristics of toxicosis (Barnett, 1961). Although, economic losses due to ticks are mainly due to the diseases which they transmit (Garcia, 2003), financial losses associated with nagging irritation and depreciation of the value of skins and hides (upto

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20- 30%) are also significant (Biswas, 2003). There are various ways to control ticks, but every method of tick control has certain shortcomings which brought Integrated Management of ticks into focus.

Integrated Parasite Management (IPM) is a method of controlling parasites in a population of animals by using combination of chemical and non- chemical methods.

Components of IPM:

It is having two components.

1. Chemical

2. Non chemical control

Chemical Control of Ticks:

Involves use of various synthetic acaricides. various chemical acaricides employed are synthetic pyrethroids, macrocyclic lactones, formamidines, carbamates, organophosphates. Earlier remedies involve use of Arsenic and Organochlorines. Use of arsenical solutions revolutionized the control of ticks in cattle, and arsenic quickly replaced other earlier tick control remidies like lard and sulphur mixture, a lard and kerosene combination, cotton seed oil or fish oil. Mixtures of kerosene, cotton-seed oil and sulphur; a 10% kerosene emulsion; a mixture of cotton-seed oil and crude petroleum; or Beaumont crude oil alone reportedly proved efficacious when applied to cattle two to three times a week with sponges, syringes, brushes, mops, or brooms (Francis, 1892; Mohler, 1906). The evolution of resistance of ticks to arsenicals, the narrow limits between the effective concentration for tick control and the toxic concentration for cattle, and concerns about toxic residues in animal tissues were major factors for replacing arsenic with synthetic organic insecticides in the decade after World War II ended (Graham & Hourrigan, 1977).

Organochlorine insecticides were the first synthetic organic insecticides to be marketed and many of them were formulated for the control of ticks on cattle. DDT and benzenehexachloride (BHC) were the first of this group of chemicals to be used as acaricides (Cobbett, 1947; Maunder, 1949; Whitnall et al.1951). Dieldrin and aldrin, cyclodiene compounds, and toxaphene, a polychloroterpine product, also were widely used for the control of ticks on cattle. Organochlorine products for treating livestock are now unavailable or have been withdrawn from the market (Kunz & Kemp, 1994). Because of their non biodegradable property they persistent in the environment; DDT, BHC and the cyclodienes are especially prone to accumulate in body fat (Ware, 2000). Non biodegradable property is the major factor for replacing Organochlorines with Organophosphates.

Unlike the persistent organochlorines, the organophosphate compounds that replaced them were chemically unstable and non-persistent. The development of organophosphate acaricides was primarily for the control of organochlorine- resistant Boophilus ticks that had become common throughout much of the cattle-producing areas of the tropics and subtropics (Shaw, 1970). Ethion, chlorpyrifos, chlorfenvinphos and coumaphos are four of the most widely used organophosphates for the treatment of tick-infested cattle. Later on Carbamateacaricides (e.g. carbaryl and promacyl), came into use and their function is similar to that of Organophosphates by inhibiting the target's cholinesterase, but they have very low mammalian and dermal toxicity. Unfortunately, the value of carbamates for the control of ticks was limited because of their cross-resistance with organophosphates (Roulston et al., 1968; Schuntner, Schnitzerling&Roulston, 1972; McDougall & Machin, 1988). Resistance to organophosphates and carbamates has

eliminated or minimized their usefulness in Australia, much of Africa and parts of Latin America (Kunz & Kemp, 1994).

The formamidines, chlordimeform, clenpyrin, chloromethiuron and amitraz, are members of a small group of chemicals that are effective against ticks. Chlordime form was introduced in Australia as an additive to organophosphates in dipping vats to restore their efficacy against an organophosphate resistant tick strain, but was removed from the market in 1976 because of evidence of carcinogenicity (Ware, 2000). Results of successful tests of amitraz for the control of B. microplus on cattle in Australia with an experimental formulation (BTS 27 419) were reported in 1971 (Palmer et al., 1971). Subsequent trials with commercial amitraz formulations in Australia (Roy-Smith, 1975) and the US (George et al., 1998) proved the efficacy of the acaricide against B. microplus. A series of trials executed over a five-year period in South Africa proved the effectiveness of amitraz for the control of *B. decoloratus, R. appendiculatus, R. evertsi* and *A. hebraeum* (Stanford et al., 1981). Amitraz is unstable in dipping vats, but adding sufficient calcium hydroxide or hydrated lime to raise and maintain the pH of the vat solution to 12 insures the stability of the active ingredient (Stanford et al., 1981; George et al., 1998).

Natural pyrethrum, a costly insecticide that is unstable in sunlight, was the predecessor to a series of synthetic pyrethrin-like materials. Compounds in this group of chemicals were originally called synthetic pyrethroids, but current nomenclature is simply pyrethroids. Pyrethroids have a history of evolution that began in 1949, but the third generation chemicals, permethrin and fenvalerate, were the first of these materials available for control of ticks on cattle (Davey & Ahrens, 1984; Ware, 2000). Cross-resistance to DDT precluded or abbreviated the use of permethrin and fenvalerate, but fourth generation Cyano-substituted pyrethroids are effective acaricides which include Cypermethrin, deltamethrin and cyhalothrin (Stubbs, Wilshire and Webber, 1982; Kunz & Kemp, 1994; Aguirre et al., 2000).It has been reported that a field strain (Malchi) in Australia has shown resistance to permethrin, cypermethrin and deltamethrin (Nolan et al., 1979).Due to this reason at recent times people are showing more interest towards macrocyclic lactones.

There are two classes of macrocyclic lactones with acaricidal activity. The avermectins are derivatives of the actinomycete Streptomyces avermitilis and the milbemycins are derived from fermentation products of S. hygroscopicus aureolacrimosus (Lasota & Dybas, 1991). Ivermectin, eprinomectin and doramectin are related to avermectins; moxidectin is the only milbemycin-derived macrocyclic lactone marketed for the control of ticks. Each of the macrocyclic lactones is active systemically in very low doses for the control of ticks. Macrocyclic lactone acaricides are efficacious, but high cost limits their use (Kemp et al., 1999).

Applications of Acaricides to Cattle

Traditional methods for the delivery of an acaricide treatment to cattle to control ticks required formulation of the acaricide into a form such as an emulsifiable concentrate, wettable powder or flowable product that could be diluted in water and applied to cattle with a hand sprayer, spray race or through immersion of animals in a dipping vat. More recently, treatment possibilities include the use of pour-on products, injectables, an intraruminal bolus, acaricide - impregnated ear tags and pheromone/acaricide impregnated devices attached in different ways to the host. The effectiveness of an acaricide applied to cattle for the control of ticks depends not only on the

degree of toxicity of a chemical, but on the quality, quantity and degree of dispersal of active ingredient deposited on cattle or delivered internally.

Drawbacks of Chemical Acaricides

Chemical control with acaricides was considered as one of the best methods, but it was shown recently that ticks have developed resistance against a range of acaricides (Martins et al., 1995). However these chemicals are toxic and costly. Problems of acaricide resistance, chemical residues in food and the environment and the unsuitability of tick resistant cattle for all production systems make the current situation unsatisfactory, which is why there is debate on the development of an alternate control method, such as

Non-chemical Prospects for Control:

There are several prospects for non-chemical control tick control

1. Managemental Practices:

A) Management of housing:

a) Housing in tick proof buildings

To the extent possible, cattle and buffalo sheds should be tick proof especially for the housing of purebred exotic and crossbred cattle, as they are more susceptible to the tick infestation than native cattle and buffaloes. There should be no cracks and crevices in the buildings (as the ticks hide and breed there). Caulking of the walls of the animal's sheds is an inexpensive measure that significantly reduces the tick burden. An acaricide channel should encircle the entire building. Heaps of dung cakes and stacks of bricks may also provide breeding places to the ticks in animal sheds and should therefore be removed regularly.

b) Slow burning of the wastes near the walls of the animal sheds

Since the female ticks generally lay their eggs in the cracks and crevices in the walls of the animal sheds, scrapping of the farm waste (feces and feed waste, etc.) against the walls of unoccupied paddocks and its slow burning over a period of one or two days is quite effective in reducing the tick burden on the animals. This practice should be periodically repeated. All common sense precautions should be exercised while resorting to this practice.

c) Separate housing of cattle and buffaloes

Cattle (in particular those with exotic blood) are more susceptible to tick infestation than buffaloes. Buffaloes do not usually carry cattle ticks except under exceptionally stressful conditions. They are not normal host of cattle ticks (Lemcke, 1997). When cattle and buffaloes are mingled together, the buffaloes sometimes also suffer from heavy tick infestation. Therefore, cattle and buffaloes should be housed separately.

d) Quarantine

Newly purchased animals should not be mixed right away with the already existing stock on the farm. If ticks are present on the bodies of new arrivals, they should be treated with acaricides so that they are free from ticks before adding them to the existing herd.

B) Pasture management:

a) Pasture spelling and rotational grazing

Pasture spelling and rotational grazing have been shown to be capable of greatly reducing the population of one-host ixodid tick *Boophilus microplus* on dairy farms in Australia (David, 2005). If cattle are placed on spelled (i.e., divided) pastures early in winter when the ticks are producing few or

no progeny and then alternated at 4-monthly intervals, the tick population can be controlled with a markedly lower number of acaricidal treatments. The spelled area to be grazed should first be checked by introduction of susceptible tracer calves. The practicability of the procedure depends upon the full-scale assessment of the increased weight gains relative to the costs of management. Duration of the spelling period varies from 2 to 3 months in summer and 3 to 4 months in winter, but these intervals need to be determined for each area. Even in countries where dairying is practiced with considerable pasture grazing (e.g., New Zealand), pasture spelling is rarely used for tick control. In developing countries like India, pasture spelling is not of much value because pastures and ranges are mostly communal with regards to ownership. Pasture spelling and rotation of pastures are not very effective for the control of multihostixodid ticks (e.g., *Hyalomma anatolicum*) or argasid ticks because of the long survival periods of the unfed nymphs and adults (David, 2005).

C) Manual removal of ticks

Where the number of tick infested cattle and buffaloes are very small, farmers remove the ticks manually generally at the time of milking. Ticks so removed are killed by putting them on a smoldering dung cake placed nearby. For manual removal of ticks, using the forefingers, first grasp the tick close to the animal's body and then twist it counter-clock wise. Entire tick can be removed in this way and with only little discomfort to the animal. Cattle enjoy manual removal of ticks. A caveat is pertinent with manual removal of ticks. When removing the tick manually, consideration should be given to the possible hazard to humans from pathogens present in these ticks.

D) Clearance of vegetation

Various stages of some ticks (e.g., *Boophilus species*) attach themselves to the blades of grass and other vegetation and stealthily attach to the cattle passing nearby. Though clearance of vegetation will annihilate their places of shelter, this type of action, however, may encourage soil erosion and may be detrimental to the ecosystem.

2) Vaccination:

a. Crude vaccines

The use of ticks to produce resistance is effective but crude and the use of tick extract is preferred instead to induce the same response. Whilst, the extract of whole tick or its parts have proved to be very effective, the level of resistance produced has never reached the levels obtained by feeding ticks (Mathewson, 1984). Crude vaccines made from extracts (containing particulate or particulate plus soluble components) of semi-engorged adult female *Boophilus microplus* gives effective immunity (Johnston et al., 1986). Antibodies destroy cells lining the tick's gut and allow blood to escape into the hemocele. Resultantly, some ticks die and the fertility of those remaining is reduced by up to 70%. The fertility of males is also reduced. Allen and Humphreys (1979) demonstrated effective immunization of the calves against infestation with *Dermacentorandersoni* by prior injection of tick homogenate. Each calf was experimentally infested with 30 male and 100 female ticks 3 days after the third injection of 67 mg homogenate protein. Ticks were removed 10 days later when engorgement should have been completed.

b. Genetically engineered and subunit vaccines

Production of an effective and safe anti-tick commercial vaccine presents several difficulties. Firstly, it is important to avoid induction of intense host reactivity to tick feeding. Secondly, salivary gland derived molecules are introduced into the host during tick engorgement. Therefore, use of these moieties might not be an optimal immunization strategy. Thirdly, antigens not normally involved in acquired resistance can be used to induce anti-tick immunity. However, these 'novel' antigens, obtained from tick gut absorptive surface, are not introduced into the host during tick feeding, but are exposed to host-immunity effector elements in the blood meal, resulting in tick rejection and prevention of ova production and death of tick. In the case of ixodid tick (hard tick), anti-tick immunity is induced with microgram quantities of ixodid gut antigen preparation (Wikel, 1988). According to Fuente et al. (2000), 5 protective antigens have been isolated from *Boophilus microplus*. The Bm 86 gut antigen is present throughout all tick stages. A recombinant vaccine based on a membrane bounded glycoprotein Bm86 (derived from gut of *Boophilus microplus*) has been shown to be as effective as the native antigen. This vaccine is also effective against ticks which have developed resistance to acaricides. Its major effect is a progressive control in tick numbers in successive generations through a decrease in their reproductive capacity. Because the vaccine acts against an antigen in the tick's gut to which cattle are never exposed, they must be given injections at regular intervals. This was the first recombinant parasite vaccine sold commercially. It was sold in Australia under the brand name of Tick- GARDTM (Hoechst Animal Health, Australia), copied in Cuba (Gavac TM; Heber Biotec S. A., Havana, Cuba; Fuente et al., 2000) and has been evaluated in other countries (Radostits et al., 2007). Studies conducted in Cuba have shown partial cross protection against *Hyalommaspp* and *Rhipicephalus* spp (Fuenteet al., 2000). A second antigen has now been added to the vaccine. This significantly enhances the efficacy and does not impair the response to Bm86. In the field trials, vaccination with Gavac TM controlled *Boophilusmicroplus* and *Boophilusannulatus* infestations (55 - 100% efficacy) 12-36 weeks after the first vaccination, increasing the time between acaricide treatments by an average of 32 ± 21 days (P = 0.0005; Fuente et al., 2000). Brazilian workers (Patarroyo et al., 2002) constructed 3 synthetic peptides (SBm4912, SBm7462 and SBm19733), derived from the Bm86 glycoprotein from *Boophilusmicroplus* gut, and used them to immunize cattle from a tick-free area. Researchers at the Department of Veterinary Parasitology, University of Agriculture, Faisalabad, Pakistan have reported a desirable immunogenicity of a *Boophilus* tick vaccine prepared from the midgut cells of the tick cultured in vitro (Akhtar et al., 1999; Akhtar and Hayat, 2001). Control of ticks and tick-borne diseases through immunological means was reviewed by Willadsen and Jongejan (1999), Willadsen (2005), Bowman and Nuttall (2004) and Ghosh et al. (2007). Although, vaccines offer long-term control, they need to be used with pasture management, acaricidal dips, and tick-resistant cattle as a part of an integrated pest management control system. Kocan (1995) advocated that future strategies of immunological control of ticks should target both tick and pathogens transmitted by them.

Indian scenario:

The work on immunization of animals against targeted tick species is initiated in India in the early nineties to develop immunoprophylactic measure that would be more effective against local tick strains (Manohar and Banerjee 1992). But the results obtained in preliminary studies have not been confirmed in the natural hosts. Kumar and a group of scientists from Haryana Agriculture University, Hissar reported cross-protective efficacy of midgut extracts of *H. dromedarii* following immunization of rabbits (Kumar and Kumar, 1996). However, the challenge dose (n = 10 pairs of ticks) used for the cross-protection study was not sufficient to establish the cross-protective potentiality of the antigen tested. Common cross- reactive proteins of 66 kDa were detected in the salivary gland extracts of *H. a. anatolicum* and in *B. microplus* (Parmar and Grewal 1996; Parmaret al., 1996). Similarly, Ghosh et al. (1998) reported six immnodominant proteins of 97.4, 85, 66,47.3,42and 31 kDa in all the stages of H. a. anatolicum. Subsequently, Ghosh and Khan (2000) reported common proteins of 68. 57.5, 50.8, 47.3 43 and <43 kDa in all the stages of *B. microplus* and *H. a. anatolicum*. However, further work using the identified common proteins for raising cross-protective immunogen has not been reported, Benerjee et al. (1990) prepared three extracts of salivary glands and tested in cattle and concluded that the protective antigens are present in the sediment collected after centrifugation. A comparatively higher level of Immunity in calves Immunized by whole extracts of salivary gland in combination with ascaris extract as immunomodulator was reported by sran et al. (1996). Sangwan et al. (1998) prepared whole nymphal extract, nymphal membrane antigen and nymphal soluble antigens of H.a. anatolicum, and used these for immunization of cattle. They were of the opinion that whole nymphal extracts are more suitable than the soluble and membrane antigens but none of the above studies have been carried further to attain the ultimate goal.

In comparison to the work done on their host ticks, experiments conducted for Immunization of cattle against one host tick, *B. microplus*, are very limited. For example, in four separate experiments the team of the Indian Veterinary Research Institute (IVRI) used crude extracts of partially fed adults and unfed larvae of *B. microplus* for the immunization of cross-bred calves and proteins of 105.4 and 92.2 kDa were recognized as immunodominant proteins present in adults and in larvae of the tick species (Ghosh and Khan 1996, 1997).

Purification of antigens and its testing as vaccine candidates

Under the priority research program of IVRI, as an empirical method of identification of target antigen, crude larval and nymphal extracts of *H.a. anatolicum* were used for the Immunization of New Zealand white rabbits (Ghosh et al., 1998) and significant reduction in the engorged weight and egg masses of adults fed on immunized animals were recorded. Getting the impetus from the preliminary positive results, Ghosh et al. (1999) immunized cross- bred calves with the larval antigens and challenged them with larvae and nymphs. A significant rejection, 57.25% of larvae and 45.75% of nymphs, was recorded. A significant percentage of abnormally fed larvae (11.4±0.8) and nymphs (8.25±1.2) were also recorded. The

larval antigens were further purified, a protein of 39 kDa was isolated and the purification level of 93.3% was achieved. The antigen was found effective in conferring protection by reducing 71.6% of larvae and 77.3% of nymphs. In continuation, the nymphal antigens were strategically purified and a protein of the same molecular weight was isolated and tested against experimental challenge infestations and found protective (Sharma et al., 2001). Later, the antigen has included in the list of identified tick vaccine candidate (Willadsen, 2001).

As a concealed antigen approach, larval gut antigens were isolated as three proteins of 100, 59.4 and 37 kDa. Immunization of animals with the isolated antigens conferred protection by reducing larval, nymphal and adult infestations by 70.6%, 54.5% and 61.9%, respectively (Das et al., 2000). Simultaneously, adult extracts of *H.a. anatolicum* were purified by immunoaffinity chromatography using anti-gut IgG as legends. A protein of 68 kDa was identified as a candidate molecule for conferring protection against tick challenge (Das et al., 2003). Further, Singh and Ghosh (2003) specifically isolated low glycoproteins of 34 and 29 kDa from the larvae of *H.a. anatolicum* and *B. microplus*, respectively. The cumulative effect of the isolated glycoproteins was tested by immunization of calves with both antigens and challenged with the stages of bothe species of ticks. The direct effect of immunization on the stages of the challenged ticks (% DT) was calculated as 69% and 52% against larvae and adults of *H. a. anatolicum* and 60% against *B. microplus* adults. The duration of immunity conferred by the isolated glycoproteins was studied in two tick active seasons and significant protection against both the species of ticks was recorded up to 30 weeks (Ghosh et al., 2005). The antigens were also tested in IPM format and a significant reduction of 35% in the frequency of application of insecticides was recorded.

In an another study, of the three earlier identified gut origin larval antigens, a 37 kDa protein was specifically isolated and tested for its protective as well as pathogen transmission blocking efficacy (Das et al., 2005). Besides the direct effect on tick stages, a partial reduction in the growth rate of *T. annulata* in ticks fed on immunized cattle was evidenced in comparison to the ticks fed on control calves. As an important component of vaccine formulation, the comparative immunopotentiating properties of incomplete Freund's adjuvant and saponin in combination with the 39 kDa larval antigen of *H. a. anatolicum* was compared and it was found that IFA could be replaced by the surfactant adjuvant, saponin. For immunization of cross-bred cattle against infestation of *H.a. anatolicum* (Ghosh et al., 2001).

The evaluation of immunoprotective and pathogen transmission limiting potential of the 34 kDa larval glycoprotein in combination with saponin is underway. Work is also underway to evaluate the cross-protective potential of individual antigens and to clone and express the most effective protein-encoding genes in suitable vector.

As evidenced form several experiments, Bm86 of its homologues are clearly present in other tick species (reviewed by De la Fuente and Kocan, 2003). A homologue of Bm86 has been found in other tick species such as *H. a. anatolicum* (Willadsen and

Jongejan, 1999) and R. appendiculatus (Saimoet al., 2005). A significant level of cross-protection between the *B.microplus* vaccine and *H. a. anatolicum* has been found (De la Fuente et al., 1999). With these informations as a lead, the IVRI team has cloned and expressed the Bm86 homologue gene of H. a. anatolicum (Izatnagar isolate) in Pichiapastoris system. The Bm86 homologue of *H. a. anatolicum* vaccine would probably have greater efficacy against *H. a. anatolicum* than the Bm86 commercial vaccines and it would be expected to reduce the transmission of the tropical bovine theileriosis. Besides the expected level of protection against homologous species there is also hope for obtaining cross-protection against *B. microplus* and *H. dromedarii.*

Although, vaccines offer long-term control, they need to be used with pasture management, acaricidal dips, and tick-resistant cattle as a part of an integrated pest management control system. Kocan (1995) advocated that future strategies of immunological control of ticks should target both tick and pathogens transmitted by them.

c. Targetting endosymbionts of ticks

Like other parasites, ticks carry some microorganisms in their bodies. These microorganisms include Rickettsia like *R. montana, R. rickettsii* present in ovaries of *Ixodesscapularis,* bacteria like *Wolbachiapersica* present in malphigian tubules of *Argus persicus,* and Eubacteria like *Francisellatularensis* present in both ovary and malphigian tubules of *R. sanguinus, Haemophysalislongicornis.* These microorgasnisms are in mutualistic or commensalistic (endosymbiosis) relation with the ticks and influence their reproductive ability. Since endosymbionts are essential for the survival of ticks, elimination of the microorganisms would be deleterious for the survival, growth and development of ticks. Endosymbionts of ticks are almost unexplored thus far. They appear to be potential future targets for tick control (Ghosh et al., 2007). Unfortunately, only few studies (e.g., Noda et al., 1997; Benson et al., 2004) that involved the identification and characterization of endosymbiont microorganisms of ticks have been conducted.

3) Biological control

It can be defined as action of natural enemies which maintains host population at levels lower than that would occur in absence of enemies or in a simple language it can be defined as "Use of one biological agent to control other biological agent". Ticks have numerous natural enemies, they are categorized as pathogens, parasitoids and predators, but only a few species have been evaluated as tick biocontrol agents. Pathogens include bacteria like *Bacillus thuringenesisisraelensis* and *entomopathogenic* fungi like *Metarhiziumanisopliae* and *Beauveriabassiana,* strains of which are already commercially available for the control of some crop pests.

These are spore forming pathogens, to achieve external sporulation they are placed along with ticks like *B. microplus* they dissolve the outer layer of ticks and release some toxins which bind with the gut epithelium of ticks and cause perforation of the gut and finally results into death of the ticks, and on other hand spores germinate and proliferation of these pathogens occurs.

Entomopathogenic nematodes and parasitoid wasps of the genus *Ixodiphagus* have only a limited pragmatic role in tick control. Parasitoids are the organisms whose larval development occurs inside or on the surface of other organisms resulting in death of the host. They either kill or sterilize their host. Predators, including birds, rodents, shrews, ants and spiders play some role in tick control. Ox peckers *Buphagus* spp. eat ticks from the bodies of infested animals and tick burden is generally low in cattle and buffaloes that are tethered under the trees in summer due to predation of ticks by some birds. Raising poultry chicks in the cattle barns greatly reduces tick burden on the infested cattle as the chicks (particularly young ones) pick ticks from the bodies of cattle as well as ticks moving in barns. Practicing mixed poultry and dairy husbandry is associated with considerable wastage of cattle feed and hazard of infectious diseases like salmonellosis and crytococcosis. In the New World (North, Central and South America), fire ants *(Pheidolemegacephala)* are noteworthy tick predators. Engorged ticks may also become parasitized by the larvae of some wasps (Hymenoptera) but their role in tick control is not significant. Nematodes of the families *Steinernematidae* and *Heterorhabditidaeare* endowed with insect killing abilities. The third-stage juvenile (infective or dauer) stage of these nematodes are able to actively locate, parasitize and kill a wide range of insect species. These nematodes owe their insecticidal activity to bacterial symbionts (*Xenorhabdus* spp. for *Steinernematids* and *Photorhabdus* spp. for *Heterorhabditids*) which they carry in their intestine and release these bacteria into the hemocele. Bacteria proliferate and kill the insect within 24-72 hours. Owing to success in mass rearing of entomopathogenic nematodes, they are now used commercially against insect pests in agriculture and gardens in Australia, China, Japan, USA and Western Europe (Samish et al., 2000). Fully engorged *B. annulatus* ticks are highly susceptible to infection by the entomopathogenic *Steinernematids* and *Heterorhabditids* with a LD50 and LD90 of upto 15 and 165 nematodes/tick/dish, respectively (Samish and Glazer, 1991). However, the results of practical application of nematodes in tick control are variable (Samish et al., 2000). Certain *Stylosanthes* spp (tropical legumes) can kill or immobilize larval ticks and the use of these plants may simultaneously improve pasture quality (Fernandez-Ruvalcabaet al., 1999). *Brachiariabrizantha* has also been shown to be lethal to *Boophilus* larvae. Owing to development of acaricidal resistance and growing public concern about insecticidal residues in food of animal origin, biological control is likely to play a substantial role in future integrated pest management programmes for tick control (Samish et al., 2004; David, 2005).

4) Breeding cattle for tick resistance

The development of cattle lines or breeds with enhanced genetically based resistance is especially attractive prospect (DeCastro and Newson, 1993). Zebu (Bosindicus; e.g., Sahiwal) and Sanga (a *Bostaurus* × *Bosindicus)* cattle, the indigenous breeds of Asia and Africa, usually become very resistant to *ixodid* ticks after initial exposure. In contrast, European *(Bostaurus)* breeds usually remain fairly susceptible. The tick resistance of Zebu breeds and their crosses is being increasingly exploited as a means of tick control. The introduction of Zebu cattle (notably Sahiwal cattle) to Australia has revolutionized the control of

Boophilusmicroplus on that continent. Use of resistant cattle as a means of tick control is also becoming important in Africa and the Americas. Resistance for ticks has been shown to be heritable and can be increased by breeding from cows and bulls selected for resistance (David, 2005). Brossard (1998) has reviewed the use of vaccines and genetically resistant animals in tick control. The observation that some individuals in the herd are more resistant than others, no matter what the breed, is the stimulus to cull out all breeding animals that are the most susceptible and carry the heaviest tick burden (Hungerford, 1990). Bonsma (1983) has mentioned the following factors as the basis of tick resistance/tick repellency of Zebu cattle: thick movable hides covered with short straight, non-medulated hair (in European breeds the skin is thin and covered with wooly hair); high skin vascularity; well developed panniculus muscle; sensitive pilomotor nervous system which moves their hides upon the slightest provocation high density of sweat glands; an efficient erector pili muscle which makes the hair stand up on provocation by flies, ticks, etc. and stimulates the secretion of sebum in the hair which is repellent for ticks

5) Ethno veterinary practices against ticks

Several plants and herbs have been shown to possess anti-tick insecticidal, growth inhibiting, antimolting and repellent activities. A number of reports are available on the effect of different extracts of plant material on tick species. Preliminary results obtained by Indian workers (Ghosh et al., 2007) with alcoholic extracts of sitaphal *(Annonasquamosa)* and neem *(Azadirachtaindica)* against different life stages of *Hyalommaand Boophilusare* highly encouraging. One of the fairly well established time honored practices for tick control in Punjab is to feed ground (powdered) Tara mira *(Roquette, Eruca sativa)* to cattle in summer. To this end, 5 kg of Tara mira is grinded. One fourth of a kg (250 gms) of this powder is soaked daily over night in water. In the morning, ice or ice cold water and salt (50-100 gm) are added. The mixture is churned or vigorously shaken for a few minutes and drenched to a tick infested cow/buffalo. This recipe is widely purported to reduce the tick burden, is considered to be galactagogue (i.e., milk yield booster) and widely touted to have a cooling effect and thus helps to sustain the rigor of heat in summer. Sometimes, farmers in Punjab resort to the external application of grated/powdered common salt for tick control.

Drawbacks of Non- Chemical Methods

Vaccines developed against ticks are not easily available in market. Future of herbal products depend on interest of pharmaceutical industry, they are not easily available in market, show lower efficacy rates than chemical acaricides and require repeated treatment at regular intervals. To achieve good Managemental practices it is too complex, effort consuming and time consuming for the owners and there is no standard protocol yet developed against non-chemical control methods.

Need for IPM

Problems of acaricide resistance, chemical residues in food and environment, availability of only few effective acaricidal drugs, huge cost involved in development of new drugs, toxicity, demand for organic animal products, non availability of vaccines and herbal products and the unsuitability of tick resistant cattle for all production systems make the current situation unsatisfactory. As parasitologists, we have a

continuing commitment to try to improve parasite control; it is of great importance that we integrate various parasite control measures within the general scope of disease control and the increased need for animal production.

Example for IPM

In Trans-mara region of Kenya an Integrated Control program for ticks and East coast fever was implemented based on conventional acaricide application, acaricide ear tags, exclusion of wildlife from paddock, immunization against *T. parva* and use of chemotherapeutic agents for tickborne diseases, which has shown better results than simple relying on chemical control methods.(young et al, 1988).

Conclusion

In conclusion, ticks infestation is a significant cause of economic losses to the dairy farmers all over the world. Up till now, the use of acaricides is the most commonly used method of tick control, but in future use of an non chemical control strategies based on managemental practices, utilization of biological control method, vaccination, breeding for tick resistance should be integrated with the chemical control in order to develop a better way of tick control.

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Fresh Cow Management

Management of Fresh cow

Feeding and management have a direct and long-term impact on -

- Health.
- Milk production.
- Reproductive performance.
- Ultimate dairy farm's potential profitability.

Fresh Cow's Accommodation –

- Enough Space should provide for each cow .
- Floor space should be even, proper bedding should be there.
- Covered area & wind breaker particularly in winter seasons to protect the animal from cold weather.
- Farm should be ticks & flies free as much as possible.
- Cattle should keep away from rodents.
- Hygiene and cleanness of farm should maintain.
- Fresh cow shouldn't be kept along with diseased cow.

A well designed Cattle shed

Continuous water supply

Feed Trough

Place to lie down

Separation of cows

Drainage line

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Bacteriological findings in 25 cases of endometritis in Dairy Buffaloes

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Abstract :

The present study was conducted to demonstrate the type of aerobic and anaerobic bacteria present in postpartum endometritis in dairy buffaloes. Twenty five dairy buffaloes having muco-purulent discharge after 15 days of calving were clinically examined and uterine swabs were collected by double sheathed uterine swabs for bacteriological studies. Out of 25 animals, all exhibited aerobic bacteria, though anaerobic could be isolated from 18 animals only. *Arcanobacterium pyogenes* was the predominant facultative anaerobe and was found in 52% of the samples, whereas *Bacteroides spp.* was the most frequent anaerobic organism isolated from 77.7% of anaerobically positive samples. Mixed infection of aerobic and anaerobic bacteria was found in 72% of the samples. All of the affected buffaloes were subsequently treated with an intra-uterine infusion of cephapirin following which there were clinical improvements and reduced bacterial isolations which suggests there may be merit in further more controlled studies to quantify the value of such treatment.

Key Words : Endometritis, buffalo, bacteria, mucopurulent discharge cepharin

The postpartum period is the most critical phase determining efficient reproduction in dairy buffaloes. Uterine diseases associated with non-specific bacterial infections during this period represent an important cause of bovine infertility (LeBlanc *et al.,* 2002) which may manifest as metritis, pyometra or clinical/sub-clinical endometritis. Out of these, endometritis is the most frequent cause of infertility in cattle and buffalo (Agarwal *et al.,* 2005).The present study was conducted to demonstrate the type of aerobic and anaerobic bacteria present in cases of postpartum endometritis in dairy buffaloes.

Material and Methods

Twenty five dairy buffaloes with muco-purulent discharge 15 days after calving were included in the study. The animals were clinically examined and uterine swabs were collected by double sheathed uterine swabs for bacteriological studies. The swabs were inoculated on blood agar, chocolate agar, MacConkey agar, Wilkins-Chalgren Anaerobe Agar and Cooked meat medium. The type of bacteria was identified on basis of colony morphology, staining characteristics and biochemical tests.

Results and Discussion:

Out of 25 animals, all exhibited aerobic bacteria, though anaerobic bacteria could only be isolated from 18 animals in the present study. Regardless of clinical health status, almost all dairy cows

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(Williams *et al.,* 2005) and buffaloes (Azawi *et al.,* 2007; Jadon *et al.,* 2005), normally have bacteria in the uterine lumen in the first 2 weeks postpartum. Any factor which compromises immune mechanisms and/or enhances bacterial challenge predisposes the postpartum uterus to non-specific infection and sub-fertility.

Most of the clinical and reproductive consequences of uterine infections are attributed to *Arcanobacterium pyogenes,* either alone or in combination with other bacteria like Escherichia. coli and obligate anaerobes. In the present study *Arcanobacterium pyogenes, Escherichia coli, Bacteroides spp., Fusobacterium necrophorum, Staphylococcus spp., Streptococcus sp., Proteus sp. and Klebsiella sp.* were the bacteria isolated. *Arcanobacterium pyogenes* was the predominant facultative anaerobe and was found in 52% of the samples, whereas *Bacteroides spp.* was the most frequent anaerobic organism isolated from 77.7% of anaerobically positive samples. Mixed infection of aerobic and anaerobic bacteria was found in 72% of the samples and these were most frequently involving *Arcanobacterium pyogenes* with obligate anaerobic bacteria. Das *et al.,* (2013) reported bacteria like *Escherichia coli, Staphylococcus aureus, Staphylococcus epidermidis, Proteus vulgaris, Actinomyces pyogenes,* and *Bacillus* species are common contaminants of the involuting uterus in buffaloes. *Actinomyces pyogenesacts* synergistically with *Fusobacterium necrophorum, Bacteroides spp.* and *Prevotella spp.* to enhance severity of uterine disease (Sheldon *et al.,* 2004; Williams *et al.,* 2005). Other aerobic and anaerobic bacteria are also isolated from cows and buffaloes (Azawi *et al.,* 2007; Agarwal *et al.,* 2005) and may contribute to pathological process.

Antibiotics are the most commonly employed modality for treatment of uterine diseases in dairy animals. After the present study (at day 15 post-calving), all buffaloes were treated with a single infusion of Metricef® (cephapirin, 500mg) and within four days of infusion, 84% (21/25 had) animals had no vaginal discharge. Post treatment, there was a marked reduction in bacterial load as evidenced by reduced number of colonies appearing on the culture media.

Efficacy of intrauterine treatment of endometritis with cephapirin has been reported to improve reproductive performances in cows in several large field trials also (LeBlanc *et al.,* 2002; Kasimanickam *et al.,* 2004); the supplementary findings above suggest the value of further controlled investigations of such treatments in buffaloes with post-calving endometritis is merited.

Summary

All 25 buffaloes under investigation 15 days post-calving had a mucopurulent discharge and exhibited aerobic bacteria, though anaerobic could only be isolated from 72% animals. *Arcanobacterium pyogenes, Escherichia coli, Bacteroides spp., Fusobacterium necrophorum, Staphylococcus spp., Streptococcus sp., Proteus sp. and Klebsiella sp.* were the bacteria isolated. *Arcanobacterium pyogenes* was the predominant facultative anaerobe and was found in 52% of the samples, whereas *Bacteroides spp.* was the most frequent anaerobic organism isolated from 77.7% of anaerobically positive samples. Mixed infection of aerobic and anaerobic bacteria was found in 72% of the samples. Subsequent treatment of the affected buffaloes with an intra-uterine infusion of cephapirin illicited some clinical improvements and reduced bacterial load which suggests there may be merit in further more controlled studies to quantify the value of such treatment for post-calving endometritis in buffaloes.

Acknowledgment:

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Fresh Cow Management

Tailor Feeding Program of Fresh cow

FEED QUALITY:

- High-quality forages & moderate amounts of fiber (rumen fill and decrease risk of a displaced abomasum)
- The particle size should be such that they stimulate cud chewing and rumen fill.
- Contain slower-digesting starch sources, such as dry shell corn, instead of wheat, barley, or high-moisture corn stored for more than 6 months that can avoid ruminal acidosis.
- Feeding unsaturated fatty acids (e.g., linoleic acid) to pre-fresh cows to improve uterine involution.
- Ruminally protected Choline and Monensin, would be expected to be the most effective and cost efficient.
- Fresh cows should have fresh feed available 22 hours daily.

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Treatment of Myiasis in Cattle with Herbal Formulation – A Field Trial Report

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Abstract

Myiasis is an infestation of the tissues by fly maggots. Fifty six cattle clinically infested with maggots were included in this trial. Four control animals given no treatment. Remaining 52 trial cattle were topically applied mixture of *Acalypha indica* juice extract and Lime water once daily. Recovery from maggots is nil and 96% in control and trial groups respectively. The herbal formulation is hence to be further studied about its property against maggots in cattle.

Keywords: *Myiasis*, Cattle, *Acalypha indica*, Lime water

Introduction

Maggots in bovine commonly infests in vagina and udder, which significantly impairs the productivity. They also penetrate into pre-existing wounds and extend the lesions considerably. This herbal formulation is mainly designed to be rich in maggoticidal property, and on trial is found to be distinctly formidable against myiasis in cattle.

In a fly brooding season, 56 cattle aged from 8 months to 4 years, different in sex and breed, were studied. They were presented for maggot infestations in various parts of the body like vulval lips, udder, neck/shoulder and ventral thigh. Examination revealed larval to adult maggots, exudation and bleeding.

Among 56, 4 maintained as control, 52 animals as trial group.

Control animal received no treatment. The trial group was topically treated with the herbal formulation containing mixture of equal volumes, 50ml, of *Acalypha indica* juice extract and Lime water. Dribble the mix over maggot wounds once daily.

No wound healing noticed in control. Trial animals wound healed in 3 to 5 days.

The plant kingdom harbors an inexhaustible source of active ingredients invaluable in the treatment of many intractable challenging and chronic diseases. The herbal formulation containing *Acalypha indica* and Lime water is prepared and used on following traces from the time immemorial.

Acalypha indica leaf powder is applied to maggot-infested wounds (PROTA, 2008). Umberto Quattrocchi, 2012, reported that the whole plant has larvicidal property, and leaves anthelmintic. In veterinary medicine, leaves crushed in salt and applied on maggot infested sores.

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Anonymous, 1843, reported that dressing with chloride of lime, with a view of stimulating the dormant vascular action, destroys the live maggots imbedded in wounds. In two days, wound looked healthy and no maggots visible and the mass of matter in the spaces become inseparable.

Lime (calcium hydroxide) is an ingredient applied to wounds. The lime kills maggots (Anonymous, 1994).

In this field study, probably the lime dried out the maggots and caused them to die of water pressure deficiency and concurrently reducing the inflammation.

McIntosh, 2011, reported traditional wound cleansing solutions may not be sufficient for maggot infestations of pre-existing wounds and supplemental treatments may be necessary to effectively treat cases of wound myiasis. On contrary, this herbal formulation is a single, unique, easy, economical and aids fast recovery.

This is a preliminary study and more work has to be carried out to explore the original mechanism of action of the formulation.

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Fresh Cow Management

Challenges in Dairy Animals

Critical Nutrient Status	Dry Period (2 Months)	Early Lactation (3 Months)	Mid Lactation (3 Months)	Late Lactation (4 Months)
Excess Energy				
Lack of Energy				
Lack of Minerals & Vitamins				
Body Condition Loss				
Metabolic & Reproductive Disorders				
Off-Feed				
Milk Fever				
Retained Placenta				
Metritis				
Displaced Abomasum				
Ketosis				

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Nutritive value of maize grain processing waste in Gir animals

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Abstract :

Nutritive value of maize grain processing waste was assessed by different methods on mixed feeding of this byproduct along with mature pasture grass hay and sole feeding of the later on six castrated Gir animals. Digestion coefficients(%) of maize grain processing waste were 78.40 ± 2.64 DM%, 81.15 ± 0.73 OM%, 76.78 ± 1.35 CP %, 56.03 ± 0.67 CF % 80.58 ± 1.70 EE %, 86.80 ± 0.96 NFE %, 72.42 ± 0.93 NDF %, and 61.52 ± 1.42 ADF%, respectively. Nutritive value of maize grain processing waste in terms of DCP and TDN contents were 5.51 and 72.71%, respectively. Overall results indicated that maize grain processing waste is an energy feed resource and can be used for feeding along with dry fodder for formulating maintenance ration.

Key word: Maize grain, Grass hay, Digestibility, Nutritive value Gir animals.

Introduction

Maize grain, a poor man's cereal contains 14.9 % moisture, 11.1 % protein, 3.6 % fat, 2.7 % fiber, 66.2 % other carbohydrates and 1.5% minerals (Anonymous, 2002). Inclusion of maize grain in ruminant rations is limited, but its by product from wet milling industry maize gluten meal is extensively used in poultry rations. Maize bran from dry milling of maize grain is available for ruminant feeding. During maize processing, waste material is generated that contains some starch, gluten, broken kernels and maize germs and is often referred to as maize processing waste. This byproduct is already used for feeding the dairy animals in Saurashtra region of Gujarat. An attempt has been made to evaluate the nutritive value of maize grain processing waste in Gir animals

Materials and Methods

Six castrated Gir animals (Age 24-26 months and B.W 184.33+8.14kg) of Cattle Breeding Farm, Junagadh Agricultural University, Junagadh were first offered maize grain processing waste (to meet protein requirements according to ICAR,1998) and mature pasture grass hay as ration components for three weeks in preliminary period followed by a digestion trial for seven days to assess the digestibility of the mixed ration. Later the same animals were fed mature pasture grass hay as sole feed for three weeks and a digestion trial period of seven days was conducted to assess the nutritive value of mature pasture grass hay. Feeds and fodder and faecal samples were analysed (proximate composition and phosphorus, AOAC, 1995, Calcium, Talapatra et. al., 1942 and Van Soest fibre fractions Van Soest and Goreing, 1970) and nutritive value of maize grain processing waste was determined by difference method.

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Result and Discussions

Maize grain processing waste contained (% on DM basis) CP,12.75 ; EE,8.0; CF,11.0; NFE,58.95, Ash,9.3, Silica,5.0; NDF,46.5; ADF,38.5; Ca,0.45 and P,0.73, respectively. It is somewhat nearer to maize bran in chemical composition (Anonymous,1973). DMI (kg/day, per cent and g/kgw0.75) were 5.03, 2.76 and 101.37, respectively on mixed ration containing maize grain processing waste and mature pasture gray. Voluntary intake of this byproduct was 59.31% of the quantity offered as per the requirement (ICAR,1998). Digestion coefficients of DM, OM, CP, EE, CF, NFE, NDF, ADF in maize grain processing waste, calculated by difference method were (%) 67.99±2.28, 77.10±0.59, 73.24±1.32, 73.88±1.46, 70.42±1.0, 80.86±0.69, 72.17±0.96 and 66.94±1.16, respectively. DCP and TDN per cent in mature pasture grass hay used in the present experiment were 0.07 and 63.13 %, respectively. Nutritive value of maize grain processing waste, obtained by difference method, in terms of DCP and TDN were 5.51% and 72.71% , respectively.

Plane of nutrition, when compared to ICAR feeding requirements, indicated that protein intake was lower by 43%, due to low voluntary intake of the byproduct in mixed ration. Overall results indicated that maize grain processing waste is principally an energy rich byproduct and protein concentration of the ration should be increased while including this product in productive rations.

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Table 1: Proximate composition of experimental feeds and fodder (% dry matter basis)

Feeds Constituents ➡ ⬇	Maize grain processing waste	Mature pasture grass hay
CP	12.75±0.11	2.04±0.03
EE	8.00 ±0.24	1.85±0.07
CF	11.00±0.09	35.45±0.29
NFE	58.95±0.17	46.46±0.14
Ash	9.30±0.09	14.20±0.11
Silica	5.00±0.07	10.45±0.12
NDF	46.50±0.44	56.60±0.63
ADF	38.50±0.53	42.50±0.57
ADS	61.50±0.23	57.50±0.17
Hemicellulose	8.00±0.09	14.10±0.13
Ca	0.46±0.01	0.55±0.02
P	0.73±0.01	0.15±0.01

* Mean of four samples

Table 2: Dry matter intake and organic matter intake during the experimental period

Nutrients	Experiment – I	Experiment – II
Dry matter intake		
DMI (Kg/day)	5.03 ± 0. 18	4.170 ± 0.16
DMI (%)	2.76 ± 0.20	2.26 ± 0.15
DMI (gm / M. BW $^{0.75}$)	101.37 ± 6. 35	83.12 ± 4. 80
Organic matter intake		
OMI (Kg/day)	4.56 ± 0. 16	3.56 ± 0. 13
OMI (%)	2.50 ± 0. 18	1.93 ± 0. 12
OMI (gm / M. BW 0.75)	91.92 ± 5.77	71.10 ± 4.10

Table 3: Digestibility in experiment-I, experiment-II and maize grain processing waste.

Digestibility	Experiment – I	Experiment – II	Maize grain processing waste by difference method
DM	67.99 ± 2.28	67.99 ± 2.28	78.40 ± 2.64
OM	77.10 ± 0.59	77.10 ± 0.59	81.15 ± 0.73
CP	73.24 ± 1.32	73.24 ± 1.32	76.78 ± 1.35
EE	73.88 ± 1.46	73.88 ± 1.46	80.58 ± 1.70
CF	70.42 ± 1.0	70.42 ± 1.0	56.03 ± 0.67
NFE	80.86 ± 0.69	80.86 ± 0.69	86.80 ± 0.96
NDF	72.17 ± 0.96	72.17 ± 0.96	72.42 ± 0.93
ADF	66.94 ± 1.16	66.94 ± 1.16	61.52 ± 1.42

Table 4: Nutritive value of experimental rations in experiment-I, experiment-II and maize grain processing waste.

Nutrient	Experiment – I	Experiment – II	Maize grain processing waste
DCP %	5.58	0.07	5.51
TDN %	70.39	63.13	72.71

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Co-occurrence of Bovine herpes virus 1 and Bluetongue virus antibodies in Cattle

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Abstract :

Sixteen serum samples of cattle were tested for presence of antibodies to Bovine herpes virus 1 (BHV1) and Bluetongue virus (BTV) by virus neutralization test (VNT) and competitive enzyme-linked immunosorbent assay (cELISA), respectively. Only six serum samples tested positive for the presence of BHV1 antibodies whereas all serum samples tested positive for the presence of BTV antibodies. The study indicated co-occurrence of antibodies to BHV1 and BTV in cattle population of Meghalaya state in India.

Keywords: BHV1, BTV, Cattle, ELISA, VNT

Introduction

BHV1, a DNA virus in the family *Herpesviridae* causes infectious bovine rhinotracheitis (IBR) in cattle and bluetongue virus, a RNA virus in the family *Reoviridae* causes BT disease in sheep and other ruminants including cattle. Meghalaya possess a total of 1.13 million domestic livestock population including 0.767 million cattle. Presence of these diseases limit animal trade from disease affected country to disease free country. Both the diseases take heavy toll on livestock due to morbidity and mortality in susceptible livestock population (Pandey *et al.,* 2014, Sreenivasulu *et al.,* 2003).

Presence of IBR and BT disease was reported first time in Indian cattle by Mehrotra in 1976 (Mehrotra et al., 1976) and Sapre in 1964, (Sapre 1964) respectively. BT disease is endemic in many states of India (Kulkarni and Kulkarni, 1984, Audarya *et al.,* 2004 and Didugu *et al.,* 2015). The presence of antibodies to BTV is common in cattle, buffaloes and goats although clinical disease is rare in these species as compared to sheep. Sheep (45.71%) and goats (43.56%) experienced higher seroprevalence than cattle (33.4%) and buffalo (20%) (Walton 2004). Indirect ELISA (Nandi *et al.,* 2007, Saravanjayam *et al.,* 2016), passive haemagglutination (Saravanjayam *et al.,* 2016) and neutralization (Nandi *et al.,* 2004, Pandey *et al.,* 2014) tests were employed for diagnosis of BHV1 infection in large ruminants. Audarya *et al.* (2004) and Nandi *et al.* (2005) used agar gel immunodiffusion test and cELISA to detect BTV antibodies in serum samples from cattle and sheep respectively. Virus neutralization test is considered as gold standard for diagnosis of IBR. Although, agar gel immunodiffusion test is most commonly used for the diagnosis of BT disease (Audarya *et al.,* 2014) it lacks sensitivity in comparison to cELISA. Earlier, cELISA has been used by Nandi *et al.* (2005) to detect antibodies to BTV in sheep population of Gujarat. Climatic

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conditions and climate change due to global warming is having favorable impact on spread of BTV and its vectors across territories (Purse et al., 2005). Presently BT vaccine is available in markets in India (Chand *et al.,* 2015). The objective of the study is to know presence of BHV1 and BTV antibodies in cattle of Meghalaya state in India.

Material and Methods

Livestock, Virus and Cell line: Serum samples were collected from unvaccinated (against BHV1 and BT) cattle of Shillong and its adjoining region (capital of Meghalaya) in the year 2005 and kept at frozen condition. A total of 16 serum samples were brought to Virus Laboratory, Centre for Animal Disease Research and Diagnosis (CADRAD), Modular Laboratory Building, Indian Veterinary Research Institute, Izatnagar and tested in July 2006. IBR virus maintained at Virus Laboratory, CADRAD was employed in VNT. MDBK cell line (National Centre for Cell Science, Pune) was maintained in minimum essential medium (MEM).

Virus neutralization test (VNT): VNT was performed for screening of serum samples to detect BHV1 neutralizing antibodies using protocol of OIE (2008) with little modifications. Serial 2-fold dilutions of inactivated test serum samples including control positive and negative were made up to 1:4 dilution in cell culture medium in 24 well plate. 50 µl of each dilution was put in triplicate wells and undiluted test serum in single well for toxicity control in 96-well micro-titre plate. 50 µl of IBR virus suspension containing 100 $TCID_{50}$ was added to each serum well and virus control well excluding cell control and toxicity control wells. The plate was incubated at 37°C for 2 h followed by addition of 100 µl of MDBK cell suspension containing $3x10^4$ cells/ml. Additional 50 µl MEM was added to toxicity control and virus control wells and 100 µl to cell control wells. Culture plate was incubated at 37°C for 3-5 days and observed for development of cytopathic effect.

Competitive enzyme-linked immunosorbent assay (cELISA): VP7 based cELISA kit (Institut Pourquier, France) was used for screening of serum samples to detect BTV group specific antibodies. In brief, 50 µl of dilution buffer was added to all wells, then 50 µl each of positive, negative and test serum samples were added in respective wells. Plate was covered with lid and incubated at 21°C for 15 min. Thereafter, 100 µl of conjugate diluted (1/10) in wash buffer was dispensed in all the wells and plate was incubated for 15 min. Optical density (OD) values were taken at 450 nm in ELISA reader after blanking in the air. Inhibition percentage (IP) values were calculated as per the following formula:

IP = OD 450 value of analyzed serum/mean OD value of negative serum x 10. IP values more than 60%, between 50-60% and less than 50% were estimated as negative, doubtful and positive, respectively.

Results and Discussion

The results of the present study are depicted in Table 1. In the present study, six (37.5%) serum samples were tested positive to BHV1 antibodies by VNT (four samples exhibited neutralizing titre of 1:4 and two 1:2). Seroepidemiology of IBR in large ruminants has indicated highest prevalence of IBR in Tamilnadu (67%) and lowest in Meghalaya but overall seroprevalence of IBR was 34% in India as per PDADMAS (2011). Higher seroprevalence of IBR antibodies in female (66%) than male (38%) was reported by Nandi *et al.* (2007). In one of the other study by Nandi *et al.* (2004) seroprevalence of BHV1 antibodies was found 46.77% in cattle and 62.96% buffaloes, respectively, in neutralization test.

In the present study in cELISA, IP values of all 16 serum samples (100%) fall in the range of 21.77% to 49.10% and hence were considered

positive to possess BTV antibodies. Presence of BTV antibodies indicated exposure of cattle to vectors which transmit BTV. During the period of 2004-05, BTV type 15 has been isolated from West Bengal which indicates circulation of BTV in livestock population and presence of its vectors in the region as per AINPBT (2005). Unrestricted movements of the relatively large numbers of cattle, sheep and goats have been implicated in transmission of the bluetongue disease and its vectors in new regions (Ravishankar *et al.,* 2005). Presently, investigations of livestock population in the region are continuing and indicated serological evidence of BHV1 and not BTV infection in livestock population during 2015-2016 as per AICRPADMAS (2015).

The study indicated presence of BHV1 and BTV antibodies in cattle population of Meghalaya state in India. Though, sample size in the present investigation is less to conclude the study reports co-occurrence of BHV1 and BTV antibodies in cattle population. The study will help in implementation of better prevention and control strategies against BHV1 and BTV in India.

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Table 1: Results of serological tests for presence of antibodies to Bovine herpes virus 1 (BHV1) and Bluetongue virus (BTV)

Sample Number	VNT for BHV1		cELISA for BTV		
	Titer	Result	OD values	IP	Result
1	1:4	Positive	0.226	31.34	Positive
2	1:4	Positive	0.204	28.29	Positive
3	1:4	Positive	0.257	35.64	Positive
4	-	Negative	0.157	21.77	Positive
5	-	Negative	0.186	25.80	Positive
6	1:2	Positive	0.203	28.16	Positive
7	1:4	Positive	0.311	43.13	Positive
8	1:2	Positive	0.237	32.87	Positive
9	-	Negative	0.184	25.52	Positive
10	-	Negative	0.270	37.48	Positive
11	-	Negative	0.204	28.29	Positive
12	-	Negative	0.203	28.16	Positive
13	-	Negative	0.354	49.10	Positive
14	-	Negative	0.293	40.64	Positive
15	-	Negative	0.344	47.71	Positive
16	-	Negative	0.257	35.64	Positive

cELISA-competitive enzyme-linked immunosorbent assay,
IP-Inhibition percentage, OD-Optical density, VNT-virus neutralization test

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Studies on clinical cases of failure of cervical dilatation in cows and buffaloes

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Abstract

Prostaglandin gel containing Dinaprostone (PGE_2) per cervically in clinical cases having failure of cervical dilatation was successful to effect parturition in cows and buffaloes. Whereas, similar clinical cases treated with Misoprostol tablet delivered successful in cows and buffaloes. Present findings indicated that Dinaprostone (PGE_2) treatment per cervically has better efficacy in clinical cases of failure of cervical dilatation in buffaloes than that of the cows whereas the Misoprostol tablet (PGE_1) therapy has higher efficacy in cows as compared to buffaloes for the treatment of clinical cases of failure of cervical dilatation.

Keywords: Buffaloes, Cows, Dinaprostone, Misoprostol, Cervical dilatation.

Introduction

Hormonal deficiency and altered endocrine pattern at term were associated with dystocia due to failure of cervical dilatation. Failure of cervical dilatation is a major cause of maternal type of dystocia and the incidence of the same was reported to be 19.1 per cent in cows (Singala *et al.,* 1990). Failure of the cervix to dilate is an important cause of maternal dystocia in the farm animals. Cervical dilatation is attempted in dystocic animals with available treatments, like use of corticosteroid (long, medium. short acting), prostaglandin, Valethamide bromide, Hyocine butylbromide, estrogens, oxytocin, misoprostol these are drugs followed routinely, but there is no speedy effect of any of these methods for prompt cervical dilatation. A greater understanding of the processes that regulate cervical remodeling during pregnancy, parturition, and the postpartum period is required to understand causes of pre-term and post-term birth in which abnormal cervical function is the primary factor. It is therefore important to develop objective methods of assessing the cervical state to understand how cervical softening is regulated. Hence, the present research experiment planned in cows and buffaloes.

Materials and Methods

Clinical cases of failure of cervical dilatation even after completion of gestation period reported to the clinics were treated with different therapeutic approaches for cervical dilatation in CDC and CDB groups to record the success rate of the treatment.

Treated cases were followed at three hourly intervals till cervical dilatation and parturition to record the treatment response interval.

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Group	Animals	Treatment Schedule
CDC-G	06	$PGF_{2\alpha}$ gel endo-cervically Inj. Calcium borogluconate 225 ml, IV BID with NS 1000 ml IV.
CDC-T	06	Tab Misoprostol 200 µg × 5 Tab endo-cervically, Inj. Calcium borogluconate 225 ml, IV BID with NS 1000 ml IV.
CDB-G	06	$PGF_{2\alpha}$ gel endo-cervically Inj. Calcium borogluconate 225 ml, IV BID with NS 1000 ml IV.
CDB-T	06	Tab Misoprostol 200 µg × 5 Tab endo-cervically, Inj. Calcium borogluconate 225 ml, IV BID with NS 1000 ml IV.

CDC: Cervical dilatation cows, CDB: Cervical dilatation buffaloes, G: Gel, T: Tablet

Results & Discussion

Clinical cases of failure of cervical dilatation presented to clinics after completion of gestation period with history of straining for 12–24 hours and further diagnosed as complete rigidity of the cervix or incomplete cervical dilatation were treated in cows and buffaloes. The treatment was undertaken in clinical cases which consisted of two protocols and the treatment response recorded regarding cervical dilatation is presented in table 01. Prostaglandin gel containing Dinaprostone (PGE_2) @ 3 gm per cervically was used in six cows (CDC-G group) having failure of cervical dilatation and it was observed that the cows parturated successfully within 4.19 ± 0.53 hours of treatment. Similar treatment in buffaloes (CDB-G group) took 3.29 ± 0.49 hrs for calving after the treatment.

Sr. No	Parameter	Observations			
		Cows		Buffaloes	
		CDC-G Group	CDC-T Group	CDB-G Group	CDB-T Group
1)	Number of animals treated	06	06	06	06
2)	Number of animals responded	06	06	06	06
3)	Number of induction failures	00	00	00	00
4)	Mean time interval bet^{n} treatment & calving (hrs)	4.19 ± 0.53	3.97 ± 0.38^{a}	3.29 ± 0.49^{x}	5.66 ± 0.52^{by}
5)	Number of assisted deliveries	06	06	06	06
6)	Post partum complications	00	00	00	00

Different superscript indicates significant difference amongst them; a and b superscripts indicate significant difference between values of CDC-T and CDB-T groups; x and y superscripts indicates significant difference between the values of CDB-G and CDB-T groups.

Statistically, the mean time interval required for parturition after treatment was found to be non significant between cows and buffaloes. Clinical cases of incomplete cervical dilatation or failure of cervical dilatation treated with Misoprostol tablet (PGE_1) @ 1000 µg endo- cervically showed efficient response and the treated cows (CDC-T group) delivered within 3.97 ± 0.38 hrs after the treatment whereas buffaloes (CDB-T group) treated with similar treatment took very long time of 5.66 ± 0.52 hrs to respond as compared to the cows. Statistically, significant difference was observed for mean time interval required for parturition after treatment in cows and buffaloes.

Protocol treatments of Dinaprostone and Misoprostol used in cows showed non significant difference for the mean time interval required for parturition but contrary to the same, the difference was significant in buffaloes. The mean time interval between treatments to response was found to be 4.19 ± 0.53 hours and 3.97 ± 0.38 hours for CDC-G and CDC-T groups in cows whereas the same in buffaloes was recorded as 3.29 ± 0.49 and 5.66 ± 0.52 hours, respectively. Present findings indicated that Dinaprostone (PGE_2) @ 3 gm treatment per cervically has better efficacy in clinical cases of failure of cervical dilatation in buffaloes than that of the cows whereas the Misoprostol tablet (PGE1) therapy @ 1000 µg endo-cervically has higher efficacy in cows as compared to buffaloes for the treatment of clinical cases of failure of cervical dilatation. Clinical cases of failure of cervical dilatation were more successfully treated in buffaloes with Dinaprostone gel which indicates that natural prostaglandins of E_2 type have better action on muscular part of the cervix whereas efficacy of $PGF_2\alpha$ in cows as compared to buffaloes is expected on the basis of its prompt luteolytic effect.

The aim of the treatment was directed to dilate the cervix in clinical cases but even after dilatation, it was found necessary to attempt the assisted delivery in all cases. The positive side of nil post partum complications was observed to the credit of the protocols. Success rate of treatment was 100 per cent for both the protocols in cows and buffaloes in terms of survival of dams and fetuses. Additionally, Dinaprostone gel and misoprostol tablet administration in clinical cases have not shown any side effect in any treated cases. Prostaglandin gel was used in clinical cases and the drug consists of Dinaprostone, a synthetic analogue of prostaglandin E_2 (PGE_2). It has been suggested that this effect may be associated with collagen degradation caused by secretion of enzyme collagenase as a partial response to locally administered Dinaprostone (Patil, 2014).

Misoprostol tablet used endo-cervically in the present trial is the prostaglandin of choice as it is cheap and stable at room temperature and available in different dosage forms. Azawi *et al.,* (2011) observed that administration of five tablets of 200 mcg Misoprostol in a case of partially dilated cervix in cow led to complete cervical dilatation in 45 minutes. However, present findings are not in agreement with the observations as the dozen cases took four to six hours for dilatation of cervix. Patil *et al.* (2013) found that tablet Misoprostol 200 mcg was efficient to effect cervical dilatation within 10.00 ± 0.61 and 13.42 ± 1.61 hours in cows and buffaloes, respectively and present report is also not in agreement for the observations as with five tablets of misoprostol, cervical dilatation took the same period in the present trial.

Summary and Conclusions

Clinical cases of failure or incomplete cervical dilatation treated with Prostaglandin gel containing Dinaprostone (PGE_2) @ 3 gm endo-cervically calved within 4.19 ± 0.53 and 3.29 ±

0.49 hrs whereas those treated with Misoprostol tablet (PGE_1) @ 1000 µg endo- cervically showed significant difference of calving within 3.97 ± 0.38 and 5.66 ± 0.52 hrs in cows and buffaloes, respectively.

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Fresh Cow Management

Early Disease Diagnosis & Interventions of Fresh Cow

- The first days after freshening are among the most critical of a cow's life
- The cow is under stress and suffers with impaired immunity.
- Observe eating & rumination (Chewing cud)
- Daily body temperature for 10 days for early disease diagnosis
- Observe for signs of metritis, ketosis, mastitis, acidosis
- Also can suffer with ecto & endo parasite infestations

Common Dairy Production Disorders

Calves : Dystocia, Scours, Pneumonia

Cows : Mastitis (contagious, environmental), Lameness, Metabolic Milk fever, Ketosis

Heifers : Pneumonia, Injury, Bloat (rare), Reproductive (Metritis, RFM), Low Production, John's Disease

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Molecular detection using PCR targeting fimA gene for Salmonella contamination of animal feeds in Chittoor and Kadapa districts of Andhra Pradesh

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Abstract :

In this study, the prevalence of Salmonella contamination in composite animal feeds and the efficacy of some control measures were evaluated. A total of 109 composite feed samples were obtained from Chittoor and Kadapa districts Salmonella contamination was confirmed through culturing and biochemical tests followed by PCR detection for final gene (85 bp).

The overall prevalence of salmonella contamination was 6.42% (07/109; 3.14 to 12.66, 95% CI) with a prevalence of 4.17% (03/72; 1.43 to 11.55%, 95% CI) in Chittoor and 10.81% (04/37; 4.28 to 24.71%, 95% CI) in Kadapa. The isolates showed colourless colonies on MacConkey agar and red colonies on Brilliant green and Xylose-Lysine Deoxy-cholate agar. The isolates were confirmed by the presence of the fimA gene through PCR. Most isolates were susceptible to Ceftriaxone (100%), Ciprofloxacin (100%) and Oxacillin (100%) followed by Ampicillin (85.70%) and Gentamicin (71.40%). Treatment of contaminated feeds with either Formaldehyde (0.5% & 1.0% w/w for 24 h); UV irradiation (10 min); and Sun drying (six days) significantly ($P<0.05$) decreased Salmonella contamination. However, Formaldehyde (0.5% and 1.0% w/w) treatment showed significantly ($P<0.05$) higher reduction compared to other treatments. In conclusion, PCR directed at fimA gene detected salmonella contamination of feeds. Formaldehyde treatment is an effective strategy in controlling salmonella contamination.

Key words: Salmonella, Polymerase chain reaction, *fim*A, UV radiation, Formaldehyde

Introduction

Animal feeds can serve as a carrier for a wide range of contaminants such as microbes (Kehinde *et al.,* 2014), pesticides (Bharathi *et al.,* 2011), heavy metals (Raj et al., 2011), molds and mycotoxins (Rani *et al.,* 2011) producing deleterious effects on the performance of animals. Pathogenic bacterial species generally found in the field are *Salmonella, E. coli, Staphylococcus, Streptococcus, Pasturella, Pseudomonas and Clostridium* (Andino *et al.,* 2015; Priya *et al.,* 2016). Among all the bacterial species identified in the field, *Salmonella* is the most important contaminant as it causes health hazards in a wide range of animals and humans.

Animal feed is an important source of *Salmonella* affecting livestock and humans. *Salmonella* has the ability to survive in feed for a long time (Afzal *et al.,* 2015) and high levels of *Salmonella* in feed

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cause productivity problems in poultry and swine (Anderson *et al.,* 1999). Members of the genus *Salmonella* are gram-negative, rod-shaped, facultative anaerobes (Le Minor, 1992). Conventional cultural and biochemical methods for *Salmonella* isolation and identification are time consuming with low specificity for pathogenic strains. Hence, molecular methods like PCR targeting *fim*A gene are gaining popularity in food and feeds due to improved specificity and reduced time of detection (Naravaneni *et al.,* 2005).

In view of the potential hazards of Salmonella contamination of feeds, it is essential to develop suitable, efficient and economic treatments to reduce contamination. Earlier, treatments such as pelleting, organic acids, formaldehyde treatment (Jones, 2011); UV sterilization (Liu *et al.,* 2015); sun drying (Wachukwu *et al.,* 2003) were tried to control Salmonella contamination in feeds. In this study, the prevalence of *Salmonella* contamination of composite feeds in Chittoor and Kadapa districts of Andhra Pradesh and the efficacy of some treatments in controlling Salmonella contamination was studied

Material and Methods

Sample collection

Feed samples were collected from different livestock and poultry farms in Chittoor and Kadapa districts of Andhra Pradesh. A total of 109 composite animal feed samples was collected and preserved in thick polyethylene bags at room temperature until processing.

Isolation, culture and biochemical characterization

Twenty five grams of feed sample was homogenized in 225 mL of buffered peptone water and one mL of sample was inoculated into selective enrichment media (Selenite F broth and Rappaport Vassiliadis soybean meal broth) and incubated at 37^{0}C for 24 h. An aliquot from the broth was streaked on to Brilliant Green, MacConkey and Xylose-Lysine deoxy-cholate agar and incubated at 37^{0}C for 24 h. Presumptive Salmonella colonies were characterized by various biochemical tests.

Molecular Characterization

Polymerase chain reaction (PCR) using oligonucleotide primers specific for the *fim*A gene of pathogenic *Salmonella* was used (Cohen *et al.,* 1996; Rambabu *et al.,* 2005). The primer sequences used for *fim*A gene were:

Forward primer - CCTTTCTCCATCGTCCTGAA;

Reverse primer - TGGTGTTATCTGCCTGACCA.

A colony of bacterial culture was inoculated in 5 mL of nutrient broth and grown overnight at 37^{0}C. One mL of the culture was centrifuged at 5,000 RPM and the pellet was collected. The pellet was re-suspended in Tris-acetate-EDTA buffer (10 mM Tris / HCl, pH 8.0), 15 µL 20% sodium dodecyl sulphate and 3 µL proteinase K (20 mg/mL). The mixture was incubated at 37^{0}C for one hour, followed by the addition of 100 µL of 5M NaCl. To the solution, 80 µL of CTAB reagent was added and incubated at 65^{0}C for 10 min. DNA was collected by centrifugation after phenol-chloroform extraction and washed with 70% ethanol and dried. The purity of DNA was checked by agarose gel electrophoresis and PCR was carried on isolated DNA.

A 50 µL PCR mixture contains 50 mM Tris-HCl (pH 8.3), 200 µm each, dATP, dCTP, dGTP and dTTP; 0.075 µm each primer, 0.65 U of Taq polymerase and 2.5 mM MgCl2. Twenty nine cycles, each cycle of denaturation at 94^{0}C for one min, annealing at 58^{0}C for 30 sec and primer extension at 72^{0}C for one min were carried out (Thermal cycler v 3.0, Kyratec Ltd, Australia). An

additional cycle of one min at 94°C, 30 sec at 58°C and 5 min at 72°C was included. The specific PCR product was an 85 bp fragment, which was visualized by agarose gel electrophoresis and subsequent staining with ethidium bromide.

Susceptibility to antibiotics

The susceptibility of all isolates was studied by Kirby-Bauer disc diffusion method according to the guidelines of Clinical and Laboratory Standards Institute (Kiehlbauch *et al.,* 2000). The antibiotics used for the study are as follows: Amoxicillin, ampicillin+cloxacillin, ceftriaxone, chloramphenicol, ciprofloxacin, oxacillin, streptomycin, gentamicin, neomycin, oxytetracyclin.

Evaluation of control measures

The composite feed contaminated with *Salmonella* was used for the evaluation of control measures. Each treatment was maintained in triplicate and a sample of 25 g was collected, from each replicate, for isolating and detecting salmonella.

Treatment I & II: Formaldehyde (0.5% or 1% w/w) was mixed with feed samples and kept airtight in a polythene bag at room temperature for 24 h.

Treatment III: Feed samples were exposed to UV radiation (240-260 nm) for 10 min.

Treatment IV: Feed samples were spread to a thickness of 1.0 - 1.5 cm in a clean, dry tray and exposed to sun for six days. The temperature during the treatment period was 37.0 – 39.0°C.

Statistical Analysis

The data for prevalence and antibiotic susceptibility was presented as percentages with 95% confidence intervals and Salmonella counts were presented as log10 values with standard error. The efficacy of each treatment was analyzed using paired t-test using before and after treatment counts. One-way ANOVA followed by Tukey's *post-hoc* test was used to compare the treatments. Statistical package for social sciences 19.0 V was used for the analysis. The level of significance was set at 0.05%.

Results

Composite feed samples showed an overall prevalence of 6.42% (07/109; 3.14 to 12.66, 95% CI). There was no significant difference between the prevalence in Chittoor district (4.17%, 03/72; 1.43 to 11.55%, 95% CI) and Kadapa district (10.81%, 04/37; 4.28 to 24.71%, 95% CI) (Table I).

The organisms isolated from feed samples and grown on selective enrichment media developed red coloured colonies on Brilliant green agar, colourless colonies on MacConkey agar and red colonies with black centers on XLD agar. The

Table I: Prevalence of Salmonella contamination of composite animal feeds

District	Prevalence
Chittoor District	04.17% (03/72, 1.43 to 11.55%)
Kadapa District	10.81% (04/37; 4.28 to 24.71%)
Overall	06.42% (07/14; 3.14 to 12.66%)

Values are Percentages with 95% Confidence intervals; Chi-square test using SPSS 19.0V

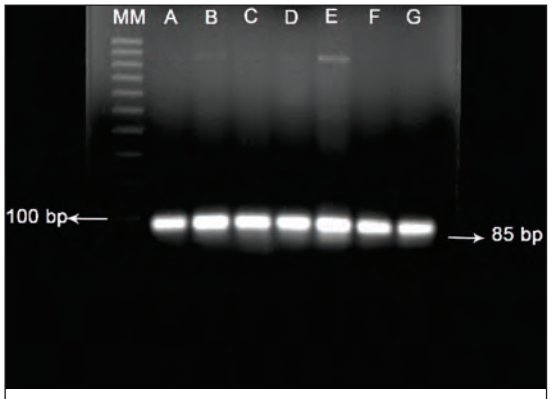

Fig 1: Molecular detection of pathogenic Salmonella using PCR targeting 85 bp *fim*A gene
MM: Molecular size marker; Lane A-G: Salmonella isolates showing the presence of *fim*A gene

isolates were further subjected to biochemical tests to identify Salmonella. The isolates were negative for indole, VP, and urease and positive for MR and citrate utilizations. On TSI agar, all the isolates produced acid butt and alkaline slant with the production of hydrogen sulphide, except two isolates, which failed to produce hydrogen sulphide gas.

DNA isolated from presumptive Salmonella positive isolates was checked for purity and integrity by agarose gel electrophoresis. A thick clear single band of DNA was observed under UV illumination. The PCR product targeting *fim*A gene showed a clear band of 85bp upon electrophoresis indicating the presence of pathogenic Salmonella organisms. A total of seven isolates from 109 feed samples were positive for Salmonella (Fig 1).

Antibiotic sensitivity pattern of the PCR positive Salmonella isolates showed that most isolates were susceptible to Ceftriaxone (100%), Ciprofloxacin (100%) and Oxacillin (100%) followed by Ampicillin (85.70%) and Gentamicin (71.40%). Most of the isolates were resistant to oxytetracycline, streptomycin, neomycin and chloramphenicol (Table II).

Table II: Susceptibility of Salmonella isolates to various antibiotics

Antibiotic	% Susceptibility of isolates
Amoxycillin (10 mcg)	6/7 (85.70%)
Ampicillin + Cloxacillin (10 mcg)	6/7 (85.70%)
Ceftriaxone (5 mcg)	7/7 (100.00%)
Chloramphenicol (10 mcg)	5/7 (71.40%)
Ciprofloxacin (10 mcg)	7/7 (100.00%)
Oxacillin (10 mcg)	7/7 (100.00%)
Streptomycin (10 mcg)	2/7 (28.50%)
Gentamicin (10 mcg)	5/7 (71.40%)
Neomycin (10 mcg)	4/7 (57.14%)
Oxytetracycline (30 mcg)	2/7 (28.50%)

Values are proportions (Percentage); mcg: microgram

Table III: Effect of different methods of treatment on total plate counts of feed samples

Treatment	Total plate counts (log10 CFU/g of feed)	
	Before treatment	After treatment
Formaldehyde (1% w/w)	5.30 ± 1.54	4.48 ± 1.30^{*a}
Formaldehyde (0.5% w/w)	5.30 ± 1.54	4.40 ± 1.48^{*b}
UV treatment	5.30 ± 1.54	4.72 ± 1.70^{*c}
Sun drying	5.30 ± 1.54	4.85 ± 1.54^{*d}

Values are Mean ± S.E (n=3); Paired t-test and one way ANOVA followed by Tukey's *post-hoc* test using SPSS 19.0V software; Values with different superscripts are significantly different (P<0.05); *significant difference between before and after values; alphabets indicate comparison between treatments

All the treatments (Formaldehyde (0.5% & 1.0% w/w for 24 h); UV irradiation (10 min); and Sun drying (six days) significantly (P<0.05) decreased Salmonella counts in the respective contaminated feeds. However, Formaldehyde (0.5% and 1.0% w/w) treatment showed significantly (P<0.05) higher reduction compared to other treatments, while sun drying was least effective and UV irradiation being medium effective in controlling Salmonella contamination (Table III).

Discussion

In this study, an overall prevalence of Salmonella contamination in composite animal feeds were found to be 6.42% with individual district prevalence ranging 4.17 to 10.18%. Earlier, the prevalence of Salmonella contamination of animal feeds was reported to generally range from 0 to 6% (Afzal *et al.,* 2015). However, exceptionally high prevalence of 12.5% was reported in animal feeds (Li *et al.,* 2012). The higher incidence of Salmonella in Kadapa district could be attributed to poor management practices.

Salmonella was detected using both conventional and molecular techniques. Salmonella showed characteristic red coloured colonies on Brilliant green agar, colourless colonies on MacConkey agar and red colonies with dark centres in Xylose-lysine deoxycholate agar (Quinn *et al.,* 2006). The organisms also showed positive methyl red and citrate utilization and negative indole and vouges-prausker test suggestive of Salmonella. The reaction on triple sugar iron (TSI) agar slants also showed the characteristic acid butt and alkaline slant with H2S production (Quinn *et al.,* 2006).

Though conventional cultural and biochemical tests help in the identification of Salmonella, they are usually laborious, time consuming and fail to detect pathogenic strains. In this study, PCR targeting *fim*A gene for detecting pathogenic salmonella was used. *fim*A gene is very specific and detects more than 27 serovars and sero-groups of Salmonella. Further, *fim*A gene can differentiate between Salmonella and non-Salmonella species and is useful to classify Salmonella up to genus level (Cohen *et al.,* 1996). In this study, this gene could detect Salmonella in all the seven feed samples that were detected by conventional methods. The feed samples negative for Salmonella did not react with PCR, further suggesting the specificity of this gene.

Antibiotic susceptibility testing is necessary to account for variation of sensitivity of serovars and helps in designing effective therapeutic strategy. In this study, the antibiogram on Salmonella isolates revealed that ceftriaxone, ciprofloxacin, oxacillin (100% sensitivity) were highly effective followed by amoxicillin (85.7%) gentamicin (71.4%). These results are in agreement with previous findings (Yhiler *et al.,* 2015; Mathura *et al.,* 2005).

In order to overcome production losses due to Salmonella contamination, there is a need for the development of suitable and economical control methods that reduce the bacterial load to acceptable levels in the feed samples. The control measures for Salmonella in animal feed such as pelleting, organic acids (formic and propionic acids), formaldehyde and blends thereof were extensively reviewed (Jones, 2011). In this work, chemical disinfection by formaldehyde, UV irradiation and sun drying were evaluated for their efficacy in decreasing Salmonella contamination.

Formaldehyde solution at 0.5% and 1%, significantly reduced Salmonella counts by 98.5% and 87.5% respectively. The effectiveness of formaldehyde in controlling Salmonella contamination is well established (Carrique-Mas *et al.,* 2007; Jordan *et al.,* 2009; Koyuncu *et al.*, 2013; Casagrande *et al.,* 2015). Recently, the efficacy of formaldehyde-propionic blends in controlling Enterobacteriaceae counts in pig feeds are reported (Sbardella *et al.,* 2015). Further, formaldehyde is reported to have residual protection up to 14 to 21 days against Salmonella in feeds (Wales *et al.,* 2013).

Feed samples exposed to UV light, for 10 min totally reduced the Salmonella organisms and could not be detected in cultural tests. Total plate counts were reduced by 75% with this treatment. Recently, UV treatment of colostrum was shown to significantly reduce bacterial counts of Listeria spp., Salmonella spp., and Acinetobacter spp., but failed to reduce the counts of *E. coli, S. agalactiae,* and *S. aureus* (Pereira *et al.,* 2014).

Sun drying is a cost-effective method for controlling bacteria and molds in animal feeds. The bactericidal activity is attributed to UV rays present in sunlight. In this study, feed samples kept for sun drying for 6 days showed a reduction by 65%. Several studies involving exposure of feed samples to sunlight for 3 days reduced the Salmonella contamination by 50% (Wachukwu *et al.,* 2003).

In conclusion, Salmonella organisms could be isolated with relative ease using conventional methods from feed samples. However, the detection of pathogenic Salmonella with PCR targeting fimA gene for had higher accuracy and was less time consuming. Formaldehyde treatment showed higher efficacy in controlling Salmonella contamination.

Competing Interests

The authors declare that they have no competing interests.

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Fresh Cow Management

Diseases of Fresh Cow

Ketosis is a metabolic disorder occurs negative energy balance.

- Ketotic cows often have low blood glucose (blood sugar) concentrations.
- Cows with excessive adipose stores (Body score condition > 3.75 out of 5)at calving are at a greater risk Ketosis usually occurs at 4 – 6 week of postpartum.
- Closely associated with underfed cattle. (metabolic shortage of gluconeogenic precursors)

Treatment :

- Administration of 500 mL of 50% dextrose solution.
- Glucocorticoids, including dexamethasone or isoflupredone acetate at 5–20 mg/dose.

Prevention:

- Oral Dextrose immediately after parturition

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Studies on The Incidence of Clostridium Perfringens in The Environmental Samples

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Abstract :

The present study was undertaken to standardize PCR assay for the detection of *Clostridium perfringens,* alpha toxin and enterotoxin from environmental samples and compare with the conventional cultural methods. Primers derived from 16S rRNA, cpa and cpe genes gave specific amplification at 481, 324 and 233bp for *C. perfringens,* alpha toxin and enterotoxin respectively. Four different template preparation methods viz. genomic DNA extraction, heat lysis, lysis buffers-1 and 2 were compared, of which heat lysis was found to be efficient and convenient. The minimum detection level with pure *C. perfringens* culture was found to be 2 CFU/ml. Fluid Thioglycollate (FTG) broth was superior over Robertson Cooked Meat Broth (RCMB) with 24h incubation period was better than 18h.

Out of 150 environmental samples (50 each of water, poultry feces and cattle feces) screened, 60 (water- 16, poultry feces- 24, cattle feces-20) and 66 (water- 18, poultry feces- 26, cattle feces-22) were positive for *C. perfringens* by cultural and PCR methods, respectively. Out of 66 PCR positives, 12 (water- 4, poultry feces- 6, cattle feces-2) were positive for *cpe* gene and all the 66 samples contained alpha toxin gene *(cpa*). The mean viable counts (CFU/g) are 2.1x105, 2.6x107 and 3.8x104 in water, poultry feces and cattle feces, respectively.

Keywords: *Clostridium perfringens,* water, feces, Cultural method, PCR.

Introduction

Clostridium perfringens is a gram-positive, anaerobic, rod-shaped, spore forming bacterium and a natural inhabitant of soil and intestinal tract of humans and many warm blooded animals (Songer, 1996). It is one of the most important pathogenic genera implicated in foodborne bacterial outbreaks, antibiotic-associated diarrhea and sporadic diarrhea as well as nosocomial diarrheal disease outbreaks, seen in both in developed and developing countries (Kobayashi, 2009).

C. perfringens is classified into five types (A–E) on the basis of their ability to produce major lethal toxins (alpha, beta, epsilon and iota). Alpha toxin encoded by *cpa* gene, is a phospholipase-C and is produced by all *C. perfringens* types A, B, C, D and E and causes gas gangrene. A minority C. perfringens produce enterotoxin that is responsible for food poisoning (diarrhoea). Beta toxin is mostly associated with Pig-bel in humans (Tweten, 2001). Epsilon toxin causes fatal enterotoxaemia in animals, classified as a category B potential bioweapon. Symptoms associated with *C. perfringens* are caused by an enterotoxin which is produced during sporulation of the organism in the small intestine

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following ingestion of large number of vegetative cells of enterotoxin-positive *C. perfringens* (Miwa *et. al.,* 1999). Enterotoxin encoded by *cpe* gene is the only toxin that is not secreted from vegetative cells but produced during sporulation (Rood, 1998).

Presence of Clostridium spp. and absence of *E. coli* and enterococci can be taken to indicate a old pollution event. The enumeration of sulphite-reducing clostridia is one of the principal procedures used in assessing drinking water quality in Europe, where the standard is 1 per 20ml (Sartory *et. al.,* 1993). *C. perfringens* is associated with human feces, gains entrance into various water sources (Drasar, 1975). *C. perfringens* are removed from water by coagulation and filtration, but the spores can be resistant to chlorine at the concentrations normally used in water treatment (Drinking Water Inspectorate Guidance Document, 2010). The sewage solids discharged acts as a reservoir for *C. perfringens,* the concentrations were higher at greater distances from discharge site and there were highest counts (> 10,000/g) in shallow water (Lisle *et. al.,* 2004).

It is not so easy to differentiate between different strains of *C. perfringens* by conventional methods. Therefore, PCR has been used to detect the presence of toxic genes and to identify the specific strains of *C. perfringens* (Das *et. at.,* 2009). Fecal matter in livestock farms frequently gains access to the water sources resulting water becoming the major source for *C. perfringens* infection. Limited research has been carried out in environmental samples (fecal samples) where in *C. perfringens* predominates and contaminates water sources and therefore it becomes necessary to study the incidence of *C. perfringens* in environmental samples (feces and water samples), which enters into the food, causing foodborne infection.

Material and Methods

Fifty samples, each from water (100 ml), poultry and cattle fecal samples (each of 50 g) were aseptically collected from local dairy and poultry farms in and around Hyderabad. About 10 ml of water sample and 10 g of each cattle and poultry fecal samples were inoculated into 90 ml Fluid Thioglycollate broth and Robertson Cooked Meat broths in individual sterile polythene bags homogenized thoroughly in a stomacher for 3 to 5 min and incubated at 37°C for 24 h under anaerobiosis in McIntosh and Fields jars. The enriched inoculum from the broths was streaked onto different selective agar plates like Tryptose Sulphite Cycloserine (TSC) agar, Shahidi Ferguson Perfringens (SFP) agar and Sulfite-Polymyxin-Sulfadiazine (SPS) agars and incubated at 37°C for 24 h. The presumptive colonies of *C. perfringens* were picked up and subjected to biochemical tests.

PCR assay: The primers used targeting 16S-rRNA for detection of *Clostridium perfringens,* whereas *cpa*, and *cpe* genes were targeted for the detection of alpha toxin and enterotoxin, respectively (Tonooka *et. al.,* 2005). They were custom synthesized by integrated DNA technologies (IDT) and are given in Table.1.

PCR amplification of the *16S rRNA, cpa,* and *cpe* gene fragments was set up to 20 µl reactions. The PCR protocol was initially standardized by optimizing the concentration of the components of the reaction mixture in the PCR assay and by varying the annealing temperature and cycling conditions.

The components of the reaction mix were finally optimized as given in Table 2. The master mix was made up to 20 µl using molecular grade water. Routinely, master mix was set up and 18 µl each was distributed to the PCR tubes, to which 2 µl of the template was added. In this study, the

template preparation was done throughout the experiment by heat lysis application. PCR assay was performed in Eppendorf gradient Thermal Cycler with a heated lid. The cycling conditions used are given in Table 3. PCR products were stored at -20°C until further use.

Table 1: Details of primers used in this study

Target Gene	Primer	Length	Primer sequence	Amplification product (bp)	Reference
16S rRNA	*ClPer-1*	18	TAACCTGCCTCATAGAGT	481	Tonooka *et. al.*, 2005
	ClPer-2	19	TTTCACATCCCACTTAATC		
cpa	*Cpa-F*	20	GCTAATGTTACTGCCGTTGA	324	Das and Jain, 2012
	Cpa-R	20	CCTCTGATACATCGTGTAAG		
cpe	*Cpe-F*	20	GGAGATGGTTGGATATTAGG	233	Lin and Labbe, 2003
	Cpe-R	19	GGACCAGCAGTTGTAGATA		

Table 2: Components of reaction mixture

S. No.	Name of the Reagent	Quantity (µl)
1.	10X Taq polymerase buffer	2.0
2.	dNTP mix	0.8
3.	Primer-F	2.0
4.	Primer-R	2.0
5.	Taq DNA polymerase	0.5
6.	Purified DNA /Bacterial lysate	2.0

Table 3: Cycling conditions used for four sets of primers

S. No.	Step	*16S rRNA (C.perfringens)*	cpa (alpha toxin)	*cpe* (enterotoxin)
1.	Initial denaturation	94°C/2min	95°C/5min	94°C/3min
2.	Final denaturation	94°C/30sec	94°C/1min	94°C/30sec
3.	Annealing	56°C/30sec	53°C/1min	55°C/1min
4.	Initial extension	72°C/1min	72°C/1min	72°C/45sec
5.	Final extension	72°C/2min	72°C/10min	72°C/5min
6.	Hold	4°C	4°C	4°C

2 µl of the bacterial lysate or purified DNA, 2 µl of 10x assay buffer for Taq polymerase containing 1.5 mM $MgCl_2$,0.8 µl of 10 mM dNTP mix, 2 µl each of forward and reverse primer (10 pmol/µl) and 1U/µl of Taq DNA polymerase, which was made up to 20 µl using molecular grade water. Routinely, master mix was set up and 18 µl, each was distributed to the PCR tubes, to which 2 µl of the template was added.

Results and Discussion

Out of 50 water samples, 16 (32%) and 18 (36%) were positive for C. perfringens by cultural and PCR methods, respectively. Out of 18 PCR positives, 4 were positive for enterotoxin by PCR, which accounts to 8% and 22.22% over total no. of samples and positive samples for *C. perfringens* by PCR, respectively. The incidence (32%) of *C. perfringens* by cultural method in the present study is lower than the incidence (100%) reported by Payment and Franco (1993).

Out of 50 poultry fecal samples, 24 (48%) and 26 (52%) were positive for *C. perfringens* by cultural and PCR methods, respectively. Out of 26 PCR positives, 6 were positive for enterotoxin by PCR, which accounts to 12% and 23.07% over total no. of samples and positive samples for *C. perfringens* by PCR, respectively. The incidence of *C. perfringens* in the present study observed is 48 per cent by cultural method, is less than the incidence (97.5%, 88.88%, 83.3 and 57.1%) reported by Das *et. al.* (2008), Cox *et. al.* (2005), Torky and Hassen (2014) and Shanmugasamy and Rajeswar (2012) respectively and higher than the incidence (5 and 16%) reported by Kalender and Ertas (2005) and Miah *et. al.* (2011) respectively. The incidence of *cpe* in the present study is 12 per cent which is slightly higher than the incidence (10%) reported by Tschirdewahn *et. al.* (1991).

Out of 50 cattle fecal samples, 20 (40%) and 22 (44%) were positive for *C. perfringens* by cultural and PCR methods respectively. Out of 22 PCR positives, 2 were positive for enterotoxin by PCR, which accounts to 4% and 9.09% over total no. of samples and positive samples for *C. perfringens* by PCR respectively. The incidence of *C. perfringens* by cultural method in the present study is 40 per cent which is higher than the incidence (22.2%) reported by Cox *et. al.* (2005)

Table 4: Cultural and PCR results of different environmental samples for C.perfringens and enterotoxin gene

Type of sample	No. of samples	Positive result for C.perfringens					Positive samples for cpe gene		
		Cultural method		PCR assay		% of cultural method compared to PCR	No. positive by PCR	% over total no. of samples	% over C. perfringens positive samples
		No	%	No	%				
Water	50	16	32	18	36	88.88	04	08	22.22
Poultry fecal samples	50	24	48	26	52	92.30	06	12	23.07
Cattle fecal samples	50	20	40	22	44	90.90	02	04	9.09
Total	**150**	**60**	**40**	**66**	**44**	**90.90**	**12**	**08**	**18.18**

lower than the incidence (58.3%) reported by Nahed *et. al.* (2013) and almost similar incidence (38%) reported by Torky and Hassen (2014). The incidence of *cpe* in the present study is 4 per cent which is lower than the incidence (6% and 22%) reported by Nahed *et. al.* (2013) and Tschirdewahn *et. al.* (1991), respectively.

All the *Clostridium perfringens* isolates will contain alpha toxin gene in general (Lin and Labbe, 2003, Kalender and Ertas, 2005 and Das and Jain, 2012) and it was proved in this study also, by showing alpha toxin in all the 66 isolates in environmental samples

The total viable count of $2.1x10^5$ ($3.2x10^4$-$1.6x10^6$) was observed in water, which is similar to the findings of Sartory *et. al.* (1993) and higher than the counts ($1.2x10^5$) reported by Payment and Franco, 1993. A count of $2.6x10^7$ ($3.5x10^6$-$5.6x10^8$) was observed in poultry feces, which is similar to the reports of Dahiya *et. al.,* (2005), Svobodova *et. al.,* (2007) and Saleem (2013) and lower than the counts ($1.6x10^6$ and $2.2x10^8$) reported by Kaldhusdal *et. al.* (1999) and Johansson (2006) respectively. The counts observed in cattle feces was $3.8x10^4$ ($1.6x10^3$-$4.9x10^5$) which were higher than the counts ($1.5x10^3$ and 100) reported by Annamari *et. al.,* (2004) and Heikinheimo (2008).

Conclusion

The incidence of *C. perfringens* in the environmental samples (water and feces) is high which in turn make its way into the foods during processing and cooking, proper precautions should be taken to limit the incidence of *C. perfringens.* Water used in processing of the foods should be properly sanitized to avoid contamination of foods.

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Agarose gel electrophoresis of PCR product of some *C. perfringens* isolates:

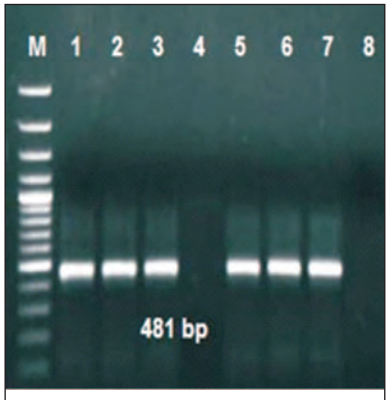

Fig. 1: Results of water, poultry and cattle feces samples for *C. perfringens*
Lane M: 100 bp DNA Ladder
Lane 1,2,3,5: poultry feces samples showing positive results
Lane 6,7: cattle feces samples showing positive results
Lane 4,8: negative controls

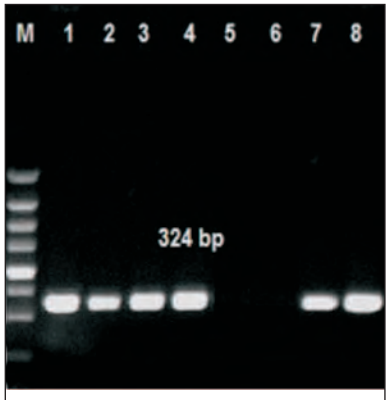

Fig. 2: Results of water, poultry and cattle feces samples for alpha toxin
Lane M: 100 bp DNA Ladder
Lane 1,2,3,4: poultry feces samples showing positive results
Lane 7,8: cattle feces samples showing positive results
Lane 5,6: negative controls

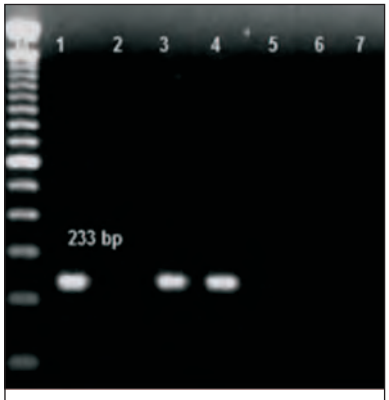

Fig. 3: Results of water, poultry and cattle feces samples for enterotoxin
Lane M: 100 bp DNA Ladder
Lane 1,3: poultry feces samples showing positive results
Lane 4: cattle feces samples showing positive results
Lane 2,5,6,7: negative controls

Fresh Cow Management

Diseases of Fresh cow

Milk Fever:

- It is caused by low blood Calcium.

Symptoms:

Lateral recumbence, Muscle flaccidity, low response to stimuli, Loss of consciousness progressing to coma, Heart rate can approach 120 bpm, with peripheral pulses becoming undetectable, If untreated, progression will continue to death.

Treatment :

- Calcium supplement by Intravenous route.

Prevention:

- Supplement of Calcium Oral immediately after calving and within 48 hr.

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Superbug A Lethal Weapon

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Abstract : Inappropriate use of antibiotics in animal husbandry is an underlying contributor to the emergence and spread of antibiotic-resistant germs, and that the use of antibiotics as growth promoters in animal feeds are considered as major part of antimicrobial resistance. The World Organization for Animal Health has added a series of guidelines with recommendations to its members for the creation and harmonization of national antimicrobial resistance surveillance and monitoring programs, monitoring of the quantities of antibiotics used in animal husbandry.

Key words: Antimicrobial resistance, World Health Organization, Global health

Introduction

Antibiotic resistance is a global threat. Emerging new forms of antibiotic resistance can spread between continents with ease and resistance spread with remarkable speed. World health professionals have described the antibiotic resistant microorganisms as "nightmare bacteria" that "pose a catastrophic threat" to people in every country in the world. Microorganisms which are called multi drug resistant (MDR) these organisms are frequently cal led as superbugs. The world heal th organization (WHO) defines antimicrobial resistance to an antimicrobial drug that was once able to treat an infection by that microorganism. This paper overviews the emergence of multi drug-resistant (MDR) microorganisms and their impact on the global health.

Resistance is a property of the microorganisms, not a person or other microorganism infected by microbes. All classes of microbes have the ability to develop resistance such as Bacteria-antibiotic Resistance, Fungi-antifungal resistance, Viruses-antiviral resistance, Protozoa-antiprotozoal resistance. Out of all classes of microbial resistance antibiotic resistance cause large threat to the public health due to the fact that availability, easy accesses and use of antibiotics more often compared to the other antimicrobials. According to officials of center for disease control, every year these drug resistant bacteria infect more than 2 million people and kill at least 23,000 people.

Centers for Disease Control and Prevention (CDC) has prioritized the bacteria in 2013 reports of Antibiotic resistance threats in the United States, into one of three categories:

Urgent Threats

Clostridium difficile

Carbapenem-resistant Enterobacteriaceae (CRE)

Drug-resistant *Neisseria gonorrhoeae*

Serious Threats

Multidrug-resistant *Acinetobacter*

Drug-resistant *Campylobacter*

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Fluconazole-resistant *Candida* (a fungus)

Extended spectrum β-lactamase producing Enterobacteriaceae (ESBLs)

Vancomycin-resistant *Enterococcus* (VRE)

Multidrug-resistant *Pseudomonas aeruginosa*

Drug-resistant Non-typhoidal *Salmonella*

Drug-resistant *Salmonella* Typhi

Drug-resistant *Shigella*

Methicillin-resistant *Staphylococcus aureus* (MRSA)

Drug-resistant *Streptococcus pneumoniae*

Drug-resistant tuberculosis

Concerning Threats

Vancomycin-resistant Staphylococcus aureus (VRSA)

Erythromycin-resistant Group A Streptococcus

Clindamycin-resistant Group B Streptococcus

Occurrence of resistance

- Natural resistant in certain type of bacteria
- Genetic mutation
- Acquiring resistance from one species to another

Causes of antimicrobial resistance

- Wide spread antibiotic use has made more bacteria resistant through the processes of evolutionary pressure. Reason includes increasing global availability over time since, the 1950'S, uncontrolled sale in many low or middle income countries.
- Antibiotic use in livestock feed
- Inadequate waste water treatment and releasing of large quantities of antibiotics in the environment during pharmaceutical manufacturing.
- Factors within the intensive care unit (ICU) setting such as mechanical ventilation and multiple underlying diseases.
- Poor hand hygiene by the hospital staffs
- Inappropriate use of antibiotic in animal husbandry
- Transmission of resistant bacteria from animal to humans

Even though antimicrobial resistant occurs spontaneously due to random mutation, the most important way by which it occurs is due to misuse/indiscriminate use of antimicrobials. Three primary areas where rising trend in drug resistance are use of antibiotic in the animal population and spread of resistant strains between human or non-human source. In general treating the bacteria with antibiotics cause sensitive bacteria to be washed out, in other hand, it creates way to increasing the number and growth of resistant bacteria further. Even though, call for new antibiotic therapies have been issued there is decline in the number of approved drugs. In United States 18 drug-resistant threats monitored by the CDC and are categorized. Example of common type of drug resistant bacteria includes methicillin-resistant *staphylococcus aureus* (MRSA), vancomycin-resistant *S. aureus* (VRSA), vancomycin - resistant *enterococcus* (VRE), multi drug - resistant *A. baumannii* (MRAB). Report released on April 2014 by WHO stated about antibiotic resistant "this serious threat is no longer a prediction for the future, it is happening right now in every region of the world and has the potential to affect anyone, of any age, in any country. Poor countries with weaker health care system

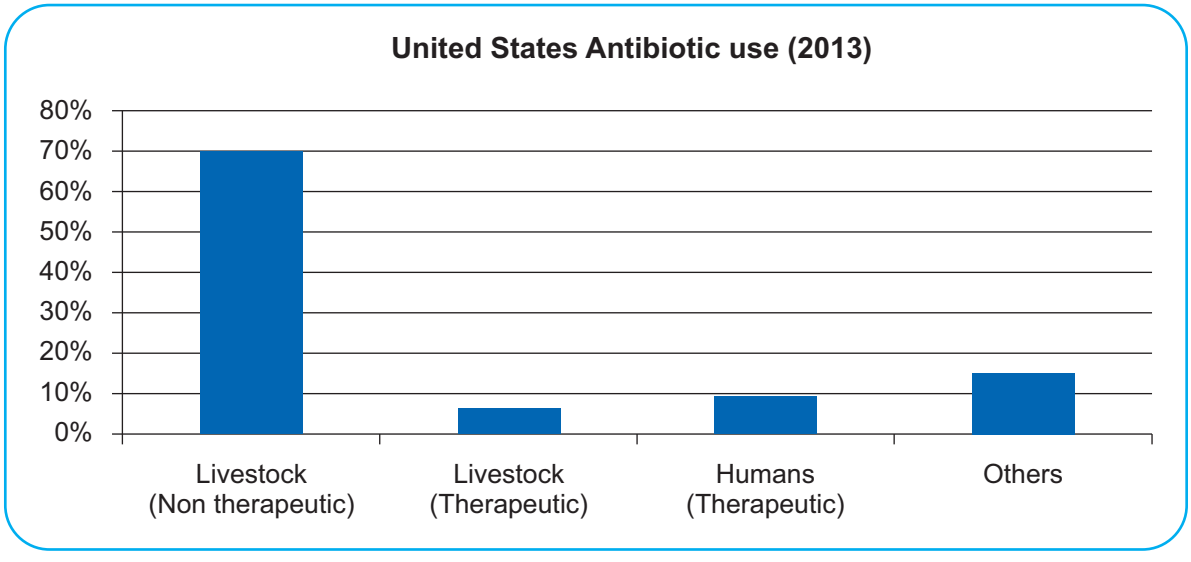
affected more.

In India and Indian subcontinent abuse of antibiotics is more common. New Delhi metallo-β-lactamase-1 (NDM-1) is an enzyme of β-lactamase family and the worldwide presence of NDM-1 among several bacterial species viz. *K. pneumonia, E. coli, E. cloacae, Proteus spp., Citrobacter freundii, K. oxytoca, M. morganii,* and *Providencia spp* has been reported in recent time. NDM-1 have been reported in many countries including Sweden, United Kingdom, India, Pakistan, Bangladesh, Australia, Netherlands, USA, Canada, Japan and China.

Prevention of antimicrobial resistance

- The prescriber should strictly follow the five rights of the drug administration such as the right patient, right drug, right dose, right route, right time.
- Antibiotics should be used when prescribed by the health professionals
- Using of narrow spectrum antibiotics rather than broad spectrum antibiotics when possible to effectively and accurately target the specific organism
- Pharmacists can help tackle resistant by dispensing right antibiotics
- Policy makers can help by means of strengthening resistance tracking and laboratory capacity. Regulating and promoting appropriate use of medicines
- Industries can help by means of development of new tools, promoting new cooperation and information sharing among all stakeholders

There are four core actions that will help to fight against these deadly superbugs are preventing infections and preventing the spread of resistance, tracking resistant bacteria, improving the use of today's antibiotics, promoting the development of new antibiotics and developing new diagnostic tests for resistant bacteria.



As per statistics of 1997 in united state half of antibiotics were used in humans and half in animals. But in recent time scenario is changed 84% of antibiotics used in animals and only 20% in humans reported in the year of 2013. This implies primary responsibility to overcome the highly fatal effect of antimicrobial resistance is mainly in the hands of animal health professionals. This shows that the animal health professionals should take responsibility to lead in front to safeguard the world from fatal effects of superbug.

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Successful Treatment of Canine Transmissible Veneral Tumour with Thuja – A Field Report

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Abstract :
A case study of treating Transmissible Veneral Tumour in dogs with Thuja has been discussed.

Keywords: Transmissible Veneral Tumour, Thuja.

Transmissible venereal tumour (TVT) is a naturally occurring round-cell tumour of dogs affecting both sexes. It is primarily located in the mucous membrane of the external genitalia, many times self limiting and though uneconomical vincristine sulfate is currently considered to be the most effective therapy. Prognosis in TVT is poor and affects further fertility of the animal.

Clinically presented 10 different dogs breed showed cauliflower or nodulated or pedunculated, ulcerated and bleeding tumour about 2 to 5 centimetres in diameter. Discharge from vaginal canal or prepuce noticed. The dogs frequently licked the affected area. Clinically and histopathologically confirmed as TVT.

Thuja 200c 0.5 ml mixed with 1.5 ml distilled water, intramuscularly administered once in a week for 6 - 8 weeks. 9 dogs showed complete recovery. Remaining one dog required 10 weeks treatment. No recurrence noticed even after an year.

Till date allopathic therapy is useful but course of treatment is longer and uneconomical. Thuja - an alcoholic preparation - derived from *Thuja accidentalis,* in human Thuja acts on skin, blood, GI tract, kidney and brain and antibacterial action in gonorrhoea, vaginitis and profuse leucorrhoea (William Boericke's, 2015). Generally oral therapy is advocated. Umadevi et al., 2015, successfully treated TVT with Thuja 200c orally. Parental was successfully tried in this case.

Immunological studies have clearly demonstrated that TVT is antigenic in the dog and an immune response against the tumour plays a major role in determining the course of the disease (Mizuno et al., 1994).

In mice, Thuja increased the T - lymphocyte counts. Thuja injected mice showed increased activity of tumour necrosis factor - α, interleukins 1 and 6 (Wynn et al., 2007).

Mode of action is to be explored more.

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Fresh Cow Management

Disease of fresh cow

Acidosis

Acidosis is a disorder where pH levels decrease very rapidly as a result of a sudden change of diets from roughage (like hay and grass) to high-concentrates (like grain).

- Acidity below a pH of 5 to 6 supports lactic-acid producing bacteria
- More acid is produced and can be Acute or sub acute.
- Acute acidosis often results in death, Illness and liver abscesses may be seen before hand.
- Cattle may become depressed, go off feed, have an elevated heart rate or diarrhea.

Treatment:

Sub acute ruminal acidosis is not detected at the time of depressed ruminal pH, there is no specific treatment for it. Secondary conditions may be treated as needed.

Prevention:

Proper feeding practices (Avoid sudden changes of feed, avoid heavy concentrate feeding, addition of fiber in the ration). Ad libido fresh drinking water. Rumen tonics can be given on regular basis for improving ruminal activity.

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Bladder sludge in rabbits: A pathoclinical manifestation of ecological anomaly?

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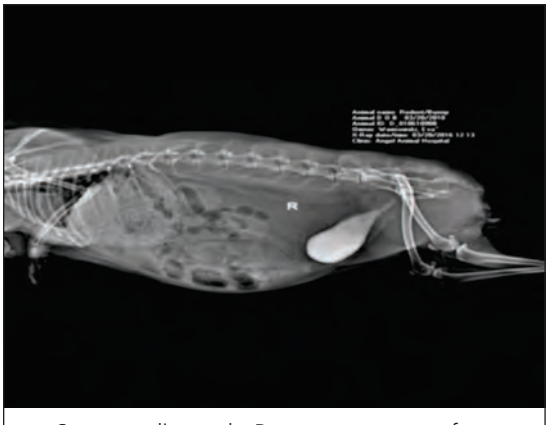
Abstract : Humans as well most animals absorb dietary calcium commensurate with the current metabolic needs of the body tissues; excess is excreted. However, calcium homeostasis in rabbits is not well balanced because of some hitherto unidentified ecological/ genetic factor. Thus, rabbits absorb calcium directly in proportion to the dietary calcium intake, regardless of the metabolic demand. The average sized adult bunny weighing ~2.5 kg consumes around 0.51 g dietary calcium per diem and excretes the excess macromineral entering the blood circulation - not through the normal hepatobiliary GIT channel into the faecal matter - but in the form of calcium carbonate ($CaCO_3$) crystals, mainly (45% -75%) through the kidneys. This explains the typical cloudy appearance of normal rabbit urine. Some rabbits exhibit a clinical syndrome of hypercalciuria, also named 'bladder sludge' in popular parlance in the United States. Meanwhile, in view of the increasing fascination of pet lovers, also in India for the house rabbit effective palliative treatment to minimize agony and provide immediate relief to the afflicted 'exotic' species is the only recourse available for addressing the new challenge being confronted by the contemporary veterinary clinician.

Key words: Rabits, Calciuria, Bladder sludge, Urine scale

Predisposing factors

These include genetic susceptibility in the individual subject, continuing reduced water intake resulting in generalized tissue dehydration, latent urinary tract disorders leading to oliguria/dysuria. Postural defects associated with arthritis in the backbone or haunches, sore hocks, and obesity restrict the rabbit's capacity to micturate normally with prolonged retention of urine and crystal build-up in the bladder. Lack of physical activity in confinement is an important contributory factor. Kidney disorders, bladder diseases (secondary infection, malignancy, benign growth) with



Survey radiograph: Bony appearance of urinary bladder

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impaired structural/ functional patency of the lining epithelium, or lack of clean toilet area may impel some rabbits to hold up urine/ urinate less frequently.

Clinical signs

1. **Altered colour and consistency of urine:** The freshly voided pale yellow coloured normal rabbit urine may present a sandy appearance, when dried up. However, on exposure to the atmospheric oxygen, it may turn dark yellow, orange, red, or even dark brown. This is not a health issue per se. Nevertheless, urine which is apparently very dark just after voiding and leaves behind a large mass of gray-white chalky material as it dries up clearly indicates tissue dehydration which needs to be remedied with the appropriate fluid replacement therapy, on topmost priority.

2. **Impaired micturition:** Bunnies often exhibit visible signs of stress and strain while frequently voiding only scanty volume of urine in each attempt because the fluid is so viscous; almost paste-like in consistency. Thus, they sit in a typical hunched-up posture often in unusual spots outside the litter box, grind their teeth in pain (pricks of sharp sludge crystals) and also occasionally dribble urine involuntarily. Cardinal signs of inflammation along with typical bald patches are clearly discernible in the inflamed inner aspects of thighs, named 'urine scald'.

3. **Anorexia and depression:** Generally associated with pain arising from pressure on the urinary bladder/ blockage of urethra, this clinical sign of impaired health status should be treated as an emergency in rabbits because of the real risk of life-threatening renal failure.

Diagnosis

1. **Case history:** Anamnesis on presentation in the clinic aims to solicit detailed factual information from the owner on the duration of the disorder, changes in the house rabbit's behaviour / food / life style / micro-environment or any remedies, already tried out at home.

2. **Physical examination:** Examination of the hind quarters of the patient may reveal accumulation of sludge on the fur and epidermis. Further, anaemia, weight loss, cutaneous lesions, dental disorders, heart and lung complications and abdominal pain, or growths may also be detected.

3. **Abdominal radiography (X-rays):** This is by far the most important definitive diagnostic tool to demonstrate sludge, entrapped inside the hallmark ballooned bladder with or without the concurrent presence of calculi in the urethra, ureters and kidneys. If surgical intervention is highly indicated thoracic radiography may be undertaken to evaluate the status of the heart and lungs in critically monitoring the health status of multiple internal organs, especially kidney.

4. **Urinalysis:** Urine samples may be collected carefully in a clean cup by gently massaging the turgid bladder. Further, cystocentesis/ catheterization (only after induction of anaesthesia) may be done for obtaining uncontaminated samples for microbiological assay. Urinalysis primarily aims to detect abnormal cells and a variety of pathological constituents like protein, blood, pus, etc. Since the normal urine passed by rabbit is often reddish in colour because of phytopigments, it is very essential to differentiate blood, easily detected with

dipstick, and microscopic examination of the sediment.

5. **Serum biochemistry:** Renal function tests, eg. serum creatinine, BUN, liver function tests, eg. alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), plasma proteins, and complete blood count (CBC) are very useful in evaluating the precise nature and magnitude of changes in homeostasis, and response to the remedial therapy. Estimates of blood calcium (total and ionized), inorganic phosphate (Pi) concentration, and Ca: Pi ratio provide useful diagnostic cues.

Treatment

1. Surgical intervention is not warranted in bladder sludge unless there is near total blockage of the urinary outflow.

2. **Flushing of the bladder:** The best option is to promptly administer a liberal quantum of judiciously selected rehydration fluid (such as Ringer lactate) through the subcut route along with a small dose of diazepam (Valium) to promote relaxation of the bladder sphincter for facilitated diuresis. Meanwhile, the caring vet ensures that the patient is kept comfortable, clean and dry. In the clinic, fluids may be administered also through i/v, i/p, or oral route. The well-informed owner should be trained to continue the highly beneficial long-term subcut fluid replacement therapy at home.

3. In more severe cases, the patient is anesthetized and a sterile catheter is gently inserted into the bladder. Then, it is flushed with physiological (0.85%) saline solution. The diluted sludge is carefully aspirated into the sterilized syringe, and the process repeated several times till the bladder sludge is minimized (evidenced by the clear urine). Consistent with the clinical judgment the urine sample is subjected to microbial culture. Analgesics may be recommended after catheterization for a certain period of time, depending on the individual patient's bio-response. Ascorbic acid (vitamin C) @ 55-110 mg/ kg body weight b.i.d. promotes healing of possible damage to the urinary tract tissue and also helps to overcome stress. Studies on humans in parallel clinical condition have proved that cranberry juice (containing -D mannopyronaside) inhibits pathogenic bacteria from adhering to the bladder wall, and is a rich source of vitamin C. Therefore, if available, cranberry tablets would be more beneficial than the synthetic preparations. If secondary bladder infection is established, potent antibiotics (based on sensitivity test) may be prescribed.

4. The use of urine acidifiers should be scrupulously avoided because normal urine of herbivorous rabbits is invariably alkaline.

Preventive measures

Though there is always 10-15% chance of recurrence of bladder sludge (with or without concurrent urinary calculi) in the rabbits, highly prone to this unique multifaceted patho-clinical disorder, certain management practices will be beneficial.

1. Make concerted efforts to increase the daily water intake of the pet; in diluted urine, the possibility of sludge formation is markedly decreased. Feed varying judicious combinations of dark leafy succulent greens (95% moisture): mustard, dandelion (yellow flowering common lawn weed), beet/ carrot tops, broccoli/ cabbage leaves and lettuces along with the use of naturally sweet flavoured fruit juices: pineapple, grape, apple and cherry (without added sugar) to induce the pet to gulp in more vegetable-based water.

2. Avoid all commercial pellet feeds loaded with the easily assimilated excess calcium. Replace alfalfa grass hay (4.5% calcium) with timothy/ grass hay (0.4% calcium) in the staple diet. However, never attempt to remove all the dietary sources of calcium to preclude deleterious hypocalcaemia.

3. **Exercise:** Enhanced physical activity induces the rabbit to urinate more frequently and consume more water with concurrent remission of hypercalciuria (bladder sludge).

4. Ensure free access for the bunny to neat and clean toilet area within the litter box.

5. **Regular veterinary medical care:** Follow-up visits to the clinic helps in monitoring the health status through repeat physical examination, radiography, urinalysis, etc.

Conclusions

Bladder sludge in rabbits appears to represent a queer twist in the ecological development hierarchy. In some cases sludge will recur even if all the tangible recommendations were followed in toto. The pet vet's main objective is to keep the companion animal happy and comfortable. This communication would furnish useful guidelines to the practicing veterinary clinicians.

Fresh Cow Management

Disease of Fresh Cow

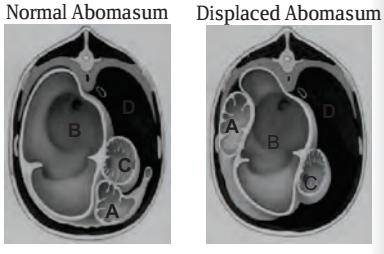
Displaced Abomasum is very common within 1st month of lactation.

- Abomasum is suspended loosely by the omenta .
- It can be moved from its normal position on the right ventral part of the abdomen to the left or right side (LDA, RDA)

Contributing Factors – Abomasal hypomotility associated with Hypocalcemia & concurrent diseases (mastitis, metritis) associated with endotoxemia.

Treatment : Rolling the animal on the ground for proper correction of position of Abdomen. If not corrected then surgical intervention.

Prevention : Proper Management.



A = Abomasum
B = Rumen.
C = Omasum.
D = Liver.

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Management of Reproductive Disorders in Bitches

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(received 27/09/2016 - accepted 16/11/2016)

Abstract : Various reproductive disorders namely Pyometra, Pseudo pregnancy, Transmissible venereal tumor, Misalliance and Termination of unwanted pregnancy and Vaginal hyperplasia are commonly encountered in canine practice. The causes, diagnosis, treatment and clinical management of the commonly encountered reproductive disorders are outlined below

Key words: Pyometra, Pseudo pregnancy, Transmissible venereal tumor, Misalliance and Termination of unwanted pregnancy.

1. PYOMETRA

Pyometra in dogs is due to increased progesterone following ovulation which leads to hypertrophy of endometrial glands and increased endometrial secretions which accumulate in uterus and allow secondary bacterial infection.

Etiology

- Cystic endometrial hyperplasia and exaggerated response of the endometrium to progesterone.
- Secondary bacterial infections like Escherichia coli being the most common organism
- Exogenous estrogens predispose to pyometra
- Stump Pyometra is a bacterial infection of the remnant of the uterine body in the neutered animal
- Intrauterine foreign material or obstruction to drainage through the cervix may lead to pyometra

Types of pyometra

1. Open type
2. Closed type
3. Stump pyometra

Clinical Signs

- Signs usually occur 1-2 months after estrus or exogenous progesterone administration

Open type

1. Purulent or sanguine purulent discharge

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from vulval lips

2. Lethargy, depression and anorexia
3. Polyuria and polydipsia

Closed type

- Abdominal enlargement, toxemia, vomiting, dehydration leading to shock, hypothermia and collapse of the animal

Diagnosis

History

1. Aged bitch in diestrum
2. Young bitch recently given a mismating shot
3. Prior treatment with megestrol acetate or other progestin

Physical Examination

1. Purulent vulvar discharge
2. Palpably enlarged, soft and doughy uterus

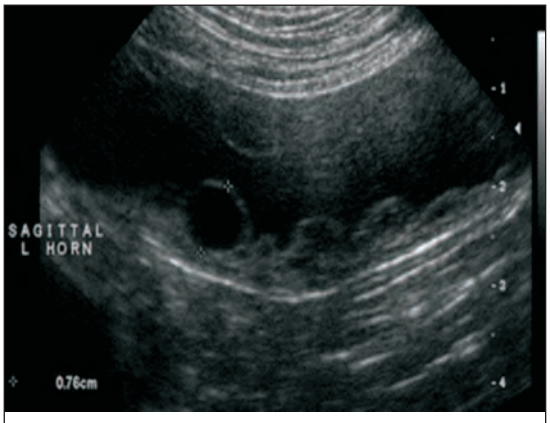
Hematologic-Finding

1. Inflammatory leukogram characterized by extreme neutrophilia with a shift to left
2. Non-regenerative anemia and hyperproteinemia with increased globulin
3. Hyper globulinemia
4. Elevated BUN & creatinine levels

Urinary tract parameters – Azotemia, hypophosphatema, isothenuria, pyuria and bacteruria – difficult to differentiate from urinary tract infection

Diagnostic Imaging

1. Ultrasonography: Determine size of uterus and thickness of uterine wall and confirm that the intrauterine material is of fluid density
2. Radiography: Pyometra is a fluid dense tubular structure in the ventro caudal abdomen. Differentiate from pregnancy less than 42 days of gestation which shows a similar uterus (before fetal skeletal calcification)



Pyometra along with cystic endometrial hyperplasia

Cytology and culture

1. Do not provide a definitive diagnosis but are helpful to choose appropriate antibiotic
2. Degenerated neutrophils in the vaginal discharge

Exploratory laparotomy - To confirm diagnosis of stump pyometra

Differential Diagnosis

1. Pregnancy
2. Neoplasm
3. Vaginitis
4. Mucometra or hydrometra

Treatment

1. Surgical Therapy
2. Medical Management

Surgical Therapy

- In a closed type pyometra, toxicity develops extremely rapidly. So, immediate overiohysterctomy is the treatment of choice

- In an advanced case where there is extensive endometrial and myometrial damage and minimal choice of a subsequent normal pregnancy after medical treatment, overiohysterectomy is the most rational therapy

Medical Management

- Medical treatment is generally reserved only for the bitch with an open pyometra or that which develop after treatment for mismating.
- If the owner wishes to attempt to salvage the dog for breeding, medical therapy with prostaglandin F2 alpha may be attempted, it is not recommended in animals older than 8 years, those which are critically ill or if the uterus is friable or the cervix is closed.
- Only natural products (Lutalyse) should be used @ 0.25 mg/kg SQ SID for 5-7 days with concurrent bactericidal antibiotics.
- Over dosage may result in severe haemorrhagic shock in the dog. Common side effects include restlessness, hyper salivation, vomiting, panting, defecation, abdominal cramping, tachycardia and fever.
- Broad spectrum antibiotics, fluid therapy and vitamin supplementations
- Recheck the animal 2 weeks after prostaglandin therapy. If purulent vaginal discharge or uterine enlargement is still present, a second series of injection can be administered.

2. PSEUDOPREGNANCY/ PSEUDOCYESIS

It is a physical and behavioural condition simulating pregnancy that occurs in the non pregnant bitch.

Causes

- During diestrus, non-pregnant bitches with normal ovarian function have serum progesterone concentrations indistinguishable from pregnant bitches
- Decreasing serum progesterone concentrations and subsequent increases in prolactin secretion at the end of diestrus cause over manifestations of periparturient behaviour.

Clinical signs

- Mammary gland development
- Lethargy and aggression
- Weight gain from overfeeding towards the end of diestrus (60-80 days post estrus)
- Nesting, restlessness, aggression and anorexia
- Mothering of inanimate objects (Toy fixation)

  Mammary glands may produce normal milk

Differential diagnosis

- Normal pregnancy

Conservative therapy

- Placing Elizabethan collar to prevent licking of mammary glands
- Water removal overnight for 5-7 days promotes fluid conservation and helps terminate lactation
- Frusemide (Lasix) 0.25 to 0.5 mg/kg TID orally
- Water restriction should not be implemented if Frusemide is used.

Treatment

- Antiprolactin drugs

1. Tab. Bromocriptine (Proctinol) @ 30 µg/kg
- B.Wt, BID up to suppression of milk production
2. Tab. Cabergoline (Cabgol 0.5) 5 µg/kg/day for 10-14 days, no side effects

- Acetic acid chalk paste may be applied externally over the enlarged mammary gland

3. Misalliance and termination of unwanted pregnancy

Indications for termination

- Unplanned mating to unacceptable male or at an undesirable time or age
- To avoid unwanted puppies.

Diagnosis

- History of mating
- Vaginal smear – Vaginal cytology is used to identify the stage of estrus and to check the presence of sperm

Treatment

1. Surgical method – Ovariohysterectomy
2. Medical methods

Prostaglandins

- Natural PG2α (Lutalyse) 0.25 mg/kg q12h, SC for 4-7 days (to effect after 25-30 days of gestation.
- Glucocorticoids – dexamethasone 0.5 mg/Kg q12h, 1M for 10 days starting on day 30 of gestation in bitch.
- Tab. Bromocriptine @ 30 ug/kg orally for 6 days
- Tab. Cabergoline @ 5 ug/kg/day once daily
- Tab. Mifepristone @ 2.5 mg/kg b.wt BID for 4-5 days or upto expulsion of all fetues
- Tab. Tamoxifen Citrate @ 1 mg/Kg BID for 10 days

4. Transmissible Venereal Tumor (TVT)

TVT is a proliterative turnor of the vagina and vulva transmitted during sexual or social contact by the direct transplantation of neoplastic cells.

Incidence

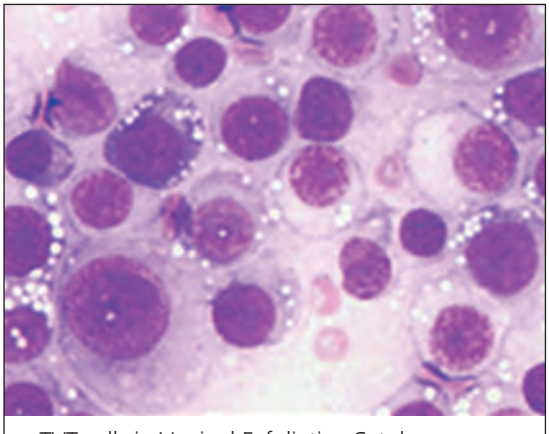
- Occurs in younger (average 4 years sexually active male and female dogs)
- Incidence higher in crowded urban population

Clinical Signs

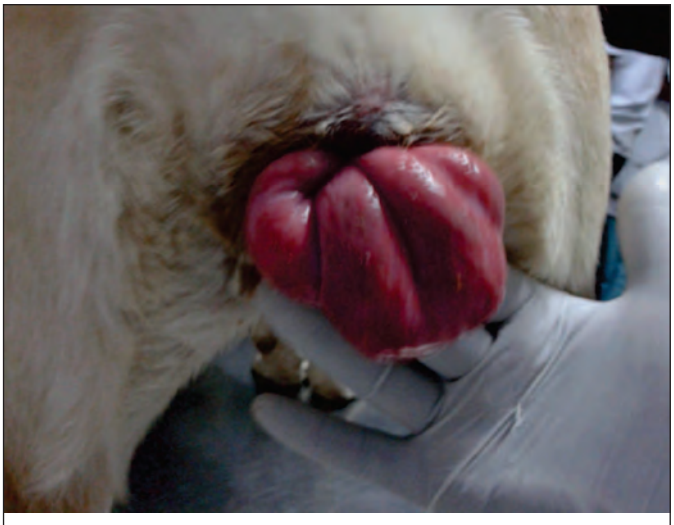
- Solitary or multiple, friable, hemorrhagic, cauliflower-like masses that may be necrotic or traumatized
- Most common site in the bitch is the caudal vagina or vestibule vaginal junction
- Extra genital sites include skin, oral cavity, nasal cavity and perineum
- Metastasis to regional lymph nodes and other organs possible

Treatment

- Single agent therapy with Inj. Vincristine at 0.025 mg/kg B.Wt, IV (maximum 1 mg) once weekly for 3-5 weeks
- Surgical excision - recurrence is common: not useful for metastatic TVT
- Radiation – as sole treatment or adjunct to surgery



TVT cells in Vaginal Exfoliative Cytology smear



Vaginal hyperplasia

- Combination chemotherapy with Vincristine, Cyclophosphamide and Methotrexate

5. Vaginal hyperplasia

Causes

- Vaginal hyperplasia is a clinical condition in which an edematous swelling of the vaginal mucosa immediately cranial to the urethral orifice and expanding caudally over the urethral orifice, may develop under the influence of estrogen.
- This may become large enough to protrude outside the vulvar lips.
- The condition which may occur in the young bitch during the first or second follicular phase under estrogen influence and may reoccur at each subsequent estrus.

Clinical signs

- If the edema expands, a swelling varying from a small bulge to a pear-shaped mass protruding from the vulva can be observed.
- The ventral part of the vaginal mucosa is involved in the majority of vaginal hyperplasia cases. In these cases a doughnut-shaped appearance is noted.
- The protruding mass of the prolapse is vulnerable to trauma, ulceration, and self-mutilation and can interfere with natural mating.

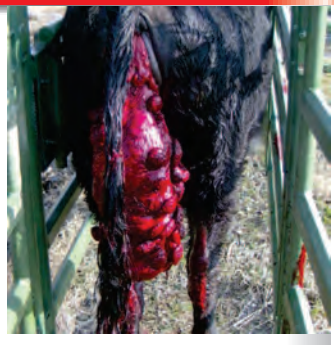
Treatment

- Treatment depends on the extent of the vaginal hyperplsia, whether one is dealing with a breeding or non-breeding bitch and whether or not the prolapse is present during estrus or at the end of pregnancy.
- In pro-estrus or estrus bitches, the edema will generally recede during the luteal phase and the bitch may be ovariectomized, preferably during anestrus.

- In moderate to severe cases the mass, which protrudes from the vulva, must be kept clean and moist and self-mutilation must be prevented.
- Lubricating jelly, antibiotic and glucocorticoid ointment, artificial tears, protective pants and an Elizabethan collar may be applied for these cases.

Fresh Cow Management

Disease of Fresh cow



Retained Placenta

When the cows immune system is suppressed due to stress and low calcium supplementation, the strength of uterine contractions at birth are reduced resulting to Retained Placenta.

Treatment:

- Manual removal had been a common practice in the past.
- This method should not be used because of possible injury to the endometrium and uterine cervix.
- Use of Hormonal preparation like PGF2alpha, oxytocin will be beneficial in many cases along with antibiotic therapy for prevention of infections

Prevention:

- Nutritional support during the pregnancy period and mineral supplementation especially Phosphorous will avoid the occurrence of Retained

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Treatment of a Horse Affected by Chronic Bacterial Diarrhea

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(received 27/09/2016 - accepted 16/11/2016)

Abstract

Chronic diarrhea is one of the series health issue in horses. A case study of chronic bacterial diarrhea in a Horse which was treated successfully by chloramphenicol after doing antibiotic sensitivity test was discussed.

Key words: Chronic Bacterial Diarrhea, Antibiotic sensitivity test, chloramphenicol.

Introduction

Chronic diarhhea is one of the serious issues in respect to the health of a horse. There are several reasons for chronic diarrhea/enteritis in a horse including both infectious and non-infectious in nature (Murray, 1996). Besides infectious agents like aerobic and anaerobic bacteria, viruses are also implicated in chronic diarrhea in equines (Quinn et al., 2011). Some organisms like Clostridium are difficult to culture and hence definitive diagnosis does not matter in the treatment. The present study reports use of antibiotic sensitivity test (AST) in selection of the antibiotic Chloramphenicol for successful treatment of chronic shooting diarrhea in a horse.

History and Observation

Mr. Bhagwan from Karhi, Khargone, Madhya Pradesh brought a horse of 15 years of age to the Veterinary Clinic, College of Veterinary Science and Animal Husbandry, Mhow. Faecal sample was received at the bacteriology laboratory in the Department of Veterinary Microbiology for antibiotic sensitivity test. Clinically the horse appeared weak, emaciated with loss of body condition and having mild dehydration. The horse was suffering from persistent shooting diarrhoea from the last one and half month. The horse was not responding to treatment given by the field practitioner.

Tentative and confirmatory diagnosis

Faecal sample was collected in a container aseptically and inoculated in sterile brain heart infusion media in a test tube and incubated overnight at 37°C for bacterial growth. Turbidity after incubation period in inoculated culture medium indicated bacterial growth. Gram's staining results indicated bacterial involvement of Gram negative bacilli and coccobacilli.

Antibiotic sensitivity test

Fresh bacterial culture was used in the antibiotic sensitivity test (AST) performed as per manufacturer's instructions (HiMedia, Mumbai) under the aseptic conditions. In short, with the help of sterile cotton swab, bacterial culture was soaked and subsequently streaked on entire Mueller Hinton Agar (MHA) surface. On drying of

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these plates in the laminar air flow cabinet antibiotic discs were placed on the agar surface as per the protocol. A total of 16 different antibiotic discs (HiMedia, Mumbai) were employed; Chloramphenicol (30 mcg), aminoglycoside Streptomycin (10 mcg), Amikacin (30 mcg) and Gentamicin (10 mcg), Kanamycin (30 mcg), synthetic chemotherapeutic antibacterial agent Norfloxacin (10 mcg), Ofloxacin (5 mcg) and Ciprofloxacin (5 mcg) and fourth generation fluoroquinolone Gatifloxacin (5 mcg), Penicillin G (10 units), Cephalexin (30mcg), third generation cephalosporin Cefotaxime (10 mcg) and fourth generation cephalosporin Cefepime (30 mcg), beta-lactam antibiotic of aminopenicillin family Ampicillin (10 mcg), polyketide antibiotic Tetracycline (30 mcg), dihydrofolate reductase inhibitor Trimethoprim (5 mcg). The plates were immediately kept in the incubator for overnight incubation at 37^{0}C. Controls were also kept in the experiment. Diameter of zone of inhibition was measured for each antibiotic disc and the results were interpreted with the help of zone size interpretative chart given by the manufacturer.

Results and Discussion

Line of treatment

The horse was not responding to the preliminary treatment given by a field veterinarian. There were no recent changes in feeding practices of the solitary horse kept for routine work. Clinically the horse appeared weak, emaciated with loss of body condition and having mild dehydration. The horse was suffering from persistent shooting diarrhoea with semisolid faeces from the last one and half month and treated as chronic in nature. Immediately, considering the possible involvement of infectious agents the horse was kept in a separate area to check spread of infection and standard hygienic measures were adopted (Weese, 2002). Antibiotic sensitivity test was employed by utilising antibiotic diffusion discs of 16 different antibiotics to aid in the treatment of the horse. Zone of inhibition sizes recorded as below for Chloramphenicol (19 mm), Streptomycin (07 mm), Amikacin (12 mm), Gentamicin (06 mm), Kanamycin (08 mm), Norfloxacin (12 mm), Ofloxacin (12 mm), Ciprofloxacin (07 mm), Gatifloxacin (06 mm), Penicillin G (12 mm), Cephalexin (07 mm), Cefotaxime (12 mm), Cefepime (06 mm), Ampicillin (12 mm), Tetracycline (07 mm), Trimethoprim (07 mm). The results indicated that among these 16 antibiotics only Chloramphenicol was effective.

Radostits et al., 2003 reported dose range of 20-60 mg/kg. Broad spectrum antibiotics at higher dose may reduce normal gastrointestinal flora hence the horse in the present study was administered with a dose of Choramphenicol at the rate of 30 mg/kg body weight by intramuscular route for 6 subsequent days. The supportive therapy included intramuscular injection of 15 ml Dicyclomine (Spaxivet), intravenous administration of Ringers lactate at the rate of 20ml/kg body weight (RL) and oral use of Neblon powder (Natural Remedies Pvt Ltd) at the rate of 50 g per day for twice a week. The horse responded to the given treatment and recovered in a week.

Conclusion

Antibiotic sensitivity test proved vital to choose the antibiotic Chloramphenicol for treatment of chronic bacterial diarrhea in the horse.

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Fresh Cow Management

Disease of fresh cow

Metritis is one of the most common during the first 10 days of parturition. Occurs due to dystocia, retained fetal membranes, twins or stillbirths. It is a general infection, if not treated lead to toxemia and death of the animal.

Endometritis wherein only the endometrium is affected leading to repeat breeding and failure to conceive.

Pyometra Is accumulation of pus due to untreated chronic endometritis

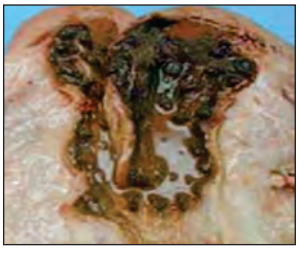
Treatment :

Metritis : Systemic Antibiotic Therapy.

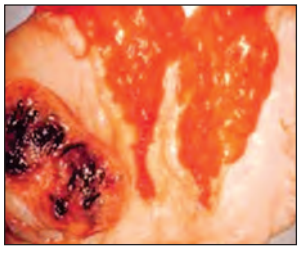
Endometritis : Infusion of intrauterine Antibiotic.

Pyometra : PGF2@

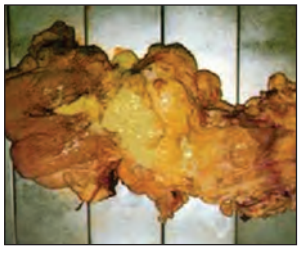
Metritis



Endo-metritis



Payometra



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Clinical Management of Goat Pox in Jamunapari Breed

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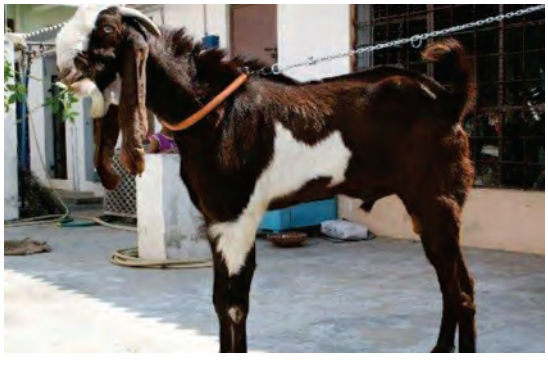
Abstract

Goat Pox is a highly contagious viral disease of goats. Generally the disease and associated mortality are less commonly seen in indigenous breeds in endemic areas as compared with exotic breeds. Goat Pox virus is a Capripox virus of the family Poxviridae. Goat Pox was suspected in patients with high body temperature with characteristic full thickness skin lesions and enlarged lymph nodes. There is no specific treatment for goat pox and treatment was given symptomatically. Animals were treated with broad spectrum antibiotic floxidin LA (Enrofloxacin) @ 100 mg / 10 kg b.wt/ I/m, Melonex-Plus (Meloxicam and Paracetamol) injection @ 1 ml /10 kg b.wt. administered intramuscularly for 5 days. Massive vaccination followed by cessation of vaccination and control of animal movements can be an effective strategy to control Goat Pox if the disease has spread extensively in an area. Quarantine of areas and premises containing infected or exposed animals is required to prevent disease spread.

Keywords: Goat Pox; Viral; Pox lesions.

Introduction

Goat Pox (GP) is one of the most important diseases of goats following Peste des Petits Ruminants (PPR) and Contagious Caprine Pleuropneumonia (CCPP). Goat Pox is a highly contagious viral disease of goats. Generally the disease and associated mortality are less commonly seen in indigenous breeds in endemic areas as compared with exotic breeds. Goat Pox is a major constraint to the introduction of exotic breeds of sheep and goats and to the development of intensive livestock production. Economic losses result from decreased milk production, damage to the quality of skins and wool, and other production losses. The skin lesions heal slowly and the scars are permanent. The existence of the disease affects trade of animals and products and can hinder efforts to improve local sheep and goats through importation of improved breeds.



Goat Pox virus is a Capripox virus of the family Poxviridae, one of the largest viruses, double stranded DNA genome, and closely related to Neethling lumpy skin disease virus. Kitching and

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Fig.1: Generalized pox lesions over skin

Fig.2: Generalized pox lesions over skin

Fig.3: After treatment dried lesions.

Fig.4: After treatment dried lesions.

Taylor (1985) have shown that strains of capripoxvirus are not host-specific and that, although the majority of strains do show a host preference, single strains can cause disease in both sheep and goats. Transmission of GP occurs by the respiratory route when there is close contact between sick and healthy animals. The disease causing organism may also enter the body through other mucous membranes or abraded skin. Intra-uterine infection can occur and in that event, lambs can be born with developed lesions. Indirect transmission of the disease occurs by contaminated litter, fodder and other objects. Indirect transmission by insects and via mechanical vectors has been reported. The virus can remain infectious for up to six months in animal pens.

History and Clinical Findings

Goats with a history of high fever (410c), depression, anorexia, lacrimation, and salivation were presented to the hospital. On clinical examination of goats revealed generalized pox lesions throughout the skin and mucous membranes. Differential diagnoses was done with contagious ecthyma (orf) and bluetongue.

Goat Pox was suspected in patients with high body temperature with characteristic full thickness skin lesions and enlarged lymph nodes.

Treatment

There is no specific treatment for goat pox and treatment was given symptomatically. Animals were treated with broad spectrum antibiotic Floxidin LA (Enrofloxacin) @ 100 mg / 10 kg b.wt/ I/m, Melonex-Plus (Meloxicam and Paracetamol) injection @ 1 ml /10 kg b.wt. administered intramuscularly for 5 days. Goats were treated with inj Hivit 2ml I/m, Avilin (Pheniramine maleate) 2ml I/m for 5-6 days to prevent secondary infections. Antiseptic ointment Loramycin (Gentamicin Sulfate) was applied to the sores of recovering animals for 6 days to prevent secondary infections for 6 days. Animals had recovered in 10-15 days after symptomatic treatment leaving scar on skin.

Discussion

A comprehensive knowledge of goat pox and sheep pox would help in the diagnosis, prevention and control as well as the management of these diseases in a proper and effective manner (Rao and Bandyopadhyay, 2000). goats introduced to endemic areas should be quarantined for twenty-one days. Movement of goats from infected to non-infected areas should be restricted. Movement of products; meat, wool, hair and skin from infected areas should also be controlled. The virus may persist for up to six months in shaded, unclean shelters and for a few months in dry scabs on the skin, fleece and hair. Shelters (Barns, corrals, pens), tools and equipment that have been in contact with infected animals must be cleaned and disinfected with disinfectants such as ether, formalin, sodium hypochlorite, 2% hydrochloric acid or phenol. It will help to remove part of the top soil and burn it. Goat pox outbreak, affected animals should be isolated immediately. Shelters should be cleaned and disinfected. Sheep and goats around the outbreak area should be vaccinated as soon as possible. In areas of frequent SGP occurrence, the most effective means of controlling losses is annual vaccination. Carcasses and contaminated materials should be buried or burned. Massive vaccination followed by cessation of vaccination and control of animal movements can be an effective strategy to control SGP if the disease has spread extensively in an area. Quarantine of areas and premises containing infected or exposed animals is required to prevent disease spread. Infected herds and sick animals should be isolated for at least 45 days after recovery.

Acknowledgement

The authors wish to thanks to the owner of gottery farm (Goatwala farm) for carrying out the work at Dhamnod.

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Feather Picking in an African Grey Parrot

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(received 12/04/2016 - accepted 18/10/2016)

Abstract :
A care of feather picking in African Gray parrot was successfully by clinical investigation and counseling.

Key words: African grey parrot, Feather plucking, Caged bird

Case history and Observations

An African grey parrot was presented for treatment of featherless appearance in the summer season (March 2015). It was kept in a cage for recreational purposes at a household in Indore city. The owner complained that the bird showed featherless areas at and around legs, back and wings from last one week. The bird was previously treated with local application of an ointment. The problem was becoming worst as excessive feather picking lead to wounds at the wing region and back.

Clinical and laboratory findings

After ruling out parasitic involvement by physical examination and laboratory tests, swabs from the wound and featherless areas were collected for bacteriological and fungal examination. These swabs were inoculated in the brain heart infusion (BHI) broth for bacterial growth and also on Saboraud's Dextrose Agar (SDA) for fungal cultivation. There was no growth in BHI broth as well as on SDA surface. So involvement of any bacterial and fungal origin was ruled out. Hence, X ray examination of the bird was carried out to examine for presence of any foreign object inside the body or injury to the bone which might be inciting misbehaviour. X ray examination did not reveal any object or injury.

Results and Discussion

In this case involvement of bacteria, fungi, parasitic agent was ruled out by different test employed in the study. So, nutritional, social, environmental and behavioural issues besides stress are implicated for a bird to pluck feathers (Schmid et al., 2006). Surprisingly, the owner was unaware of the habitual feather picking in these parrots and about the basic requirements of rearing the exotic bird at home for recreational purposes. Feeding in bowl does not provide sufficient exercise and gives it a extra time to spend to a caged bird than a bird enjoying natural foraging and hence food should be kept in a cage so that the bird remain engaged (Johannes et al., 2008).

Line of treatment

It is suggested to the owner of African grey parrot to keep appropriate toys in the cage which may divert its attention from feather picking. It is advised to keep the bird in a lengthier cage for

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Figure 1. African grey parrot showing feather picking (Front and Side views).

assisting in more physical activity with toys and also provide comfortable conditions during the summer season. It is also suggested to keep applying the ointment on the wounds of the skin as mentioned earlier to avoid secondary bacterial infections. The owner of the bird did not report fresh incidence of feather picking in African grey parrot even after few months of the previous report.

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Mixed Skin infection in Goats

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Abstract

A clinical case of mixed skin infection in Goat was successfully treated with Ivirmectin

Key words: Skin infection, Ivermectin.

Arthropod pests limit production in the goat industry in many ways. External parasites feed on body tissue such as blood, skin and hair. The wounds and skin irritation produced by these parasites result in discomfort and irritation to the animal. In goats, S scabiei var caprae, D. caprae are relatively common in goats. Dorny *et al* (1994) conducted a survey and reported the prevalence of various mange organisms causing the skin infection in goats. These are responsible for a generalized skin condition characterized by marked hyperkeratosis. Lesions start usually on the head and neck and can extend to the inner thighs, hocks, brisket, ventral abdomen, and axillary region.

Case presentation

Five goats aged 6m-2y were presented with a history of 4 weeks' duration that started with generalized alopecia, spectacle eye appearance, multifocal erythematous papules, particularly on the distal limbs, which progressed to generalized erythema with localized scaling and thinning of the hair coat. There was moderate focal scaling and crusting of the pinnae, nares, and peribuccal skin. Upon clinical examination all vital values were within the normal range. Skin scrapings were examined for the presence of external parasites. Examination revealed presence of both sarcoptes and demodex sps.

Treatment and discussion

Ivermectin @0.5mg/kgbwt s/c was given once and repeated after a week.. Avilin @2.0ml I/M, Tribivet @ 2.0ml/M, was also given daily for 5 days. Advised the owner to give a bath/dip with amitraz containing water(1:100) once.

Enrofloxacin @ 5mg/kgbwt I/M was also given to combat secondary bacterial infections. After 10 days complete recovery was observed in all goats with out leaving a mark or pigmentation. Strable et al also used avermectin compound @ 0.5mg/kg b wt once in a week for 12 weeks for treating the skin infection in goats and succeeded. Brügger and Braun 2000 also used amitraz 1in100 dilution for the treatment of demodicosis in goats and observed the decrease in skin lesions. Manurung *et al* (1990) also reported the efficacy of the ivermectin given twice at the interval of 7 days rather than single dose in treating the sarcotic mange in goats.

Conclusions:

Skin infections are common in goats due to external parasites. Correct diagnosis and timely implementation of the therapy are required for saving the goat industry.

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Fresh Cow Management

Calcium requirements post calving

The skeleton contains around 98% of total body calcium and calcium pools are under strict homeostatic control. There is around 3g Ca in the plasma pool and only 8-9 g Ca in compartments outside the bone of a 600kg cow. At parturition there is a sudden increase in the cow's calcium requirements for colostrum (2-3g Ca/L) and milk (1.22-1.45g Ca/L) requiring a 2-4 fold increase in calcium availability. This comes from the calcium mobilised from bone storage and an increased rate of dietary Ca absorption.

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Management of Ascites of Hepatic Origin in a Dog - A Case Report

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Abstract

Several therapeutic modalities were available for treatment of ascites of hepatic origin. In this study colloidal infusion solution following paracentesis was tried for the management of dog with severe ascites along with standard therapy which resulted in complete recovery.

Key words : Ascites, colloidal solution, paracentesis

Introduction

The liver accounts for approximately 3-8% of the total body weight in the carnivores and occupies a central role in diverse metabolic activities that helps maintain the body's normal homeostatic mechanism (Nottidge *et al.,* 2003). Ascites is the abnormal fluid accumulation in the peritoneum. It has been attributed to chronic hepatic failure, congestive heart failure, nephritic syndrome, malnutrition, ankylostomiasis and protein losing enteropathy in canine (Pradhan *et al.,* 2008). Portal hypertension, hypoalbuminemia, and renal retention of salt and water cause ascites in patients with hepatic disease. Hepatic disease is often treatable and has a predictable prognosis when a definitive diagnosis is made (Keith, 2003). Cases with large or refractory ascites are usually initially managed by repeated large volume paracentesis. Several clinical studies have demonstrated that large volume paracentesis with colloid replacement is rapid, safe, and effective (Moore and Aithal, 2006). In this case study colloidal infusion solution as plasma volume expander was tried for the management of dog with ascites along with standard therapy.

Material and Methods

A 5 months old non-descript pup was presented at Medicine Clinic of TVCC, CVAS, Bikaner with the complaint of marked enlargement of abdomen, difficult breathing, off feed and irregular and decrease urination. Physical examination reveal rectal temperature 101.2^{0}F, pale mucous membrane, melena, increase pulse and heart rate with low amplitude, respiratory distress, increase capillary refill time and buccal mucosal bleeding time 1.4 minute. The coat was rough, dry and lustreless, ribs was visible prominently and eyes was sunken. There was enlargement of the abdomen and on taping the abdomen there was undulating movements of the fluid. Haematological finding reveal Haemoglobin (7.4 gms%), Total Red Blood Cells (5×10^6/µL), Packed Cell Volume (25%), Total Platelet Count (557×10^3/µL), Total Leukocyte Count

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(30.3×10^3/µL) and DLC- Neutrophils (79%), Eosinophils (1%), Monocytes (3%) and Lymphocytes (17%). Biochemical findings revealed Blood Sugar (44mg/dl), Total Protein (3.4gm/dl), Albumin (1.25gm/dl), Serum Alanine Aminotransferase (155 IU/L), Serum Aspartate Aminotransferase (128 IU/L), Serum Creatinine (0.2mg/dl), BUN (5mg/dl), GGT (11 IU/L), Alkaline Phosphatase (150 IU/L), Total Bilirubin (0.1mg/dl) and Serum Cholesterol (73mg/dl). Peritoneal fluid examination revealed pure transudate fluid with specific gravity 1.015, clear appearance and absence of any leucocytes, blood cells and protein and presences of traces of glucose which is typically associated with hepatobiliary disorders.

Faecal examination revealed absence of any parasitic infestation. Urine was clear pale yellow. Differential clinical examinations to the dog diagnosed ascites because of liver dysfunction.

Treatment

The case was managed with inj. Ceftriaxone @ 25mg/kg b.wt. I/V bd, inj. Frusemide @ 2 mg/kg b.wt. I/V bd, inj. 50% Dextrose @ 1ml/kg I/V bd along with B-Complex inj. Tribivet 1 ml I/V od, inj. Ascorbic acid 100 mg I/V od, Plasma Volume Expander (Haemaccel) @ 10 ml/kg b.wt I/V bd, syrup Livoferrol 0.5 TSF po bd, cap. Evion 250 mg 1 cap po od. Paracentesis was done on alternate day for 3 times to remove half of the total fluid from the abdomen. From 5th day onwards the abdominal distension decreases in size and pup started improving. Same treatment was continued for next 7 days and in place of frusemide dog was kept on tablet Lasilacton 50 po bd (frusemide 20 mg and spironolactone 50 mg) and on hepatic diet manufactured by Royal Canine.

Discussion

Clinical signs recorded in present case simulated with the observation of Saravanan *et al.* (2012) and Haridas *et al.* (2013). Portal hypertension, hypoalbuminemia, and renal retention of salt and water cause ascites in patients with hepatic disease (Cynthia, 2010). Decrease in Hb, PCV and TRBC concentration and leucocytosis with increase in neutrophils was in agreement with Pradhan *et al.* (2008). Anaemia is more common finding in hepatic disease and is often associated with inefficient utilization of systemic iron stores (Cynthia, 2010). Hepatic insufficiency results in lower blood glucose levels due to inadequate glycogen storage and gluconeogenesis (Susan and Sherding, 2006). Decrease total serum protein level and hypoalbuminemia may be due to lack of production occurring with hepatic disease as albumin is synthesized exclusively by the liver, protein-calorie malnutrition, from an increased volume of distribution due to ascites resulting in a dilution effect on serum albumin concentration or because of ammonia (when elevated with hepatic disease) that inhibits albumin release from hepatocytes (Cynthia, 2010). The liver manufactures urea and with hepatic failure this process fails, and BUN concentration falls. However, because there are many other factors that influence urea metabolism BUN concentration is an insensitive and nonspecific test of hepatic function (Keith, 2003). Increase serum alanine aminotransferase and serum aspartate aminotransferase indicate hepatocyte membrane damage and necrosis. Serum activity of these enzymes increases when there is increased permeability of the hepatocyte membrane, resulting in leakage from the hepatocyte. The extent to which enzyme leakage occurs depends on both the severity and number of cells damaged (Susan and Sherding, 2006). Hypocholesterolemia occurs due to decreased cholesterol synthesis or increased incorporation of cholesterol into bile acids or with late-stage chronic liver disease in dogs (Cynthia, 2010). No change was observed in other biochemical and haematological parameters. Transudative type of

ascites noticed as depicted by the specific gravity was in agreement with Haridas *et al.* (2013) which is typically associated with hepatobiliary disorders. Therapeutic paracentesis is the first line treatment for cases with ascites. Studies suggests that plasma expanders like dextran 70 or haemaccel are clinically effective in the prevention of hyponatraemia and renal impairment and paracentesis should be followed by plasma expansion with a synthetic plasma expander like haemaccel @ 10 ml/kg b.wt I/V bd (Cathy, 2010). Ceftriaxone have been shown to be effective antibiotic against spontaneous bacterial peritonitis (Moore and Aithal, 2006). Hypoglycaemia due to hepatic diseases can be managed with intravenous glucose supplementation (50% Dextrose) @ 1 ml/kg I/V. Certain B vitamins are converted to their active form and stored in the liver. Therefore, supplementation with a good-quality multiple vitamin preparation is helpful. Vitamin C (ascorbic acid) and vitamin E supplementation is also recommended (Keith, 2003). Combinations of frusemide and spironolactone is very effective to treat ascites (Susan and Sherding, 2006).

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Surgical Treatment of a Salivary Mucocele in a Mongrel Dog: A Case Report

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Abstract

A six year male mongrel dog weighing 25 kg was presented with the history of swelling at the submandibular region. On the basis of clinical examination and needle aspiration of swelling the animal was diagnosed with the salivary mucocele. After taking all the preoperative preparations; operation for correction of salivary mucocele was done under general anaesthesia. Animal was given systemic antibiotics for five days and analgesic for three days postoperatively. No reoccurrence of the swelling was reported.

Keywords : Mongrel dog, swelling, salivary mucocele.

Introduction

A salivary mucocele is defined as an accumulation of leaking salivary secretion in single or multiloculated cavities in the connective tissue of the mouth or neck contiguous to a salivary gland or duct (Brown NO, 1989 and Brown CC et al., 2007). It is the most common clinically recognized disease of salivary glands in dog (Smith, 2000). The cause of salivary mucocele is a rarely identified (Bellenger and Simpson, 1992 and Boydell et al., 2000). However, blunt trauma, foreign body and sialolith have been suspected as major causes of salivary mucocele.

The diagnosis is usually made based on the history, physical examination by palpation and cytological examination after aspiration of the cyst and can be confirmed by histopathological examination (Prassinos et al., 2005).

Case History and Observations

A six year male mongrel dog was presented at the TVCC of CVAS, RAJUVAS, Bikaner with the swelling at the submandibular region (Fig-1). According to history provided by the owner the swelling developed gradually after an accidental trauma with a blunt object at the facial region. On physical examination by palpation the swelling was soft, fluctuating and painless. The animal was bright, alert and responsive. Needle

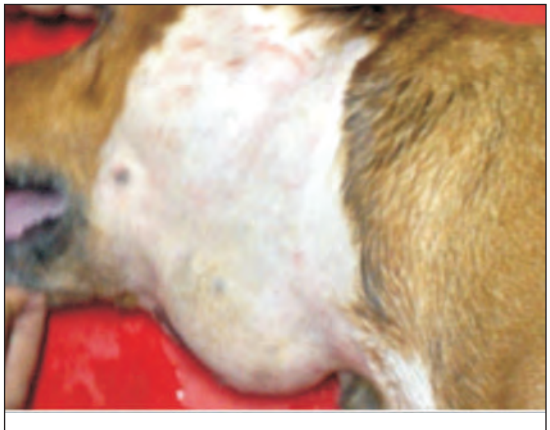

Fig.1-Submandibular Mucocele

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Fig.2- Blood tinged saliva aspirated from the swelling.

aspiration (Fig.2) under aseptic conditions revealed that the fluid was consistent with blood tinged saliva. Routine haematology and serum biochemistry were within normal limits. On the basis of history and clinical examination, it was diagnosed as a case of cervical mucocele with the involvement of mandibular salivary gland and decided to operate under general anaesthesia.

Surgical Treatment

The mandibular region was clipped and prepared for aseptic surgery. Under general anesthesia using combination of atropine, xylazine and ketamine, the dog was secured in right lateral recumbency. A 3 cm long skin incision was made over the center of mucocele. After incising skin, subcutaneous tissues, and the platysma muscle, the fibrous capsule of the mandibular salivary gland was identified and incised to expose the gland.

The mandibular gland duct complex was ligated and transected caudal to the lingual nerve (Fig-3). The superficial muscles, subcutaneous tissue and capsule of the gland were sutured using 1/0 vicryl absorbable suture material. The skin incision was sutured by simple interrupted sutures with silk no.1. Postoperatively, injection Ceftriaxone with Tazobactum b.i.d for 5 days

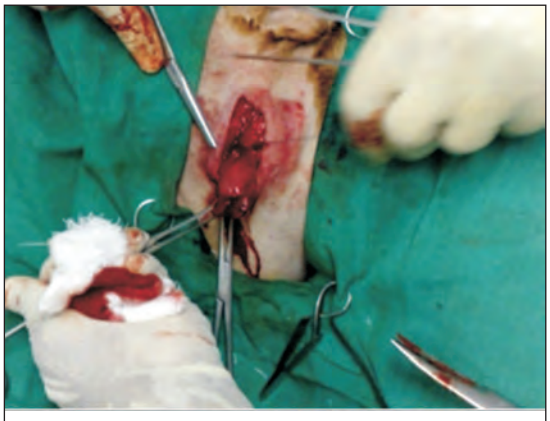

Fig.3-Ligation of mandibular gland-duct complex

and Injection Meloxicam for 3 days were administered intramuscularly. The animal recovered uneventfully and skin sutures were removed after 10 days.

Discussion

The incidence of canine sialoceles is less than one in 200 dogs. They occurred in dogs three times more frequently than in cats (Smith, 2000). Breeds more commonly affected include the Poodle, Dachshund, Australian silky terrier, and German shepherd (Bellenger and Simpson, 1992; Hedlund, 2002). The sublingual salivary gland is most frequently affected (Durtnell, 1977 and Harvey, 1993). The most common sites for collection of the extravasated saliva are the subcutaneous tissues of the intermandibular or cranial cervical area and the sublingual tissues on the floor of mouth (Maps and Anderson, 1984; Waldron and Smith and Harvey, 1993). In present case the site of saliva collection was the subcutaneous tissues of the intermandibular area.

Blunt trauma, foreign body and sialolith have been suggested as the causes of salivary mucocele (Harvey, 1993; Hedlund, 2002 and Smith, 2000). In the reported case the cause of salivary mucocele was the blunt trauma at the

face. Diagnosis of salivary mucocele is mainly based on clinical signs, history and paracentesis (Smith, 2000). Salivary mucocele have treated by various methods that are removal of damaged gland, drainage of mucocele, marsupialization plus removal of gland and surgical repair of the ruptured duct of the affected salivary gland (Harvey, 1993). In present case the extirpation of the duct gland complex was done similar to the case reported by Gahlot et al., 2013.

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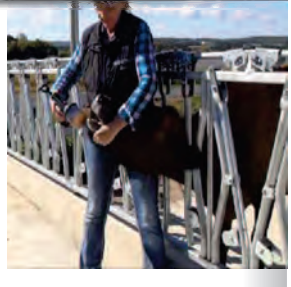
Fresh Cow Management

Calcium drenches at calving



Calcium drenches and boluses can aid in the prevention of milk fever if given within 12 hours of calving and continued for several days after calving. Due to the labour intensive nature of drenching cows, these strategies are best restricted to cows considered be a high risk for developing milk fever.

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A rare case of Fibrothecoma in a Crossbred Cow and its Surgical Management

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Abstract :
A crossbred cow with Fibrothecoma was successfully cured by surgical removal of the tumor and supportive therapy.

Key words: Fibrothecoma, Surgical treatment.

Introduction:

Sex cord stromal tumors are the most common ovarian neoplasms in cattle (McEnteek and Zepp; 1953) (Norrish *et al;* 1969). Sex cord gonadostromal tumors are usually composed of both granulo and theca cells.(Stabenfeldt *et al*; 1979) Stromal tumors are composed predominantly of theca or stromal cells. Sex cord-stromal tumors frequently contain several cell types; therefore, classification depends on the predominant cell type and pattern (Nielsen *et al*; 1976). Although in animals thecoma is included to sex cord stromal tumors as granulosa cell tumor and fibroma included to mesenchymal tumors now a days in human medicine fibrothecoma (Fibrosed thecoma) is included to the tumor of thecoma fibroma group. However ovarian fibrothecoma has not yet been reported in domestic animal except an aged Chimpanzee (Graham; 1977). They are unique in their capacity to secrete or stimulate the production on a variety of hormones that cause various reproductive and behavioral abnormalities (i.e. male like behavior due to testosterone or nymphomania due to estrogen) (Bosu *et al;* 1982) (Nielsen and Moulton; 1990) (Stabenfeldt *et al;* 1979).

In human, the ovarian fibrothecoma is a rare benign tumor which occurs in both pre and post menopausal women, growing from the gonadostromal tissue of the ovary (Okada *et al ;* 2004). Women with these tumors are generally asymptomatic masses are typically detected with palpation during routine gynaecological examination in middle age women and elective surgical removal is usually performed (Young;1987). There is no definitive diagnostic test for granulosa theca cell tumors, and identification is usually based on the history, rectal examination, serum hormone analysis, and ultrasonographic examination(Christman ;1999)(Hinrichs and Hunt ;1990). Surgical removal of the affected ovary is the treatment of choice, (Meagher DM *et al* 1997) (Perino and Didier ;1985) as these tumors rarely metastasize (Bosu et al ;1982) (Meagher *et al* ;1997) (Perino and Didier ;1985). Sex cord stromal tumors are usually benign in cow and mare (Maclachlan and Kennedy, 2002); (Zanghi *et al*., 2007).

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The objective of this report is to evaluate the results of ovariectomy in a crossbred cattle that had an ovarian fibrothecoma in the left ovary and had 2 years history of infertility.

History and clinical signs:

The case was presented to the zonal veterinary dispensary, sankhali Goa. The animal was 13 years old crossbred cow whose owner had noticed the animal was continuously in heat and unable to conceive last 2 years. On the present history the crossbred cow was clinically examined crossbred cow showing nymphomania and masculine body development. At rectal examination, the right uterine horn was normal and right ovary (2 x 1 cm) carried developing follicle. The left uterine horn was pulled cranioventrally and could not be retracted revealed the presence of solid mass. The uterus was found to be enlarged and had smooth contour. Based on history and clinical signs an ovarian tumor or cyst was suspected and animal was prepared for exploratory laprotomy.

Surgical treatment and follow up:

The left abdomen was routinely prepared for laprotomy and 35 cm line was infiltrated with lignocaine Hcl 2 %. Upon opening the peritoneal cavity, a multilobular spherical mass (20 x 25 cm) was found in place of left ovary (Fig. 1), mesenteric lymphnodes and adjacent viscera appeared normal. Unilateral overiectomy was performed. The ovarian pedicle was ligated in a transfixed pattern with chromic catgut no. 2 and major blood vessels were ligated separately (Fig. 2).

A gross inspection of the removed ovary weighed 4 kg, a tumoral mass with whitish yellow and whorled appearance was observed (Fig. 3). In the sectioning process the mass revealed to be predominantly solid and firm, containing few miliary bloody areas (Fig 4).

The removed left ovary was fixed in formalin, put through routine processes for sectioning and sections were stained with hematoxylin eosin (HE). Histologically, the tumor was observed to be composed of spindle cells with elongated nucleus and vacuolated cytoplasm indicates lipid loaded cells mitotic figure are abundant (Fig 5) the location of the tissue and histopathological picture are suggestive of Fibrothecoma.

Discussion:

Little information is available on neoplastic diseases of bovine genital organs, especially on

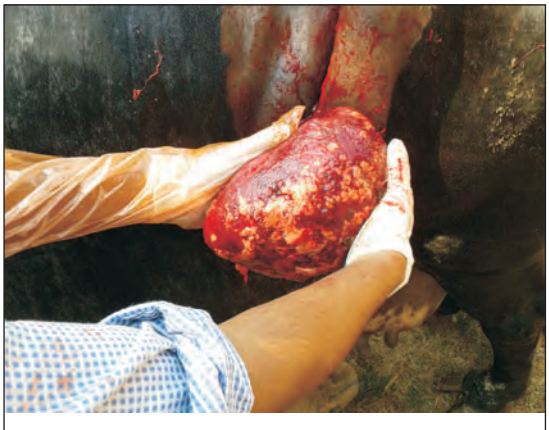

Fig. 1 General view of left ovary

Fig. 2 Ligation of ovarian pedicle

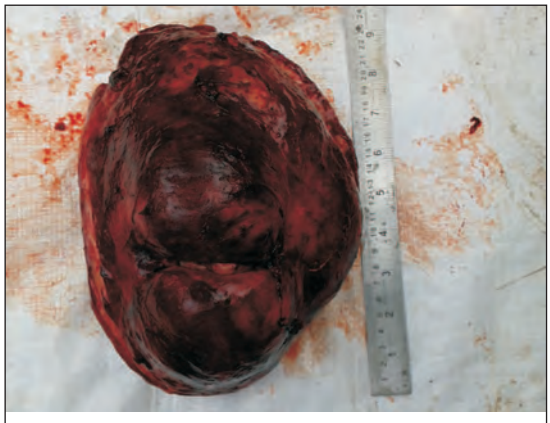

Fig. 3 Gross appearance of tumoral mass.

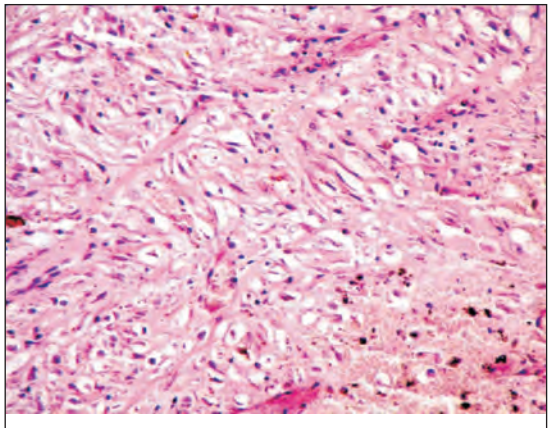

Fig.5 Microscopic features of ovarian fibrothecoma with spindle cells having elongated nucleus and lipid loaded cells

the morbidity of granulosa cell tumor in cattle. Lagerlof and Boyd reported detection of only 3 cases of granulosa cell tumor in 6,286 bovine genital organs which they had examined. Saeki also described only one case of this tumor in a survey of the literature on neoplasms in domestic animals in Japan from 1900 to 1960. Kanagawa 1963, reported only one case in 192 slaughtered cattle. Andreson and Davis1958, reported 6 cases of granulose cell tumor among 42 neoplasms affecting bovine internal genital organs. The incidence of this tumor seems to be

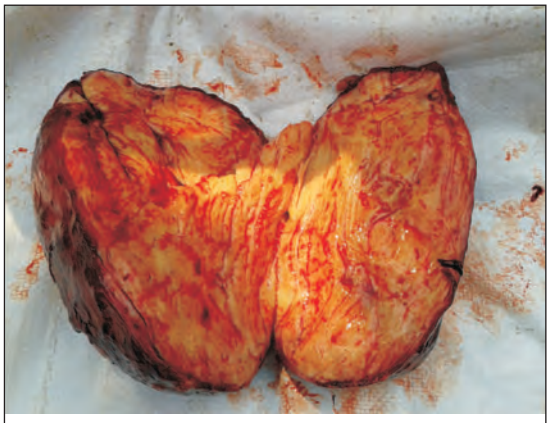

Fig. 4 Sectioning of tumoral mass.

fairly high among the various bovine ovarian neoplasms. McEntee and Zepp 1953, have reported that 17 of 18 bovine ovarian tumors were granulosa cell tumors. Likewise, Moniux et al. described 6 granulosa cell tumors in 7 ovarian neoplasms.

It is generally accepted that neoplastic diseases in humans and domestic animals tend to increase with age. In humans, it is considered that approximately 50 percent of ovarian granulosa cell tumors occur in women in the post-climacteric (Willis ;1959). This seems also to be true in the bovine. In this connection, it is noteworthy that Yamauchi has reported 3 cases of this tumor in Japanese Black Cattle of 17, 21 and 28 years and that we mentioned above case was observed in a 13-year-old Crossbred cow and Fincher's case, cited by Roberts 1953, in a 14-year-old Angus cow.

Little is known about the clinical symptoms of granulosa cell tumors. This may be partly because neoplastic diseases in bovines are generally detected only in animals to be slaughtered. The most prominent, but not constant, symptom of the tumor seems to be nymphomania. In the present study the crossbred cattle showing the symptoms of nymphomania as well as masculine body development. Tumors derived from sex

cord-stromal tissues of the ovary can produce varying amounts of progesterone, estrogen and inhibin, and these hormones can profoundly influence the productive behavior of the affected animal and induce changes in extra-ovarian tissues. Animals with hormonally productive sex cord-stromal tumors often exhibit abnormal reproductive behavior that may range from estrogenic activity to masculinization (McEntee;1990) (MacLachlan and Kennedy; 2002). Progressive increase in tumor size, hormone production and infertility necessitate removal. Removal of the affected ovary can enable the contralateral ovary to have a normal reproductive potential (Nóbrega *et al;* 2008) (Stabenfeldt *et al;*1979) (Pugh *et al;* 1985l). In our case crossbred cattle with ovarian fibrothecoma stayed sterile.

Stromal tumors of the ovary include thecoma and fibroma, yet in human when the differentiation between these two types may be difficult the term fibrothecoma has emerged in recognition. The immunohistochemical features of these tumors resemble both thecoma and fibroma (Conte *et al* 1991). Recently, although there are specific markers for the differentiation of sex cord-stromal tumors, those markers do not works properly in some cases (Sills *et al;*2006) (McCluggage and Maxwell ;2001). However, the criteria used for the diagnosis of this fibrothecoma which is called fibrosed thecoma were based on the morphological and histological features. Both fibromatous and thecomatous elements were found in the tumor in varying proportions.

Acknowledgments

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Clinical Management of Cervico-Vaginal Prolapse in a Cross bred Cow

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(received 03/10/2016 - accepted 22/12/2016)

Abstract

A seven year old cross breed cow with a history of cervico-vaginal prolapse was presented. The prolapsed mass was extremely edematous and contaminated with dung and debris. The everted mass was cleaned with mild antiseptic solution and then lubricated. The mass was reduced and replaced into normal position. Buhner's sutures were applied to prevent recurrence and resulted in an uneventful recovery.

Key words: Cross bred cow, cervico vaginal prolapsed, Buhner's sutures.

Introduction

Prolapse is commonly occurring postpartum complication in farm animals including cows, buffaloes, ewes and does. Causes of prolapse include dystocia, twinning, mineral imbalance, high estrogen content in blood and increased intra abdominal pressure (Tyagi *et al.,* 2002). Hypocalcemia leads to atony of genitalia and cause prolapse (Pandit *et al.,* 1982). Delayed management leads to edema, ischemia, laceration and hemorrhage. Correction of prolapse have been made by Buhner's suturing pattern (Potter *et al.,* 2008 and Kumar *et al.,* 2011). Early attainment and treatment leads to good recovery without much complications. The present communication documents a case of cervico-vaginal prolapse and its management in a cross breed cow.

History and Observations

A pluriparous cow of seven years age was brought with a history straining and swollen red mass noticed at vulva since early morning. The animal was showing severe straining, anorectic and restless. The clinical parameters were in normal range. The prolapsed mass was soiled with dung and debris (Fig.1). Physical examination revealed prolapsed cervix and vagina. Based on history and physical examination, the case was diagnosed as cervico-vaginal prolapse.

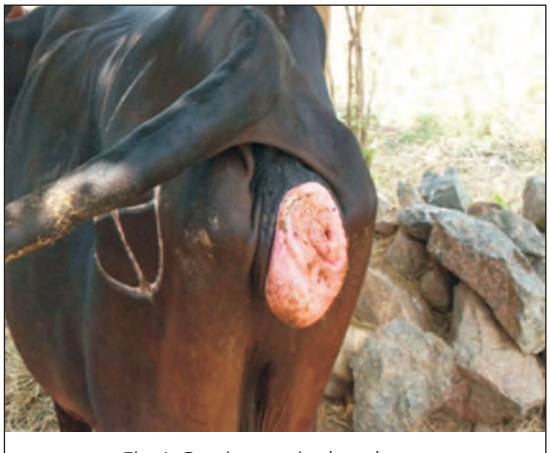

Fig.1 Cervico vaginal prolapse

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Treatment and Discussion

The main goal of the treatment is to reduce the mass followed by reposition and retention. Epidural anesthesia (2% lignocaine hydrochloride, 10ml) at sacrococcygeal space was given to reduce the straining by restraining the animal in standing position. The prolapsed mass and perineal area was washed with mild antiseptic solution (Potassium permanganate). Ice packs was applied to reduce the edema. The prolapsed mass was well lubricated, pushed and replaced to its position. To prevent recurrence Buhner's sutures were applied (Fig.2). Following successful reposition, animal was administered with Inj. DNS, 2 litres IV, Inj. Ceftriaxone @ 5mg/kg body weight IM, Inj. Meloxicam @ 0.5mg/kg and the treatment was continued for next 4 days.

Genital prolapse is a common obstetrical problem which affects both the productive and reproductive performance of animals. Post parturient prolapse of vagina in cattle is due to severe straining, infection following a serious dystocia. Lack of exercise and closed confinement were reported to be the predisposing factors. The prognosis could be fair to good for both dam and fetus but there would be a chance of recurrence unless proper preventive measures were taken (Arthur *et al.,* 2001). The other causes include deficiency of calcium and disturbed calcium and phosphorous ratio (Khar *et al.,* 1993). The present case of cervico-vaginal prolapse is attributed to recent calving and debility.

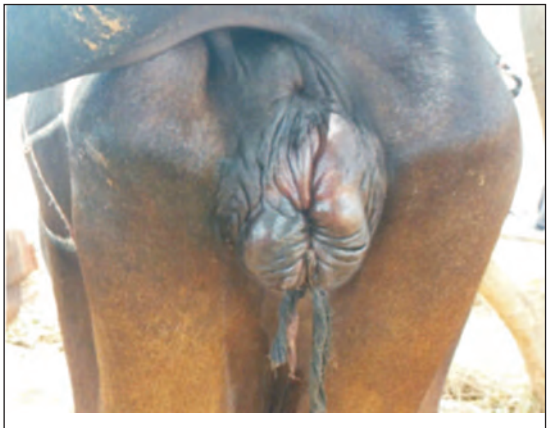

Fig.2 Application of Buhner's sutures

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Dystocia due to Dicephalus monster in a Graded Murrah Buffalo- A Case Report

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(received 03/10/2016 - accepted 22/12/2016)

Abstract

A rare case of conjoined twins (Dicephalus monster) causing dystocia in a multiparous graded murrah buffalo was diagnosed and successfully delivered through cesarean section

Key words: Dystocia; conjoined twins; buffalo.

Introduction

Dystocia is the common sequlae of monostrosities. Double monsters or conjoined twins consist of two fetuses joined together and are common in cows and buffaloes (Sane *et al.,* 1994). Varying degrees of conjunction can occur, but anterior duplication is more oftently seen (Arthur *et al.,* 1989). The definite etiological agents are unknown, however abnormal duplication of germinal area in fetus will give rise to congenital fetal abnormalities (Bugalia *et al.,* 1990). Fetal duplication nearly always cause dystocia (Sloss and Dufty, 1980) requiring fetotomy or cesarean section to relieve. The present communication records a rare case of dystocia due to dicephalus conjoined twins and its successful delivery by performing cesarean section.

Case History and Obseravtions

A pluriparous five year old murrah buffalo was presented with history of full term pregnancy and straining from last 4 hours after expulsion of first water bag. Both forelimbs were protruded at vulva without any progress of parturition. Vulval lips and vagina were congested. Pervaginal examination revealed a completely dilated cervix with fetus in anterior longitudinal presentation, dorso sacral position and extended limbs in birth canal. Fetal reflexes were not evident indicating that fetus has died. On detail examination it was tentatively diagnosed as dicephalus monster.

Treatment and Discussion

Attempts were made to relieve fetus per vaginum by traction but was unsuccessful. Hence it was decided to deliver the fetus through cesarean section. Following local anesthesia by infiltration of 2% lignocaine hydrochloride by lower left flank approach cesarean section was performed as per standard procedures and a dead male dicephalus monster fetus was delivered (Fig.1).

The buffalo was treated with parenteral administration of antibiotics Ceftriaxone @ I/M, Inj. Histamin (Chlorpheniramine maleate) 10mg/ml I/M @ 0.25-0.5 mg/kg body weight, Inj. Meloxicam (Melonex) 5mg/ml I/M @ 0.5mg/kg body weight to reduce pain, Inj. DNS 5% 3 litres

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Fig.1 Dicephalus Monster

I/V. The treatment was continued for next 4 days. The monster delivered through cesarean section had two heads and necks and both the twins showed exactly similar development with no evidence of duplication of thorax and body. Both the heads were joined behind neck and had two fore limbs and two hind limbs. This observations evidenced that the monster was a dicephalus fetus. Conjoined twins arise from a single ovum and are monozygotic. Embryonic duplications occur 1 in 1 lacs bovine births (Roberts, 1986). The two heads of the monster fused dorsoventrally with a common thorax and body. As per Roberts (1986), the present monster calf can be described as dicephalus conjoined twins. Solanki *et al.* (2011) and Sloss and Dufty (1980) opined that fetotomy of conjoined twins is often a difficult task and cesarean section can be easily performed to deliver monster as in the present case and the fetus was delivered through cesarean section.

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Concurrent infection of Babesia felis and Granulocytic Ehrlichiosis in a Kitten

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(received 03/10/2016 - accepted 23/12/2016)

Abstract :

A case of Concurrent babesiosis and ehrlichiosis in a kitten is reported and discussed. Weakness, letharzy, anaemia, fever and tachycardia were predominant symptoms. Kitten responded well to doxycycline and primaquine treatment.

Key words: *B felis*, doxycycline, electrcardiography, granulocytic ehrlichia, primaquine,

Introduction

Tick borne protozoal and rickettsial diseases have been well documented in various domestic species however reports on these diseases in cats are lacking. Feline babesiosis was first reported in 1904 (Lingard and Jennings, 1904), the disease has subsequently been reported sporadically (Changkija and Varshney, 2006; Varshney *et al.,* 2008). Feline granulocytic ehrlichiosis has been reported by Varshney *et al.* (2009). However concurrent infection in felines has not been reported so frequently. The present report documents a successfully managed case of a concurrent infection of *B felis* and granulocytic ehrlichia in a kitten.

Case History, Observations and Treatment:

A one month old female kitten was presented at Nandini Veterinary Hospital with a history of anoerexia and diarrhoea for last two days. Clinical examination revealed poor general condition with rough hair coat, dullness and lethargy, pale mucous membranes and pinna, elevated rectal temperature (103.4), loose consistency of faeces, marked weakness, lethargy and decreased appetite. Thoracic auscultation revealed tachycardia. Blood smear revealed the presence of small oval and round shaped parasites in the RBCs (Fig.1) resembling to that of *Babesia felis* and intracytoplasmic inclusions in the neutrophils (Fig.2) resembling to that of granulocytic ehrlichia in dogs. RBC morphology was normocytic hypochromic with anisocytosis and many crenated and degenerated cells. There was marked thrombocytopaenia. Electrocardiographic examination revealed sinus tachycardia (Fig.3).

The cat was treated with primaquine phosphate (0.5mg/kg body wt) weekly for two weeks, doxycycline (10mg/kg body wt) orally for two weeks, and prednisolone (1.0 mg/kg b.wt. orally for 7 days) and vitamin- B complex drops for 14 days.

Results and Discussion

Marked weakness, lethargy, anoerexia, anaemia, diarrhoea and tachycardia were non specific signs. The demonstration of small oval and round

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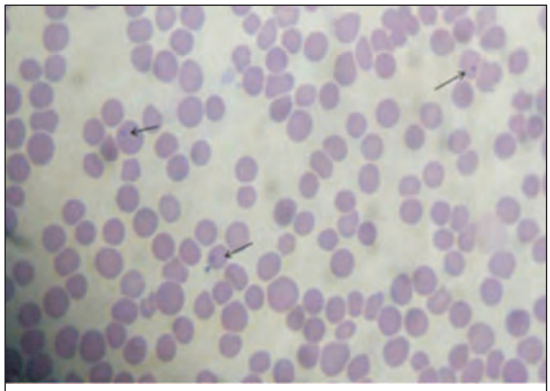

Fig.1. Blood smear of the kitten revealing the presence of small oval and round shaped parasites in the RBCs resembling to that of Babesia felis in one field.

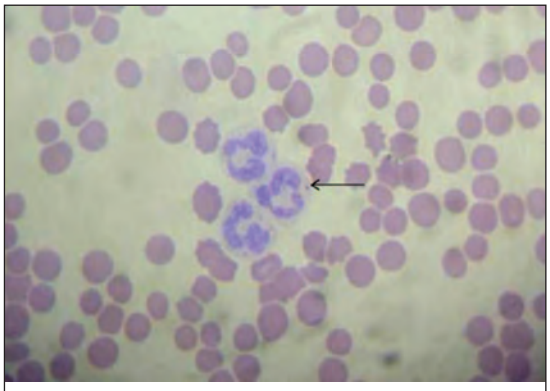

Fig.2. Blood smear of the same kitten revealing the presence of morulae in neutrophils in another field.

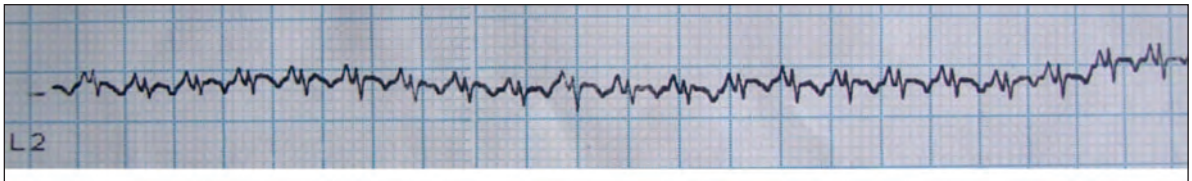

Fig.3. Electrocardiogram of the same kitten with concurrent infection of Babesia and Ehrlichia showing sinus tachycardia (H.R 280 bpm with regular R-R intervals).

shaped parasites in the RBC's, resembling to those described by Davis (1929) and Carpano (1934) as *B. felis* in wild cat and in puma, and intracytolasmic morulae in the neutrophils confirmed a concurrent infection of Babesia and granulocytic ehrlichia in the kitten. Feline ehrlichiosis (Varshney *et al.,* 2009) and feline babesiosis (Varshney *et al.,* 2008) have earlier been reported as separate entity in felines. However, in the present case a concurrent infection was diagnosed that made the clinical picture complex .This appears to be first report of concurrent infection of Babesia and Ehrlichia in a cat in India. Primaquine phosphate has been a reported a drug of choice (Stewart *et al.,* 1980, Potguiter, 1981) in feline babesiosis and doxycycline in ehrlichiosis (Egenvall *et al.,* 1994; Kumar, 2004). The kitten made an uneventful recovery with the primaquine and doxycycline administration (Changkija and Varshney 2006; Varshney *et al.,* 2008; Varshney *et al.,* 2009).

Acknowledgements:

The authors are thankful to the Chairman, Managing trustees and Board of trustees for providing necessary facilities at the hospital.

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Fresh Cow Management

Disease of fresh cow

Mastitis

Is the inflammation of the mammary gland and udder tissue

- Bacteria entering the teat canal and moving to the udder.
- It is about 8 times more likely to occur in a cow that had milk fever.
- Sub-clinical mastitis, no external symptoms, Chemical composition changes and more common leading to loss of production.
- Around 70-80 percent of mastitis is due to bacterial infections.
- Contagious pathogens like Strepto and Staphylo and environmental like E.coli

Treatment:

Antibiotic therapy with both systemic and local application.

Prevention:

Dry Cow therapy needs to be followed, which clears the presence of bacteria during the pre-dry period and prevents fresh infections.

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Retrieval of Various Esophageal Foreign Bodies in Domestic Animals

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(received 24/09/2016 - accepted 17/11/2016)

Abstract :

Four different types of foreign were found obstructing the cervical and thoracic esophagus in different animals. It was a trichobezoar in a cow, sugarcane chaffing in a mule and a hair pin and a bone piece in dogs. The foreign bodies at cervical esophagus are removed easily by blind oral approach or by performing esophagotomy in two animals. But two animals having foreign body obstruction in thoracic esophagus died during attempt of removal.

Keywords: Animals; esophagus; foreign body

Introduction

Esophagial foreign bodies (EFBs) are very common in animals. Depending on the feeding habits various type of foreign bodies are found in animals. In cattle and buffalo, esophageal obstruction due to ingested vegetables and fruits (Guard, 1990, Radostits *et al.,* 1994, Jain et al., 2003, Vishwanatha *et al.,* 2012), tarpaulin cloth (Sreenu and Sureshkumar, 2001) and trichobezoar (Patel and Brace, 1995, Jaiswal *et al.,* 2009) have been reported. Trichobezoars were more common in young cattle (Abutarbush and Naylor, 2006). Hofmeyr (1974) reported that 80% of oesophageal obstruction occurs in the cervical region in cattle. Commonly ingested foreign bodies in dogs include bones, rawhide, toys and balls, greenies, fish hooks, coins, towels, socks, underwear and nylons. The most common were bone (29.7%) and rawhides (29.7%). The most common location was in the caudal esophagus (59.3%) (Thompson *et al.,* 2012). In horses esophageal obstruction due to phytobezoar has also been reported (Macdonald et al., 1987).

In cattle, acute and complete oesophageal obstruction is an emergency because it prohibits the eructation of ruminal gases, and free-gas bloat develops. In dogs EFBs, especially bones, can have serious consequences (Tams and Spector, 2011, Sen *et al.,* 2013).

Objects lodged in the cervical esophagus may be located via palpation. It can be diagnosed by radiographic examination. Endoscopic evaluation and the inability to pass a stomach or nasogastric tube in horses or cattle can also confirm the diagnosis (Vishwanatha *et al.,* 2012).

Treatment depends on the location, chronicity, nature of the foreign body and equipment availability. Various techniques, such as endoscopic removal, blind forceps retrieval orally, oesophagotomy, combinations of endoscopy/surgery, forceps retrieval fluoroscopic methods reported for successful removal of EFBs in animals (Gianella *et al.,* 2009, Keir *et al.,* 2010).

Here also four cases of different foreign bodies

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removed from the esophagus of dogs, cattle and a mule are discussed.

Case history and clinical symptoms

A cow was presented with the symptoms including dysphagia, hypersalivation, severe free-gas bloat, nasal discharge (having ingesta), protrusion of the tongue and respiratory distress.

The mule was presented with typical sign of choke i.e. dysphagia with regurgitation of food and saliva through the nostrils, acute onset of pain manifested by restlessness and abducted elbows. The mule was anxious, grunt frequently and makes repeated attempts to swallow.

One dog was presented with the symptoms of dysphagia, gaging, chronic vomiting which was not responding to antiemetics, while in another dog the onset was acute and immediate vomiting after drinking or feeding was observed along with the gaging and dysphagia.

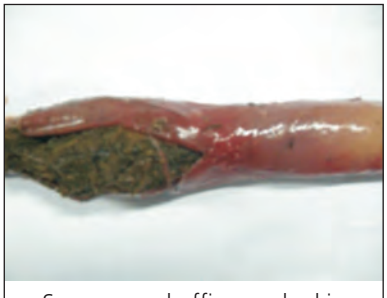
Diagnosis

In case of cow EFB was easily palpable in the cervical esophagus. The probang could not be passed across the palpable foreign body. The foreign body was confirmed as trichobezoar after its removal and bisection.

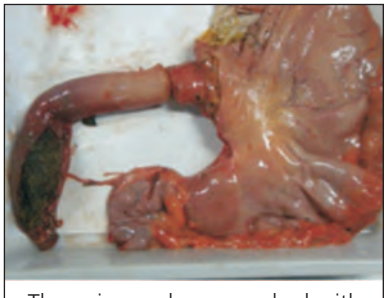
In case of mule it was tentatively diagnosed by the hindrance in passing the stomach tube to the stomach after thoracic esophagus. It was confirmed on postmortem examination of the mule after its unfortunate death. The esophagus was tightly packed by sugarcane chaffings just before stomach.

In dogs it was diagnosed by radiography. In first dog, it was a hair pin used by ladies for making 'Juda' in thoracic esophagus from T-4 to T-6 and in second dog it was a bone piece at anterior part of cervical esophagus from C-3 to C-6.

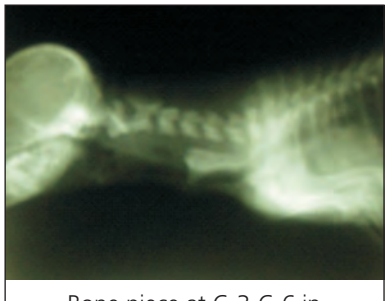
Trichobezoar removed from cervical esophagus of a cow



Sugarcane chaffing packed in esophagus

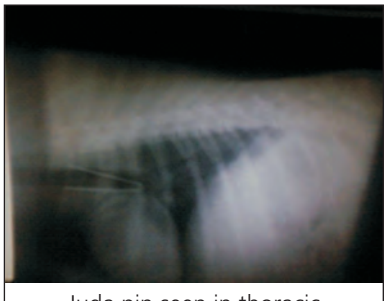


Thoracic esophagus packed with sugarcane chaffing



Bone piece at C-3-C-6 in esophagus as seen in Radiography

Bone piece removed from esophagus



Juda pin seen in thoracic esophagus in a dog

Treatment

In cow the bloat was relieved first by inserting trocar and fixing the cannula in rumen. The foreign body was removed by cervical esophagotomy in standing condition under local anesthesia. The esophagus is repaired in standard manner. A postoperative course of systemic antibiotic (Floxidin) along with regular antiseptic dressing up to 10 days was followed. During this period animal was kept completely on fluid therapy and after that semisolid diet i.e. gruel was started. After 15 days normal diet was started.

In case of mule, unfortunately death occurs during an attempt to push the foreign body to the stomach.

In dogs in first case, the dog died during surgery but in second case the foreign body was removed by using forceps along with percutaneous manipulation. After removal meloxicam was administered for three days to control inflammation and pain. A course of antibiotic Floxidin was given systemically to avoid infections for three days.

Result and Discussion

The foreign body removed from cervical esophagus of the cow had a smooth surface, spherical in shape, and weighed 80 g. Bisection of the foreign body revealed that it was a trichobezoar, densely packed with hair and with a thin outer shell. There were no teeth marks on its outside surface. In case of mule sugarcane chaffing expanded, becomes moistened with saliva. Pelleted feed and beet pulp expand quite a bit after getting wet. So, if a horse takes a large swallow of dry pellets or pulp and it mixes with saliva, it can expand enough to become lodged in the esophagus. In case of dogs proximal cervical obstruction can be retrieved orally by blind forceps approach. Removal of thoracic foreign body by open surgical procedure is difficult but endoscopy might provide an easier option.

Summary and Conclusion

Four different types of foreign were found obstructing the cervical and thoracic esophagus in different animals. It was a trichobezoar in cervical esophagus in a cow, sugarcane chaffing in thoracic esophagus in a mule and a hair pin in thoracic esophagus and a bone piece in cervical esophagus in dogs. The foreign bodies at cervical esophagus are removed easily by blind oral approach or by performing esophagotomy in two animals. But two animals having foreign body obstruction in thoracic esophagus died during attempt of removal.

Esophageal foreign body obstruction is a common condition in domestic and pet animals. The obstruction may be caused by various types of foreign bodies. In cattle it is a more serious condition than in the horse. Obstruction may result in a failure to eructate leading to the development of free-gas bloat. Acute and complete esophageal obstruction is an emergency because it prohibits eructation of ruminal gases, and free-gas bloat develops. Severe free-gas bloat may result in asphyxia, because the expanding rumen puts pressure on the diaphragm and reduces venous return of blood to the heart. So to save the animal decompression of the rumen should be done prior to the attempts for removal of foreign body. In cattle cervical foreign body can be removed easily by cervical oesophagotomy in standing condition. In dogs oesophagial foreign body can easily diagnosed by radiography. Removal of proximal cervical foreign body by blind oral approach after achieving anesthesia may be tried first.

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Subclinical mastitis in a Jersey cross bred cow -A case report

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(received 08/12/2016 - accepted 30/01/2017)

Abstract :

A Jersey cow of 3rd lactation was presented to veterinary dispensary, Halathi, Nagamangala, Mandya with the history of reduction in milk yield, milk is rejected since 2 days in local milk collection center due to low fat/SNF. On the basis of CMT (california mastitis test) and S.F.M.T (Surfa field mastitis test) cow was diagnosed as a case of subclinical mastitis and it was successfully treated with Enrofloaxcin LA, Phenaramine malate and Trisodium citrate.

Key words: Cow, Subclinical mastitis and trisodium citrate

Introduction:

Subclinical mastitis is the presence of an infection without apparent signs of local inflammation or systemic involvement. It is more prevalent than clinical mastitis, ranging from 19% to 78%. In the subclinical-mastitis-affected animals, the milk yield reduces considerably: milk yield loss ranges from 100 to 500 kg per cow per lactation (NAAS, 2013). *Staphylococcus* sp. is the main etiological agents of clinical and subclinical mastitis in cows while, S. aureus and Escherichia coli are most commonly isolated pathogen from the clinical mastitis, coagulase negative *Staphylococci* (CNS) are the most frequently isolated pathogens from the subclinical cows mastitis **(Contreras et al., 20003).** The diagnosis of subclinical mastitis is more problematic than clinical mastitis since the milk appears normal but usually has an elevated somatic cell count. Various methods based on physical and chemical changes of milk and **cultural isolation of organisms, are used for diagnosis of subclinical mastitis (Batra and Mcallister, 1984).** subclinical mastitis can be identified by several diagnostic methods such as California mastitis test (CMT), Modified White Side test (MWT), SCC(Somatic cell count), pH, SFMT (Surfa field mastitis test) chlorine and catalase tests. These tests are preferred to be screening and diagnostic tests for subclinical mastitis as they can be used easily, yielding rapid as well as satisfied results **(Lesile et al., 2002).**

case history and Clinical observations:

A Jersey cow of 3rd lactation was presented to veterinary dispensary, Halathi, Nagamangala, Mandya with the history of reduction in milk yield, milk is rejected since 2 days in local milk collection center due to low fat/SNF.On detailed clinical examination temperature of cow was found to be 102 deg celcius, ruminal motility and ruminal liquor pH is normal. On physical examination of milk found to be normal in color, consistency, pH of milk found to be 8. On examination of milk using CMT (california mastitis test) shows thickening of milk from all quarters after 20seconds of mixing with CMT reagent, S.F.M.T (surfa field mastitis test) and Bromothymol Blue (BTB) strips (Ayurvet ltd) also shows positive for subclinical mastitis.

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Treatment:

The jersey Cow was treated with long acting enrofloaxcin (Floxidin LA, Intervet-MSD) @ 10 mg/kg Bwt I.M, inj AD3E-H (Lavitone H, TTK Pharma) 5ml I.M, inj phenaramine malate (Avilin vet, MSD-Intervet) 5 ml I.M, infuse 100 ml of 10% trisodium citrate freshly prepared solution slow I.V for 2 days. Prescribed VM all chealated@25gm bid, Lactaid oral @ 30ml bid, Powder trisodium citrate@10gms bid and Mastilep (Ayurvet India) ointment for external application of teats and udder twice a day. After 3 days of treatment milk yield returns to normal quantity and quality. On 5th day CMT kit, S.F.M.T and Bromothymol Blue (BTB) strips shows negative for subclinical mastitis.

Discussion :

The overall prevalence of SCM is unexpectedly high. This applies especially to the prevalence at cow level, where **Mukesh et al., (2014)** reported around 46% of affected animals were observed to lie within 30–90-day period of lactation. Species-wise highest incidence of the disease was observed in crossbred cows which implied that crossbred cows are more susceptible to the disease. Less incidence of the disease in buffaloes might be due to the thick and compact epithelium, thick keratin layer, and thick muscle sphincter in streak canal of udder of buffaloes as compared to crossbred cows. **Pankaj et al., 2012** reported the overall quarter wise and animal wise prevalence on the basis of cultural examination was 64.21 and 39.83%, quarter wise and animal wise prevalence on the basis of cultural examination respectively from 364 quarters of 95 lactating cows at an organized farm in Harayana. **Contreras et al., (2003) reported** Staphylococcus sp. is the main etiological agents of clinical and subclinical mastitis in cows while, *S. aureus, Escherichia coli* and coagulase negative *Staphylococci* are the most frequently isolated pathogens from the subclinical cows mastitis cases. The antibiogram of isolates of 364 quarters of 95 lactating cows revealed 100 % sensitivity to Cloxacillin, Ceftriaxone and Cefoperazone and high (90 to 100 %) sensitivity towards Enrofloxacin, Cephalexin, Gentamicin and Lincomycin **(Pankaj et al.,2012)**.Cows affected with subclinical mastitis and treated with enrofloxacin showed 80 per cent animal cure rate and 86.95 per cent quarter cure rate **(Sachin et al., 2015).**The antimicrobial susceptibility test revealed that most of the bacterial strains (gram positive, gram negative, and mixed) isolated from subclinical mastitis milk samples, were highly sensitive to enrofloxacin 53.91%, least sensitive to oxytetracycline 17.39% and ampicillin 7.83%, and resistant to streptomycin. The therapy with enrofloxacin and nimesulide was found more efficacious (92.30%) in treating subclinical mastitis cows **(Sachin et al., 2006).** In field conditions enrofloaxcin long acting injections is found to be more useful than other antibiotics because antibiotic property remains for 72 hours and sensitivity wise. **Ved Prakash et al., (2013)** reported that trisodium citrate administration increased the fat, S.N.F, milk yield in clinical and subclinical mastitis cases. Administration of trisodium citrate creates unfavourable pH medium in the quarter/udder retarding the infection. Citrate, indeed, is the main constituent of the buffer system responsible for the maintenance of pH (~6.50) in the udder and regulates the homeostasis between Ca2+ and H+ ions and is the mainstay for the fluidity of milk through its effect on casein micelles (Faulkner et al., 1982). Citrate in udder also ensures the sequestration of soluble Ca2+ in milk **(Kon et al., 1961)**. Hence, deficiency of citrate in udder would lead to the "clumping" of Ca2+ which manifest as flakes in the mastitic milk. These flakes of Ca2+ behave like lime and probably injure the parenchymatous tissue in the udder alveoli due to reduced moderator effect of

citrate. Following this injury the impermeable barriers to citrate in both directions between blood and milk is disrupted and the inflammatory reaction sets in leading to an array of subsequent events. Furthermore, important ions e.g., bicarbonate, chloride, sodium etc., transudates from blood into milk during clinical and subclinical mastitis due to permeability of tight blood-milk barriers. Thus, swapping of ions between blood and milk brings the pH of milk equal to that of blood or even higher and changes the pH of udder towards alkalinity i.e., 7.4 or higher. At pH of 7 or higher the alkalinity of the udder is such which promote the growth of harmful mastitis pathogens such as Staphylococcus , Streptococci, E coli, Bacilli and Klebsiella. Trisodium citrate maintains the pH of the milk at 6.5 which prevents the growth of mastitic organisms and thereby decreases the incidence of clinical and subclinical mastitis. With intravenous administration of tri-Sodium citrate in sterilized normal saline as 5% given morning and evening in 50ml doses or 10% in 100 ml doses the recovery period shortened to 1-3 days in clinical and sub clinical cases **(Dhillon et al., 2011). Rajhora and Pachauri** reported that there was reduction in pH and increase in the milk components (solids) especially fat in cows were treated for SCM with Mastilep on whole udders after each milking for five days. Zinc is an active component of more than 90 metalloenzymes and has significant effects on gene expression and cellular growth. A summary of 12 lactation trials addressing zinc supplementation showed a 33% reduction in somatic cell count **(Kellogg, 1990, Socha and Tomlinson, 2002).** The Lactaid oral syrup and VMall chealated having Zinc helps in scavenging of free radicles in udder and reduction in somatic cell count.

Acknowledgment: Special thanks to Rangarajan, Sales manager MSD-Intervet and Sheaker, Sales representative, Mysore Division MSD-intervet for providing inj Floxidin LA, inj Avilin, Pow vm all chealated and lactaid oral samples for conducting field trials.

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Fresh Cow Management

Deworming in Fresh Cow

Why it is required?

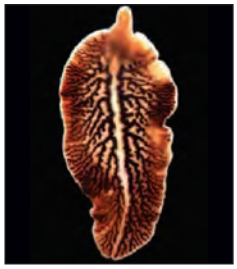
- Parasites can stress An already stressed animals.
- Lactating cows required periodical deworming for their steady milk yields.
- During advanced pregnancy cow deworming resulted increased milk production.
- Loss of productivity due to chronic liver fluke infestation in cattle

Each adult fluke can ingest 1ml of blood daily

Round worms

Tape worms

Flukes



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Incidence of immature amphistomiasis and coccidiosis in sheep and goats.

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Abstract : In late winter seasons water flowing recourses get stagnated and little of green grass remains around these ponds which will acts as a source of snails. And snails are acts as a intermediate host for flukes. Harm to sheep due to immature amphistomiasis is more common than goats due to their feeding habits. In the present paper concurrent pathogenesis, incidence and complications occurred due to mixed infection of coccidia and immature amphistomiasis is discussed.

Key words: Amphistomiasis, Sheep, Goats

Sheep and goats plays important role in the rural economy of Maharashtra. Many shepherds are raring their animals in traditional grazing ways. In the late winter seasons flowing water from, rivers, nalas, lakes etc. is getting dry off and vicinity or banks of such water reservoirs became a source of plenty of parasitic infestations of different parasitic diseases. In the present paper such incidence of amphistomiasis has been elaborated. In the present study out breaks of 20 different places were evaluated and successfully treated.

Materials and methods:

In the present study 20 flocks of sheep and goat were studied having complaint of sub mandibular edema followed by death. Detailed necropsy examinations, duodenal and intestinal samplings were taken for laboratory investigations. Hematological examinations of 40 ailing animals of these 20 flocks were carried out.

Results and observations:

Necropsy examination: necropsy examinations revealed presence of gelatinous soft edematous swelling at sub mandibular regions. Pale mucous membranes and sub cutaneous tissues. Presence of 3-5 liters of clear watery to slightly blood tinged fluid in abdominal cavity. Similar type of fluid in thoracic cavity. In trachea frothy exudates, lung edema and gelatinous alterations of pericardial adipose tissues and local adhesions of lung lobes to pericardium and adjacent ribs were evident. All the adipose tissues of abdomen, mesentery, and abdomen converted in to gelatinous material. Livers were fibrotic in nature and showed typical lesions of chronic venous congestion. Kidneys were pale and swollen and slightly fibrotic. Terminal small intestines showed proliferative lesions with moderate hyperemia the scrapings of these lesions were collected for microscopic examination. Peripancreatic adipose tissues were edematous and gelatinous. Severe dilatation and

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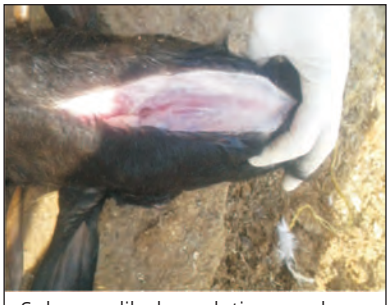
thickening of duodenums, mucosa showed small tiny pink dots with pin point hemorrhages. The scrappings of duodenum were collected for microscopy.

Microscopic examination of mucosal scrapings of intestines revealed presence of large numbers of coccidial ocytes, lymphocytes, macrophages and cellular debris. In the scrapings of duodenum large numbers of immature amphistomes were observed.

Hematological examinations reveled hemoglobin between 4 to 5.8 g% range, total leucocytic counts were between 13500 to 16700 / cumm. Platelets counts were between 210 lacks to 983 lacks / ml. packed cell volume was between 11 to 17%. In differential leucocytic count Neutrophil percentages were 33 to 45 %, lymphocytes percentages were 40 to 53 %, eosinophils were between 9 to 15 % and monocytes were between 4-9 %. Total protein was lying between 3.8 G% to 5.3 G%.

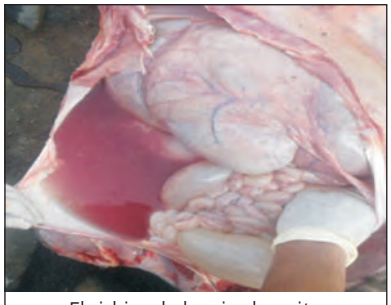
Treatment aspect: all of these 20 flocks were treated with Niclosamide+ fenbendazole, hematinics and Amprollium powder. Mortality in 18 flocks stopped within 3 days of treatment. Two flocks were not responded to this treatment; hence ivermectin + clorsolone used and after 3-4 days mortality of these two flocks were stopped. Complete recovery in these flocks achieved after 7 days.

Preventive measures advised: change the drinking water places, if possible use copper sulphate spray or any other moluscicidal spray.

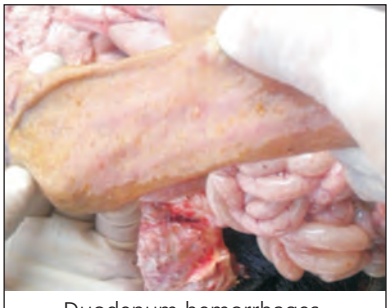


Sub mandibular gelatinous edema

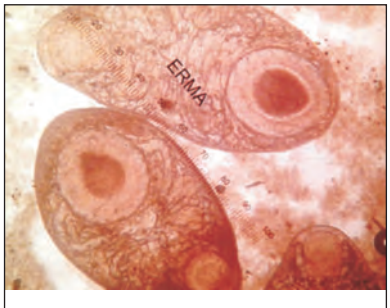
Fluid in abdominal cavity



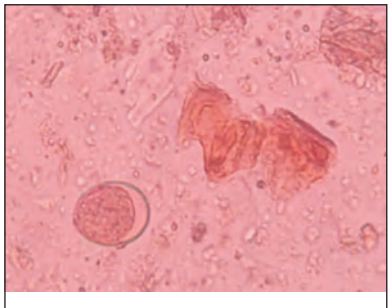
Fluid in abdominal cavity



Duodenum hemorrhages, thickening of mucosa and tiny pink amphistomes



Immature Amphistomes recovered from duodenum. Unstained 100X



Coccidial ocytes unstained 400X

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Kennel Cough - A Respiratory Threat

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(received 21/01/2017 - accepted 31/01/2017)

Abstract : Kennel cough is multi-etiological disease but Bordetella bronchiseptica, a Gram negative bacterium, has been considered the main causative agent (Erles et al., 2004). It causes canine infectious tracheobronchitis characterized by frequent dry and hacking coughing with high morbidity (80%). This organism has also reported to cause zoonotic infection in human beings. Pneumonia, sepsis and death have been reported after infection in human being. PCR is the most reliable diagnostic methods for B. bronchiseptica infection. Vaccination plays an important role and in addition adequate housing, proper cleaning and ventilation are critical factors in preventing outbreaks of kennel cough.

Key words: Kennel cough, *Bordetella Bronchiseptica*

Introduction

Dog population in India was around 10.2 millions in 2012 (Bradley and Kingnov, 2012) and is increasing rapidly with change in socio-economic structure. Kennel cough is described as an acute and highly contagious respiratory infection of dogs characterized by sudden onset, paroxysmal cough with variable expectoration and naso-ocular discharge with high morbidity (80%). The cough is typically described as "hoarse" or a loud "honking" sound. Canine infectious tracheobronchitis or kennel cough affects dogs of all ages. It is more common in dogs housed together in re–homing centres, boarding or training kennels, pet shops, shelters and veterinary clinics than in individually owned and stray dogs. Kennel cough is so named because the infection can spread quickly among dogs in the close quarters of a kennel or animal shelter. Outbreaks of kennel cough may affect more than 50% of dogs in a densely populated environment.

Aetiology

There are many agents that can cause kennel cough. The primary agents are *Bordetella bronchiseptica* and canine parainfluenza virus (Erles *et al.,* 2004). Other infectious agents are canine adenovirus, reovirus, canine herpes virus and mycoplasma etc.

Epidemiology

B. bronchiseptica has worldwide prevalence being a commensal organism of the respiratory tract in dogs. It is rarely implicated in human infections and is mainly observed to cause illness in those who are immunocompromised.

Host Range

B. bronchiseptica causes respiratory tract disease mainly in animals such as dogs, swine, cats, rats, mice, ferrets, foxes, turkeys, monkeys, sheep, skunks, guinea pigs, raccoons, horses, hedgehogs and rabbits, and occasionally in humans. The most important and best described natural infections occur in dogs and pigs (Lennox and Kelleher, 2009).

Pathogenesis

B. bronchiseptica is a Gram-negative, aerobic coccobacillus regarded as one of the principal

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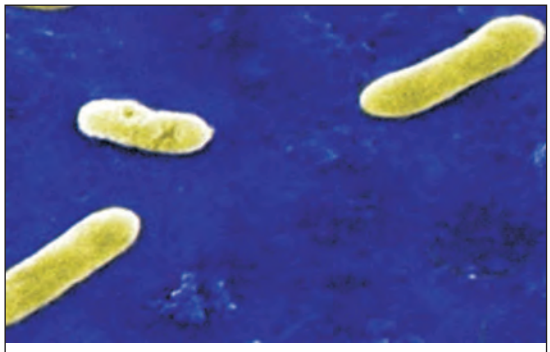

Figure 01: Scanning electron micrograph (SEM) depicting Gram-negative *Bordetella bronchiseptica*

causative agents of canine ITB (Rapuntean and Rapuntean, 2005). During an incubation period of approximately 6 days, *B. bronchiseptica* preferentially attaches to and replicates on the cilia of respiratory epithelium. *Bordetella* attaches to the surface of ciliated respiratory mucosa by means of adhesin molecules and releases potent toxins that causes ciliostasis and impair phagocytosis. *B. bronchiseptica* possesses several intrinsic mechanisms for evading host defenses. For example, fimbriae (hair like appendages extending from the cell membrane of *B. bronchiseptica*) recognize specific receptors within the respiratory tract. This allows *B. bronchiseptica* to colonize specific tissues where it then releases various exotoxins and endotoxins that impair the function and integrity of the respiratory epithelium and compromise the ability of the infected host to eliminate the infection.

Clinical findings

The time between exposure and onset of signs of canine ITB ranges from 3 to 10 days regardless of the agents. Two forms of the disease have been suggested. The most common uncomplicated form is associated with dry hacking cough, gagging and retching behaviour in dogs. The complicated form is characterised by wet cough and is common in puppies or immunocompromised dogs. Infected dogs may shed the pathogen for 2-3 months even after clinical recovery (Edinboro *et al.,* 2004).

Diagnosis

1) History and clinical signs

History of vaccination or uncertain vaccination along with coughing and other signs may give indication about the disease.

2) Routine haematology and biochemistry profiles

These are not diagnostic but monitor the health status of affected dogs. A leukogram characterized by neutrophilia, lymphopenia, and eosinopenia may be evident.

3) Bacterial culture and isolation

Bordetella species grow readily on Blood agar and MacConkey agar at an optimum temperature of 37°C. *B. bronchiseptica* strains have phase 1 (smooth, small, convex and virulent) and phase 4 (rugged, large, and non-virulent) colonies. Biochemically, all strains are positive for oxidase, catalase and citrate utilization test and are negative for fermentation of any sugar, production of gelatinase, DNAase, indole and H_2S (Denes *et al.,* 2006).

4) Isolation of Viral agent

Since the disease has multiple etiologies , so isolation of causal factor is to be done in different media. For isolation CPIV or CP2 ,nasal, pharyngeal or tracheal swab may be taken and specific cell lines may be used. Bacterial isolation can be done from nasal or pharyngeal swab in broth or an agar media while cultivation of mycoplasma require specific media.

5) Serological test

Due to its multiple etiology, it is difficult to

diagnose the disease by specific serological test.

6) Molecular Diagnosis

PCR has been exploited to attain a fast and accurate detection of *Bordetella* in clinical samples (Kumar, 2013).

Differential diagnosis

1) Coughing caused by parasitism, allergy, foreign body

2) Coughing due to Congestive heart failure

Therapy

Antimicrobials

Administration of an oral or a parenteral antibacterial agent reduces the duration of coughing in affected dogs. Although the antimicrobials prescribed should be ideally based on the results of bacterial culture and susceptibility. The isolate of B. bronchiseptica is sensitive to azithromycin, imipenem, ciprofloxacin, gentamicin, piperacillin + tazobactum, tetracycline, polymyxin-B and nalidixic acid whereas resistant to vancomycin, lincomycin, penicillin, cefotaxime, ceftazimide, nitrofurantoin, ceftriaxone and amoxicillin + clavulanic acid (Bhardwaj *et al.,* 2013).

Management of Outbreaks

Vaccination

Vaccination plays an important role in the prevention of infectious canine tracheobronchitis. Both viral and bacterial vaccines are available against most of the agents having a known pathogenic role in canine ITB. When the disease prevalence is high in an environment, current protocols should be modified to use at least two parenteral and one intranasal vaccine during the primary vaccination series. For adult dogs, annual vaccination should be given.

In addition to vaccination, adequate housing, proper cleaning and ventilation are critical factors in preventing outbreaks of ITB whenever dogs are housed within crowded environments.

Public health considerations

The zoonotic potential of canine *B. bronchiseptica* infection has been reviewed. At greatest risk, individuals who are immunocompromised resulting from conditions related to alcoholic malnutrition, haematologic malignancy, long-term glucocorticoid therapy, concurrent human immunodeficiency virus infection, splenectomy and pregnancy (Brady *et al.,* 2014). Pneumonia, sepsis and death have been reported after infection in human beings. (Shimoni *et al.,* 2000).

Conclusion

Kennel cough is one of the respiratory tract infection of dogs in close confinement. Being a multi-etiological disease, the identification of organism is little bit difficult. In developing countries including India, this disease has not been given much importance due to other important health problems in dogs thus majority of bordetellosis remain unnoticed. PCR is most accurate tool for the diagnosis of kennel cough so, some reliable and economical test need to be developed. Proper vaccination, adequate housing, proper cleaning and ventilation are critical factors in preventing outbreak of kennel cough.

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Your problems ?

Expert's solutions

An expert

Veterinary Parasitology

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Dr. V. Chengalva Rayulu is currently holding the position as Professor and University Head of Veterinary Parasitology in Sri Venkateswara Veterinary University, Tirupati. Started his carrier as Technical Manager during the year 1988 and later served as Veterinary Assistant Surgeon, Assistant Professor and Associate Professor. Actively involved in teaching, research and prepared practical manuals of Veterinary Parasitology. Developed monoclonal antibody based Latex Agglutination Test for the first time in India for diagnosis of Trypanosoma evansi infection in domestic and wild animals. Published more than 50 research articles in the journals of repute. Referee for 10 national and international journals. Resource Scientist/Guest Faculty, External Examiner, Question Paper setter and Member in the Panel of Selection Committee of various Universities. Presented research / invited papers and acted as Chairman, Co-Chairman and Rapporteur in several seminars / symposia / conferences / training programmes. Member/Life member of '9' professional societies including 'World Association for the Advancement of Veterinary Parasitology'. Executive Member, Joint Secretary and Treaurer of Indian Association for the Advancement of Veterinary Parasitology (IAAVP) and Vice-President of A.P. Veterinary Association. Received Antonie van Leeuwenhoek Research Award - 2015 in Parasitology.

1. How parasites/worms are transmitted from animal to animal?

It's difficult to pinpoint the transmission ways of internal parasites, as it mostly relies on the life cycle pattern and location of the worm inside the host. But usually, the gastrointestinal parasites are transmitted from animal to animal by contaminated pastures/feed/water. In the gut, the parasites lay eggs/ova that are shed in the animal's feces. Once reaching the ground, the eggs develop to infective larvae which find their way to the host by means of oral route. Ticks and haematophagous flies transmit blood protozoan and filarial infections. Lice and mange mites usually spread between animals by direct contact.

2. What should I do when I bring a new animal in the herd in order to control worm population?

Any time you purchase animals, don't go for introducing them to your farm or herd immediately. It's recommended to quarantine them for at least two weeks period. This gives some time for illness to show up and allows time to treat the new ones for internal parasite infection. That is why it is so important to give all your new arriving animals a "quarantine drench". If the new animals are carrying internal parasites that are resistant to your dewormer, you will need to use a different dewormer or a combination of dewormer drugs to check the entry of resistant parasites into the farm.

3. What are obvious signs of worm burden in animals?

If the animals have good access to feed yet are still losing condition, worm burden is a strong possibility. Parasites can create anemia from blood loss. Depending on the parasite, signs can vary from weight loss, diarrhoea, soiled hind quarters (messy hinds), dags (wool matted with dung) in case of sheep and goat, anemia with pale mucous membranes of the eyes and mouth, generalized weakness, lack of appetite, slow growth rate, coughing and "bottle jaw "condition (edematous swelling under jaw) eventually leading to death of the animals. But there are conditions where the wormy animals don't exhibit any of the above signs and absence of signs does not mean absence of worms. A proper worm test and confirmation by veterinarian remain the only way to diagnose infections.

4. How often should I drench my animals?

Young animals pick up parasites as soon as they start grazing, so the best time to begin drenching is at weaning age that is at three months old. After this they should be drenched every 28 days over the danger period of summer and autumn. However, in calves first deworming is advised at 10-14 day old in view of trans-mammary transmission of *Toxocara* sp.

5. Do the older animals in the herd need drenching?

Older animals resist worm burdens and are not mostly affected by internal parasites. However, if there is high burden in the farm or if the animal's immunity goes down due to other diseases, parasites may take upper hand and in such cases older animals get benefitted from a drench.

6. How do I minimize the risk of worm disease in my herd?

A reasonable goal is to deworm less than three times a year, and to deworm only those animals that need it. You can reach that goal by selecting the strongest animals and providing good management to them. If your animals require more frequent deworming, then you have a problem with your animals, your management, or both. Maintain your animals in good condition and use always safe and clean pastures for grazing. Animals that are under-nourished are far more susceptible to worms. Use clean water troughs and feed troughs; provide clean and dry lounging areas. Avoid overcrowding and there is no single schedule for deworming treatments that fit the needs of all farms and ranches. To avoid treating your animals when they don't need it, and to avoid delaying treatment until animal health is compromised, consult with your Veterinarian on how best to use these medicines. Haphazard use of deworming medicines can induce anthelmintic (dewormer) resistance of the parasites, and the medicines may permanently lose their efficacy to kill the gastrointestinal parasites found in sheep flocks and goat herds. Loss of anthelmintic efficacy becomes especially important if these drugs are over-used. Occurrence of fluke infections (immature amphistomosis, fasciolosis and schistosomosis) are seasonal and corresponds to the prevalence of snail population. Treat the animals for control of flukes during and after rainy season in those areas endemic for fluke infections.

7. How can I control ectoparasites ?

Ticks, lice, mites, fleas, bugs and flies are the

common ectoparasites infesting animals as well as poultry. They can be controlled by using insecticides such as Deltamethrin (Butox) or Amitraz. Managemental practices such as providing proper drainage, clearing of bushes etc., for arresting the breeding of ectoparasites around the animal or poultry houses is essentially required for effective control. Practice of dipping of sheep in tanks with insecticide is the best approach for control of ectoparasites.

8. How can I control blood protozoan parasitic diseases in animals?

Blood protozoan parasitic diseases such as theileriosis, babesiosis and trypanosomosis (surra) are responsible for production losses and eventually death in domestic livestock. Currently ther is no vaccine for prevention of these infections in India except Raksha vac T against theileriosis which is also limited in use. Since these are vector born, application of insecticides at regular intervals and also right chemotherapy is required to control blood protozoan parasitic diseases

Pet animals:

1. At what age should I go for deworming my pets?

Puppies can easily catch worms/eggs from their lactating mother; so it's always advisable to go for first treatment at 2 weeks age then at regular short intervals until they are 3 months old. Meanwhile bitch should also be treated at the same time. Kittens should have their first worming at 6 weeks age, and the lactating queens should also be treated to avoid further source of worms.

2. My Dog looks perfectly healthy. Do I still need to deworm it?

Yes obviously you need to deworm your healthy dog. Pets can pick up parasites/worms at anytime and from almost anywhere, but most of the times they won't exhibit obvious clinical signs and by the time they do display, it may be too late to handle.

3. How often should I deworm my pet/Dog?

The fact is, a dog can be infected and reinfected with parasites at any time. So there is every chance that a recently dewormed pet/ dog can still get reinfected within a week's time. Furthermore, worming treatments don't provide long lasting effect so the only way to be sure is to deworm on a regular basis. It is recommended to deworm your dog at least every 3 months to kill any worms present and prevent them developing to a stage where they can damage your dog's health. In certain situations more frequent treatments may be needed.

4. Can I catch parasites from my pets?

Fortunately, most parasites are host specific; however there are few parasites that can get transmitted between humans and pets. Some species of roundworms, hookworms, tapeworms and ectoparasites of dogs can infect people. Children are at higher risk than adults because of their playing habits, geophagia and less attention to hygiene.

5. Is diarrhoea in puppies after worming- a sign for good dewormer?

It's a misconception that an effective dewormer will cause diarrhoea in puppies. But, diarrhea in puppies after worming is not uncommon. Many pups will develop a reaction to the worming medication and shows signs of vomiting, diarrhoea and loss of appetite. These signs are not persistent and will subside off; if not then immediately discontinue the use of medication and consult your Vet.

6. How long does it take for a dog dewormer to start working?

It may take anywhere from 24 to 48 hours for a deworming medication to be effective after it has been administered. At this point of time some worms may begin to pass through their gut system. If the white cucumber shaped worms begin to appear in their stool one week after the dog dewormer usage, then it is an indication of presence tapeworm transmitted by fleas.

7. How can I identify if my pet has worm burden?

The truth is, Veterinarian's opinion is always needed to confirm the worm burden, as most of the dogs don't always show obvious clinical signs. But, there are some common signs that indicate your pet may be having worm infestation. The signs include scooting (where the animal drags its anus along the carpet/ floor), vomiting, diarrhoea, foul smelling stools, loss of appetite and in case of young puppies 'pot bellied' condition. If you look closely you can sometimes see tapeworm segments in infected dog faeces.

Equines:

1. What type of parasites can affect my horse?

The most common parasite to affect horses are Stronglyes, Ascarids, Tapeworms and bots. **Stronglyes (Blood/red worms)** can cause damage in the mesenteric arteries, eventually causing colic, gangrenous enteritis, or intestinal stasis and possibly rupture. They are active blood feeders and can lead to anemia, weakness, emaciation and diarrhea. Small redworms (Small strongyles/cyathostomes) can cause diarrhea, rapid weight loss as well as life-threatening colic. **Ascarids (roundworms)** are an issue with younger horses up to about 15 months of age because of their lack of immunization against the worms. Heavy infection can trigger weight loss, stunted growth, rough hair coat and/or pot-bellied appearance, and cause lethargy and/or colic. **Tapeworms** increase the risk of intestinal obstruction or rupture due to inflammation at the attached site. **Bots** get attach to the lining of the stomach and causes irritation, digestive issues and obstruction. Some pinworms lay eggs around rectum causing irritation.

2. How does a horse get worms?

Horses get worms when they are exposed to contaminated pastures or when kept along with infected horses. Contamination of feed and water with eggs/larvae of parasites is the main reason for picking up infection by susceptible animals. As the horse grazes, parasitic stages get ingested and develop to maturity.

3. When should I deworm my horse for the first time and how often do I have to do it?

One should begin the deworming of foals at the age of 6 weeks old. Foal's are open to infection with parasites especially round worms. Continue to deworm them once monthly until they reach 2 years of age. Age of the horse, level of exposure to parasitic stages, and type of wormer are all the factors that will affect the deworming schedule. Horses should be wormed routinely throughout the year for the control of roundworms, with strategic treatment given at specific times for the control of worm's most importantly encysted small red worms.

4. Do I need to deworm my horse for Tapeworms?

Treatment to tapeworms is recommended every 6 months.

5. What is the difference between strategic and routine worming?

A strategic worming programme involves the use of faecal worm egg counts (FWEC) throughout the year with extended dosing interval periods between treatments. Horses in this programme are treated only when FWEC results are above a specific level i.e., 200 eggs per gram. Care must be taken with this strategy, as FWEC do not give an accurate measure of worm burden and not accounting for larval forms. Routine worming is the use of equine anthelmintics throughout the year in accordance with the dosing schedule recommended by your Veterinarian that is targeted towards roundworms, tapeworms and bots.

Unknown Disease Kills 13 Cattle in Odisha State

INDIA - Outbreak of an unknown disease in agrarian areas of Odisha's Kendrapara district has claimed 13 cattle over the past one week, a veterinary official said today.

According to DNA India, unofficial reports, however, put the toll at 50.

The disease hit areas are mostly from Iswarpur and Dangmal gram panchayats close to the Bhitarkanika national park, the official said.

The veterinary units are on the job to contain the cattle disease. A vaccination drive is underway and over 200 cattle have already been vaccinated. As per symptoms observed from dead cattle, it appeared that the cattle were affected by SARA (Sub-Acute Ruminal Acidosis) disease, said Chief District Veterinary Officer (CDVO), Chaitnya Kumar Sethy.

The disease is yet to be diagnosed though it is suspected to be Sara from the symptoms. Blood samples of infected cattle were sent for laboratory test. Mass vaccination drive has been undertaken and veterinary surgeons are keeping close watch on the situation , the CDVO added.

Veterinary officials said the whole of the cattle population was being covered under the vaccination drive and were hopeful that the disease would be contained.

However, locals alleged that though the outbreak of the disease was reported more than a week back, the vaccination drive got underway only on Thursday.

Huge backlog of vacancies in the posts of veterinary surgeons and livestock inspectors has aggravated the situation further, the villagers said.

Around 50 milk-yielding cows have perished since past one week in these villages while nearly 100 cattle farmers are battling to save their domesticated animals from the deadly disease, the villagers said.

The remote villages are home to around 2000 cattle farmers. Besides cattle farming, fishing and crop cultivation are alternate livelihood sources.

Dalits and migrant scheduled tribe labourers constitute sizeable bulk of the demographic pattern of the backward villages.

(Source : From the cattle site)

Indian Cows to Get Unique Identification Code

INDIA - After AADHAR, the Indian government is jumping onto the next big unique identification scheme, but this time it's not for human beings. The government is all set to assign a 12-digit identification number to 88 million cattle in the country.

The move will help officials track the general health of cows and check for timely vaccinations. According to a report by The Economic Times, the government has set aside a budget of Rs 148 crore for the entire operation.

A special team of technicians equipped with 50,000 tablets, special tags and health cards aims at tagging 41 million buffaloes and 47 million indigenous and cross-bred cows that produce milk.

The tags will cost Rs 8 per piece and is built with a special light material that won't cause discomfort for them. The tag will contain the unique 12 digit number and the owner will be provided with a special health card to keep up with the vaccine schedule.

The technician will then update the unique code in their online data base.

(Source : From the cattle site)

Know the prestigious Institute

ICAR- Central Sheep and Wool Research Institute Avikanagar

The ICAR-Central Sheep and Wool Research Institute is a premier Institution of Indian Council of Agricultural Research engaged in research, education and extension activities on sheep and wool. It was established in 1962 in the hot semi-arid region of Rajasthan at Malpura. Now campus is known by the name of Avikanagar. The campus is spread over an area of 1591.2 hectare. The Institute has sanctioned posts of 88 scientists, 141 technical, 83 administrative and 151 supporting staff. It has three Regional Research stations in different climatic zones of the country: North Temperate Regional Station (NTRS) in temperate region at Garsa, Kullu in Himachal Pradesh, Southern Regional Research Centre (SRRC) in sub temperate region at Mannavanur in Tamil Nadu and Arid Regional Campus (ARC) at Bikaner in the arid region of Rajasthan.

Northern Temperate Research Station, Garsa: The North Temperate Regional Station (NTRS) was established in 1963 at Garsa, Kullu (Himachal Pradesh). In April 1976, this Station

was upgraded as Division of Fur Animal Breeding. During 1978, studies were extended to rabbit breeding for wool and meat. The station has elite flock of Fine Wool Synthetic sheep. The elite animals are made available to farmers of the region from station. The station has made sizable contribution in establishment of Angora rabbit farms and Angora shawl industries in the region.

Southern Regional Research Centre, Mannavanur: It was established in 1965 in sub-temperate region at Mannavanur (Tamil Nadu). An elite flock of Bharat Merino and Avikalin sheep suitable to cold climate has been established at the station. The station has made sizable contribution in establishment and popularization of broiler rabbits in the southern regions.

Arid Regional Campus, Bikaner: It was established in 1974 as Division of Carpet Wool and Karakul Pelt Production. The centre has 636 hectares of land. The campus is undertaking research on genetic improvement of Magra, Chokla and Marwari sheep breeds suitable for carpet wool production. The centre is contributing in increasing carpet wool production in the western Rajasthan through supply of elite rams of carpet sheep breeds.

Vision

Sustainable sheep production to address the issues and to inspire an exchange of ideas among experts, policy makers, stakeholders, industrial leaders and general public

Mandate

- Basic and applied research on sheep husbandry
- Dissemination of technologies for sheep productivity enhancement and management

Mission

- Enhancing mutton production through increasing prolificacy and genetic improvement through selection
- Improvement of sheep for wool production
- Development and improvement of technology for value addition in sheep products and by-products
- Disease surveillance, health care and disease diagnostic tools
- Validation, refinement & dissemination of developed technologies

Major Research Areas

- FecB gene introgression from Garole in non-prolific sheep for multiple births
- Genetic improvement of sheep for enhancing mutton and wool production
- Breeding of sheep for resistance / resilience to gastrointestinal nematodes
- Intensive feeding of lambs for enhancing mutton production
- Use of prickly pears in sheep feeding
- Ration balancing to reduce methane emission
- Melatonin receptor in sheep in relation to reproductive seasonality
- Genetic variability in immune response of sheep and goat for PPR and ET vaccine
- Indigenous impregnated sponges for oestrus synchronization and AI with chilled semen
- Accelerated lambing system (3 lambs in 2 years) to increase life time production

- Modified worm management through single strategic anthelmintic intervention during mid to late monsoon
- Targeted selective treatment (TST) approach to reduce use of anthelmintics
- Neonatal mortality losses
- Identification of adulteration in Pashmina fibre with other fibres
- Fibre rich and low salt mutton products
- Mozzarella cheese and paneer from sheep milk
- Carcass evaluation and yield
- Imparting training and dissemination of technologies on different aspects of sheep production

Infrastructure

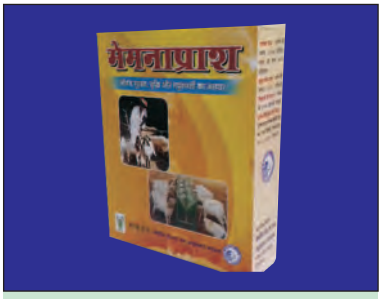
- Well-equipped laboratories for research in animal nutrition, physiology and reproduction, adaptation physiology, animal health, animal biotechnology, animal genetics, livestock product technology, wool fibre and textile chemistry.
- Sheep shades: Presently institute is maintaining around 4000 sheep and goats at six different sectors having all the basic required facilities.
- The germplasm maintained are Malpura, Patanwadi, Avishaan, Garole, Kendrapada, Garole x Malpura, Avikalin sheep and Sirohi goats at CSWRI, Avikanagar; Marwari, Magra and Chokla at ARC, Bikaner; Bharat Merino and Avikalin at SRRC, Mannavanur and Fine wool synthetic at NTRS, Garsa.
- Institute has wool processing plant and feed technology unit
- Guest house, PG hostel and Kisan Ghar facilities
- Auditorium, conference hall and committee room with AV aids
- Portable water reservoir
- Sheep washing facility

Technologies / products / processes developed

- Avishaan – A prolific genotype of sheep with more than 50% twinning
- Genetically superior Malpura sheep
- Magra: A lustrous carpet quality wool sheep
- Marwari: A robust sheep breed of arid zone
- Chokla: Best carpet wool breed of Rajasthan
- Genetically improved Avikalin sheep
- Bharat Merino: Fine wool producing sheep of India
- Improved sheep strain for fine wool production
- Fix time AI with short-term preserved liquid chilled semen
- Indigenous intra-vaginal sponges for estrus induction and synchronization in sheep flocks
- Accelerated lambing system (3 lambs in 2 years)
- Embryo transfer technique in sheep
- Ram semen freezing techniques
- Fat lamb production
- Supplementary feeding system

Avishaan -Prolific sheep

Avikasil-S for estrus synchronisation



Memnaprash milk powder for lambs

- Complete feed block technology for feeding animal during scarcity
- Supplementary multi nutrient blocks / Mixture
- Area specific mineral mixture
- Milk replacer (Mamnaprash) for lambs
- Prickly pear cactus silage for feeding sheep during scarcity
- Silage making in bags utilizing monsoon herbage
- Planned health programme for sheep flocks
- Modified worm management programme for sheep flocks
- Targeted selective treatment (TST) for management of haemonchosis in sheep flocks
- FROGIN: A software for forecasting GI nematodiasis in sheep of Rajasthan
- Bio-climatographs for GI nematodes
- PCR-SBT for detection of allelic variation in DQB1 and DRB3 of goat and DQA2 of sheep
- DNA test for identification of the FecB gene and its application in MAS programme in sheep
- DNA test for diagnosis of BZ resistance in H. contortus
- Identification of Cashmere (Pashmina) fiber from processed textile products by PCR-based technique
- Identification of adulteration of meat of sheep and goat by PCR-based technique
- Aesthetic and durable carpet from indigenous wool and Its blends
- Natural colour for wool and specialty hair fibre
- Development of woollen handicrafts from coarser wool
- Aesthetic and durable carpet from indigenous wool and its blends
- Angora rabbit hair - BM wool blended shawls
- Development of table top paddle operated Charkha for Cashmere (pashmina) spinning
- Development of pure Pashmina yarn using PVA as carrier fibre
- Natural dyes with antimicrobial and anti-moth properties for wool and specialty hairs
- Ornamental home furnishing from coarse

- wool braided yarn
- Fabric from fine wool of Dumba sheep
- Value added products - sheep meat and milk
- Organic sheep manure from wool waste
- Fat tail/rump sheep (Dumba): Extra ordinary growth and demand

Training and Capacity Building

Institute organizes the training programmes for

- Field Veterinarians - Recent advances in sheep production and health
- Women empowerment and artisan capacity building - Woollen and handicraft products
- Sheep and goat farmers – Sheep and goat rearing practices

The Institute provides training in the following areas for participants of foreign countries:

- Advances in sheep production and utilization
- Nutrition of range managed sheep
- Artificial Insemination in sheep
- Embryo transfer technology in sheep
- Marker assisted selection for prolificacy in sheep.
- Detection of anthelmintic resistance and its management
- Processing and value addition of wool and specialty hairs
- Strategies for improving biomass yield and nutritive value of semi-arid and arid range lands
- Pre- and post- ruminant feeding for augmenting lamb production

Consultancy areas

The Institute through a team of scientists and technical officers provides consultancy services to woolen industries, Central Wool Development Board, Commercial farms, Animal Husbandry Departments etc. on following areas:

- Sheep farming and economic
- Sheep diseases and prevention
- Reproduction and AI
- Feed and fodder development for sheep
- Meat products development
- Wool grading, processing and products
- Natural dying

Education

Institute has linkages and collaboration and entered into MoU for post graduate and Ph.D. programmes with following Universities and Institutions:

- RAJUVAS, Bikaner
- MAFSU, Nagpur
- CGKV, Durg
- NDRI, Karnal
- IVRI, Izatnagar
- Banasthali Vidhyapith, Tonk
- Mewar University, Chittorgarh
- IIS University, Jaipur
- SHIATS, Allahabad
- UPTTI, Kanpur

- IICT, Badhohi

Patents filed

- Indigenous progesterone impregnated vaginal sponges for estrus synchronization in sheep
- Method to deliver nematophagous fungus, Duddingtonia flagrans to sheep for biological control of Haemonchus contortus
- Area specific mineral-mixture pellets for augmenting reproduction and production in sheep
- Production of fermented probiotic feed, production protocol, fermentation conditions, drying, storage and uses thereof
- Fermentation vessel for conducting gas production studies (in vitro): fabrication, protocol and uses
- Low cost, indigenous cradle for safe restraining of sheep for pregnancy diagnosis
- Low cost, indigenous vaginal sponges for estrus control in buffaloes

Copy rights

- Computer software work- FROGIN (Forecasting for Rajasthan on ovine gastrointestinal nematodiasis) (SW-8118/2014)
- Cinematograph film work- semen collection and artificial insemination (AI) in sheep (CF-3786/2014)
- Cinematograph film work- estrus synchronization in sheep and goats (CF-3785/2014)

Services

- Supply breeding seed stocks on book value
- Vaccination and drenching
- Medicine and treatment of sick animals
- Wool procurement and processing
- Product manufacturing from procured wool
- Feed blocks/supplementary feed

Facilities

Institute extend following facilities to farmers / stakeholders / industries / entrepreneur on payment basis

- Testing of wool and woolen products
- Testing of meat and meat products
- Analysis of feed and fodder
- Disease diagnosis
- Semen analysis and pregnancy diagnosis
- AI in sheep with chilled semen
- Fec B genotyping of sheep
- Pashmina fibre detection in samples

Network Project on Sheep Improvement

The Network Project on Sheep Improvement (NWPSI) aims at genetic evaluation and improvement of indigenous sheep breeds

Breed	Location
Marwari	ARC, Bikaner
Muzaffarnagari	CIRG, Makhdoom
Deccani	MPKV, Rahuri
Nellore	SVVU, Palamner
Madras Red (Field)	TANUVAS Kuttupakkam
Magra (Field)	ARC, Bikaner

through selection for better growth and wool production. Presently, there are six cooperating centres of NWPSI in the country with its coordinating unit at ICAR-CSWRI, Avikanagar.

Mega Sheep Seed Project

The major objective of the project is improvement of indigenous sheep breeds in their respective breeding tracts by providing genetically superior germplasm to the farmers in terms of distribution of elite rams as well as estrus synchronization coupled with artificial insemination of the ewes with freshly diluted liquid semen. Presently, the project has five cooperating units.

Breed	Location
Chhotanagpuri	BAU, Ranchi
Mandya	KVAFSU, Bidar
Mecheri	TANUVAS, Chennai
Sonadi	RAJUVAS, Bikaner
Malpura	CSWRI, Avikanagar

Congratulations

Dr. Ramnath Sadekar honored with life-time achievement award

Dr. Ramnath D. Sadekar, editor of "The Blue Cross Book" has been honored with life-time achievement award by Senior Veterinarians' foundation, Maharashtra Pune, for his significant contribution in the areas of Veterinary Academics, research, extension and administration. The award was presented at the hands of Shri Bhonsale, Commissioner Animal Husbandry, Maharashtra Pune in the presence of Dr. Bhilagaonkar, Scientist IVRI and incharge of extension and training centre of IVRI, Pune. The award consisted of Rs. 5,000/- cash, a momento, a citation and traditional shall and shreephal.

Earlier, Dr. Sadekar had been presented with best teacher and best research worker award by Dr. Panjabrao Deshmukh Agril University Akola from where Dr. Sadekar retired as professor and head of the department of pharmacology and medicine.

Dr. Sadekar had also been a recipient of Dr. G. R. Murkibhavi and Dr. S. Swaminathan Gold Medals of Indian Veterinary Association for his clinical and research articles in the Indian Veterinary Journal.

MSD Animal Health congratulates Dr. Sadekar for his feats and wishes him happy and healthy post-retirment life.

Pioneer's Profile

Yadav, Mahendra Pal
Ex. Vice Chancellor, H.No. 365, Sector No. 45,
Gurgaon 122003, Haryana

Born in Surkhuroo, Bulandshahar, India on 2 June 1945. Educated at A. S. Inter College, Jahangirabad 1955-56; Chaubsia Inter College, Mohana, Bulandshahar 1957-59; DAV Inter College, Aligarh 1960-62; B.R. College, Agra 1962-63; Veterinary College, Mathura, 1963-68; Indian Veterinary Research Institute, Izatnagar, 1969-72; B.V.Sc & AH 1966; M.V.Sc. 1968; Ph.D. 1973.

Professor, Virology, 1981-82, and Prof. & Head, Division of Virology, 1982-87, Indian Veterinary Research Institute (IVRI), Mukteswar; Principal Scientist & In-charge Animal Health Unit, 1987-93, and Director, 1993-2000, National Research Centre on Equines, Hisar; Director, IVRI, Izatnagar, 2000-06; Vice-Chancellor, Sardar Vallabhbhai Patel Univ. of Agric. & Tech., Meerut, 2006-09.

Awards/Honours:

Chancellors Medal 1966: Lance Award, 61 Cavalry, India 1996; ICAR Special Award 1998; Major (Mrs.) Malika IAAVR Award 2001; OIE International Meritorious Award 2000; Distinguished Veterinarian Award 2002; Dr. P. Richard Masillamony Oration Award 2003; Vocational Education and Development Award 2003; Higher Education and Development International Award 2004; Order of Merit Award in Management 2004; Swadeshi Vigyan Puruskar 2004 of Vigyan Bharati; UP Council of Science & Technology Vigyan Gaurav Award 2004-05; NRDC Meritorious Invention Award 2005; World Intellectual Property Organization (WIPO), Geneva Award 2005; Dr. C.M. Singh Samman 2005; IAVPH Life Time Achievement Award 2006; Eminence Award 2007 (Society of Plant Research); World Institution Building Programme Life Time Achievement Award, 2008; Lakhi Ram Memorial Award 2008; Lalbahadur Shashtri Honor 2008; Padma Vibhushan Dr. M.S. Swaminathan Agricultural Scientist Award 2009; Dr. P. G.

Pandey Oration Award 2010 (IAVMI); Life Time Achievement Award, 2011 (ISACP); Dr. A. Lingard Memorial Award, 2012 by Indian Academy of Environmental Sciences; Dr. M. R. Dhanda Memorial Oration Award, 2012 (IAPH); Excellence in Virology Award- 2013 of Indian Virology Society(IVS); Prof. K. S. Bhagava Oration Award- 2016 (IVS). President, Indian Virological Society 1996-2003; President, IAVMI 1999 to date; President, IAUA 2006-07; President NAVS(I) 2011-13; FAO National Consultant; Consultant, Haryana Farmers' Commission, 2010-13; Secretary, National Academy of Agricultural Sciences (2014-16); Patron, Society of Plant Research (2008 to date).

Fellow:

National Academy of Veterinary Sciences; Indian Association for Advancement of Veterinary Research; Indian Virological Society; Indian Society of Veterinary Immunology & Biotechnology; Society for Immunology & Immunopathology; Royal Society of Crop Sciences.

Research Areas: Veterinary virology & bacteriology, infectious diseases, vaccinology & biotechnology

Address:

Ex. Vice Chancellor, H.No. 365, Sector No. 45, Gurgaon 122003, Haryana; [Tel: Res. (0124) 2382652, Cell: 09810820093; Email: yadav_mp@hotmail.com]

Secretary 1 Jan, 2014; Member Executive Council 1 Jan, 2011 to 31 Dec, 2013; Member Executive Council (Casual Vacancy) 21 Nov, 2009 to 31 Dec, 2010; Dr. P. Bhattacharya Memorial Award 2003-2004

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 :

Abstract :

Key words :

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.

We would appreciate if you kindly send us your manuscript (technical article) in Word File through e-mail.

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.

All manuscripts should be mailed to the following address:

E-mail : bluecrossbook@merck.com

"The Blue Cross Book",
MSD Animal Health,
Intervet India Pvt. Ltd.
Intervet House, 33, Pune-Nagar Road, (Behind Eden Gardens), Pune - 411014, India
Tel. (Direct): +91-20 66294723. Fax: +91-20-66050403,
Mobile : 09890623470.

MSD
Animal Health

The Science of Healthier Animals™

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

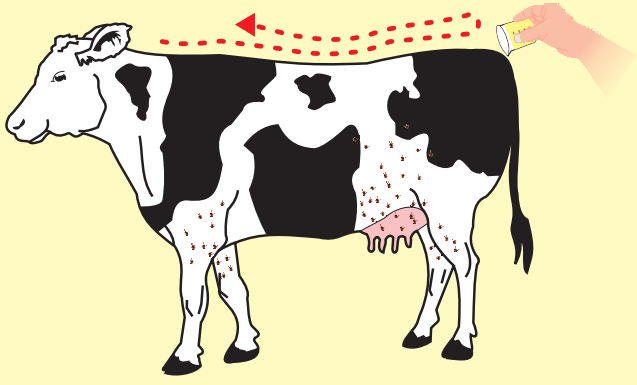
NEW INTRODUCTION

Introducing

OUT LINE™

POUR ON

The most Powerful Pour on Ectoparasiticide with Triple action



Safe in pregnancy

Withdrawal period :
Milk : 2 days
Meat : 20 days

Measuring cup

Hand glove

Can be used on Buffalo

YELINTRA*™

Faster relief for mastitis

Withdrawal period :
Meat & Offal : 14 days
Milk : 96 hours (8 milkings)

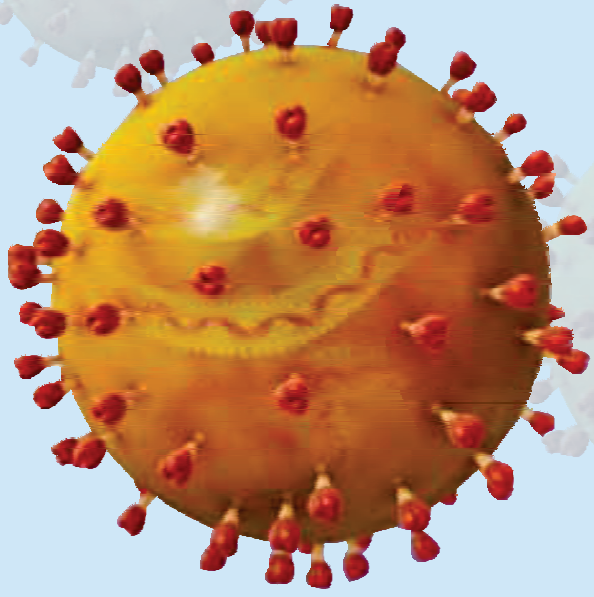
Most trusted by Farmers and Practitioners Across the Globe

*TM under registration

NEW INTRODUCTION

Nobilis® IB Ma5

An Early start on protection for a more profitable business



Nobilis® IB Ma5 : The Power of 5

1. Early immunity and early peak titer level
2. No interference with maternal antibody level
3. Superior technology - Plaque purified technology
4. Safe vaccine as it cause minimal respiratory reaction and safe to give at early chick stage
5. Nobilis® Ma5 and ND Clone 30 gives combine protection against IB and ND

MSD Animal Health

NEW INTRODUCTION

FARMQUAT®

Disinfectant for Breeder, Broiler and Layer Premises and Equipments

- 5th generation quaternary ammonium compound for use in presence of bird.
- Ability to work at high pH level.
- Highly effective in hard water condition.
- Non corrosive and prevents deposition of metal salts on equipment .

FARMPHENE®

Strong terminal disinfectant for empty shed

- Strong antimicrobial and antifungal action in presence of heavy organic matter load.
- Ability to kill most resistant form of spores.
- Combination of natural and synthetic phenol along with cresylic compounds.
- Ability to work in 1000 ppm water hardness level.

RECENT INTRODUCTION

Introduces...

The Best Weapon to Improve Fertility –

VM^{all}™ Chelated

Promotes Health Improves Fertility

1st time in India with 6 Chelated Minerals

Zn Cu Co Se Fe Mn

- Improvement of Fertility
- Optimum Milk Yield and Fat
- VM^{all} Chelated helps in:
- Better Growth
- Maintaining the Health of Livestock

Nutritional Value per Kg:

Vit A	20,00,000 IU
Vit D_3	2,00,000 IU
Vit E 50%	3,000 IU
Vit B_3 (Niacin)	1,000 mg
Calcium	230 g
Phosphorus	115 g
Zinc	9,600 mg
Magnesium	6,000 mg
Copper	4,500 mg
Manganese	3,900 mg
Iron	1,500 mg
Iodine	500 mg
Cobalt	200 mg
Selenium	20 mg

Available in 1 kg & 5 kg

Direction for use

- After calving : from day 5 to day 60
- Feed VM^{all} Chelated 25g to 50g/day/cow
- Or mix 100g VM^{all} Chelated per 10kg feed

MSD Animal Health

Global Leading Brand in Dry Cow Therapy

Cepravin®

Dry cow mastitis protection

Broad Spectrum — Action against all major mastitogens includes *Staphylococcus aureus* , *E.coli*, *Streptococcus uberis* , *Streptococcus dysgalactiae*

Long Acting for +/- 60 days — Cepravin' s long acting formula treats the existing infection and prevents new infection throughout the dry period

- Significantly lowers somatic cell count into following lactation
- The Ideal choice for dry cow therapy

Composition:

Each syringe contains 250 mg Cefalonium dihydrate as active ingredient

Indication:

For routine dry cow therapy to treat existing sub-clinical infections

Prevent new infections during dry period

Dosage:

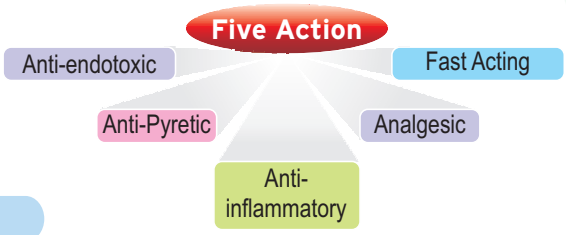
One syringe should be infused into the teat canal of each quarter immediately after the last milking of lactation

Withdrawal period:

Milk : 54 days after last treatment 96 hours after calving.

Meat & offals : Zero days

Finadyne™



- Fast acting, most potent NSAID
- Manages endotoxemia and inflammation

Composition :

Each ml contains:

Flunixin Meglumine IP	83 mg
Equivalent to Flunixin	50mg

Indications:

In Cattle, Sheep, Goat, Camel - for the control of inflammation and pyrexia associated with mastitis, respiratory disease and metritis

In Horse: For the alleviation of inflammation and pain associated with musculo-skeletal disorders

In Dogs: For use to alleviate Fever, Inflammation, endotoxemia or Sepsis

Withdrawal period:

Cattle - Milk: 24 hours after last treatment
Meat : 5 days from the last treatment Horse
Horse - Meat : 7 days from last treatment Pigs
Pig - Meat : 22 days from last treatment

Dose and Administration:

Cattle, Sheep, Goat and Camel: 1.1 mg to 2.2 mg Flunixin per kg body weight or 1 to 2 ml of Finadyne® injection per 45 kg body weight given by slow intravenous or intramuscular administration.

Horses: by slow intravenous injection for Musculo-skeletal disorder at rate of 1ml per 45 kg bodyweight (1.1 mg Flunixin/kg) once daily for up to 5 days

Dog: by intramuscular or slow intravenous at dose rate of 0.5-1 mg/kg body weight as a single dose or if necessary once a day for not more than 3 days.

MSD Animal Health

RECENT INTRODUCTION

CHIKVIT Liquid (VET)

COMPOSITION

Consists of Vitamin A, Vitamin B complex and Vitamin D along with Essential Trace minerals. It also contains sorbitol as an instant energy source

BENEFITS

Helps in releiving the stress during transport

USAGE

Regular Supplementation 0.5ml per litre of drinking water
In stress condition
1 ml/lt through drinking water

PRESENTATION

1 lt

RECENT INTRODUCTION

KNZ™

Globally accepted scientific way to provide salt

Free choice salt and mineral licks

UNIVERSAL MULTI
Daily support

Ensures a daily balanced intake - with iron

Available in 4 x 5 kg lick

Component	Value
Sodium chloride	> 99%
Magnesium	2000 mg/kg
Zinc	810 mg/kg
Iron	3000 mg/kg
Iodine	50 mg/kg

FERTILITY
Stimulates fertility

Stimulates fertility with higher level of selenium, iodine and vitamin E-plus yeast selenium for higher effectiveness

Available in 4 x 5 kg lick

Component	Value
Sodium chloride	> 99%
Magnesium	2000 mg/kg
Selenium	23 mg/kg
Selenium as yeast	2 mg/kg
Vitamin E	1000 IU/kg
Iodine	300 mg/kg

One 5 kg lick may be consumed by one animal in approximately 6 months.
(However the consumption depends on more than one factor).

Transmix™

- Eases the calving stress
- Improve immunity and waning the chances of retained placenta and metritis
- Optimises milk production

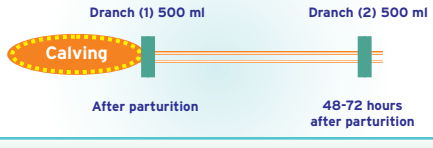
Instant & Sustained

Nutrients supplementation for maximizing profits in transition period

Precaution :

Take necessary precaution to avoid accidental entry into Trachea, Lungs & contact nearest veterinarian if animal exhibits any signs of discomfort

After calving



Recommendation

- Ketosis
- Negative energy balance
- Hypocalcemia

Floxidin™ LA (Vet)

(®Enrofloxacin 10%)

First Line Single Shot Therapy

- Broad spectrum action against gram positive and gram negative bacteria
- Antibiotic property remains for 48-78 hours.

Presentation: 50 ml

WITHDRAWAL PERIOD :
Milk : 84 hrs.
Meat : 14 days

Indications

- **Systemic Infections** - Mastitis, Metritis, Pneumonia, Gastro-intestinal infections
- **Soft Tissue infections** - Wounds, Post Surgical recovery, supportive treatment in cases of FMD

Dose of Floxidin™ LA (VET)

Body wt(Kg)	Floxidin™ LA (Ml)
30	3
50	5
100	10
200	20
300	30
400	40
500	50

At the dose rate of 1ml/ 10 Kg BW

HORMONES

Receptal® VET.

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

CHORULON®

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

FOLLIGON®

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each vial contains Pregnant Mare Serum Gonadotrophin injection (Freeze dried) 1000 IU	Females: • Anoestrus	Cow/Buffalo Anoestrus : 500 - 1000 IU IM	Box containing 5 vials (1000 IU each) with 5 vials of solvent
	• Super ovulation	Super ovulation: 1,500-3,000 IU, IM between day 8-13 of cycle	
	• Increase of fertility rate after progestagen pre-treatment	300-750 IU, IM, at the end of a progestagen treatment	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

Receptal®2.5 ml/5 ml

Estrumate™ 2 ml

Receptal®2.5 ml

Fixed time AI

7 days | 48 h | 16-24 h

Suggested times

Day 0 At any time

Day 7 4 PM

Day 9 4 PM

Day 10 8 AM to 3 PM

Synchronization of oestrus

Synchronization of ovulation

ANTI-INFECTIVE

COBACTAN® 2.5%

ACHIEVE MORE

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml of suspension contains 29.64 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) • Mastitis 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 Cattle : Meat : 5 days, Pig : Meat : 3 days Milk : 1 day

COBACTAN® LC

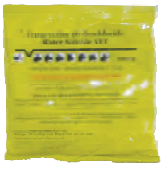
ACHIEVE MORE

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each syringe of 8 gm 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 (7 milkings) Meat : 2 days

Floxidin™ VET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Floxidin 10% injection : Each ml contains - Enrofloxacin I.P. 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 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:22 days Poultry : 5 days Pig, Sheep & Goat : 28 days

METRICEF™

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each single dose syringe of 19 g contains: Cephapirine Benzathine intrauterine suspension in pre filled syringe-500 mg	• Subacute/chronic endometritis in cows over 14 days postpartum • Repeat breeders (3 or more unsuccessful inseminations).	Single dose syringe to be administered intra-uterinely	Single dose (19 g) syringe provided with a separate disposable catheter and a glove. WITHDRAWAL PERIOD Meat & offals : 24 hours Milk :0 (Zero) hours

PARASITE CONTROL

butox® Vet

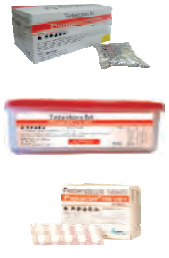
Highly effective & safe ectoparasiticide only for external use.
Ideally suited for control of ticks, mites, lice & flies of livestock, poultry, dogs & farm houses.

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Deltamethrin I.P. 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 6 ml, 15 ml, 50 ml & 250 ml with plastic measuring cup. WITHDRAWAL PERIOD : Milk : 4 milking/2 days Meat : 1 day for cattle & goat 7 days for sheep & pig



Panacur® VET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
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. I.P. Each 150 mg tablet contains 150 mg of active Fenbendazole. I.P.	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 tablet per 30 kg body weight & Panacur 1.5 gm bolus per 300 kg body weight (5 mg Fenbendazole per kg body weight). Dose for horses : 7.5mg/kg bw	Box of 1.5x2'-1.5 gm bolus Box of 5 x 2'- 3 gm bolus Box of 5 x 10'- 150 mg tablets. WITHDRAWAL PERIOD Milk : 4 days Meat : 8 days for large animals 14 days for sheep & Goat

Panacur® 25% Wettable powder (vet)

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each gram contains Fenbendazole I.P 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 : 4 days Meat : 8 days for large animals 14 days for sheep & Goat

PARASITE CONTROL

Panacur® 2.5% Suspension (VET)

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

Tolzan® Plus-L

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Oxyclozanide I.P. - 3.4% w/v Levamisole Hydrochloride I.P. - 2.5% w/v	• 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 : 7 days Meat : 14 days

Tolzan® F VET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml of suspension contains Oxyclozanide I.P suspension of 3.4% w/v	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. WITHDRAWAL PERIOD Milk : 7 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).	Large Animals : 5-20 ml. Small Animals : 1-3 ml. In chronic conditions- Large Animals : 2.5-5 ml Small Animals : 1-2 ml.	Vial of 10 ml and 30 ml Now also available 100 ml vial

VM^{all}™

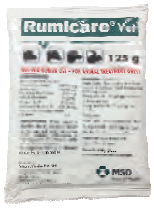
CONTENTS PER KG	BENEFITS	DOSAGE	PRESENTATION
Each Kg contains a nutritional value of : Cobalt 120mg, Copper 1000mg, Magnesium 5000mg, Iron 2500mg, Potassium 100mg, Manganese 2000mg, Flourine 60mg, Calcium 150g, Selenium 10mg, Vit A 1200000 IU, Vit D3 120000 IU, Sulphur 0.70%, Vit E 1200 IU, Iodine 300mg, 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

CONTENTS PER KG				BENEFITS	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	6000 mg	Calcium	225 g			
Manganese	2200 mg	Phosphorus	90 g			
Potassium	100 mg	Niacinamide	1000 mg			
Sodium	8 mg	Biotin 2%	500 mg			
Sulphur	1%	Bioactive				
Zinc	9000 mg	chromium	65 mg			

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 B_6 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 sachet

Avilin® Vet

For quick relief from allergic manifestations.

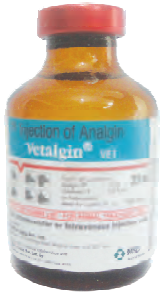
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains: Pheniramine maleate IP 22.75 mg.	Itching due to eczema, dermatitis, urticaria, skin oedema, insect bites, photo-dermatitis, rhinitis, tail eczema in horses, stomatitis & inflammation of the hooves of cattle, serum sickness, paresis during 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 of Avil 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 : Cattle Sheep & Goat : 5 days Pig : 28 days

Vetalgin® VET



Highly effective analgesic, antispasmodic, antirheumatic & antipyretic agent.

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Analgin I.P. 0.5 g Chlorbutol (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

COMPANION ANIMAL

Nobivac®:Puppy DP

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each 1 ml dose contains : live infectious canine distemper virus strain Onderstepoort minimum 5.0 $\log_{10}$ $TCID_{50}$ Live infectious canine parvo virus strain 154 minimum 7.0 $\log_{10}$ $TCID_{50}$	Active immunization of dog against CDV and CPV.	Reconstitute one vial of Nobivac Puppy DP in one vial of Nobivac Solvent & inject subcutaneously.	One box contains 10 vials of 1 dose.

Nobivac®:DHPPi

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each 0.5 ml dose contains : Live infectious canine distemper virus (CDV) strain Onderstepoort at least 4.0 $\log_{10}$ $TCID_{50}$ Live infectious canine adeno virus type 2 (CAV_2) strain Manhattan LPV_3 at least 4.0 $\log_{10}$ $TCID_{50}$ Live injections canine parvo virus (CPV) strain 154, at least 7.0 $\log_{10}$ $TCID_{50}$ Live injections canine para-influenza virus (CPI) strain cornell at least 5.5 $\log_{10}$ $TCID_{50}$	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 interrogans serotype Canicola strain Ca-12-000 $\geq$ 957 units/ml and Leptospira interrogans serotype Ictero haemorrhagiae strain 820K $\geq$ 625 units/ml	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 dose contains rabies virus (Pasteur RIVM Strain) inactivated $\geq$ 2 IU	For the active immunisation of healthy dogs, cats, cattle, sheep, goats, horses and in principle all healthy mammals against Rabies & can be used for both (prophylactic immunisation & post bite therapy.	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 1 ml dose contains : Rabies virus inactivated antigen suspension $\geq$ 3.0 IU Leptospira interrogans sero group Canicola $\geq$ 40 hamster PD_{80} Leptospira interrogans sero group icterohaemorrhagies $\geq$ 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

Nobivac® KC

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each (0.4 ml) dose Contains Brodetella bronchiseptica strain B-C2 - > 108.0 CFU and canine para influenza virus stain Cornell > 103.0 TCID50	Active immunization of dogs against Kennel Cough.	Nobivac KC aims to make administration as easy as possible: ● Low 0.4 ml dose ● Single nostril only Can be used with or without applicator	One box contains 5 vials of dose and 5 vials of diluent along with one applicator

Taktic® 5% EC

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Amitraz I.P. 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 & lice at weekly intervals. Taktic to be used as dip or spray	Glass bottle of 25 ml with plastic measuring cup

Taktic® 12.5% EC

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Amitraz I P 125 mg	It is indicated for the topical treatment of Demodectic & sarcoptic Mange, ticks & lice in dogs	Mixing Rate/ lit of water Demodectic Mange – 4 ml Sarcoptic Mange – 2 ml Ticks & Lice – 2 ml In severe cases of infestation a second treatment is recommended 5-10 days after the first.	Glass bottle of 25 ml with plastic measuring cup

San Coat®

NUTRITIONAL VALUE	BENEFITS	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)

DELVOSTERON®

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains proligestone Injection 100 mg	Suppression & postponement of oestrus in the bitch, treatment of pseudo pregnancy in the bitch, suppression and postponement of oestrus in the queen and suppression and postponement of oestrus in the ferret.	Dogs 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

DERMA STRENGTH™

NUTRITIONAL VALUE		BENEFITS	DOSAGE	PRESENTATION
Active Ingredients per 1 tablet :		• Collagen production • Skin texture • Circulation • Immune system response and circulation • Tissue recovery • Normal histamine levels • Provides support during allergy season	Directions for use or as directed by a veterinarian : Give 1 tablet per 10 kg of body weight daily. If giving more than 1 tablet daily, divide between AM and PM.	30 tablet
Methylsulfonylmethane (MSM)	75 mg			
N, N-Dimethylglycine Hcl (DMG	50 mg			
DL-Methionine	50 mg			
L-Cysteine	50 mg			
Grape Seed (Vitis vinifera) Extract	30 mg			
Ascorbic Acid (Vitamin C)	25 mg			
L-Proline	25 mg			
Perilla (Perilla frutescens) seed Extract	20 mg			
dl-alpha Tocopheryl Acetate (VitaminE)	10 IU			
Zinc (Zinc Citrate)	5 mg			
Hyaluronic Acid (HA)	5 mg			
Niacinamide (Vitamin B3)	4 mg			
Retinyl Acetate (Vitamin A)	37 IU			

CANINE PLUS™

NUTRITIONAL VALUE		BENEFITS	DOSAGE	PRESENTATION
Guaranteed Analysis Represents Minimum Levels per Tablet Unless otherwise Specified :		• Enhances immunity, support bone formation. Blood formation • Nerve formation, skin health, general health, antistress and antioxidant function	Directions for use or as directed by a veterinarian : Under 20 kg : 1 tablet daily Over 20 kg : 2 tablets daily When more than one tablet per day is required, dividing between AM and PM is optional.	30 and 60 tablet presentation
Moisture (max	5.655%			
Methionine	3.75 mg			
Calcium (6.25%)	37.5 mg			
Phosphorus (3.13%)	18.75 mg			
Potassium (0.03%)	0.187 mg			
Magnesium (3.13%)	18.75 mg			
Iron (3750 ppm)	2.25 mg			
Copper (3.33 ppm)	0.002 mg			
Zinc (1250 ppm)	0.75 mg			
Iodine (10 ppm)	0.006 mg			
Selenium (3.33 ppm)	0.002 mg			
Vitamin A	450 IU			
Vitamin D3	37.5 IU			
Vitamin E	3.75 IU			
Thiamine (Vitamin B1)	3.75 mg			
Riboflavin (Vitamin B2)	1.875 mg			
Panthothenic Acid	3.75 mg			
Niacin	3.75 mg			
Vitamin B6	1.875 mg			
Folic Acid	0.001 mg			
Vitamin B12	0.001 mg			
Choline	3.75 mg			
Biotin	0.001 mg			
Ascorbic Acid (Vitamin C)	9.375 mg			
Bromelain (Pineapple)	0.675 GD Units			

COMPANION ANIMAL

BLADDER STRENGTH

NUTRITIONAL VALUE		BENEFITS	DOSAGE	PRESENTATION
Active Ingredients per Tablet :		• Deals with urinne incontinence problems in male and female dogs which is due to less level of estrogen on testosterone. • These dogs are basically geriatric dogs, bitches post sparying , animals with poor anatomical disposition or having urinary tract infection.	Give one tablet per 14 Kg or 30 ponds of body weight. half tablet for animal - less than 30 Ponds of weight If giving more than one tablet, divide between AM and PM	30 tablets presentation
Pumkin Seed Powder	150 mg			
Rehmannia glutinosa (root) Powder	150 mg			
Wild Yam Extract	150 mg			
Soy Protein Extract	100 mg			
Corn Silk Powder	60 mg			
Saw Palmetto Extract	60 mg			
OliveLeaf (15% Oleuropein) Extract	50 mg			
Pyridoxine HCl (Vitamin B6)	25 mg			

CARDIO STRENGTH™

NUTRITIONAL VALUE		BENEFITS	DOSAGE	PRESENTATION
Active Ingredients per Capsule :		• Dogs and cats with pre-existing sub-optimal cardiovascular functions • Breeds of dogs and cats that are predisposed to cardiovascular stress • Support of geriatric patients	Directions for use or as directed by a veterinarian : Cat : Give 1 capsule daily. Dogs : Give 1 capsule, per 10 kg of body weight, daily. If giving more than 1 capsule, divide between AM and PM.	30 and 60 tablet
L-Carnitine HCl	125 mg			
L-Taurine	125 mg			
N, N-Dimethylglycine HCl	25 mg			
d-alpha Tocopheryl Succinate (Vitamin E)	30 IU			
Coenzyme Q10	10 mg			
Folic Acid	0.9 mg			
Magnesium (as Magnesium Citrate)	0.5 mg			
Potassium (as Citrate/Malate)	.01 mg			
Selenium (as Sodium Selenite)	0.007 mg			

GLYCOFLEX®

NUTRITIONAL VALUE		BENEFITS	DOSAGE	PRESENTATION
Active Ingredients per Tablet :		• Glyco FLEX Canine represents our comprehensive support for dogs needing moderate joint support. • These delicious chewable tablets are also recommended for adult and maturing dogs, sporting and working breeds as well as support normal recovery after orthopedic surgery.	Directions for use or as directed by a veterinarian : Up to 15 kg :½ tablet daily 15.5 kg-30 kg : 1 tablet daily 30.5 kg-45 kg : 2 tablet daily 45.5 kg & over : 2 ½ tablets daily If giving more than 1 tablet, divide between AM and PM.	30 and 60 tablet presentation
Glucosamine HCl (Shrimp and Crab)	375 mg			
Pena Canalicus (Glycomega™ brand Green Lipped Mussel)	300 mg			
Methylsulgonylmethane (MSM)	250 mg			
N, N-Dimethylglycine HCl (DMG)	50 mg			
Manganese (as Mn Proteinate)	5 mg			

RENAL ESSENTIALS

NUTRITIONAL VALUE		BENEFITS	DOSAGE	PRESENTATION
Active Ingredients per Tablet :		• Renal circulation • Immune and antioxidant defense system function • Homocysteine balance • Normal fluid retention • Stress management • Kidney and liver function • Normal detoxification	Directions for use or as directed by a veterinarian : Give 1 tablet per 10 kg of body weight, day For dogs less than 7 kg, give 1/2 tablet daily If giving more than 1 tablet, divide between AM and PM.	45 tablets presentation
Astragalus Root Powder	60 mg			
Rehmannia glutinosa Root Extract	50 mg			
Nettle (Urtica dioica) Seed Extract	50 mg			
Cordyceps sinensis Extract	50 mg			
Lecithin	50 mg			
L-Arginine	50 mg			
N, N-Dimethylglycine HCl (DMG)	25 mg			
Potassium (K Gluconate)	8.25 mg			
Inositol	8 mg			
Pyridoxal 5-Phosphate (Vitamin B6)	8 mg			
Thiamine (Vitamin B1)	4 mg			
Riboflavin (Vitamin B2)	4 mg			
Choline	4 mg			
Folic Acid	0.15 mg			
Methylcobalamin (Vitamin B12)	0.05 mg			

POULTRY PRODUCTS

Live Vaccine

Nobilis® Gumboro 228E

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Live Gumboro disease virus strain 228E at least 2.0 log_{10} EID_{50}	The vaccine is recommended for active immunization of chicken against Gumboro Disease (IBD)	One dose per bird through drinking water	1000 ds 2500 ds

Nobilis® Gumboro D78

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Live Gumboro disease virus strain D78 at least 4.0 log_{10} $TCID_{50}$	The vaccine is recommended for active immunization of chicken against Gumboro Disease (IBD)	One dose per bird through drinking water	1000 ds 2500 ds

Nobilis® ND Clone 30

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Live Newcastle Disease strain Clone 30 at least $10^{6.0}$ ELD_{50}	The vaccine is recommended for active immunization of chicken against Newcastle Disease	One dose per bird through drinking water, spray, intranasal/intra ocular	1000 ds 2500 ds 5000 ds

Nobilis® IB H120

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Live Injectious Bronchitis virus strain H120 at least 3.0 log_{10} EID_{50}	The vaccine is recommended for active Immunization of chicken against Infectious Bronchitis	One dose per bird through drinking water, spray, intra-nasal / intra-ocular	1000 ds 2500 ds 5000 ds

Nobilis® MG 6/85

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Live Mycoplasma gallisepticum strain MG 6/85 minimum $10^{6.9}$ CFU	The vaccine is recommended for active immunization of chicken to reduce the clinical signs of Mycoplasma gallisepticum infection.	One dose per bird through intraocular	1000 ds

Cell Associated Vaccine

innovax™ ND-SB1

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each lyophilised ampoule per dose (1 ml) contains : Live Turkey Herpes virus strain HVT/NDV-F at least 1534 PFU/bird Marek's disease virus serotype 2 strain SB-1 at least 1514 PFU per bird dose	The vaccine is recommended for active immunization of chicken against Marek's Disease (MD) and Newcastle Disease (ND)	0.2 ml injection subcutaneously per chick in the neck	2000 ds 4000 ds

Inactivated Vaccine

Nobilis® MG inac

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Inactivated Mycoplasma gallisepticum strain MG 6/85 NLT 0.23 units	The vaccine is recommended for active immunization of chicken against infections caused by Mycoplasma gallisepticum.	0.5 ml S/C	500 ml (1000 ds)

Nobilis® E. coli inac

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each 0.5 ml dose contains : F11-antigen Suspension containing 100 µg F11-68.3 mg FT-antigen Suspension containing 100 µg FT-68.3 mg	The vaccine is recommended for passive immunization of broilers against colibacillosis by vaccination of broiler breeders	0.5 ml S/C or I/M	500 ml (1000 ds)

Nobilis® Salenvac T

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each ml contains, Formalin killed cells of Salmonella Enteritidis (phage type 4 strain 109) : 2 x 10^9 cells inducing $\geq$ 2 RP*, Formalin killed cells of Salmonella Typhimurium DT104 : 2 x 10^9 cells inducing $\geq$ 2 RP* (*relative potency)	The vaccine is recommended for active immunization of chickens against S. enteritidis and S. typhimurium and to give passive immunity against these agents in the progeny	0.1 ml for day-old chicks and 0.5 ml for older birds I/M	500 ml (1000 ds)

Nobilis® Newcavac

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each 0.5 ml dose contains: Inactivated ND virus (Clone 30) inducing $\geq$ 4 $\log_2$ HI Unit per 1/50th of a dose or $\geq$ 50 PD_{50} units/dose	The vaccine is recommended for booster vaccination of layers and breeding stock for protection against Newcastle Disease throughout the laying period	0.5 ml S/C or I/M	500 ml (1000 ds)

Nobilis® ND Broiler

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each 0.1 ml dose contains: Inactivated Newcastle Disease virus (Strain Clone 30) cantoning $\geq$ 20 PD_{50} units/dose or inducing $\geq$ 4 $\log_2$ HI Unit per 1/50 dose	The vaccine is recommended for the vaccination of Newcastle Disease in day-old chicks in areas where ND is endemic	0.1 ml S/C or I/M	200 ml (2000 ds)

Nobilis® Corvac

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each 0.5 ml dose contains: Inactivated Avibacterium paragallinarum Strain 083 (serotype A), at least 1 CPD_{70}*, Strain Spross (serotype B), at least 1 CPD_{70}, Strain H-18 (serotype C) at least 1 CPD_{70}. (*CPD_{70} : 70% chicken protective dose)	The vaccine is recommended for protection against Avibacterium paragallinarum infections in chicken	0.5 ml S/C	500 ml (1000 ds)

Nobilis® Coryza

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each 0.25 ml dose conrains : Inactivated Avibacterium paragallinarum Strain 083 (serotype A) at least 1 CPD_{70}, Strain Spross (serotype B) at least 1 CPD_{70}, Strain H-18 (serotype C) at least 1 CPD_{70}	The vaccine is recommended for protection against Avibacterium paragallinarum infections in chicken.	0.25 ml I/M or S/C	250 ml (1000 ds)

Nobilis® Reo inac

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Inactivated Reovirus strains 1733 and 2408, inducing $\geq$ 7.4 $\log_2$ ELISA units/dose per 1/50th dose	The vaccine is recommended for booster vaccination of breeding stock against Avian Reovirus to protect their offspring against Avian Reovirus infections	0.5 ml S/C or I/M	500 ml (1000 ds)

Nobilis® G + ND

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Inactivated infectious Bursal Disease virus (Strain D78) inducing $\geq$ 14.5 $\log_2$ VN units/dose, Inactivated Newcastle disease virus (Strain Clone 30) inducing $\geq$ 4 $\log_2$ HI units per 1/50th of a dose or containing $\geq$ 50 PD_{50} Units/dose	The vaccine is recommended for booster vaccination of future breeders to protect against Newcastle Disease throughout the laying period, and to induce high maternal antibody levels against infectious Bursal Disease in their offspring.	0.5 ml S/C or I/M	500 ml (1000 ds)

Nobilis® IB + ND

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains: Inactivated Infectious Bronchitis virus (strain M41) inducing $\geq$ 6.0 $\log_2$ HI units/dose, Inactivated Newcastle Disease Virus (Clone 30) inducing 4 $\log_2$ HI units per 1/50th of dose or $\geq$ 50 PD_{50} units/dose	The vaccine is recommended for the booster vaccination of layers and breeding stock for protection against Newcastle Disease and the Massachusetts type of Infectious Bronchitis.	0.5 ml S/C or I/M	500 ml (1000 ds)

Nobilis® IB multi + ND

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Inactivated Infectious Bronchitis virus (Strain M41) inducing $\geq$ 4.0 $\log_2$ VN units/dose, IB virus (Strain D249G) inducing $\geq$ 4.0 $\log_2$ VN units/dose, Inactivated Newcastle Disease virus (Strain Clone 30) inducing $\geq$ 4.0 $\log_2$ HI units per 1/50th dose or containing $\geq$ 50 PD_{50} units/dose	The vaccine is recommended for booster vaccination of layers and breeding stock for protection against the Massachusetts and D207/D274 (and related nephropathic) serotype of Infectious Bronchitis and Newcastle Disease.	0.5 ml S/C or I/M	500 ml (1000 ds)

Nobilis® IB + G + ND

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Inactivated Injections Bronchitis virus (strain M41) inducing $\geq$ 6.0 $\log_2$ HI units, Inactivated Injections Bursal Disease virus (Strain D78) inducing $\geq$ 14.5 $\log_2$ VN units, Inactivated Newcastle Disease Virus (Strain Clone 30) inducing $\geq$ 4 $\log_2$ HI units per 1/50th of a dose or Containing $\geq$ 50 PD_{50} units/dose	The vaccine is recommended for breeding stock: as a booster vaccination to protect against Newcastle Disease and the Massachusetts serotype of Infectious Bronchitis, and to induce high maternal antibody levels against Infectious Bursal Disease in their offspring	0.5 ml S/C or I/M	500 ml (1000 ds)

Nobilis® Reo + IB + G + ND

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Each dose contains : Inactivated Injections Bronechitis virus (Strain M41) inducing > 6.0 log_2 HI units Inactivated Injections Bursal Disease virus (strain D78) inducing > 14.5 log_2 VN units Inactivated NDV (Strain Clone 30) > 4 log_2 HI units per 1/50th of dose containing > 50 PD_{50} units/dose Inactivated Reo virus (Strain 1733 & 2308) inducing > 7.4 log_2 ELISA.	For vaccine of Chicken against disease caused by Reo-virus, infectious Bronchitis virus of Massachusetts type Newcastle Disease virus & injections bursal disease virus.	0.5 ml S/C or I/M	500 ml (1000 ds)

Feed Supplement

Enradin®

CONTENTS PER KG	BENEFITS	INCLUSION RATE	PRESENTATION
Each 1 Kg of Enradin contains 80 gm of Enramycine HCL	Helps in ease the incidence of sub-clinical necrotic entritis in chicken	5-10 ppm (63-125 gm) per ton of feed	20 Kg Withdrawal period - 7 days Avoid use in laying hens

Amnovit®

CONTENTS PER KG	BENEFITS	INCLUSION RATE	PRESENTATION
Scientifically Balance formulation of vitamins and amino acids	Helps in relieving the stress conditions by supporting vitamins and minerals	Through water 1gm/lit for 5-7 days Through feed 500gm/ton for 5-7 days	1 Kg

Pharma Product

Floxidin™

COMPOSITION	INDICATIONS	DOSE & ROUTE	PRESENTATION
Enrofloxacin 10% oral solution	The product is recommended for treatment of the common infections caused by gram-positive, gram-negative, anaerobes and mycoplasma species	10 mg per kg BW for 3-5 days	5 Lt Withdrawal period - Meat - 8 days Eggs - Stop using 14 days before laying

VAC-SAFE®

CONTENTS	BENEFITS	INCLUSION RATE	PRESENTATION
An effervescent tablet that dilutes easily and neutralizes the chlorine in the water	Helps in improving the quality of drinking water during vaccination	1 tablet /100 Lt water	Box of 30 tablet

A trusted source for comprehensive animal health solutions

Today's Merck is a global healthcare leader working to help the world be well. MSD Animal Health, known as Merck Animal Health in the United States and Canada, is the global animal Health business unit of Merck. MSD Animal Health offers veterinarians, farmers, pet owners and Governments the widest range of veterinary pharmaceuticals, vaccines, health management solutions and services. MSD Animal Health is dedicated to preserving and improving the health, well being and performance of animals. It invests extensively in dynamic and comprehensive R & D resources and a modern, global supply chain. MSD Animal Health is present in more than 50 countries, while its products are available in some 150 markets.

For more information,

visit www.msd-animal-health.co.in

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