The Blue Cross Book

For the advancement of the veterinary profession

MSD
Animal Health

27

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Intervet India Pvt. Ltd.
33, Pune-Nagar Road, Viman Nagar, Pune-411014. India
Ph. No.: +91 20 66050400/01, Fax: +91 20 66050403
E- mail : info.india@merck.com www.msd-animal-health.co.in

From Editor's Desk

The Editorial Board of Blue Cross Book is happy to bring out its 27th volume. The relaunching of "Blue Cross Book" from its 25th volume (October 2010) has evoked considerable response from the fellow professionals as is evidenced by the flow of articles and feedback we have been receiving.

The 27th volume has brought forward some important topics. 'Use of oxytocin for milk let down' has been a matter of hot discussions, of course, without going into its scientific aspects. The effects of Oxytocin in animals as well as in human health are always debated. The 'Blue Cross Book' has tried to provide answers for myths about Oxytocin. Mysthenia Grevis, though as critical in canines as in human beings, has been seldom discussed. The Veterinarians dealing with canines may enrich themselves through the article on this subject.

Infertility or reduced reproductive activity among dairy animals is a matter of great concern, not only to dairy owners, but also to practicing Veterinarians. Hormonal deficiency or imbalance is being recognized as an important causative factor for reduced fertility and Veterinarians are now more inclined to resort to hormonal therapy to deal with delayed puberty, anoevstrus, postpartum anoestrus etc. A caution is, however, needed in the use of hormones. Though seem clinically effective, it shall be more rational if accompanied with laboratory investigations and proper nutritional management.

The present volume brings forth a important field study, which claims 'Theilariasis' as an emerging protozoan disease in buffaloes also. Earlier, this disease was considered limited to cattle, more to crossbred cattle, in India. The field Veterinarians may detect and report such cases to 'Blue Cross Book' for publication, so that its importance can further be emphasized.

The readers are appealed to strengthen the efforts of 'Blue Cross Book' for professional advancement through their feedback and contributions.

Dr. Yash Goyal
Managing Director,
MSD Animal Health

Fellow Professionals,

MSD Animal Health wishes a "Happy Festive Season -2012" to all the readers of "Blue Cross Book". It has been the endeavour of MSD Animal Health, not only to heighten the health and productivity of livestock, but also to widen the knowledge horizon of those who deal directly with the health and productivity of livestock. The publication of "Blue Cross Book" is one such effort through which we publish review articles clinical trials, clinical reports and many other important professional topics, which are helpful to a Veterinarian in his day to day working. This effort of MSD is being highly acclaimed as evidenced by the feedback we receive from the Veterinary fraternity.

I appeal to all academicians and scientific community, research workers and veterinarians working in the coveted areas of livestock health and productivity, to share their knowledge, expertise and experience by contributing through articles. This shall enrich the professional outlook of a field Veterinarian and carry forward the fruits of scientific knowledge to the ultimate beneficiary - a livestock keeper.

Hope "Blue Cross Book" becomes your partner in profession.

Best wishes,

Yash Goyal

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When Merck and Schering-Plough merged in 2009, we became a division of the second-largest health company in the world.

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

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It was feed manufacturer Wim Hendrix who laid the foundations of Intervet in 1949 in the Netherlands. He observed that 'sick chickens don't eat', and set about enlisting scientists to create the first ever vaccine for Fowl Pox. It was one of many firsts Intervet was to bring to the animal health market.

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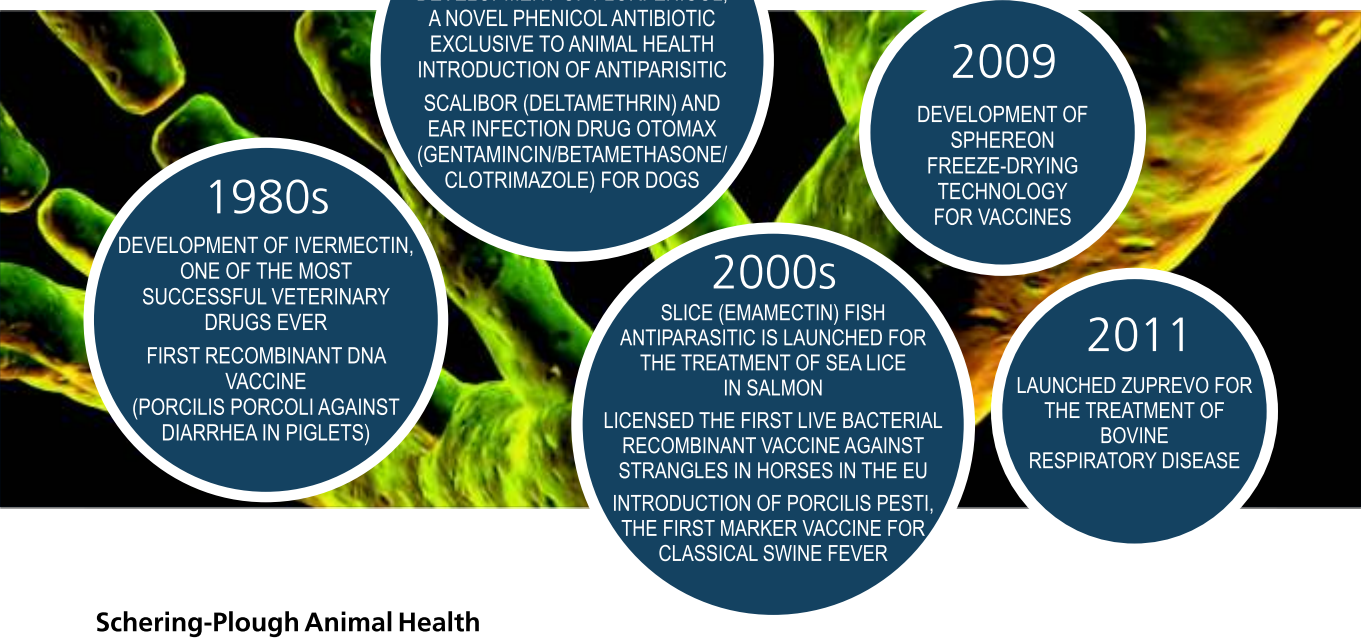

1980s

DEVELOPMENT OF IVERMECTIN, ONE OF THE MOST SUCCESSFUL VETERINARY DRUGS EVER

FIRST RECOMBINANT DNA VACCINE (PORCILIS PORCOLI AGAINST DIARRHEA IN PIGLETS)

1990s

DEVELOPMENT OF FLORFENICOL, A NOVEL PHENICOL ANTIBIOTIC EXCLUSIVE TO ANIMAL HEALTH INTRODUCTION OF ANTIPARISITIC

SCALIBOR (DELTAMETHRIN) AND EAR INFECTION DRUG OTOMAX (GENTAMINCIN/BETAMETHASONE/ CLOTRIMAZOLE) FOR DOGS

2000s

SLICE (EMAMECTIN) FISH ANTIPARASITIC IS LAUNCHED FOR THE TREATMENT OF SEA LICE IN SALMON

LICENSED THE FIRST LIVE BACTERIAL RECOMBINANT VACCINE AGAINST STRANGLES IN HORSES IN THE EU

INTRODUCTION OF PORCILIS PESTI, THE FIRST MARKER VACCINE FOR CLASSICAL SWINE FEVER

2009

DEVELOPMENT OF SPHEREON FREEZE-DRYING TECHNOLOGY FOR VACCINES

2011

LAUNCHED ZUPREVO FOR THE TREATMENT OF BOVINE RESPIRATORY DISEASE

Schering-Plough Animal Health

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

MSD Animal Health

Review Articles

Clinical Trials

Clinical Reports

Oxytocin: structure, function, facts and myths in Veterinary use: an overview

Vikash Chandra

Scientist, Animal Physiology
Division of Temperate Animal Husbandry
Indian Veterinary Research Institute, Mukteswar; Nainital-263138 (Uttarakhand)

Introduction

Oxytocin discovered in 1909, is a peptide hormone of nine amino acids, naturally released from the posterior pituitary gland. Its well-known function is the milk letdown by causing the contraction of milk alveoli of the udder. About 80% of the milk is stored in the alveoli. Naturally, oxytocin is released from the pituitary while suckling due to tactile teat stimulation or sound in trained cows, via neuroendocrine reflex. This causes the contraction of myoepithilial cells, forcing the stored milk into mammary ducts and gland cistern. Thus, naturally on each and every milking, there is a release of minimal level of oxytocin hormone in the blood only for few minutes (Kumud and Prakash, 2001). Further, oxytocin is also released from some other tissues like testis, ovary, uterus and placenta. Receptors of oxytocin are present in uterus, brain, kidney, thymus, as well as in reproductive tract of male and female.

Therapeutically, oxytocin is used for the induction of labour pain, treatment of retained placenta and metritis, uterine involution, manual correction of prolapse in dogs and in treating agalactia. In dairy practice, exogenous oxytocin is administered to induce milk letdown in disturbed cows. But in recent years, there have been apprehensions regarding the use of oxytocin for milk letdown in cattle and buffaloes. It is thought that exogenous oxytocin may be secreted in the milk and may cause adverse effects like early puberty, uterine/breast cancer etc. when consumed along with milk. But recent research has proved that only a minimal amount of oxytocin is detected in milk even in treated cows with high dose of exogenous oxytocin (Macuhova et al., 2004). Moreover, due to the presence of oxytocinases present in the blood, tissues, and organs, its half-life is only 3-6 minutes.

Oxytocin structure and function:

The neurohypophysial hormone oxytocin was the first peptide hormone to have its structure determined and the first to be chemically synthesized in biologically active form (Du Vigneaud et al., 1953). It was named oxytocin as it causes "quick birth" due to its uterotonic activity. Oxytocin was also found to be responsible for the milk-ejecting activity. The structure of the oxytocin gene was elucidated (Ivell and Richter, 1984), and the sequence of the oxytocin receptor was reported (Kimura et al., 1992) in due course.

The human gene for oxytocin prepropeptide consists of three exons: the first exon encodes a translocator signal, the nonapeptide hormone, the tripeptide processing signal (GKR), and the first nine residues of neurophysin; the second

exon encodes the central part of neurophysin (residues 10–76); and the third exon encodes the COOH-terminal region of neurophysin (residues 77– 93/95). The oxytocin prepropeptide is subject to cleavage and other modifications as it is transported down the axon to terminals located in the posterior pituitary and stored in the axon terminals until neural inputs elicit their release. Oxytocin is found in the neurosecretory granules of the posterior pituitary in the form of oxytocin-neurophysin complexes and these complexes are broken down when the complex is released from the neurosecretary granules.

Oxytocin receptors are found in uterus, ovary, mammary tissue, brain, kidney, thymus etc. Oxytocin receptor, first isolated and identified by Kimura et al. (1992), is a 389- amino acid polypeptide with 7 transmembrane domains and belongs to the class I G-protein-coupled receptor. Oxytocin receptors are functionally coupled to GTP binding proteins and stimulate phospholipase C. which leads to the generation of inositol trisphosphate (IP3) and 1,2-diacylglycerol (DAG). IP3 triggers Ca^{++} release from intracellular stores, whereas DAG stimulate protein kinase C (PKC), which phosphorylates target proteins. Ca^{++} forms complex with calmodulin complexes, triggering activation of neuronal and endothelial isoforms of nitric oxide (NO) synthase. NO in turn stimulates the soluble guanylate cyclase to produce cGMP. In smooth muscle cells, the Ca^{++} -calmodulin system triggers the activation of myosin-kinase activity, which initiates smooth muscle contraction, e.g., in myometrial or mammary myoepithelial cells (Sanborn et al., 1998). In neurosecretory cells, rising Ca++ levels in the neurosecretary cells control cellular excitability, modulates their firing patterns, and lead to transmitter release. Further Ca++-promoted processes include gene transcription and protein synthesis.

a). Induction of labour pain: Oxytocin is a potent uterotonic agent. Thus specific antagonist of oxytocin may prevent the preterm labour and regulate dysmenorrhoea (Manning

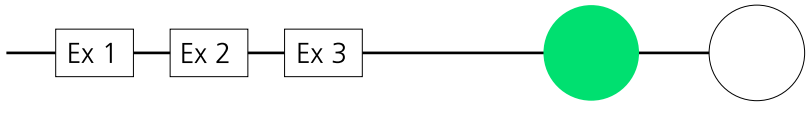

Figure 1: Organization of Oxytocin gene

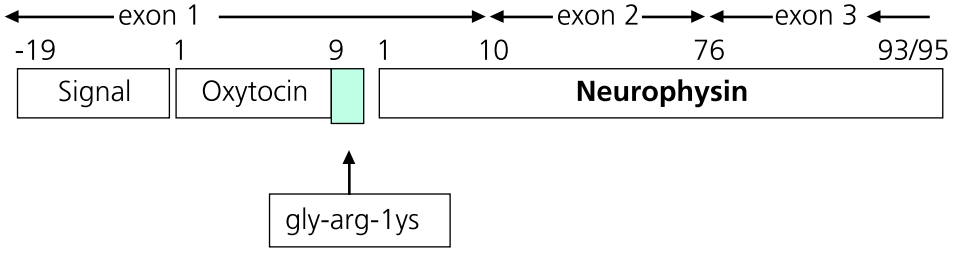

Figure 2: Domain organization of preprooxytocin

et al., 1995). During early labor, there is marked increase of oxytocin mRNA expression in the myometrium (200 times than the normal), which stimulates uterine contractions. Gonadal steroids play important role in the regulation of oxytocin receptors. Maturation of fetal hypothalamus leads to an increased secretion of CRH, which in turn stimulates the pituitary to secrete ACTH (Fuchs et al., 1995). Subsequently, ACTH stimulates the fetal adrenal to release cortisol. Cortisol increases the activity of the key enzyme cyctochrome P-450c17α, which promotes placental pregnenolone turnover into estrogens, which increase the oxytocin receptors receptivity.

b). Luteolysis and ovarian cyclicity: Oxytocin is synthesized and secreted by the corpus luteum, exclusively by the large luteal cells and during estrous cycle, its concentration coincides with the level of progesterone. Thus during estrus cycle oxytocin may act in paracrine manor. The interaction of neurohypophysial oxytocin with endometrial oxytocin receptors evokes the secretion of luteolytic pulses of uterine PGF2α. During pregnancy, the developing conceptuse must prevent endometrial PGF2α from being released into the uterine vasculature to prevent corpus luteum regression and progesterone withdrawal. The continued progesterone secretion is required for establishment and maintenance of pregnancy.

c). Parental behavior: Pedersen and Prange (1979) first demonstrated that injection of oxytocin into the lateral ventricles of nulliparous ovariectomized rats induces maternal behavior. However, it is important to note that oxytocin is effective just for the initiation of maternal behavior. Steroid priming was found to be essential for the initiation of maternal behaviors in all cases studied so far.

d). Social behavior: Love and social attachments function to facilitate reproduction, provide a sense of safety, and reduce anxiety or stress. Recent studies in rodents suggest that the neurohypophysial hormones in concert with steroids are key components in the central

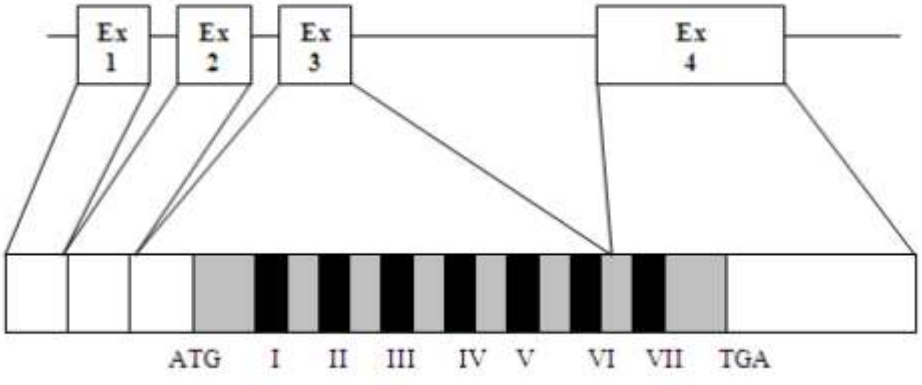

Figure 3: Organization of the human oxytocin receptor gene including the localization of consensus sequences for transcription factors. The human oxytocin receptor gene consists of four exons. Exons 3 and 4 encode the amino acid sequence for the oxytocin receptor. (Adopted from Gimpl and Fahrenholz, 2001)

mediation of complex social behavior, including affiliation, parental care, sexual behavior, mate guarding, and territorial aggression (Young et al., 1998).

e). Antistress effect: Oxytocin exerts potent antistress effects in rats such as, decrease in blood pressure, corticosterone/ cortisone level, and increases insulin and CCK level. After repeated oxytocin treatment, weight gain could be promoted, and the healing rate of wounds increased (Uvnas, 1998). Stress-induced central release of oxytocin can ameliorate the stress-associated symptoms such as anxiety (Mc Carthy et al., 1996).

f). Memory and learning: Oxytocin was shown to facilitate the extinction of avoidance reaction (Ibragimov, 1990) and to attenuate the storage of verbal memory. Wide variety of observed effects has also led to the suggestion that oxytocin has a more general effect on the cortical arousal rather than a specific effect limited to a certain stage of information processing (Fem and Born, 1991).

Myths regarding use of oxytocin for milk letdown:

In the recent past, people raised voice against the use of oxytocin in dairy livestock for milk let down. Public media in India raised issues concerning the health of those drinking milk from oxytocin treated animals. Major health concerns raised were early maturity in girls, predisposition for cancer, reduced nutritive value of milk, lack of natural antibodies in milk etc.

Whether oxytocin is present in milk of exogenously treated animals?

Some reliable tests are available for quantifying oxytocin in the blood as well in the milk like EIA (enzymeimmunoassay) and RIA (radio immune assay). Praksh et al (2009) have developed enzymeimmunoassay for the detection of oxytocin in the skimmed milk of treated cows. This assay has been validated by European Union-Decision 2002/657/EC criteria. The assay has analytical range of 10-250 pg/ml with a decision limit of 30pg/ml and detection capability of 41.5pg/ml.

Under normal condition, 0.1 IU of oxytocin is required for the milk let down. Prakash et al (2009) administered 50 IU (250-500 fold the desired dose) and found that there was minimal level of oxytocin in the milk i.e. 23.1-20.2pg/ml which is well below the decision limit of 30 pg/ml. Though the peak plasma oxytocin concentrations were 4-5 fold higher in cows administered 50IU of oxytocin than the peak plasma oxytocin concentration when stimulated normally for milk let down, these high concentrations were attained 7-9 minutes after the treatment (Macuhova et al., 2004). Moreover, the consumed oxytocin may not remain intact after the digestion in the gastrointestinal tract. Even the boiling of milk may also destroy the antigenic activity of oxytocin. Nostrand et al., (1991) reported that daily injection of 20 IU oxytocin (i.m.) during whole lactation in the cows yielded 849kg more milk with no apparent effects on health. Belo and Bruckmaier (2010) reported that chronic treatment with high doses of oxytocin (23 IU, i.m.) may make udder less sensitive (down regulation of oxytocin receptors) to the physiological oxytocin due to reduced cotractractibility of myoepithilial cells of mammary gland, while low doses (0.2 to 0.5 IU) have minimal side effects. Thus the consumption of milk from oxytocin treated cows can be considered to be safe for human

health (Ijaz and Aleem, 2006). Daily oxytocin injection increases milk production by about 3% (Ballou et al.1993).

It may be concluded that considering the minimal levels of oxytocin in the milk of oxytocin treated animals at the recommended dose of 10-20 USP units i/m, the milk is safe for human consumption.

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Myasthenia Gravis in dogs - An Overview

Srivastava Mukesh, Srivastava Ashish, Sachan Pratibha, Singh Shanker K. and Saroj Vivek K.

K. Saroj**
Department of Veterinary Clinical Medicine,
College of Veterinary Science & Animal Husbandry, DUVASU, Mathura-281001 (UP)

Introduction

Myasthenia Gravis (MG) is a neuromuscular disease that is characterized by exercise associated muscle weakness and fatigue (Shelton, 1995) that often improves with rest. MG occurs in both acquired and congenital forms (Pedroia, 1989), acquired form being more common in dogs. Acquired MG is an immune-mediated disease in which autoantibodies, predominantly IgG, are generated against ACh receptors which block neuromuscular transmission either by directly interfering with the action of ACh on receptors or activation of compliment mediated lysis of post-synaptic membrane (Dewey et al., 1997) and characterized by failure of neuromuscular transmission due to reduction in number of functional nicotinic acetylcholine receptors (AChR) on the post-synaptic membrane of the neuromuscular junction (Pflugfelder et al., 1981). The congenital MG is a result of an inherited deficiency of acetylcholine receptors at the postsynaptic membrane in skeletal muscles and is common in Jack Russell Terriers, Springer Spaniels, and Fox Terriers (Couturier et al., 2009). The physiological basis of congenital form is the same as that of acquired form. However, anti-acetylcholine receptor antibodies are not demonstrable in serum or muscles in congenital MG. Ultrastructurally, there appears to be increased postsynaptic membrane density and shorter fold depths, possibly associated with abnormal trophic influences during synaptogenesis (Wilkes et al., 1887).

Pathophysiology

The cause of MG is the reduction in the number of functional acetylcholine receptors in the postsynaptic membrane of the neuromuscular junctions (Shelton, 1995). Acquired MG is characterized by the presence of autoantibodies against acetylcholine receptors (Cuddon, 1989). Although the cause of autoantibodies is not exactly known, it has been suggested that the thymus may play a role (Pedroia, 1989), however, autoimmunity signs have been reported to be absent in congenital MG (Shelton, 1995). This deficiency of receptors reduces the sensitivity of the postsynaptic membrane for the acetylcholine. Reactive antibodies are usually demonstrable in the sera of dogs (approximately 98%) with acquired MG (Shelton, 2002). Antibodies reactive with muscle striations and other autoantibodies may coexist with a high titer of AChR-ab. Based on experimental and human clinical studies, MG involves both B and T cells. T cells and complement are involved in persistent B cell stimulation and in cell-mediated postsynaptic destruction of the neuromuscular junction, and there is antibody-induced blockade of the

function of the remaining AChR molecules (Bartt and Shannon, 1999). In human, the thymus plays an important role in the pathogenesis of MG (Weller et al., 1997). Acquired MG in dogs and cats also occurs in association with thymic dysfunction, including thymomas (Shelton et al., 2001 and Wood et al., 2001) and other thymic abnormalities such as thymic cysts or non-neoplastic thymic diseases (Day, 1997). The reported incidence of thymoma is approximately 3% in dogs (Shelton et al., 1997). In these animals, the pathogenesis of the autoimmune response of acquired MG remains unclear but it may be para-neoplastic and related to the recognized antigenic similarity between myoid cells of the thymus and receptor-bearing muscle cells at the neuromuscular junction. Wekerle et al., (1981) suggested that disruption of the thymic lymphocytes or muscle cells may lead to an autoimmune attack against acetylcholine receptors and other skeletal muscle components. Human patients with thymoma-associated MG may also produce autoantibodies to a variety of neuromuscular antigens, including the muscle protein titin, skeletal muscle calcium release channel (ryanodine receptor, RyR), and voltage-gated potassium channels (Romi et al., 2002). Titin and RyR antibodies have been recently detected in dogs with thymoma-related MG, as well as in dogs with other forms of MG (Shelton, 2001). The presence of circulating RyR antibodies seem to be associated with a severe form of thymoma associated myasthenia gravis in human and canine patients (Mygland et al., 1994). In a recent report involving 5 dogs with fulminating MG, titin and RyR antibodies were found (Shelton et al., 2001). Occasionally, MG may develop in dogs after removal of the thymoma (Gores et al., 1994). In dogs, acquired MG has also been reported in association with other tumors including cholangiocellular carcinoma (Krotje et al., 1990), osteogenic sarcoma (Moore et al., 1990), anal sac adenocarcinoma (Shelton et al., 1998), and non- epitheliotropic cutaneous lymphoma (Ridyard et al., 2000). Acquired MG and polymyositis developed in one dog following fetal hematopoietic cell transplantation, along with presence of AChR-ab and immune complexes reactive with myoneural junctions (Shelton, 1998). Acquired MG has also been reported in dogs with hypothyroidism (Dewey et al., 1995), hypoadrenocorticism, thrombocytopenia, and hemolytic anemia (Shelton, 2002).

Age, sex and breed predilection

In one study, generalized MG was reported in 57% of cases (Shelton et al., 1997) while incidence of focal forms ranging from 26% to 43% (Dewey et al., 1997). Acquired MG has been observed in adult dogs of all sizes, but more commonly in medium-to-large breeds, and particularly in German Shepherds, Golden Retriever, and Labrador Retrievers (Shelton et al., 1997). In this study, it was also demonstrated the relative risk of acquired MG in different breeds of dogs was highest in Akitas (Shelton et al., 1997). Newfoundlands may also be predisposed to acquired MG (Lipsitz et al., 1999). Congenital MG as a postsynaptic disorder is reported in young dogs of several breeds: Jack Russell terrier (Palmer et al., 1980), Springer Spaniel (Johnson et al., 1975), and Smooth haired Fox Terrier (Miller 1983), usually appearing between the ages of 6 and 9 weeks, and with multiple cases occurring in a single litter. Palmer and colleagues (1980) demonstrated a marked reduction in

acetylcholine receptors (AChR) in skeletal muscle samples from Jack Russell terriers and Springer Spaniels with congenital MG (Oda et al., 1984). Spayed female dogs may have heightened risk (Shelton et al., 1997). A bimodal age of onset (<5 years and >7 years) was reported by Shelton et al (1988) in affected dogs. Hopkins, (1992) reported that acquired MG in dogs is seen to begin in animals from eight weeks to eleven years of age but it is usually observed between the ages of one and eight years. The clinical symptoms of congenital MG have been reported to arise in 6-8 week-old puppies (Pedroia, 1989). Presynaptic congenital MG has been reported in 12 to 16 week old Gammel Dansk Honsehund dogs, with autosomal recessive inheritance (Flagstad et al., 1989).

Clinical Signs

Myasthenia gravis involves spectrum of clinical signs and disease has been classified into three types, viz., focal, chronic generalized and acute fulminant generalized myasthenia (Dewey et al., 1997). Focal form is characterized by variable degree of facial, pharyngeal, laryngeal and esophageal dysfunction but without evidence of limb weakness (Lainesse et al., 1996 and Webb et al., 1997). Focal MG in dogs may occur with thymoma (Lainesse et al., 1996).Chronic generalized form, and acute fulminant generalized forms may be differentiated by the rate with which clinical signs develop. Dogs have generalized muscular weakness which worsens with exercise (Hopkins, 1992), tetraparesis, and severe dyspnea. Clinical signs of myasthenia gravis vary depending on the muscle groups involved. Appendicular muscle weakness can manifest as weakness, stiff gait, or collapse. Facial muscle weakness can manifest as reduced or absent palpebral reflex; esophageal muscle weakness as megaesophagus with regurgitation; pharyngeal weakness as dysphagia; and laryngeal muscle weakness as voice change or inspiratory stridor (Dewey, 1997). Megaesophagus is common in all forms of disease being as high as 88% in one survey (Shelton et al., 1997), which is responsible for chronic regurgitation and aspiration pneumonia (King and Vite, 1998) but most common findings of MG are reported to be walking disorders following exercise (Hopkins, 1992). Less common clinical signs that have been associated with myasthenia gravis include an arched spine with pelvic limb proprioceptive deficits, hyporeflexia, lameness, shortening of stride, collapse, tremors, and distended bladder (King and Vite, 1988). Approximately 25% of dogs presented with idiopathic megaesophagus have increased serum titers of AChR-ab (Holland et al., 1994). Idiopathic cardiac conduction disturbances have been reported in some dogs with MG, with and without thymomas and with generalized and focal MG (Hackett et al. 1995). King and Vite (1988) reported that 40% of the dogs presenting with acute fulminating myasthenia gravis had bladder distension, requiring assistance to urinate. In humans, voiding dysfunction in conjunction with myasthenia gravis is rare and seems to be associated with a recent diagnosis of myasthenia or an exacerbation of the disease process (Sandler et al., 1988). It is suggested that autonomic dysfunction in patients with myasthenia gravis might indicate a unique subset with a worse prognosis (Sandler et al., 1988). Human myasthenics have an increased occurrence of several associated disorders, including

autoimmune diseases such as hypothyroidism, lupus erythematosus and rheumatoid arthritis (Drachman, 1994). The presence of circulating RyR antibodies in dogs with various forms of MG may have negative prognostic significance (Shelton, 2001).

Diagnosis

Definitive diagnosis for MG can be made by its response to cholinesterase drugs, which cause enzymatic elimination of acetylcholine, thereby increasing its concentration at the postsynaptic membrane. However, false positive and false negative results are possible (Taylor, 2000). A positive response to the short-acting anticholinesterase drug edrophonium chloride @ 0.1 - 0.2 mg/kg, IV in dogs is suggestive of myasthenia gravis. Neostigmine methylsulfate at 40 mg/kg, IM or 20 mg/kg IV) may also be used in dogs for diagnostic purpose. Following injection, an animal that has been previously recumbent may be restored immediately to normal activity, which will last for a few minutes before muscle weakness gradually returns. However, some dogs with MG may not respond, while dogs with other neuromuscular disorders may be responsive. Diagnosis may also base on response to pyridostigmine bromide, using a dosage of 0.1 to 0.5 mg, IV. Clinical response to this drug is often erratic, with frequent relapses and animals may become refractory to treatment (Palmer et al., 1980.).Recently, molecular cloning of the canine nicotinic acetylcholine receptor alpha-subunit gene has been reported along with development of an ELISA assay to facilitate diagnosis of MG in dogs (Yoshiloka et al., 1999). In people, nearly all cases of MG can be diagnosed using a combination of tests, including ACHR-ab titers, repetitive nerve stimulation studies, and single fiber EMG demonstration of increased "jitter" (Bartt and Shannon, 1999). A decremental response to nerve stimulation is not always detected in dogs and cats with acquired MG (Poffenbarger et al., 1985).

Autoantibodies to ACh receptors

Definitive diagnosis can be made using radioimmunoassay for detection of serum acetylcholine receptor antibodies that appear to be specific for acquired MG in dogs (Shelton, 2002). This test (a positive antibody titer in dogs is > 0.6 nmol/L) will detect nearly all cases of generalized MG (Shelton, 2002); lower serum titers occur in animals with the focal form of MG (Shelton et al., 1990). High serum AChR-ab titers were reported in dogs with acute fulminating MG (King LG, Vite, 1998). It is important to know that the assay is not necessarily correlated to the severity of clinical signs (Hopkins,1992) in affected animals, results may be negative in a small percentage of animals with generalized (<2%) or focal forms, and serum titers are decreased by immunosuppressive therapy (Shelton, 1998). This immunoprecipitation radioimmunoassay is highly sensitive and specific, detecting approximately 98% of dogs with generalized acquired myasthenia gravis with rare false positive results (Shelton, 2002). According to some investigators (Shelton et al., 1990), AChR antibodies can be determined in 80 to 90% of canine and human patients with acquired MG; however, no complete correlation has been determined between a single antibody concentration and the severity of disease (Hopkins, 1992). Additionally, suggested explanations of seronegativity include the following: low titre of high affinity antibody

with all available antibody bound to receptors, inability of the standard radioimmunoassay to detect antibodies bound to the bungarotoxin site, antibody present to end-plate determinants other than the acetylcholine receptor, technical factors affecting test sensitivity and antigenic differences in acetylcholine receptors (Shelton et al., 1990). Antibodies have also been detected to muscle protein 'titin' and Ca^{++} channel receptor 'raynodine (RyR)' (Tizard, 2009).

Management

Treatment strategies in people with MG include anticholinesterase inhibitors, thymectomy, corticosteroids, cytotoxic agents (azathioprine, cyclosporine) and plasma exchange. Intravenous pooled immuno-globulins have led to a low mortality rate and favorable prognosis for most patients, although lifelong immunomodulating therapy may be needed (Bartt and Shannon, 1999). Drugs known to impair neuromuscular transmission like aminoglycosides, phenothiazines, methoxyflurane, magnesium, and anti-arrhythmic agents must be avoided in animals with acquired or congenital MG (Shelton, 2002).

Medical treatment usually involves a trial and error approach to the drug(s) used, dosage, frequency, or combination. Long-acting anticholinesterase drugs such as pyridostigmine bromide may result in clinical control. Dosages range from 30 to 60 mg, PO, two or three times a day in dogs. Dosage depends on the severity of signs and on the size of the dog. Overdose in animals can produce a cholinergic crisis with signs of muscarinic (hypersalivation, lacrimation, urination, defecation, pupillary constriction, bradycardia, respiratory paralysis), nicotinic (muscle fasciculations, tremors, stiff gait), or CNS (anxiety, hyperactivity, anorexia, generalized seizures) stimulation. Administration of atropine (at 0.2 - 0.4 mg/kg IV, slowly over 5 minutes) will reduce the muscarinic signs. Some animals with acquired MG may become refractory to anticholinesterase therapy after a period of successful treatment. However, Shelton (1998) has recently reported spontaneous clinical and immunologic remission in 47 of 53 dogs treated only with anticholinesterase therapy without using any immunosuppressive drugs within an average of 6.4 months (Shelton 1998). MG requires long-term combination therapy (Schutt and Kersten., 1986). Some investigators (Klebanow, 1992) have reported using anticholinesterases for a period between 6 weeks and 6 years, while Hasan et al (1998) treated case of MG by pyridostigmine bromide for only a month. Corticosteroids have been reported to be widely used in the treatment of acquired MG (Cuddon,., 1989, Hopkins, 1992). The primary beneficial effect of corticosteroids in this disease is related to suppression of initiating aberrant immune response against acetylcholine receptors (Hopkins, 1992). It has been reported that corticosteroids have also been reported to be successful on their own in the treatment of acquired MG (Maddison et al., 1984). On the other hand, although myasthenic crisis and signs of MG during treatment can quickly be cured by the use of corticosteroids and cholinesterase (Cuddon,., 1989), it has been reported that corticosteroids cannot be recommended in all case (Shelton, 1995).

In many dogs, muscle weakness is not adequately controlled with anticholinesterase therapy alone. In such cases

immunosuppressive therapy is recommended either in conjunction with anticholinesterase treatment or as the sole therapy (Shelton, 2002). Prednisone is the most commonly used immunosuppressive agent; however, azathioprine, cyclophosphamide and cyclosporine have been reported to be efficacious (Dewey, 1998). Dogs with megaesophagus are managed with small, frequent feedings in the upright position, of a solid or semi liquid diet, depending on individual response, and are monitored closely for signs of aspiration pneumonia. The prognosis for dogs with myasthenia gravis is variable; however, severe aspiration pneumonia, persistent megaesophagus, acute fulminating myasthenia gravis, and the presence of a thymoma carry a poor prognosis (Lewis., 1994).

It has been stated that anticholinesterases provide only symptomatic relief and have no effect on the underlying immunological dysfunction (Cuddon, 1989). In some dogs combination of corticosteroids and anticholinesterases has been necessary (Poffenbarger et al., 1985). The efficacy of the corticosteroid treatment is probably related to both suppression of the immune response and to a direct facilitatory presynaptic action. Corticosteroids may initially worsen clinical signs in some instances and steroid induced polydipsia can exacerbate the problem of regurgitation (Rusbridge et al., 1996). Azathioprine, alone or with pyridostigmine, has been used successfully to treat dogs with MG (Dewey, 1999). Another dog was successfully treated using plasmapheresis and corticosteroids (Batrtges et al., 1990). In one report, surgical removal of a thymoma in a 10 year old mixed breed dog resulted in rapid remission of signs; however, the thymoma recurred 6 months post-operatively (Lainesse et al., 1996).

Clinical improvement of signs may be associated with decreasing AChR-ab titers, and remission of signs may occur when titers reach < 0.6 nmol/L (Shtelton et al., 1990). Prognosis is guarded, especially in dogs with thymoma (Rusbridge et al., 1996). The disease can be managed on long term anticholinesterase therapy in order to prolong the interaction of ACh with receptors. Pyridostigmine bromide at 1-3 mg/kg, 8-12 hrly or Neostigmine at 0.04 mg/kg IM 6hrly can be given to myasthenic dogs. But these treatments have minimal effect on esophageal motility. Shelton and Lindstrom (2001) treated 53 dogs diagnosed positive for autoimmune canine myasthenia gravis with anticholiesterase therapy only and reported clinical and immunological remission in 47 dogs within an average period of 6.4 month. Corticosteroid therapy started with lower dose and gradually increased dose has been reported to manage disease in some cases (Maddison et al., 1984).

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Canine Metritis
An antibiogram

A study on bacteriological profile and antibiogram of canine metritis in Karnataka revealed the presence of gram positive and gram negative organisms equally (45-55%), with the predominance of *E-coli, Proteus*, *Klebsielle, Enterobacter* and *Psudomonas* among gram negative organisms, whereas *Staphylococcus aureus* and Streptococcus pyogenes were prominent among gram positive organisms. Most of the isolates of gram positive and gram negative organisms (more than 90%) showed high sensitivity to Ciprofloxacin, followed by Gentamicin and were highly resistant to Ampicillin and Streptomycin.

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Prevalence, treatment and control of Nasal Schistosomosis in cattle and buffaloes

Placid E. D'Souza

Centre of Advanced Faculty Training in Veterinary Parasitology
Veterinary College, KVAFSU, Hebbal, Bangalore-560024 (Karnatak)

Introduction

Schistosomosis is a common disease problem in bovines and is endemic in nature. This disease is peculiar to Asian countries. This disease is now well recognised as a major helminthosis of domestic animals in the subcontinent in terms of morbidity in cattle and buffaloes.

Nasal schistosomosis or bovine nasal granuloma caused by *Schistosoma nasale*, commonly known as pinasi roga , pinas, busa rogan or snoring disease has been wide spread in the Indian subcontinent. The intermediate host is snail *Indoplanorbis exustus* which is also commonly prevalent in most parts of India. The eggs deposited in the capillaries and venules of nasal mucosa and submucosa of ruminants by the worms are responsible for the growths in the nostrils. Initially, these lesions around the eggs are infiltrated by mononuclear cells, lymphocytes and eosinophils. In cattle, a severe inflammatory reaction is initiated which

Table 1: Nasal schistosomosis in bovines in different parts of India (% in nasal samples)

States	Cattle	Buffalo
Andhra Pradesh	51.27-80.0	0-88.8
Assam	6-16.9	2.0-40.0
Bihar	47.5-60	-
Chhattisgarh	36.77	8.33
Gujarat	13.3	-
Karnataka	24.7-72.6	2.6-51.2
Kerala	+	59.5
Madhya Pradesh	1.0	0.9
Maharashtra	30.4-88.5	+
Orissa	+	56.0
Tamil Nadu	15.5-53.5	24.4-60
Uttar Pradesh	0-100	3.5-100
West Bengal	20-60	0.9-87

progresses to intense fibrous tissue proliferation and in the process, exuberant granulation growths develop in the nasal mucosa.(Fig 2) Rhinitis is present in the initial stages of the disease but, as the size of the growths increases, signs of snoring and respiratory discomfort also appear.

Prevalence in India

This disease is highly prevalent due to existing managemental and feeding practices under field conditions and also because of the incorrect treatment. The rate of prevalence in different parts of India as reported by Muraleedharan 2009 and based on detection of eggs in nasal samples is tabulated in Table.

A systematic study of Schistosomosis in 300 slaughtered male cattle at Bangalore was reported (Sumanth et al., 2004). In this study the nasal scrapings and their contents were screened for eggs and the nasal cuttings were examined for worms. Eggs of *Schistosoma nasale* were observed in 197 samples and worms in 218 carcasses respectively. The incidence of nasal schistosomosis based on the detection of eggs was 65.6%

Schistosoma nasale infection is reported to occur more commonly in buffaloes than in cattle. However, the cattle suffer severely to this infection. The infection in buffaloes may remain undetected as they possess some degree of innate tolerance to the infection and manifest only a subclinical disease. Unlike in cattle, the schistosome eggs in buffaloes do not appear to incite an appreciable inflammatory reaction in the subepithelial nasal mucosa and, because of this low grade host reaction, only slight inflammatory granular eruption on the mucosal surface is present.(Kumar 1999) However,

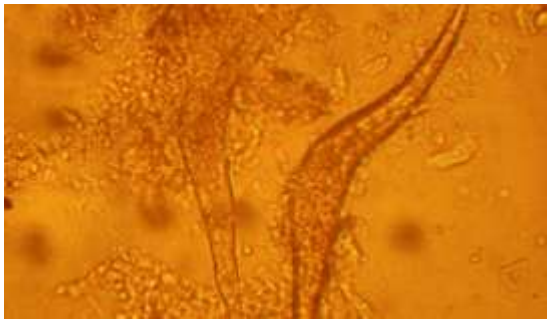

Fig1 *Schistosoma nasale,* typical boomerang or Napolean hat shaped ova in nasal scrapings.

unusual clinical manifestations have been reported to occur in buffaloes infected with *Schistosoma nasale* such as oedema of jaw region, forearm, hind limbs and fetlocks, lameness, paresis of cheeks and jaws, diarrhoea, dehydration, recurrent tympanny, slight fever and purulent bilateral conjunctivitis. In some of the animals, growths may be noticed in the nostrils, in others pin head sized elevations can be observed on the nasal mucosa. These symptoms were attributed to thrombosis or occlusion of the veins by the worms.

Diagnosis:

Demonstration of schistosome eggs or eventually the hatched miracidia in the nasal scrapings or discharge is a direct method for the detection of active schistosomosis. The shape of schistosome eggs is the most reliable indicator for the clinicians as to the species specific diagnosis. The rate of egg excretion, however, varies considerably depending on the intensity and duration of infection. The eggs of schistosomes appearing in the faeces of infected animal hosts are conventionally examined by faecal egg concentration methods

and the boomerang or Napolean hat shape helps in specific diagnosis. (Fig. 1). Material should be collected in normal saline and can be cleared with 10% potassium or sodium hydroxide which improves visuability and detection.

Therapeutic Management

The drug commonly used to treat Schistosomosis is lithium antimony thiomalate which leads to temporary reduction or cessation of egg excretion and accompanying clinical improvement of the affected animal. This gives a false impression about the drug efficacy, but once the treatment is withdrawn and its effects have subsided, relapse usually occurs.

The drug of choice for treatment is Praziquantel at the dose rate of 20mg/kg oral as a single dose as reported by Rahman, et. al. 1988, but this drug is not widely available for large animal use. Therefore it is recommended to use Oxyclozanide at the dose rate of 10mg/kg orally thrice at weekly intervals based on a study and report of Muraleedharan and Rajashekar (1996) who observed very good results and cure in affected animals. This drug is widely available, cost effective and has a broad spectrum anti trematodal action which includes liver fluke, schistosomes and amphistomes as well. The different trials conducted on efficacy of different drug treatments are presented in Table 1.

Prevention through Snail Control Measures

Since it is a snail mediated infection ,control strategies against snails should be advocated. An ideal molluscicide should be safe for man, environment friendly, target specific; it should not affect the other non-target fauna or flora, and should be cost effective. Among the various chemical molluscicides, **niclosamide**, because of its safety and target specificity, is of major interest. Despite its relatively high cost, it has been widely used in Brazil, Egypt, Saudi Arabia, Iran and several other countries for schistosomosis control. In some areas in Egypt, this molluscicide has been applied three times in a year to major irrigation facilities. Niclosamide is available commercially as a 70% wettable powder and usually applied in the water bodies in a proportion so as to reach a final concentration of 0.6 ppm. of the active ingredient. In the molluscs infested marshes and stagnant water bodies, niclosamide is recommended for application by spraying. In slow flowing waters, like irrigation canals and small tributaries, it may be used as drip-feed, by applying the chemical at a distribution point upstream which in the process impregnates the water flowing down the stream to affect the target molluscs. Another molluscicide, **sodium pentachlorophenate**, is still used in China. The technology of controlled release, based on the diffusion of the molluscicide impregnated in a suitable device appears an interesting approach for mollusc control under field situation, but system needs to be target specific and environmentally acceptable. **Copper sulphate** is a safe and economical molluscicide which also has fungicidal and weedicidal properties. 1-2.5 ppm is effective against *Lymnaea luteola* and *Indoplanorbis exustus* in marshy areas. One part of copper sulphate in 100000 parts of water or 1 part of copper sulphate in 100kg of mud or sand can be used for effective control of aquatic and land snails, respectively.

Table 2: Treatment trials against nasal schistosomosis in cattle

Drug	Dose	Route & duration	Efficacy	References
Sodium antimony tartrate (SAT)	1.5 mg/ kg. b.w.	I/V twice/ thrice daily for 2days; once daily for 4 days 2.5% aqueous solution @20ml for 3 days	Fairly effective	Alwar,1962, IVJ, 39:33 Muraleedharan, et al., 1977, IVJ,54:703 Sreeramulu, 1994, IVJ,71: 1043
Anthiomaline	10-20ml according to b.w.	I/M; 3-7 days, thrice at weekly interval	75% cure rate, temporarily , but recurred after 3 months	Narayana Rao and Gopala-krisnamurthy,1964, IVJ, 41: 289 Anandan and Lalitha,1979, Cheiron, 8:187 Muraleedharan and Rajsekhar,1996, IVJ,73:265
Antimosan	maximum 40 ml /adult	I/M; 3 injections at 4 days interval	effective	Bhatia and Rai, 1976, IJAR, 10: 43
Neguvon	8gm / animal; 30, 40, & 50 mg /kg b.w.	oral , for 4-10 days-daily, alternate days or thrice weekly	temporary cure	Rao, et al., 1962, IVJ,39, 341 Muraleedharan, et al.,1977, IVJ, 54:703
Ambilhar	25-50mg / b.w.	oral	not curative (fatal at 75 mg / b.w.)	Muraleedharan, et al.,1977, IVJ, 54:703
Sod.antimonyl -dimethylcysteino tartrate	7.5mg/ kg. b.w.		71.5% cure	Anandan and Lalitha,1979, Cheiron, 8:187
Praziquantel	20mg / kg. b.w.	single dose	reduction of symptoms and lesions	Sano et al., 1988, J. Vet. Med. (Japan),801:45
Oxyclozanide	10mg/kg. b.w.	orally thrice at weekly intervals	highly effective	Muraleedharan and Rajasekhar,1996, IVJ,73:265
Levamisole	1 ml/30kg. /b.w	S/C thrice weekly	effective	
Rafoxanide	7.5 mg/ kg b.w.	oral; once		
Ivermectin	1ml/50kg. b.w.	I/ M; single dose		

Fig 2 Cauliflower like growths in the nasal cavity of affected cattle

Parts of few plants show molluscicidal properties. Plants such as Eucalyptus, Soapberry (Shikakai) and neem are promising agents for snail control that can be grown in snail infested areas for effective control. It can be concluded that nasal schistosomosis can be controlled effectively with specific drugs and snail control measures.

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Effect of GnRH and HCG in follicular rupture of anovulatory cows

Bhat F. A., Bhattacharyya H. K., Hassan M. N., Wani A. R. and Baba M. A.

Division of Animal Reproduction, Gynaecology and Obstetrics,
Faculty of Veterinary Sciences and Animal Husbandry, SKUAT, Shuhama-Alusteng, Srinagar-190006, J&K

Introduction

Several hormonal preparations are available under field conditions to induce ovulation. However, effect of these drugs on follicular rupture with respect to synchrony of ovulation and insemination is not available in the scanned literature. The present study was conducted to know the effect of GnRH and HCG in follicular rupture of anovulatory crossbred cows.

Material and methods

A total of 38 crossbred multiparous cows suffering from anovulation were the subject of present study. The animals were considered anovulatory when follicle was not ruptured upto the 5th day from the onset of estrus with no mature corpus luteum at mid cycle (10-12 day following estrus). In the subsequent estrus, animals were treated with either GnRH or HCG therapy at 12-24 hours after onset of estrus. Animals were divided into two groups viz. Group I and group II keeping equal numbers of animals in each group. Animals of group I were treated with 5 ml Receptal (GnRH) i/v as single dose and inseminating 6 hours later; whereas group II animals were treated with Chorulon (HCG) 1500 IU i/v, followed by insemination 6 hours later. Animals of both the groups were per rectally examined for persistence/ rupture of follicle at every 12 hour intervals starting from the initiation of treatment upto 60 hours to know the effect of drugs on the follicular rupture. The time of follicle rupture was calculated from the finding found in last examination. If the follicle was not ruptured within 24 hours of treatment therapy, a 2nd insemination was carried out at 24 hours after the first. Conception rate was compared between two groups using chi- square test.

Result and Discussion

In Receptal treated group, follicle ruptured at an average duration of 32.80 ± 0.15 (12-48) hours, whereas in Chorulon treated group follicle ruptured at 22.24 ± 0.12 (12-36) hours. It was observed that follicle persisted upto 36 – 48 hours in most of the animals in Receptal treated group whereas follicle persisted upto 24 hours in most of the animals in Chorulon treated group. This might be due to the exogenous GnRH causing preovulatory LH surge quite lately than exogenous LH application and thereby delaying ovulation. It is therefore recommended that when GnRH is administered to induce ovulation, a 2nd insemination at 12- 24 hours after 1st one is required to synchronise the time of ovulation with insemination. Alternatively, it is recommended to inseminate cow at least not before 12 hours after Receptal administration. On the other hand, when Chorulon is used to induce ovulation, cow may be inseminated within 6 hours of its administration. Another important point to be noted is that repeated administration of Chorulon should be

discouraged as it may cause anti-hormone production and thereby nullifying its ovulatory effect. However, such deleterious effect is not observed with Receptal.

First insemination conception rate was observed to be 78.95 % (Table 1) in Receptal treated group, where as 68.42 % conception rate was observed in Chorulon treated group, although this difference was statically non significant. First insemination conception rate recorded in the present study was quite higher than indicated in a good fertile herd (Sane et al, 1995). However, conception rate in the present study is slightly lower than the one recorded in the earlier study in the same locality (Bhattacharyya and Fazili, 2010).

From the present study, it is inferred that Receptal is a better choice of drug in inducing ovulation, provided a 2nd insemination is done at 12-24 hours after the first one.

Table 1: Comparison of GnRH and HCG treatment therapy for induction of ovulation in anovulatory cows.

Groups	Treatment protocol	Total no of animals treated	No. Of animals conceived at 1st insemination	1st insemination Conception rate (%)
I	Receptal @ 5ml i/v as a single dose and inseminating 6 hours later	19	15	78.95
II	Chorulon @ 1500 IU i/v as a single dose and inseminating 6 hours later	19	13	68.42

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Antibiogram of *Salmonella* isolates recovered from various species sources of Guwahati area.

Borah Partha Pratim, Borah Probodh and Sharma R.K.

Department of Microbiology
College of Veterinary Science, Khanapara, Assam Agricultural University,
Guwahati-781022, Assam.

Introduction

The genus *Salmonella* owes its name to D.E. Salmon, a Veterinary Bacteriologist who with Theobald Smith isolated and described the "hog cholera bacillus" for the first time. It comes under the Enterobacteriaceae family, which consists of gram negative, fermentative, aerobic or facultative anaerobic bacilli that are generally motile with peritrichous flagella (except *Salmonella* pullorum and *Salmonella* gallinarum). Currently, there are more than 2435 Salmonella serotypes prevalent in the world (Barrow et al., 2000). Salmonellae have been grouped into two species viz. *Salmonella bongori* containing 18 serovars and *Salmonella enterica* consisting of more than 2400 serovars. Until late fifties; nearly all salmonellae were sensitive to a wide range of antimicrobial agents. However, due to indiscriminate use of antibiotics world-wide, both in humans and animals as medication or in animal feeds, plasmid mediated resistance has appeared in them throughout the world. The drug resistance pattern of *Salmonella* isolated from animals varies with the pattern of drug use in animal production. Consequently, there are variations in the predominant patterns of drug resistance of *Salmonella* from different countries, from different animal species and from different farms. Presence of such a wide array of drug sensitivity profiles establishes the logic that antibiogram pattern of an organism might give a clue to the antibiotic regime needed in individual cases.

Material And Methods

Source of Material / Samples

Samples for performing in-vitro drug sensitivity test were collected during the period from December 2010 to October 2011 from diarrhoeic and apparently healthy calves, poultry and human beings. Samples were collected from different sources like Instructional Poultry Farm, Cattle Farm and Department of Veterinary Pathology and Parasitology, College of Veterinary Science, Khanapara, private farms in and around Guwahati and Ranbaxy Laboratory, Bhangagarh, Guwahati. Faecal / stool samples, intestinal contents, and cloacal swabs were collected for this study.

Isolation and maintenance of *Salmonella*

Rappaport-Vassiliadies broth was used as enrichment broth for isolation of Salmonella. Brilliant Green Agar (BGA) was used as selective

media for primary isolation from Rappaport - Vassiliadies broth. Nutrient Agar (2%) was used for preservation of the isolates. For long term preservation of culture, 80 per cent glycerol stock was used.

Inoculation of Samples

Samples (faecal/intestinal contents or cloacal swabs) were inoculated in test tube containing 3-5 ml Rappaport- Vassiliades broth. The tubes were inoculated aerobically at 42° C for a period of 24 – 48 hours. It changed its normal blue colour to colourless after the incubation. Subculture from this broth was made on Brilliant Green Agar (BGA) plate by streacking a loopful of inoculum. The plates were incubated aerobically at 37° C for 24 hr and *Salmonella* suspected colonies showing pinkish colour were smeared and stained by Gram's staining method and examined microscopically. Characterization and primary isolation of suspected *Salmonella* cultures were done on the basis of morphology, colony characteristics and biochemical reactions as per the method recommended by Edwards and Ewing (1972).

Biochemical tests and Serotyping

The following biochemical tests, specific for *Salmonella* were performed as per the method described by Cruickshank et al., (1975).

- Indole test
- Methyl Red (MR)
- Voges Proskauer's test.
- Citrate utilization test
- H_2S production test.
- Carbohydrate fermentation test.

The isolated *Salmonella* strains were sent for serotyping to the National Salmonella and Escherichia Centre, Central Research Institute, Kasauli, Himachal Pradesh, India.

Antibiogram pattern of the isolates

The isolated *Salmonella* strains were placed under various disc diffusion techniques recommended by Cruickshank et al., (1975), using the discs from Hi-Media Laboratories, Mumbai, India. The anti microbial agents used and their concentrations per disc were as follows:

- enrofloxacin 10µg
- ampicillin 10µg
- gentamicin 10µg-
- furazolidone 50µg
- ceftriaxone 30µg
- tetracycline 10µg
- ofloxacin 5 µg
- ciprofloxacin 10µg
- cloxacillin 10µg
- streptomycin 10µg
- nalidixic acid 30µg
- cephalexin 30µg
- neomycin 30µg
- norfloxacin 10 µg

A pure and single colony was inoculated into five ml of nutrient broth and incubated overnight at 37° C. About two ml of each culture was spread uniformly on the surface of a nutrient agar plates and kept undisturbed for 15 min in the incubator. The excess broth was sucked out from the plates with the help of a sterile pipette. The plates were allowed to dry again. The antimicrobial discs were placed gently on the inoculated agar surface keeping a distance of two cm from each other. The plates were then incubated at 37° C for 24 hr in inverted position.

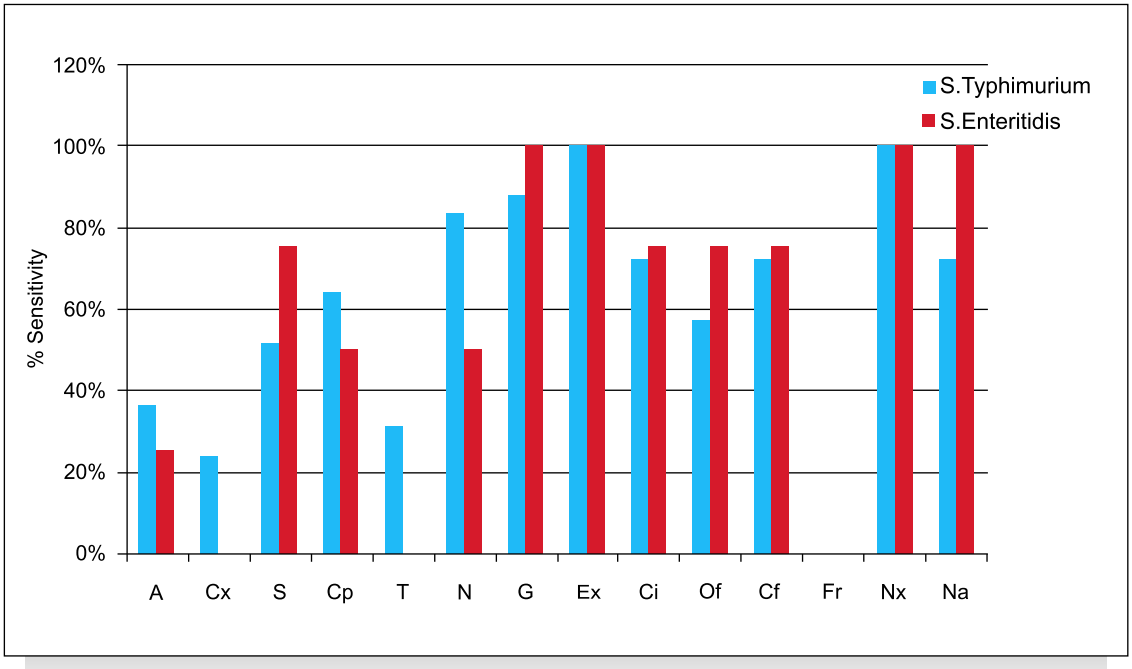
The diameter of the zones of inhibition around the discs was measured to the nearest millimeters (mm) after 24 hr of incubation. The results were interpreted using the zone size interpretative table provided by the Hi- Media

Lab. Pvt. Ltd., Mumbai, India.

Results

Among the nineteen (19) isolates of *Salmonella* isolated from human, cattle and poultry, 15 were serotyped as *S. typhimurium* and 4 as *S. enteritidis*. All of them showed 100% sensitivity to enrofloxacin and norfloxacin, 89.47% for gentamicin, 78.94% for nalidixic acid, 73.68% each for ciprofloxacin, neomycin and ceftriaxone, 63.15% for ofloxacin, 57.89% for cephalexin and 52.63% for streptomycin. Others were less sensitive. (Table 1 and Fig 1)

Figure 1. Antimicrobial sensitivity pattern of S. typhimurium and S. enteritidis isolates



- A= Ampicillin
- Cx = Cloxacillin
- S = Streptomycin
- Cp = Cephalexin
- T = Tetracycline
- N = Neomycin,
- G = Gentamicin
- Ex = Enrofloxacin
- Ci = Ciprofloxacin
- Of = Ofloxacin
- Cf = Ceftriaxone
- Fr = Furazolidine
- Nx = Norfloxacin
- Na = Nalidixic acid

DISCUSSION

In the present study, all 19 isolates were subjected to antibiotic sensitivity test against fourteen commonly used antimicrobial agents. Highest sensitivity of Salmonella to enrofloxacin, norfloxacin, gentamicin and

nalidixic acid and resistance to furazolidone was reported by Saikia (2001). Rutsa (1992). Shah and Jhala (1992) also reported the highest sensitivity to gentamicin and resistance to tetracycline. Gupta et al., (1993) recorded resistance to tetracycline, chloramphenicol and ampicillin.

Both the serovars of *Salmonella* including *S. typhimurium* (3) and *S. enteritidis* (4) isolated from poultry showed highest sensitivity (100%) to enroflofaxcin and norfloxacin (100% to each) and resistance to furazolidone (100%) and tetracycline, cloxacillin and ampicillin (0% to 33.33%). This observation was similar to that reported by Murugkar (2001) and Barman (2010).

The present investigation revealed 100 per cent sensitivity of Salmonella from human, cattle and poultry to enrofloxacin and norfloxacin and proved to be the most effective drug followed by gentamicin (89.47%), ciprofloxacin, neomycin and ceftriaxone (73.68%), nalidixic acid (78.94%), ofloxacin (63.15%) , cephalexin (57.89%) and streptomycin (52.63%). Resistance showed to furazolidone, tetracycline, ampicillin and cloxacillin might be due to injudicious and frequent use of these drugs in prophylaxis as well as treatment. Appropriate and judicious use of antibiotics in prophylaxis and treatment after in-vitro testing is recommended.

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Estrus synchronization using different PGF2α protocols in cows

Ikhar, A.M., Ingawale, M.V., Pawshe, C.H. and Deshmukh, S.G.

Department of Animal Reproduction,
Post Graduate Institute of Veterinary and Animal Sciences, Akola-444 104 (MS)

Introduction

The production efficiency of the animals is directly related to the fertility. The fertility of the animals is affected by major reproductive disorders like prolonged postpartum anestrus, fertilization failure and early embryonic death leading to longer calving interval. Synchronization of estrus is one of the alternatives for the control and manipulation of reproduction. Though PGF2α is being widely utilized for synchronization, some researches have reported lower conception rate in spite of proper dose and route of administration of PGF2α (Ott and Gustafasson, 1981). For increasing conception rate in PGF2α induced estrus cows, gonadotrophin releasing hormone (GnRH) has been tried (Straaten et al., 1997; Tandel et al., 2000). GnRH given at the time of insemination may modify the function of pre and postovulatory ovarian follicle, thus ensuring ovulation (Taponen. 1999). It also recruits good quality of luteal cells which results into increased P4 level and increased conception rate (Mee et al., 1993).GnRH given during mid luteal phase results in increased progesterone secretion by corpus luteum (Kittok et al. 1973). The present study was planned to study the efficacy of PGF2 in different protocols for estrus synchronization and efficiency of GnRH on conception rate in synchronized cows under field condition.

Material and methods

Thirty selected cows irrespective of age, milk production, parity and devoid of infection with post partum subestrus were grouped in three equal groups. All the selected cows were given presynchronization medicinal treatment (PSMT) which included Injection Hitek @ 1 ml per 50 kg body wt. s/c., Injection Urimin 10 ml i/m, Injection Intavita 10 ml i/m and Chelated Mineral Mixture (Agrimin forte) @ 50gm orally daily.

After fifteen days of the PSMT, all the thirty cows were treated with injection PGF2α 2 ml twice 11 days apart and timed insemination was carried out after 72-96 hours from last PGF2α injection. Cows from group-II and III were additionally treated with injection GnRH 2.5 ml i/m at the time of insemination and on 11th day post insemination respectively. The pregnancy diagnosis of all inseminated cows was carried out 60 days after per-rectal examination. Statistical analysis was carried by Chi square test.

Result and discussion

Out of thirty cows from group I, II and III treated with $PGF_2\alpha$, twenty three (77.77 %) cows responded to first injection, whereas, 100 per cent responded for 2nd injection. The result of the present study for estrus exhibition after 1st

$PGF_2\alpha$ injection is in close agreement with results obtained by Pawshe et al. (1991), who reported 77.77 per cent , Kumar et al. (1996) who reported 75 per cent and Jadhao (1999) who observed 80 per cent estrus exhibition. The response of $PGF_2\alpha$ after 2nd $PGF_2\alpha$ injection is in agreement with Kumar et al. (1996) and Patil (2000) who have reported 100 per cent estrus response. However, the response after 1st $PGF_2\alpha$ injection was not in concurrence with Patil (2000) and Mane et al. (1992) who recorded 91.67% and 50% estrus response respectively. The variation in the estrus response may be due to the luteal activity related to the age of the existing corpus luteum on the ovary (Watts and Fuquay, 1985). The luteolytic effect after $PGF_2\alpha$ treatment is achieved in the cows which are in the diestrus stage of estrus cycle (day 7 to 17). Thus, prostaglandin treatment is ineffective during first five days and last four days of estrus cycle. The variation in the response may also be due to age, breed, and nature of $PGF_2\alpha$ molecule used.

The first service conception rate was 40, 60 and 40 per cent in group - I, II and III respectively (Table 1), which differs significantly in different treatment groups.

Table 1 Conception rate in different treatment groups.

Sr. no	Group	No. of cows treated	No. of cows conceived	Chi square test (chi value)
1	Group I	10	4(40%)	9.55*
2	Group II	10	6(60%)	
3	Group III	10	4(40%)	

* Significant ($P<0.05$).

The present finding regarding conception rate in group I is in agreement with Ingawale et al. (2003) observing 50 per cent conception rate in 10 cows treated with 25 mg of $PGF_2\alpha$ intramuscularly as a single dose treatment. Some workers have reported lesser conception rate (Ott and Gustafasson, 1981) after 25 mg of $PGF_2\alpha$ administration.

The conception rate observed in the group II is higher than other treated groups which might be due to effect of GnRH given at the time of insemination. The present finding regarding conception rate in GnRH treated cows are in close agreement with Ingawale et al. (2003), observing 66.66 per cent conception rate in $PGF_2\alpha$ synchronized cows and administered 2.5 ml GnRH (Fertagyl) intramuscularly at the time of insemination. The lower conception rate than the present study is reported by Straaten et al. (1997) after synchronization of estrus by using $PGF_2\alpha$ and administration of GnRH immediately after insemination in induced estrus cows.

Conclusion

The double dose $PGF_2\alpha$ regime is better synchronization protocol for estrus

synchronization and the conception rate can be improved by administration of GnRH at the time of insemination in estrus synchronized cows.

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National Dairy Plan (2012-22)

The World Bank, in March 2012, has approved a 352 million dollars (Rs.17671 crores) credit for National Dairy Development Board's ambitious National Dairy Plan (NDP). The project will cover over 40,000 villages across 14 major dairy States in India, benefitting estimated 1.7 million households.

The NDDB aims at increasing the animal productivity through improved breeding plans for genetic improvement of cows and buffaloes, and optimal use of feeds and fodder. It also aims to expand infrastructure for milk procurement at the village level and enhance milk processing and marketing capacity.

Prevalence and management of ovarian cyst in cattle

Bhattacharyya H. K. and Fazili M. R.

Faculty of Veterinary Sciences and Animal Husbandry, SKUAST-K, Shuhama-Alusteng, Srinagar-190006, (J&K)

Introduction

Ovarian cysts in dairy cows are anovulatory follicular structures, 2.5 cm or larger in diameter that persist in absence of a corpus luteum for 10 days or more. The condition is termed as ovarian cyst, cystic ovary, cystic ovarian degeneration or cystic cows. The reported incidence is 6.7 to 13.1% (Brito and Palmer, 2004). Several studies have been done covering occurrence, causes, costs involvement and therapy (Nanda et al., 1989; Garverick, 1997). No report is, however, available on clinico-therapeutic management of ovarian cyst from this part of India. The present study was planned to record prevalence and management of ovarian cysts in cattle from rural tracts of Kashmir valley, which is a temperate region.

Material and methods

A total of 23 cattle (21 cows and 2 heifers) suffering from ovarian cysts constituted the subject of the study. Cysts were diagnosed with their specific characteristics by rectal palpation (Dabas, 2002). Prevalence of the disease with respect to breed, parity, milk yield status, time of occurrence, season, type of cyst, number of cysts, involvement in the ovary and any other accompanying diseases was recorded. Season comprised of spring (March, April, May), summer (June, July, August), autumn (September, October, November) and winter (December, January, February). Depending on the type of cysts, animals were divided into three groups. Group-I animals with follicular cysts were treated with 3000 I.U. HCG (human chorionic gonadotrophin, Chorulon) intravenously. Animals with luteal cysts were included in Group-II and were treated with 500 mcg of cloprostenol i/m. Group-III included animals in which cyst could not be confirmed by rectal palpation and were treated with 5 ml of Receptal (GnRH). i/v followed by 500 mcg cloprostenol 9 days after GnRH administration (Table 1). Time required from initiation of treatment to subsequent estrus was recorded. Animals that did not respond to this treatment were excluded from the study and were subjected to other treatment protocol. The animals in estrus were inseminated as per recommended methodology using frozen semen with at least 50% post-thaw motility. Conception rate (CR) was determined by pregnancy diagnosis per-rectally at 60-70 days post-insemination.

Results and discussion

The prevalence of cystic ovary increased from 1st to 4th parity (Table 1) which might be due to increased milk production as reported earlier (Roberts, 1998). Hernendez Ledzma et al (1984) observed that incidence of cystic ovary increased from 8.4% in primiparous cows to 25.9% in cows in their 5th lactation. No cyst was observed beyond 5th lactation. Under Kashmir agro-climatic condition, cattle are generally put to sale after 5th lactation. The disease

Table 1: Prevalence of cystic ovary with respect to breed, parity and season (n=23)

Sl. No	Parameters	No of animals	% animals
1	Breed		
	Crossbred Jersey	17	73.9
	Crossbred HF	6	26.09
2	Parity		
	Heifer	2	8.70
	1st	3	13.04
	2nd	4	17.39
	3rd	5	21.74
	4th	7	30.43
	5th	2	8.70
3	Season		
	Spring	7	30.43
	Summer	7	30.43
	Autumn	5	21.74
	Winter	4	17.39

predominantly occurred between 2-8 months (average: 4.87 months) following parturition i.e. early to mid lactation. Only few cases (13.04%) were observed after 1 year of parturition. Average milk production of the affected cows was 9.57 liters (5-15 liters). Lactation stress may be a predisposing factor in occurrence of cystic ovary (Anonymous, 2008). Menge et al (1962) reported a genetic correlation (0.12) between milk production and ovarian cysts. In 8.70% of cases, cyst was observed in heifers and it may appear to be due to genetic nature of the disease. Johanson (1960) reported heritability in cystic ovary condition to 0.05 to 0.48.

Highest prevalence was recorded in spring and summer followed by autumn and winter respectively (Table 1). In Kashmir, as most of the calvings take place during winter and spring, animals suffer from ovarian cysts subsequently either in spring or in summer.

Total number of follicular cysts found were 13 (46.63%) out of total 28, and luteal cysts were 7 (30.43%). Number of remaining 8 cysts could not be diagnosed by palpation. Rectal palpation is the most common/ effective method for cystic ovary diagnosis (Brito and Palmer, 2004). However, differentiation between follicular and luteal cysts can not be made accurately with one examination by rectal palpation and correct diagnosis is achieved only in 50% of the cases (Farin et al., 1992; Douthwaite and Dobson, 2000).

Mean number of cysts were 1.22 per animal. Eighteen animals had a single cyst. Five animals had double cysts, and in 4 animals, 2 follicular cysts on the left ovary of each animal were found. In other animal, 2 luteal cysts were recorded, one in left and other in right ovary. This finding corroborates with the finding of Roberts (1998), that follicular cysts are generally multiple and luteal cysts are generally single.

Right ovary was affected more (60.87%: 14/23) than left one (34.78%: 8/23) and only in 4.35% (1/23) cases, both ovaries were affected which simulates the finding of Kaikini et al (1983).

In some animals (17.39%; 4/23), ovarian cyst was accompanied with cerivicitis and or metritis as was also reported earlier (Anonymous, 2008), wherein association of cystic ovary with metritis (14.6%) and retained fetal membrane (13.6%) were recorded.

Two follicular cysts in two different animals (having two cysts in left ovary of each animal) were ruptured by mild finger pressure during manipulation of genitalia.

Clinical symptoms shown by the animals were either frequent or irregular estrus or anestrus or combination of both and the estrus behaviour was irrespective to the type of cyst.

In group-I, 7 animals recovered from the disease exhibiting estrus within 26 to 37 days (average; 31 days). Ijaz et al (1987) recorded 65 to 80% recovery rate with LH, HCG or products high in LH activity. Kesler et al (1978) reported that most cows showed estrus within 18-23 days after GnRH therapy. First insemination CR was recorded as 85.71% (Table 2). This was higher than the reports of Singh (2002) using GnRH therapy.

Cloprostenol caused lysis of luteal cysts in all animals of group-II. This was similar to the findings of Singh (2002). All animals showed estrus within 12-24 days (average 18 days) and 100% CR was achieved. It is inferred that single injection of prostaglandin (PG) or its analogue is effective for treatment of luteal cysts (Ijaz et al., 1987; Singh, 2002).

In group-III all animals showed estrus within 13-16 days (average: 14 days) after GnRH treatment. Administering PG 9-12 days after GnRH or LH treatment is an effective method to shorten interval from GnRH or LH treatment and subsequent estrus (Brito and Palmer, 2004), because leteinization usually occurs 9-10 days after luteotropic therapy. Administration of PG earlier than 9 days after GnRH treatment is not successful; as there is high rate of cyst

Table 2: Treatment protocol for ovarian cysts in cattle

Group	No. of animals	No of animals recovered (%) in 1st dose	No. of animals conceived at 1st insemination (%)
Group-I	9	7 (77.78)	6 (85.71)
Group-II	6	6 (100)	6 (100)
Group-III	8	8 (100)	7 (87.5)

recurrence or persistence rate (Dabas, 2002). Seven animals in this group conceived on 1st insemination. It can be concluded that administering PG or its analogue 9 days after GnRH therapy is most effective treatment for ovarian cyst without going into differentiation of cyst type.

Summary

A total of 23 cattle (21 cows and 2 heifers), suffering from ovarian cyst were included in the study. Highest prevalence was recorded in crossbred Jersey, in 4th lactation and during summer and spring. Right ovary was affected more than left one and mean number of cysts recorded were 1.22 per animal. Follicular cysts could be treated with human chorionic gonadotrophin (HCG) in 77.78% cases, and, luteal cysts with cloprostenol in 100% cases. However, in cases where cyst could not be differentiated by rectal palpation, administration of cloprostenol 9 days after GnRH treatment was found 100% effective in curing the disease.

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Treatment protocol for enhancing the reproductive efficiency of buffaloes

Mujumdar K. A. and Kulkarni P. D.

Bovine Practitioners, Mumbai-400601

Introduction :

Buffalo milk, because of its higher total solids, is a choice in urban area like Mumbai. There are about one lakh buffaloes located at different stables. Aarey Milk Colony accommodates about 16000 buffaloes. The average number of buffaloes with each owner is around 50 ranging from 25 to 100. Few owners possess 250 to 300 animals. The feeding schedule of these buffaloes is concentrate oriented due to limitations of green fodder availability. Most of the owners use mineral mixture supplements of standard manufacturers. Some of the owners use bypass fat to overcome energy deficiency. These buffaloes have lower reproductive efficiency mainly due to anoestrus condition, repeat breeding and abortion. According to the abattoir survey of reproductive abnormalities in buffaloes as reported by. Razzaque et al, (2004), 37.84 percent showed involvement of ovaries leading to anoestrus condition. Metritis causing repeat breeding problem were at 6 percent level. According to Sharma et al (1967), the incidence of anoestrus was 10 to 11 percent in organized farms and 30 to 60 percent at village condition. According to Singh et al (1979), it was 17.4 percent.

The present study was undertaken to provide the treatment protocol for enhancing fertility in anoestrus and repeat breeder buffaloes in organised farms around Mumbai.

Material & Methods:

For setting up of treatment protocol for enhancing the fertility rate of the buffaloes under organized farm, 60 organised dairy farms were visited regularly. About 1500 buffaloes were examined. The cause of the infertility problem was confirmed by thorough gynecological examinations of each buffalo and by recording the reproductive history of the animal. The treatment data for two years from one unit located at Aarey Milk Colony is analysed. The unit consists of total 300 buffaloes. The buffaloes were with good physical condition (Body Score 3.5) and were given well balanced cattle feed in required quantities depending upon the milk yield of individual animal. Bypass fat (50 to 75 gm per day per animal) was offered for energy purpose. The animals were also provided with standard mineral mixture. Green fodder (paragrass) was provided at the rate of 6 kg per day per buffalo.

The anoestrus cases with smooth and inactive ovaries, plus flabby uterus were treated with GnRH (Injection Receptal 5ml, intramuscular) along with trace mineral supplement, (Bolus cyclomin7) 1 bolus per day for 10 days. The oestrus was observed in 85% treated buffaloes within an average period of 12 days (range 2 to 19 days). The buffaloes were served naturally. The second dose of GnRH was administered to enhance the ovulation process. During the year

2006 and 2007 number of cases treated for anoestrus buffaloes was 58 and 70 respectively.

The repeat breeder cases due to uterine infection were treated with long acting tetracycline (Terraycin LA – 50 ml deep i/m). The buffaloes were also treated with Phosphrus (Injection Tonophosphon 15 ml i/m alternate day for 3 occasions. The buffaloes were served during the next oestrus & treated with GnRH Receptal 5ml I/M after service. Repeat breeders cases treated were 27 & 33 during the year 2006 & 2007 respectively with conception rate observed was 63% & 61 percent.

Anoestrus cases due to persistent corpus leteum were treated with Leuteolytic hormone dinoprost trome thamine 5 mg per ml (Injection Lutalyse 25 mg I/M) The luteolytic effect was observed from 10 to 12 days after treatment. The animal in oestrus were served by natural service and GnRH (Injection Receptal 5 ml I/M) was administered after the service. With this protocol during the year 2006 & 2007 number of buffaloes treated was 7 and 8 respectively with conception rate 57 and 62 percent. Details of the treatments are given in Table 1.

Results & Discussion:

(A) Treatment for anoestrus buffaloes

From the enclosed table, it can be seen total 128 buffaloes with anoestrus condition were treated out of which 79 buffaloes conceived with 61.7 conception percentage. Studies on hormonal

Table 1 Treatment protocol and its effects in post partum anoestrus, repeat breeders and persistent corpus luteum buffaloes

Condition	Incidence %	Treatment Protocol	No. of cases		
			Treated	Pregnant	Conception rate
Anoestrus	20-23	Inj. Receptal 5 ml I/M Bolus Cyclomin7 one/day X 10 Injection Receptal after service 5ml I/M.	128	79	61.7
Repeat Breeders	9-10	Injection Terramycin LA 50 ml Deep I/M. Injection Tonophosphon 15ml I/M alternate day x 3 Service during next oestrus Injection Receptal 5 ml I/M after service	60	37	61.6
Persistent Corpus luteum	2-3	Injection Lutylase 5 ml I/M Injection Receptal 5 ml I/M after service.	15	9	61.5

profile of buffaloes have revealed lowered serum gonadotropin levels than cows (Razdan et al 1981). As per Hafez (2000), gonadotropic releasing hormone (GnRH) plays important role in endocrine regulation of estrous cycle. The initial does of GnRH may have helped for stimulation of ovarian activity, whereas, the second dose of GnRH after service may have helped for maturation of ovarian follicle & lutinisation process. Micro elements like copper, cobalt, manganese, selenium, iodine, zinc are essential for ovarian activity and better conception rates. (Shella Choudhari 2004; C.N. Galdhar 2004). Provision of these elements along with GnRH to buffaloes with good physical condition have resulted in better conception rates (61%) for solving the anoestrus problem.

(B) Treatment for Repeat Breeders due to uterine infection:

Total 60 buffaloes with repeat breeding problem on account of uterine infection were treated with parental injection of long acting tetracycline. (Injection Terramycin LA- 50ml. deep 1/M route). It was noticed that the uterus was flaccid. For improving uterine tone to expel the uterine infection, phosphorus preparation (Inj Tonophosphon 15 ml I/M alternate day for 3 occasion) was administered. The buffaloes were served during next oestrus cycle and after service GnRH (Injection Receptal) was administered for timely ovulation process. Out of 60 treated buffaloes, 37 buffaloes conceived at first service with 61.6% conception rate. Combined treatment of antibiotic, phosphorus and GnRH has yielded better conception rate in problematic animals. Dhami et al (2004) observed overall pooled conception rate from 53.85% to 66.66% and 80% with GnRH treatment.

(C) Treatment for persistent corpus luteum

Total 15 cases with persistent corpus Leteum were treated with leuteolytic hormone (Inj Lutalyse – Dinoprost tromethamine 5 mg/ml. Dose 25 ml I/M.) The animals expressed oestrus signs from 10 to 12 days after treatment. The buffaloes were served and GnRH (Inj Receptal) was administered after service. Out of 15 buffaloes treated, 9 conceived with first service (CR% - 60%). The treatment is very useful as untreated buffaloes would have continued to be in anoestrus condition for long period.

Conclusion:

From the treatment protocol, it is observed that culling percentage on account of reproductive problem has come down from 15 percent during the year 2005 when the protocol was not followed to 5 percent during the year 2007. Thus every year owner could save Rs. 12 lakhs (30 animals x Rs. 40000/ buffaloes) due to lesser replacement cost. The treatment cost worked out to be Rs. 75000/- per year, which was cost effective.

Acknowledgment:

The authors express thanks to Shri C.K. Singh, owner of the unit & Mr. Indrabhan, Manager where the treatments were undertaken, for full co-operation extended.

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National Dairy Plan (2012-22)

The National Dairy Plan shall focus on fulfilling the demand of milk in 2021-22, which is projected to grow to around 180 million tonnes (presently 114 million tonnes in 2011-12). This will require milk production to grow by 5.5 to 6% per annum over the next decade to make the anticipated demand.

The NDP will support long term investments in animal breeding, extensive training to dairy farmers and doorstep delivery of artificial insemination and advisory services on balancing animal feed and nutrition.

Epidemiological studies, antibiogram pattern and therapeutics of Canine Dermatitis in Jammu region

Tiwari S, Soodan J. S. , Kotwal S. K., Singh M. and Malik M.

Division of Veterinary Clinics and Teaching Hospital
Faculty of Veterinary Science and Animal Husbandry, SKUAST-J, Jammu - 181101 (J&K)

Introduction

Though skin is a protective barrier of the animal body, it harbors large varieties of micro-organisns like Streptococcus Spp., Staphylococcus spp. and Psudomonas Spp. The present investigation was undertaken to study the antibiogram pattern of bacterial population isolated from canine dermatitis cases from Jammu region.

Material and Methods

Out of 75 cases of dermatitis, skin swabs were taken from 18 cases appeared to be suffering from bacterial dermatitis, discharging purulent exudates from skin lesions. All the skin swabs were subjected to culture sensitivity testing, using standard disc method (Ward and Bates, 1983).

Culture Sensitivity Testing

The organisms isolated from dermatitis cases were tested for sensitivity to various chemotherapeutic agents. Standard discs of those antimicrobial agents were preferred for which oral or injectable preparations are easily available in the market (Table 1). Standard disc method described by Ward and Bates (1983) was followed for sensitivity test. Four to five colonies of the organisms to be tested were inoculated in 5 ml of nutrient broth or in brain heart infusion broth tube (for fastidious organisms). The tubes were incubated at 37^{0}C for about 6 hours to obtain moderate turbidity. With the help of a sterile cotton swab, the culture was evenly spread over the entire surface of Muller Hinton agar (MHA) plates. In case of fastidious organisms, MHA was supplemented with 5 per cent defibrinated sheep blood. The incubated plates were dried in incubator for 10 minutes at 37^{0}C. The discs were placed at an approximate distance of 3 to 4 cm from each other. The growth inhibition zones were measured after 24 hours of incubation at 37^{0}C and results were interpreted as sensitive or resistant in comparison with the standard chart supplied along with discs.

The prevalence study of bacterial dermatitis was done in respect of prevalence rate, age, sex, season, breed and cumulative incidence rate (CIR) as suggested by Thrusfield (2000).

The cases suffering from bacterial dermatitis were treated with cefrioxone in combination with tazobactum @ 15-25 mg/Kg bwt daily for 5 days and other supportive therapy like anti-infalmmatory drug Anistamin followed by Levocitrizine tablet @ 5 mg bid for dogs less than 10 kg bwt and 10 mg bid for dogs more than 10 kg bwt for 7 days.

Table 1: Antibiogram pattern of bacteria isolated from canine dermatitis

S. No.	Antimicrobial agent disc	Concentration per disc	% of isolates sensitive	% of isolates resistant
1	Ampicillin	10 µg	0	100
2	Amikacin	30 µg	80	20
3	Cephaloridine	30 µg	25	75
4	Gentamicin	10 µg	75	25
5	Streptomycin	10 µg	75	25
6	Norfloxacin	10 µg	50	50
7	Lincomycin	2 µg	0	100
8	Co-trimoxazole	25 µg	0	100
9	Tobramycin	10 µg	75	25
10	Penicillin	10 units	0	100
11	Chloramphenicol	30 µg	75	25
12	Kanamycin	30 µg	75	25
13	Oleandromycin	15 µg	0	100
14	Methicillin	5 µg	0	100
15	Tetracycline	30 µg	75	25
16	Ceftrioxone	30 µg	80	20

Results and Discussion

Prevalence

Age wise prevalence was 50%, 28%, 17% and 3% respectively in 0-1 year, 1-5 years, 5-10 years and 10-15 years age group (Fig 3). Sex wise prevalence was 82% and 19% in males and females respectively (Fig 4). Season wise prevalence were 22%, 28%, 29% and 19% in Summer, Rainy, Autumn and Winter season respectively (Fig 5). Breed wise prevalence was 50%, 25% and 8% respectively in Labrador, German shepherd and Great dane, Pomeranian and Boxer. Cumulative incidence rate of bacterial dermatitis was 8% (Fig 6).

Prevalence of skin affections like dermatitis, fungal dermatitis, bacterial dermatitis, sarcoptes infection, demodectis infection, ectoparasitic infection, alopecia, itching, flea allergy dermatitis, pruritus were 33%, 8%, 8%, 5%, 10%, 10%, 6%, 1%, 4% and 1% respectively (Table 2 and Fig 1).

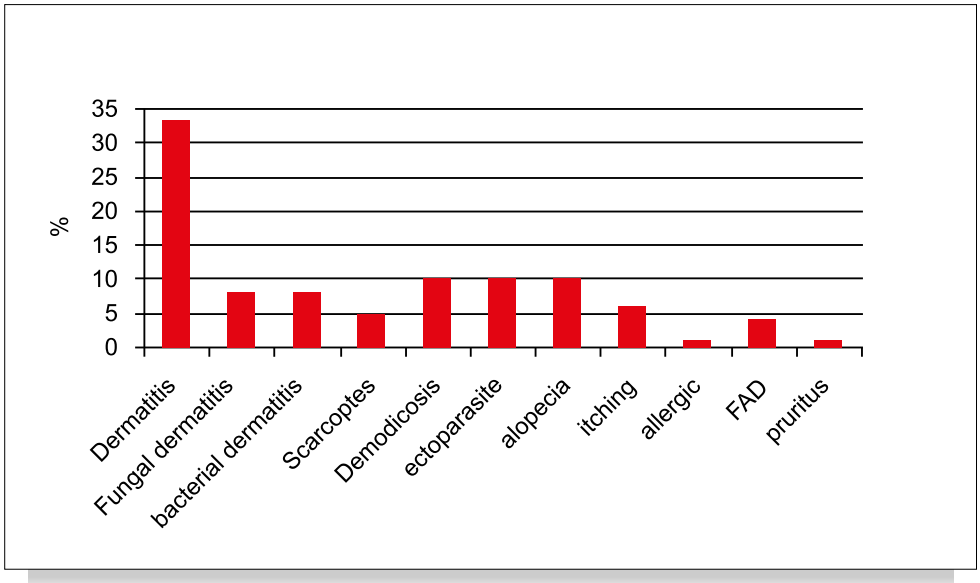
Cultural isolation and Antibiogram Pattern

Out of 18 samples subjected to culture

Table 2: Prevalence of different skin affections in canine dermatitis

S. No.	Disease	No of Cases	%
1	Dermatitis	25	33.33
2	Fungal dermatitis	6	8
3	Bacterial dermatitis	6	8
4	Sarcoptes	4	5
5	Demodicosis	8	10
6	Ectoparasite	8	10
7	Alopecia	8	10
8	Itching	5	6
9	Allergic	1	1
10	FAD	3	4
11	Pruritus	1	1

Fig 1: Prevalence of skin affection (%)



sensitivity testing, six showed bacterial growth on blood agar media. Out of 6 samples, *Staph aureus* had been isolated from 4 samples. 80 % of isolates were sensitive to Ceftrioxone and Amikacin. 75 % of isolates were sensitive to Kanamycin, Cholarmphenicol, Tobramycin, Streptomycin and Gentamicin whereas 25% of isolates were resistant to former drugs mentioned. 50% of isolates were sensitive to norfloxacin. Cephaloridine showed sensitivity towards 25% of isolates. All the isolates were resistant to other antibiotics used i.e. Penicillin, Oleandromycin, Methicillin, Lincomycin, Ampicillin and Co-trimoxazole (Table 1 and Fig 2).

Clinical signs and Therapy

All the cases were showing purulent exudates from the skin lesions. In 4 cases, lesions were confined to groin areas, in 6 cases lesions were confined to ventral aspect of body and in rest of the cases, generalized lesions were shown. Other clinical parameters like temperature, respiration rate, heart rate, capillary refill time, mucous membrane were normal. All the cases were having normal appetite.

The cases which were suspected to be suffering from bacterial dermatitis were administered cefrtioxone inj at the prescribed dose rate along with supportive therapy for 5-7 days. Many authors recommend therapy of soft tissue infection with ceftrioxone (Tripathi 2010). 4 cases out of 6 which had shown positive culture sensitivity testing were recovered after treatment which shows that efficacy of ceftrioxone against bacterial dermatitis was 66.67%.

Fig 2: Antibiogram pattern of bacterial isolates from bacterial deramatitis

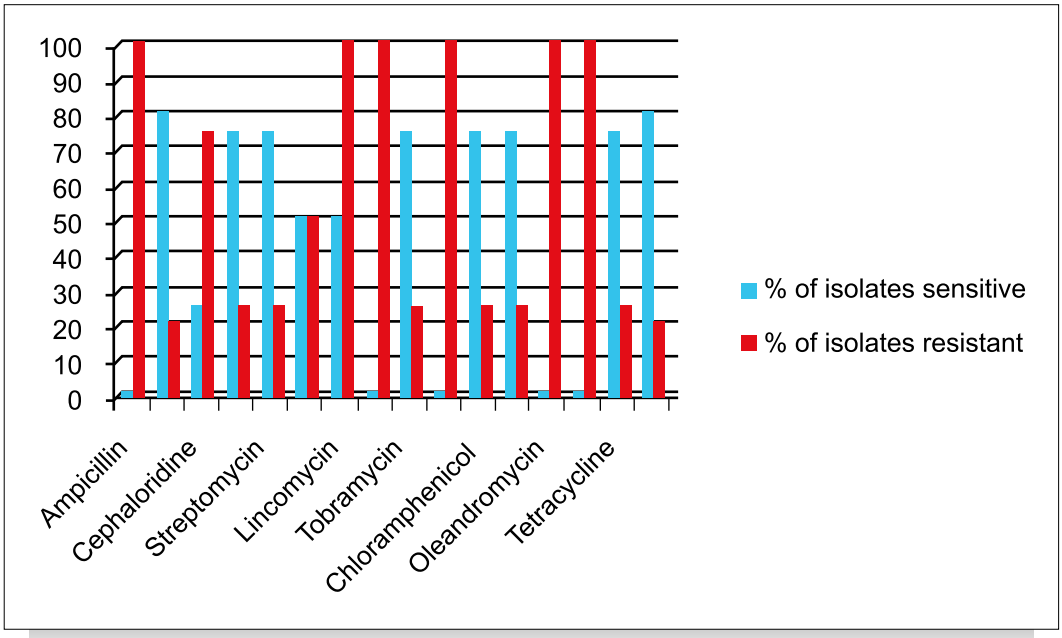


Fig 3: Age wise prevalence in canine dermatitis (%)

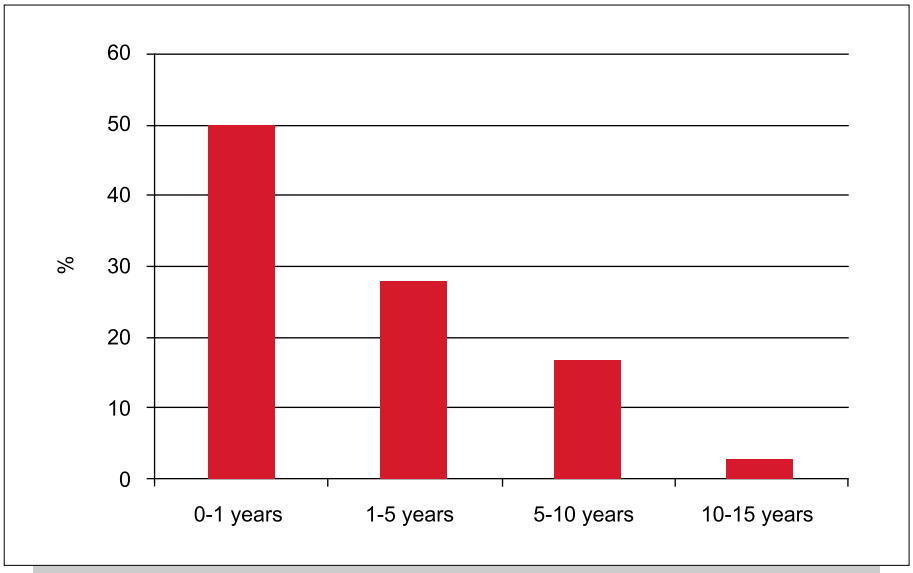


Fig 4: season wise prevalence of canine dermatitis

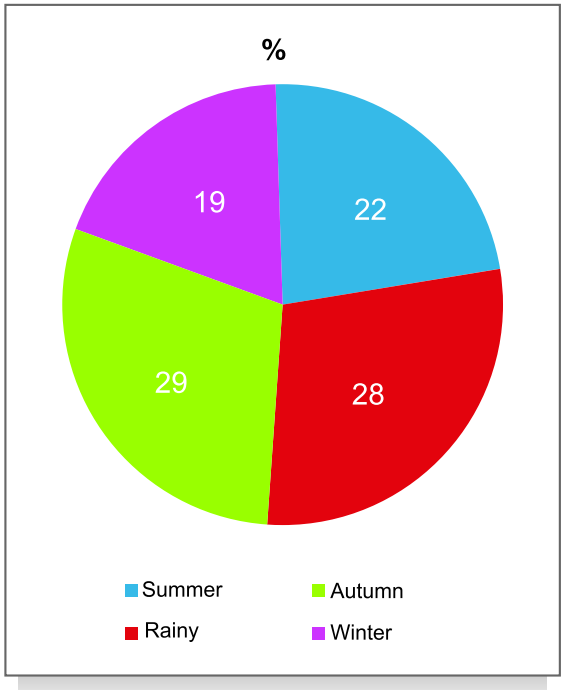
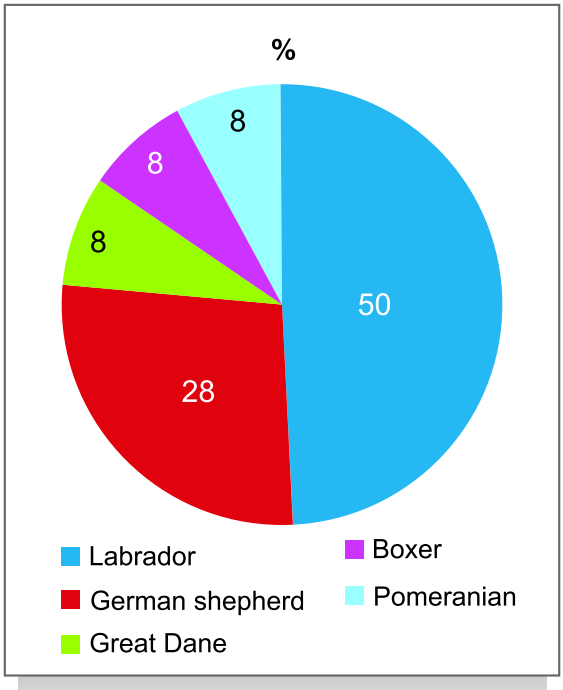


Fig 5: Breed wise prevalence of canine dermatitis



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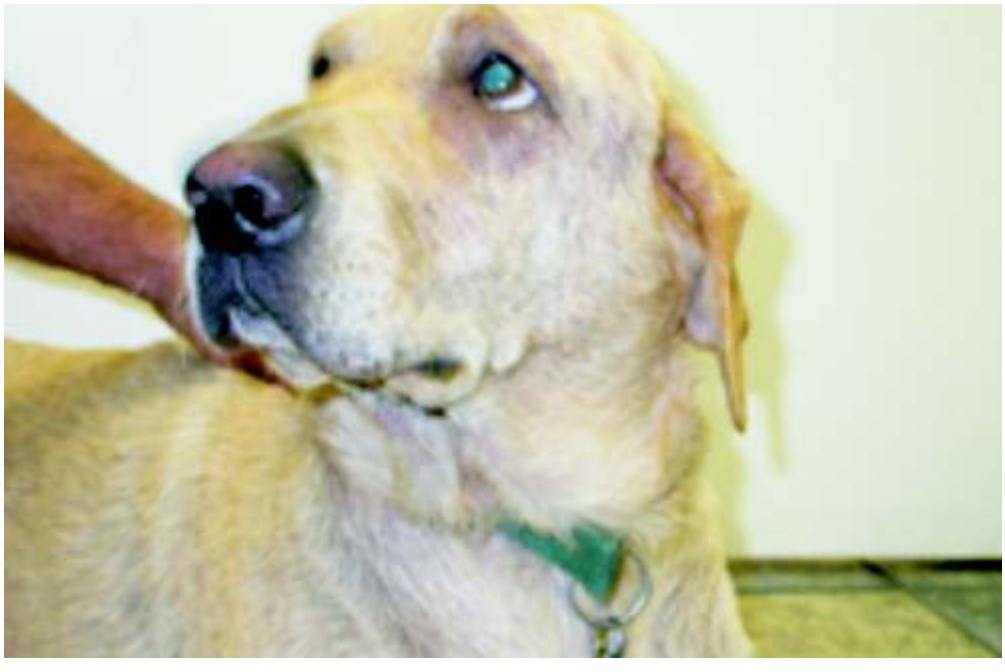

Incidence of pigeon pox in Mumbai city

Sawale G. K., Ingole K. H., and Roshi R. R.

Department Of Veterinary Pathology
Bombay Veterinary College, Parel, Mumbai- 12 (MS)

Fig 1: Pigeon showing nodular growth around beak and eye

Introduction

Pigeon pox is a slow spreading viral disease of birds caused by DNA (avipoxvirus) virus from the family Poxviridae and characterized by proliferative and scab lesions on skin (cutaneous form), trachea and esophagus (diphtheritic form). Three common strains have been identified and include fowl pox virus, pigeon pox virus and canary pox virus. Fowls and turkeys are particularly susceptible to fowl pox virus while pigeons suffer most from pigeon pox virus. The strains vary in their virulence and have the ability to infect other avian species. However, many of the strains are group specific. Approximately, sixty species of birds from 20 families have been diagnosed with avian pox (OIE, 2008; Tripathi and Reed, 2008). Total of six cases of pigeon pox are presented here which are recorded over a period of one year.

Material and Methods

A total of six pigeon pox cases were included in the present study during routine investigation of illness in pigeon. Nodular growths of 0.5 to 1.0 cm in diameter were observed on non-feathered parts of body such as around beak, mouth, eyes, ear (Fig. 1) and cloaca. Occasionally, scabs were also observed in interdigital spaces, neck and abdominal skin. Clinically, pigeons showed anorexia, dullness and greenish faeces. Out of six pigeons, two died during the course of treatment. The scabs were collected from live as well as dead animal, fixed in 10 % formalin, routinely processed and stained with Eosin and Haematoxylene stain (Culling, 1968).

Result and discussion

In the present investigation, all the cases were recorded in summer. The clinical signs such as nodules or scab on nonfeathered part of skin (Cutaneous form) reported in the present investigation have also been reported by various authors (Mohan and Fernandez, 2008; OIE, 2008; Tripathi and Reed, 2008). Diphtheritic lesions were not observed in the present investigation which is in accordance with the

observation of Mohan and Fernandez, (2008) who did not find diphtheritic lesions.

Necropsy of dead pigeons revealed dehydrated carcass with greenish, watery faeces intermixed with chalky material in one pigeon. The death of the pigeon could have possibly been due to severe skin lesions and anorexia. The necropsy of other pigeon revealed severe injuries on neck region, communicating with esophagus and there by ulceration in esophagus as well as wound on skull bone with opening into cerebrum. The focal haemorrhagic spot was also seen on cerebrum at the point of wound. The history from the person who had brought the pigeon from road side revealed that the pigeon was dull and crows had attacked the pigeon. This could possibly have produced multiple injuries on skin and brain resulting into the death of pigeon.

An outbreak of pigeon pox in eight local golla breed of pigeon with death in few has been reported. The death of pigeons in these outbreaks has been suggested due to pigeon pox along with heavy parasitic load (Singh et al, 1990). Morbidity and mortality in pigeon pox have been reported to be very high as compared to fowl pox. Moreover, these birds can succumb to predator, injuries, secondary infection and accidents (Reece, 1989).

Histopathological examination of section of affected skin (scab) revealed moderate to severe balloon degeneration and severe necrosis with dense intracytoplasmic, eosinophilic viral inclusion bodies (Bollinger bodies) in the clear vacuoles. At few places, numerous bacterial colonies were also seen in superficial layer of epidermis and showed ulceration with congestion and necrosis. These observations are in accordance with earlier observation recorded by various authors (Mohan and Fernandez, 2008; OIE, 2008; Tripathi and Reed, 2008). Preliminary diagnosis of pigeon pox has been done with clinical examination and gross lesions. The confirmatory diagnosis was made on the basis of histopathological lesions and presence of intranuclear, eosinophilic inclusion bodies. All the six natural cases of pigeon pox occurred in summer indicating that the disease could have possibly been due to heat stress. Moreover, virus is sturdy and can remain viable in dry scab. The transmission in the present investigation is not known. However, transmission through damaged skin, vector bite, contact of infected pigeon to wound of healthy pigeon has been suggested (OIE, 2008; Tripathi and Reed, 2008).

Thus, pigeon pox is an important disease of pigeon and need to be studied on its epidemiology and molecular characteristics of virus to prevent and control the epidemic..

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Autohaemotherapy In Bovine Papilloma

Syaama Sundar N. and Saritha G.

Department of Veterinary Medicine, College of Veterinary Science, Proddatu,.- 516 360 (AP)

INTRODUCTION

Autohaemotherapy is a simple technique where patient's own blood is injected parenterally. This method is preferable as it is simple and economical, compared to other conventional approaches. The beneficial effect of autohaemotherapy is due to its immunostimulating effects. Enhanced production of both humoral and cell mediated immunity has been reported after autohaemotherapy. In the present report, a preliminary clinical trial was undertaken on 8 crossbred cows.

CASE PRESENTATION

Eight crossbred cows showing warts on various parts of body were subjected to autohaemotherapy. Before initiating the treatment, the general clinical and systemic examination of all the animals was taken up. There was no detectable abnormality in all these animals except the presence of cutaneous lesions. The body temperature, pulse, respiration, conjunctival mucous membrane and ruminal motility were normal in all the animals. Examination of blood revealed no haemoprotozoan infections and dung sample testing revealed no parasitic burden in all the eight cows.

LESION DISTRIBUTION

Four cows showed warts on their teats and mammary glands, whereas one animal had big lumps of growth on legs and back, one animal had papillomatous growth in the inner aspect of pinna of ear. One animal had papillomatous growth on neck and ear. One animal had growth on the back.

CLINICAL MANAGEMENT

All the animals were subjected to autohaemotherapy. 20ml of blood was collected in a clean syringe by jugular vein puncture . 10ml was given subcutaneously, on the side of neck and another 10ml was given intramuscularly. The treatment was repeated at weekly intervals.

RESULTS AND DISCUSSION

The animals recovered completely after 3-8 injections. Animals which were having small warts on the teats and mammary glands as well as growths on the inner aspect of ear recovered after 3 injections. The animal showing growths on the back; another showing on the neck and ear received five injections. One animal which

had big lumps of growths on the legs recovered after eight injections.

Autohaemotherapy is a very simple method wherein patient's own blood is given parenterally. This method is preferable as it is simple and economical compared to other conventional approaches. The action or effectiveness of this may be due to its immune enhancing effects (Atulya et al.,2011). Enhanced production of both humoral and cell mediated immunity was reported after autohaemotherapy by earlier workers (Klemparskaya et al.,1986). Similar technique was reported by Chetan kumar (2011) on a five and half year old cow.

In a study of 154 cattle diagnosed as carriers of cutaneous papilloamas, more efficient recuperation was noted in those subjected to autohaemotherapy (Francolasilva and V.de Sajayane, 1998) Autohaemotherapy might be an alternative method in the field (Biricik et al.,2003). Autohaemotherapy was successfully employed on five buffalo calves, 3 female calves and buffalo heifers aged 8 months to 3 years in West Bengal by Jana and Jana (2009). They administered fresh blood from the affected animals @ 5ml/100kg. Half of the dose was given intramuscularly at the gluteal region and other half as subcutaneous injection in the neck region. Treatment was repeated at weekly intervals for 4-5 weeks. The warts gradually regressed and sloughed. In the present study the same technique of administration of fresh blood was undertaken and the lesions disappeared after a period of 3-8 weeks.

It may be concluded that autohaemotherapy is a very simple, safe and economical method compared to other conventional approaches, This is a good alternative method in the field and also a safe method as animal products are not subject to withdrawal time.

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Colic in horse and its management

Waghmare S.P. , Kanghule S.M. and Mode S.G.

Teaching Veterinary Clinical Complex
Post Graduate Institute of Veterinary and Animal Sciences, Akola - 444104 (M.S.)

INTRODUCTION:

Colic is the most important disease condition of horses encountered by Veterinary Clinicians. It is almost invariably associated with impaired gastrointestinal function, usually alteration in motility or absorptive function of intestine. The major cause of colic is dietary errors (Radostitis et al., 2000).

The present case report deals with colic in a horse and its therapeutic management.

HISTORY AND CLINICAL EXAMINATION

A Kathiawadi horse aged about 5 years, from Nandura, District Buldhana was referred to Teaching Veterinary Clinical Complex (TVCC) with a complaint of abdominal pain manifested by pawing, frequent lying down and getting up, frequent urination, cessation of defecation, straining and anorexia since 3 days. The horse was previously treated at local Veterinary Hospital. As the animal had not responded to the treatment, it was referred to TVCC, Post Graduate Institute of Veterinary & Animal Science, Akola.

The clinical examination revealed severe abdominal distension, rise is pulse (64/min) and respiratory rate (42/min). The rectal temperature was 101.40F, conjunctival mucous membrane was congested; capillary refill time was > 2 sec. Auscultation of abdomen revealed absence of gut motility. The animal showed patchy sweating over the ventral abdomen, thigh and neck region. The rectal examination revealed no faeces in the rectum.

TREATMENT AND DISCUSSION

The treatment was initiated with the immediate administration of Inj. Vetalgin1 20 ml, Inj. Fortwin2 @ 0.5 mg mg/kg intravenously and Inj. Avil 10 ml intramuscularly along with DNS (Sodium Chloride & Dextrose 5%) 2 lit and RL (Ringer Lactate) 4 lit intravenously. The animal responded to the treatment and exibited no pain. After 2 hours; the horse again started exhibiting signs of abdominal pain with pawing, recumbancy and getting up. The horse was again treated with Inj. Ketop4 @ 2.2 mg/kg body wt, Inj. Banamine5 @ 1 mg/kg body weight, Inj. Oriprim V6 15 ml intravenously along with DNS 1 lit and RL 2 lit intravenously.

Luke warm soap water enema was given to lubricate the gut mucosa. The horse showed improvement with decrease in signs of pain, reduction in abdominal distension, initiation of peristaltic movement and urination. The animal started passing gases and faeces after 8 hours. On next morning, the animal showed remarkable improvement with reduction in abdominal distension, improvement in gut motility, absence of pain and attempt to eat. The elevated pulse, heart and respiratory rates

were restored to normal after treatment. The analgesic, antibiotic and fluid therapy was given for another 2 days. The owner was advised to administer bolus Pancure 3 gm (fenbendazole) orally as a single dose. The animal was kept under observation and discharged on 3rd day of treatment.

The present case of colic might be due to the excessive ingestion of poor quality feed stuff which impaired gastrointestinal function. The pain is the hallmark of gastrointestinal diseases in horses and is attributable to distension of the gastrointestinal tract and stimulation of stretch receptors in the bowel walls and mesentery. It is manifested by pawing, frequent rolling on the ground, lying and getting up, frequent attempts to urinate or defecate (Radosititis et al., 2000). Similar signs of abdominal pain were observed in the present case. The pain inhibits the normal gut motility and function, allowing accumulation of ingesta and fluid, resulting in distension and further pain (Hay and Moore, 1997). As horse responds very violently to abdominal pain by showing signs of pain, immediate administration of analgesic and sedative drugs is very important to relieve sever pain. In the present case, the horse was given potent analgesic and sedative to relive uncontrolled pain.

In colic, there is rapid and severe loss of fluid and electrolytes into the lumen of the gastrointestinal tract, which leads to haemoconcentration, dehydration and shock. Therefore, correction of fluid and electrolyte balance is very important in the management of colic. Administration of intravenous fluids, preferably a balanced isotonic, polyionic fluid such as lactated Ringer's solution, dextrose and normal saline are necessary to correct dehydration and electrolyte imbalance. In present case, 8 to 10 liters of fluid was administered intravenously to correct dehydration and electrolyte imbalance. Yadav et al (2011) successfully treated cases of impactive colic by administrating combinations consisting of pentazocine, fluid therapy, ketoprofen parentrally and liquid paraffin orally.

The present case of colic was successfully treated with administering potent analgesic, sedative and intravenous fluid. The horse responded well to above therapy with complete recovery.

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Dystocia due to dicephalus tetrabrachius ischiopagus tripus dicaudatus in buffalo

Pandey Anand Kumar and Singh Gyan

Teaching Veterinary Clinical Complex, College of Veterinary Sciences,
Lala Lajpat Rai University of Veterinary and Animal Sciences Hisar - 125004 (Haryana)

Fig. 1: Dicephalus Tetrabrachius Ischiopagus Tripus Dicaudatus in Buffalo

Introduction

Fetal monster is an important fetal cause of dystocia in animals. Teratological development or arrest in ovum may result in the death or malformations of the antenatal individual resulting in dystocia (Roberts, 1986). Incidence of monstrosities in animals is 0.51% (Bahr and Distl, 2005). Depending upon the area of fusion or non-separation, the types of the twins may differ e.g., cephalopagus 2%, ischiopagus 2%, pyopagus 18%, omphalopagus 35%, and thoracopagus 40% (Fernando, 1993). Delivery of conjoined twin was undertaken usually by caesarean section (Whitlock et al., 2008). The present communication records delivery of monster fetus by fetotomy.

Case history

A full term Murrah buffalo (Case no. 10-2327) in its third parity with complete gestation period was presented in recumbent position at Teaching Veterinary Clinical Complex, LLRUVAS, Hisar with the history of ruptured water bag and severe labour pain since 6 hr earlier.

Clinical Observations

The clinical parameters (temperature, pulse, heartbeat) were within the normal range. Per-vaginum examination following lubrication with carboxymethyl cellulose revealed that cervix was fully dilated with fetus in anterior presentation, dorso-sacral position and three fore limbs in the birth passage. Further exploration revealed one more fore limb flexed beneath the body and two heads attached to the fetus. Fetal movements and other reflexes were absent. The fetus was diagnosed as monster.

Treatment

Following epidural anaesthesia (Lignocaine hydrochloride 2%, 5 ml), birth canal was lubricated with carboxymethyl cellulose. Three

forelimbs presented in birth canal were amputated one by one followed by amputation of both head. Thereafter, three hind limbs were amputated judiciously. The traction was applied on one fore limb and ribs, surprisingly delivering the fetus. Following delivery, the buffalo was treated with broad spectrum antibiotics and supportive therapy for 5 consecutive days. Recovery was uneventful.

Discussion

The dead male monster calf had two normal heads, four fore limbs, two vertebral columns lying parallel and the fetus was fused together from lower part of pelvic region, three hind limbs and two tails (Fig.1). The monster calf was diagnosed as "Dicephalus Tetrabrachius Ischiopagus Tripus Dicaudatus" monster as mentioned by Roberts (1986). On post-mortem examination, fetus revealed extensively enlarged one heart and lungs, however, remaining body parts were in duplicate and normal.

In monozygotic twins, incomplete division of embryo into two components at the primitive streak state leads to conjoined monstrosities (Noden and Delahunta, 1985). Dicephalus dipus dibrachius monster with two separate necks in anterior longitudinal presentation (Patil et al., 2004) and Diplophagus dicephalus dipus tetrabrachius ziphopagus dicaudatus is reported (Shelar et al., 2007). The causes for congenital bovine fetal anomalies can be categorized into toxic, nutritional, infectious and heritable categories (Whitlock et al., 2008). It is suggested that these etiological agents could be responsible for the failure of separation of conjoined twins (Romero et al., 1988). It is concluded that the delivery of monster fetus could be achieved by fetotomy, so that chances of future fertility of the dam can be saved.

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Haemogalactia in buffaloes

Saikrishna K.S., Rajesh Anusha K. and Syaama sundar K. N.

Department of Clinical Veterinary Medicine, Ethics and Jurisprudence
College of Veterinary Science – Proddatur - 516 360 (AP)

Introduction:

Haemogalactia i.e., blood in milk, is a commonly noticed mammary affection under field conditions, which may be physiological owing to natural hyperemia of mammary gland and rupture of tiny blood vessels (Kahn, 2010). It may range from mild blood tinge (Muhammad et al. 1977) to frank blood in milk (Raina et al.1990). Trauma could be an important underlying cause for this bloody milk whereas Vitamin C deficiency, feeding with rubiacea feed stuffs, mastitis, leptospirosis (Balakrishnan et al., 2009) and harsh milking practices can also result in haemogalactia. If neglected this condition may precipitate mastitis that results in further economic losses to the farmer.

Case history and Clinical observations:

A total of four buffaloes were brought to Teaching Veterinary Clinic, Proddatur with the symptom of pink coloured milk from the teats. Physical examination of the teat revealed no palpable abnormality in one animal, whereas, in another animal blood clot was noticed that was squeezed out (Fig. 1). In two cases, mild inflammation of teat was noticed. No alteration in the normal consistency of milk was noticed. Faecal examination and wetblood film examination revealed no internal parasites and haemoprotozoans respectively. Of the four animals examined, a single teat was affected in three cases (One LH & Two RH) while both the hind teats were affected in one case.

Treatment and Discussion:

The affected animals were given inj. Adrenochrome (Styptochrome) @ 10ml i/m along with Inj. Enrofloxacin (Floxidin) @ 5mg/kg i/m, Inj. Meloxicam (Melonex) @ 0.5mg/kg i/m. Same therapy was continued for three days and three animals showed complete clinical recovery. One animal showed recurrence on 5th day and that animal was given Inj.Ceftriaxone (Intacef) @ 3.0 g/day along with Inj.Adrenochrome (Styptochrome) @ 10ml i/m for 3 days. Complete recovery was noticed on

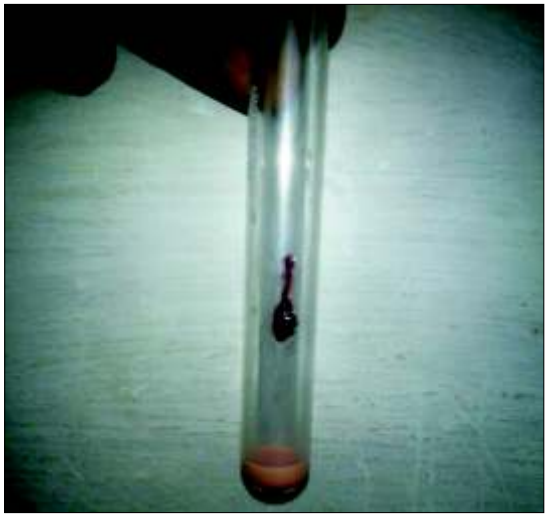

Figure. Pink coloured milk along with the blood clot

4th day. Animals were examined for 30 days where in no relapse was noticed.

In buffaloes haemogalactia occurs most commonly because of trauma to the mammary system as a result of butting by other animals or pressure from the hard particles in the bedding area. Hind quarters are most commonly affected than forequarters as they are larger and more vascular, lying close to hind legs. They are subjected to greater possibility of trauma and contamination (Singh and Prasad, 1987). Styptics like adrenochrome, haemocoagulase, vitamin K analogues etc., should be administered systemically to control haemorrhage. Broad spectrum antibiotics should also be administered to prevent colonization of bacteria at the site of injury. Supportive treatment in the form of ice packs, cold water sprays must be provided to reduce inflammation. Bedding area should be examined for hard objects to avoid trauma to the udder.

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National Dairy Plan (2012-22)

NDP at a glance

- National milk production to be increased to 180-200 million tones by 2021-22 (presently 114 million tones in 2011-12).
- Per capita availability of milk to be increased to 350 gm/day (presently 268 gm/day in 2011-12).
- The number of co-operative primary dairy membership to be increased to 19 millions (presently 13 millions).
- Increase in employment potential in milk production, collection, processing, distribution and marketing, so also in on farm and input sectors.

Surgical management of Sole Ulcer, Interdigital Hyperplacia and White Line Disease in a Jersy Cow

Kale V. D. , Ulemale A. H. , Gaikwad S. M. , Kadam D. V. and Patil H. M.

Department of Surgery & Radiology
KNP College of Veterinary Science Shirval, 412 801 (MS)

Introduction

Poor hygine, imbalanced diet, hard flooring, longstanding hoof contact with manure, anatomical defects of body are the factors responsible for lameness. The lameness condition in dairy animals results into decreased milk production, anestrus, repeat breeding and high cost of treatment. In most of the cases, lamness is due to hoof deformities. Hoof deformities may be infectious and non-infectious. Among the non-infectious hoof deformities, interdigital hyperplacia, sole ulcer and white line disease are common. The present paper describes the multiple hoof disorder in a lateral claw.

Case History, Diagnosis and Treatment

A longstanding case of multiple hoof deformities was identified in a small dairy farm. The cow was showing lameness since five months, which was treated by local Veterinarian as a general wound without any improvement. Thorough examination of the affected lateral hoof revealed multiple hoof deformities like regressed interdigital hyperplacia, 4-5 cm sole ulcer and white line towards the toe.

The animal was restrained in lateral recumbancy with affected limb on the upper side. Analgesia was achieved with ring block by infiltrating 2% lignocaine hydrochoride. Hoof was throughly cleaned. Overgrown hoof was fuctionally trimmed at a desired level. Necrosed part and accumulated filth was removed from the white line. No abscess observed in the underlying tissue.

Overgrowth on the sole ulcer was curreted. Incision around the hyperplastic growth was taken. Complete growth along with interdigital fat was removed. Remaining part, after removal

of growth, was cauterized with liquid nitrogen spray by using cryogun. Freezing and thawing was done twice still ice crystal formation over the incised area. Toing of hoof was performed by drilling two holes on toe with flexible steel wire. Wodden block was applied on medial claw. Postoperativly Inj. Dicrysticin 2.5 gm for five days and Inj. Ketoprofen 15 ml i/m was given for three days. Unevetful recovery was observed after 4 weeks.

Discussion

Lameness in dairy cattle is a emerging challenege in organised dairy farms. It leads to heavy economic losses in the form of reduced milk yield and poor reproductive performance. In humid condition, interdigital hyperplacia in predominant. Sole ulcer is the dominant abnormality in animals (Clarckson et al. 1996). Weaver et al. (2005) believed that sole ulcers and white line disease are major causes of bovine lameness. White line disease, interdigital hyperplacia and sole ulcer are the secondary complications of subclinical laminitis (Bergsten, 1995).

The present case had dystokia and retained placenta four months back. Since then, the animal was ill due to arthtitis and hoof problems. The retained placenta and other complications led to subclinical laminitis, white line disease, interdigital hyperplacia and sole ulcer. Uma Rani and Kathiresan (2008) opined that surgical excision with thermocautery is effective for interdigital hyperplasia. Surgical excision alongwith cryosrgery is the most effective treatment for the interdigital hyperplacia (Tank et.al. 2009). Functional hoof trimming and wooden block application was

effective treatment for white line disease and sole ulcer.

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Successful management of uterine torsion in a cross bred cow: A case report

Gaikwad S. M., Kale V.D.

Department of Animal Reproduction Gynecology and Obstetrics
KNP College of Veterinary Science Shirwal. 412 801 (MS)

Introduction

Uterine torsion is twisting of uterus on its long axis. It may occur in all species of animals, but seen most commonly in dairy cattle and occasionally in sheep and goats. (Arthur 1982). Torsion occurs mostly in early part of second stage of labor or the later part of first stage (Roberts 1971, Morrow, 1986).

History and Diagnosis:

A cross bred cow in her fourth gestation was presented with the history of completion of gestation period and symptoms of initiation of parturition process. The case was previously attended by the local Veterinarian. The cow had abdominal straining since last two days (approx. 48 hours). The animal was dull with intermittent straining efforts. No vaginal discharge was noticed by the owner or the attending Veterinarian. The teats were engorged with milk. Other symptoms like rapid pulse, anorexia, tachycardia, restlessness, vulval edema were observed in the cow. Per rectal and per vaginal examination revealed right side uterine torsion. The viability of the fetus was also checked by presence of fremitus which was very weak, indicative of dead fetus . The case was diagnosed as post cervical uterine torsion of right side.

Treatment:

It was decided to roll the cow to detort the uterus. Prior to detorsion, the cow was administered 1 litre Ringers Lactate, 1 liter D5, 40mg dexamethsone, epidosin 40ml intravenously. Vetalgin and Avil were administered intramuscularly. The cow was casted on right lateral recumbancy and both fore and hind limbs tied separately. The cow was rolled by following Schaffers modified Sharma's method. The cow was rolled slowly towards the direction of torsion i.e. in right side direction. While rolling the animal the uterus and fetus were fixed/ held in place by applying plank and weight of man standing on it. One complete roll was accomplished in a co-ordinated manner so that both the hind and fore limbs brought to the right side simultaneously. After one roll the cow was reexamined by per vaginal examination to assess the improvement. There was still some twist, so the second roll was given to the cow in the same manner as the first one. After the second roll, there was complete detorsion which was examined by per vaginal examination and presence of water bag at the vulva. The dead feteus was delivered by traction. Following the expulsion of the calf, the cow was administered with routine treatment i.e. antibiotic/analgesics fluid therapy etc. The recovery of the cow was absolutely normal.

Casting of the animal

Rotation of the animal and fixation of uterus by wooden plank

Delivery of dead calf

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Incidence of theileriasis in Indian buffaloes

Suryawanshi Dayaram & Pawar Pavan

Omega Laboratories , Lonand, Pin- 415521 (Maharashtra)

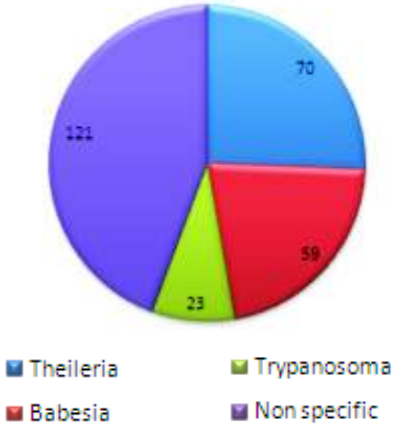
Introduction:

Incidence of theileria in buffaloes has remained undiagnosed due to lack of awareness about the susceptibility of buffaloes to theileria. Cases with high fever are usually treated with routine antibiotics and other symptomatic treatment along with supportive medicines. The present paper puts on record the laboratory diagnosis of Theilerial infection in buffaloes along with clinicohematological findings and management.

Material and methods:

273 buffalo blood samples were examined and clinical signs recorded during last 3 years. Detailed hematological investigastion like hemoglobin (gm%), RBC count (million / cmm), PCV (%), TLC (10^3/ cmm) and platelet count (lacks/ml) were also carried out.

Figure 1 Incidence of blood protozoans



Clinical observations included body temperature, nature of feeding pattern and general clinical signs.

Treatment :

Treatment included: Inj. Buparvaquone @ 3 mg /kg body weight given deep intramuscularly at two sites on neck regions. Oxytetracyclin @ 100 mg/ kg bodyweight IV in DNS, antipyretic and plasma expanders were given along with standard lactobacillus and yeast culture orally.

Amongst 273 buffalo blood samples, 23 were positive for trypanosomiasis, 59 were positive for babesioosis, 121 samples were positive for non specific bacterial septicemia, whereas, 70 samples were positive for Theileria spp. (Figure 1) The hematological findings included low hemoglobin contents i.e. 3.4 to 5.6 gm%, RBC count of 1.44 to 3.22 million/cmm, PCV between 7 to 19%, TLC within the normal

Enlargement of supramammary Lymph node (white arrow)

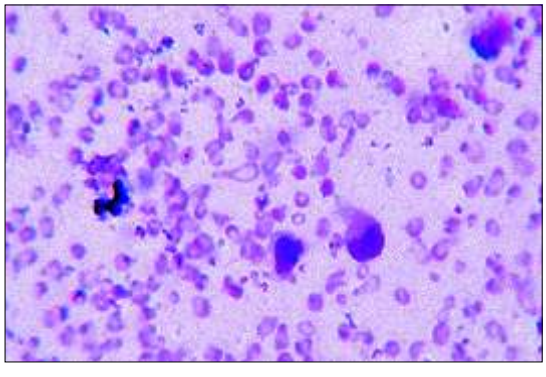
range of 4500 to 8800/cmm and platelet count (5.9-10.3 lacks/ml). Elongated platelets with basophilic inclusions were typically recorded in all the theileria cases. Morphological changes in RBCs included microcytosis with hypochromacia were also seen.

Clinical signs observed were high rectal temperature (105 to 107^{0}F), selective anorexia to concentrate intake, diarrhea in 15 buffaloes, constipation in 20 cases, whereas, in 10 cases out of 70, melena was evident. Nasal discharge, coughing, respiratory distress and polypnoea was noticed in almost all the cases. Abortions in 3 advanced pregnant buffaloes was observed. Drop in milk production to the extent of 50% was evident in lactating buffaloes. Mild swelling of supramammary lymph node was seen in few cases. The corneal opacity was observed in 4 cases.

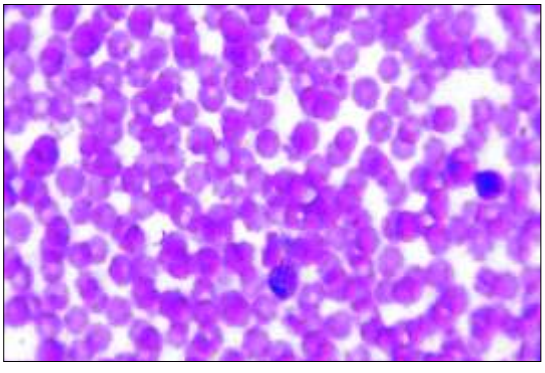
On the second day of treatment body temperature subsided to 102 to 103^{0}F, respiratory distress remained for 3 days and buffaloes returned to normal lactation after 7 days of treatment.

Conclusions:

Theileria in buffalo, though occuring commonly, remains un-noticed. Severe anemia, jaundice, drop in milk production and abortion in advanced pregnant buffaloes are predominantly seen. Theileriasis in buffaloes is an emerging disease and early diagnosis with the help of laboratory investigation is possible. The success rate of treatment is as high as 100 percent.



Severe microcytic anemia along with piroplasm in RBCs



Hypochromic RBCs (red arrow), Koch blue bodies in lymphocytes (blue arrow)and piroplasm in RBCs. (white arrow)

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Summer mastitis in a crossbred cow

Padmaja K. , Lakshmi K. and Krishnaiah N.

College of Veterinary Science, Rajendranagar, Hyderabad - 500030 (AP)

Introduction:

Summer mastitis is an acute suppurative bacterial infection of udder in heifers and dry cows (Chirico et al., 1997), although lactating animals may also be affected usually after injury or the development of black spot on the teat (Radostits et al., 2007). In sporadic cases, the method of spread is attributed to biting insects and the prevalence of disease is related to the peaks of fly populations and the favourable climate conditions especially in summer months (Bramley et al., 1985).

Case History and Clinical Observations:

A crossbred HF cow after 45 days of calving, which had survived an attack of FMD, was brought to the clinic with the history of dullness, anorexia and watery secretions from left half of the udder. Clinical examination revealed high temperature (104.4oF), decreased ruminal motility (1 per 3 minutes) and congested conjuctival mucous membrane. On palpation, udder was hard and left half has watery secretions and difficulty in milking. Milk samples were collected in sterile tubes for cultural examination. Subsequently, the udder secretions turned purulent with putrid odour and developed abscess in the left half rupturing through the floor of the udder.

Treatment:

The milk from the left quarters was removed, udder was washed and ointment, Mastilep was applied topically to whole of udder surface. The cow was administered intra venously 1 liter of Intalyte (20% Dextrose with Electrolytes) and intra muscularly Bayrocin single shot (Long acting Enrofloxacin, 30 ml and Melonex powder (Meloxicame) 3 ml on day 1.

From day 2 to day 4 the above treatment was repeated by including Intacef Tazo 4.5 g (Cephataxime with Tazobactum) intra muscular in place of Bayrosin. From day 5 to day 7, the treatment was continued by replacing Intalyte with Akacyi (Amikacin) , 2.5 g intramuscular.

Results and Discussion:

The case was confirmed as summer mastitis. Milk sample on cultural examination revealed *Corynebacterium pyogenes* followed by Staphylococcus aureus and Streptococcus uberis. These bacteria are capable of causing suppurative mastitis (Chirico et al., 1997). Moreover this incidence was reported in the month of March, which is dry and hot and this was corroborated with the findings of Wage et al. (1999) where it was reported that *Staphylococcus aureus* and *Corynebacterium pyogenes* occupied highest proportions in mastitis that occurred during summer season. The cow was administered fluid therapy and Enrofloxacin as there was systemic involvement. But there was no improvement in the condition. Fernandez et al. (2001) reported that the antimicrobial activity of Ciprofloxacin on the Corynebacterium isolates from ewe's mastitis was unpredictable. As all the bacteria were gram positive (confirmed by cultural examination), Cephatoxime with Tazobactam

was given for 3 days (2nd to 4th day) and Amikacin was given along with Cephataxime with Tazobactam for synergistic effect on 5th, 6th and 7th day of treatment. The line of treatment given limited the infection to left half and prevented the spread to the other half even though the left half was totally destroyed and became functionless. Similar findings were reported by Saini et al. (1992). Cattle infected with summer mastitis are usually culled in the Western Countries (Hillerton et al., 1987).

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Lameness in cattle and milk production

Lameness in dairy cattle due to hoof and joint pain is one of the major diseases that affects the dairy business, the other being mastitis and infertility. The lame animal is always prone to loss in milk production, reduced reproductive ability and increased risk of culling. These effects are due to the pain and discomfort caused to the animal. In organized dairy farming, where mostly the cemented floors exist in the shades, the incidence of lameness is seen increasing. The HF cross bred cattle have been observed to be more prone to lameness. In addition, once the cow becomes lame in one lactation, she is more likely to have recurrent lameness problem in ensuing lactations.

Lameness needs to be controlled at the subclinical stage by following the trimming of hooves every 6 months, providing a walk though a footbath (15 x 3 x ½ feet) containing 120 lit of water, mixed with 5 lit of formalin and supplementation of biotin containing trace mineral mixture.

Therapeutic management of Trypanosomiasis in a buffalo

Lakshmi K. and Padmaja K.

Department of Clinical Veterinary Medicine,
College of Veterinary Science, Rajendra Nagar, Hyderabad - 500030. (AP)

Introduction:

Trypanosoma evansi, a blood protozoan parasite, causes a serious disease known as 'surra' in domestic and wild animals. It is a mechanically transmitted arthropod borne disease and Tabanus spp. has been implicated as the main vector.(Shyma et al., 2012). In India, *T. evansi* infection is widely prevalent in different parts and is of significant economic importance in livestock production (Juyal et al., 2007). The disease is widely distributed in tropical and subtropical countries. The incidence of the disease, however, varies depending on vector, availability of host and /or climatic conditions (Kumar et al., 2011). The present paper reports the therapeutic management of Trypanosomiasis in a buffaloe.

Case history and observations:

A 5 year old nondescript she buffalo was presented to the Campus Veterinary Hospital, College of Veterinary Science, Rajendranagar with a complaint of inappetance, progressive loss of body weight, weakness and reduced milk yield from 6 litres to 2.5 litres per day. The animal was treated symptomatically by a local Veterinarian without any improvement. The clinical examination of the animal revealed high rise of temperature (105.8° F), nasal discharges, pale conjunctival and buccal mucous membranes and erection of hairs. Upon palpation, ruminal motility was found sluggish (1/3 minutes), pulse rate was : 74 beats /minute and respirations were 28/minute. Blood smears were collected for laboratory examination.

Results:

Wet blood film examination (40 X) revealed motile trypanosomes. Peripheral blood smears stained with Giemsa examined microscopically revealed presence of flagellated Trypanosomes as per morphology described by (Soulsby, 1982). Stained blood smears revealed normocytic and hypochromic RBCs. Based on history, clinical observations, laboratory findings, the case was diagnosed as Trypanosomiasis. The peripheral blood smear examination after a week was negative for trypanosomes.

Treatment:

The affected animal was treated with a single dose of Inj. Triquin @ 4.4 mg/kg body weight subcutaneously. Supportive treatment was given with Dextrose normal saline 1 litre intra venously for 3 days. The treatment was continued with Ferritas @1 ml/50 kg. b. wt for 5 days along with Tribivet 15 ml intramuscularly for 5 days. A marked improvement was observed and the buffalo responded well to the

above treatment.

Discussion:

The incidence of this case was in the month of September where predominance of flies is noted. However, the disease is seasonal and the incidence is higher during rainy and post rainy seasons due to preponderance of Tabanus flies (Juyal et al., 2007). In the present case, anemia had a complex pathogenesis involving mainly increased erythrophagocytosis, hemolysis and dyshaemopoisis (Radostits et al., 2007). The similar findings were observed by Kumar et al. (2009). The blood examination of all susceptible animals should be carried out immediately in situation like above to institute specific therapy instead of using nonspecific drugs. Quinapyramine compounds along with supportive therapy can be tried in suspected cases at field conditions (Kumar et al., 2011). Quinapyramine compounds are the drug of choice in cases of Trypanosomiasis in buffaloes (Bhonsle et al., 2005, Radostits et al, 2007 and Kumar et al., 2009).

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Intestinal coccidiosis in Osmanabadi kid.

Sawale G. K., Ghorpade P. P. and Roshini S.

Department of Veterinary Pathology
Bombay Veterinary College,
Goregaon Campus (East) Mumbai - 400065 (MS)

INTRODUCTION:

Coccidiosis is an enteric disease affecting particularly kids up to 4-6 months of age. The disease is usually asymptomatic or mild in adult animals. The clinical disease occurs when young non-immune animals are exposed to massive challenge with sporulated oocysts. It is characterized by debility, malaise, inappetance, diarrhoea or sometimes dysentery, dehydration and death in untreated animals. Coccidiosis in goats is caused by protozoa of the genus *Eimeria*. There are numerous species of *Eimeria* affecting goats, however, *Eimeria arloingi*, and *Eimeria ninakohylakimovae* are considered to be the most pathogenic species of *Eimeria* in goats and can result into death of animals, particularly kids . The present paper puts on record a case of intestinal coccidiosis in Osmanabadi kid.

MATERIAL AND METHODS:

A two month old Osmanabadi kid with sudden death was presented for necropsy. The detail clinical history about illness of kid revealed that the kid was anorectic and had anaemia, emaciation and diarrhoea. The detail necropsy was carried out and gross lesions were recorded. Affected portion of small intestine was collected in 10 per cent formalin for histopathological examination. Tissue sample was processed, embedded in paraffin and sections of 5-6 µm thickness were taken and stained by Haematoxylin and Eosin (H & E) (Culling, 1963).

Grossly, serosal surface of intestine, particularly jejunum and ileum showed small, circular, focal but multiple greyish-white raised plaque (Fig 1). On mucosal surfaces, there were small but focal white raised plaque with haemorrhages underneath. The intestinal contents were watery and brown coloured. The liver, kidneys and lung were pale. Other organs did not show gross lesions of any significance. The gross lesions observed in the present investigation are in accordance with reports of various authors (Soulsby, 1982; Urquhart et al, 1996; Nourani, et al., 2006). Destruction of capillaries in the intestinal mucosa may lead to hypoproteinaemia and anaemia (Kusiluka and Kambarage, 1996). Coccidiosis is self limiting disease. However secondary bacterial infection can cause severe enteritis. Moreover, the changes in the intestinal mucosa causes

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

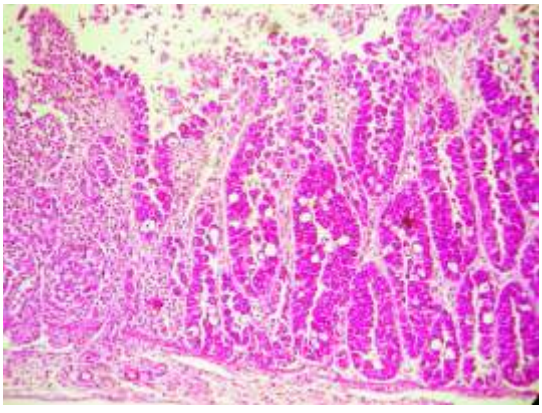

Fig 2: Section of intestine with hyperplastic villi and crypts with different stages of coccidia, infiltration by inflammatory cells and fibrosis in between the crypts (HE x 100 X)

increased rate of peristalsis, malabsorption and diarrhoea. Diarrhoea is followed by dehydration, acidosis, anaemia and terminal shock and death of animal (Kusiluka and Kambarage, 1996).

The Microscopic examination of the jejunum and ileum showed focal hyperplastic mucosa. The epithelial cells of the villi and the crypts were hyperplastic and contained different stages of coccidia, especially the gametogonal stages and oocyst (Fig 2). The colon was unaffected. Stages of coccidia were seen throughout the villus, but the crypts of Lieberkuhn were more severely parasitized (Fig 3). Severe infiltration of inflammatory cells like lymphocytes, plasma cells, eosinophils and macrophages were observed in the lamina propria. Similarly, histopathological examination of the intestine containing various developmental stages of the coccidia especially gamatogenesis stages within the hyperplastic villous and crypt epithelial cells have been reported in intestinal coccidiosis in kid (Nourani, et al., 2006). It has been suggested that when many cells of epithelium are parasitized at one time, the denuded mucosa bleeds freely and intense inflammation of lamina propria and sometimes sub mucosa results and the remaining epithelium is stimulated to replace that tissue which was lost and thus result into raised patches as the replacement of epithelial cells exceeds their loss (Jones et al., 1997). The severity of lesions in coccidiosis depends on various factors viz. initial load of oocysts, age of animals, species of Eimeria present, immune status of the host, location of the parasite in tissues and number of host cells destroyed and environmental condition (Soulsby, 1982; Urquhart et al, 1996). The present outbreak was recorded in the month of September when the temperature is low in Mumbai. Moreover, the goats are allowed to graze on pasture and are kept in loose housing. The temperature, moisture and oxygen tension (humid environment) could have triggered the sporulation of oocysts and occurrence of the disease. The species of coccidia could not be identified in the present investigation.

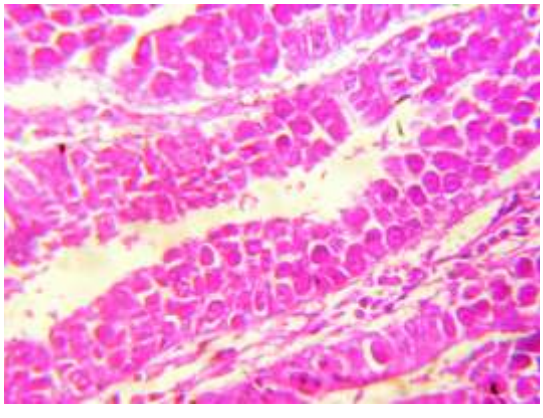

Fig 3: Section of intestine with gamonts (HE x 400 X)

ACKNOWLEDGEMENT

Authors are thankful to the Dean, Bombay Veterinary College, Mumbai and Maharashtra Animal and Fishery Sciences University, Nagpur for providing necessary research facilities for the present study.

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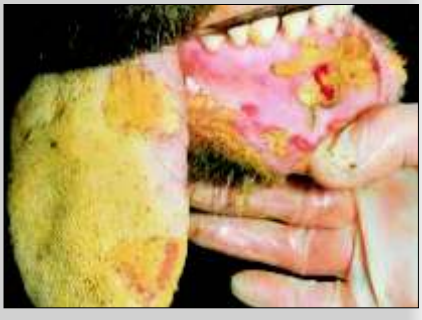
FMD in India - an update

History of research: Pre-independence



- In India, FMD was first officially documented in 1864 during extensive outbreaks in many parts of the country. Although the disease had been known to be widely prevalent in India even during early years of 19th century, no research could be initiated at Imperial Bacteriological Laboratory, Mukteshwar (Estd. 1893), due to lack of infrastructure and scientific man power.
- In May 1943, Imperial Council of Agricultural Research (ICAR) sponsored an ad-hoc scheme entitled "Vaccination of Indian Cattle against FMD" at IVRI Mukteshwar to initiate research on the disease and to evolve suitable vaccine for protecting Indian cattle.
- Serotyping of field strains by guinea pig cross protection test was initiated in 1943 and the virus serotypes prevalent in the country were identified as O, A and C.

Trypanosomiasis associated with abortion in Pomeranian Dog.

Roshini S., Tirpude N. V., Sawale G. K. and R . H., Gaikwad R. V.

Department of Veterinary Pathology
Bombay Veterinary College,
Parel, Mumbai-400012 (MS)

Introduction:

Trypanosomiasis is a hemoprotozoan disease of domestic and wild animals like opossums, wood rats, raccoons, armadillos and coyotes, warthog, bush pigs and various antelopes. It is generally spread by biting of tabinid flies (Barr et al. 1991; Urquhart et al. 2002). This disease is generally acute and fatal in canines (Soulsby, 1982). Dogs are susceptible to *Trypanosoma brucei* and *Trypanosoma congolense* and the disease is acute, characterized by anemia, fever, myocarditis, hemorrhages on the mucosal and serosal surfaces and less commonly corneal opacity (Urquhart et al. 2002).

Trypomastigote develops persistent parasitemia as it evades immune system and continue to multiply subclinically and spread to other parts of the body primarily through macrophages (Urquhart et al. 2002; Barr et al. 1991). Anemia is an important feature of this disease, in which red blood cells are lysed and removed by the phagocytic cells (Urquhart et al. 2002). Numerous antitrypanosomal drugs are available for dogs including Triquin, Surramin and Diaminazene aceturate (Berenil), However, single dose of Triquin is effective in treating the trypanosomiasis in canines (Rani and Suresh 2007). This paper reports the occurrence of trypanosomiasis in a pregnant dog its effect on some blood parameters and its therapeutic management with Triquin.

Case History:

A pregnant Pomeranian dog of 6 years age was brought to BSPCA Animal Hospital, Mumbai with the history of anorexia, dullness and persistent fever for three days. On clinical examination, mucous membranes were found pale with generalized debility and temperature of (104˚F). Blood was collected for CBC (Complete blood count) and serum for biochemical analysis for liver function and kidney function tests (Coles, 1986). The bitch was one month pregnant and had an abortion on the day after the referral to polyclinic.

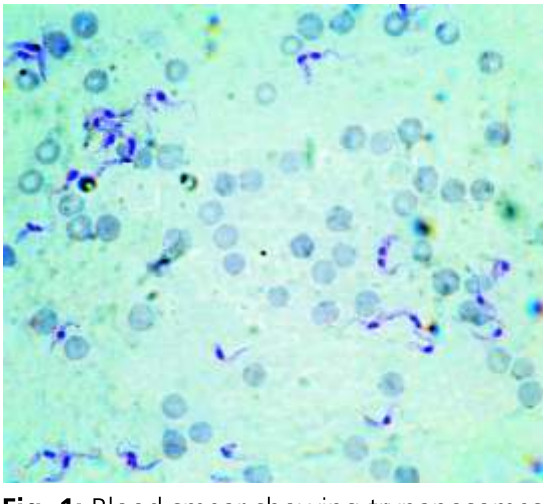


Fig. 1: Blood smear showing trypanosomes (Leishman stain, 1000X)

Result and Discussion:

Trypanosomiasis was diagnosed on the basis of finding numerous trypanosomes in blood smear by staining with Leishman stain (Fig.1). The clinical signs such as prolonged and persistent fever, anorexia, dullness, generalized debility, and pale mucus membrane has been reported by various authors which is in agreement with the present findings (Rashid et al., 2008; Rani and Suresh, 2007). However, the corneal opacity, which has been reported by some authors in chronic trypanosomiasis (Thirunavukkarasu et al. 2004) was not observed. The total trypanosomes were 127 per thousand red blood cells in direct blood smear. The CBC finding revealed low Hb, PCV and Total Erythrocyte Count. Anaemia was characterized as normocytic normochromic anemia. The erythrocyte sedimentation rate was increased and found to be 70. Total leucocyte and differential leucocyte count was found to be within normal range. Platelet count was decreased on count (1.5 lakhs/cu mm). Decrease in Hb, PCV and increase in ESR values observed in the present investigation are in accordance with the previous observations recorded by various authors (Rashid et al., 2008; Rani and Suresh, 2007).

Biochemical analysis of liver function and kidney function tests did not show any significant alteration and were within normal range. Morphometry of trypanosomes was 28-30 µm. The dog was treated with single dose of triquin at the rate of 5 mg/kg body weight subcutaneously along with iron dextran injection, antihistaminics, corticosteroids and erythropoietin for four days. The treatment was successful.

Summary

Trypanosome infection was diagnosed in a pregnant Pomeranian dog of 6 year age. Clinical signs, CBC and biochemical parameters were studied. The dog was successfully treated with single dose of triquin along with supportive therapy.

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Role of non-structural protein in detection of Foot and Mouth Disease Carriers

Srivastava Mukesh, Sachan Pratibha, Srivastava Ashish and Sharma Deepak

Department of Veterinary Medicine
Mathura Veterinary College
DUVASU, Mathura - 281001 (UP)

The carrier animal is defined as one from which live FMD virus can be isolated 28 days after contact with infection. This may be a fully susceptible animal that develops clinical disease and in which virus persists following recovery (Recovered carrier), or a vaccinated animal that has contact with live virus and fails to develop clinical disease, but becomes a carrier (Vaccinated carrier). In the carrier state, FMD virus persists in the Oesophago- pharyngeal region, in the presence of specific anti-FMD virus antibodies in the circulation and pharyngeal secretions. The mechanism whereby the virus is able to persist in the face of the host's immune response is not understood (Zhang et al., 2002) Sheep are reported to carry FMD virus for upto nine months, goats upto four months, cattle and African buffalo possibly longer than three and five years respectively (Alexandersen et.al, 2002), pigs do not become carriers and other susceptible wildlife ungulates probably carry virus for only a relatively short period (Salt, 1993). In spite of considerable research effort, the specific cells in the pharynx in which FMD virus persists, have not been identified. The importance of the carrier animal in the epidemiology of FMD has long been assumed, and for the purposes of international trade, any animal with FMD virus antibody is considered a potential carrier. All vaccinated, sero-positive cattle, and sheep, would be considered potentially to have had contact with live virus, and therefore, possibly to be carriers. If these animals were not very soon slaughtered after the outbreak had been controlled, they would require constant surveillance to ensure that they did not mix with susceptible animals. However, there is no reliable technique available to distinguish between the serologically positive carrier and non-carrier animal, and because of the costs of an outbreak of FMD, only a 100% sensitive test would be acceptable. One hundred percent specificity would not be essential, assuming then number of false positive reactions was within acceptable limits. Because of the requirement to identify the carrier animal, much of the research into new diagnostic tests has been directed towards this aim. Vaccination does not prevent the acquisition of the asymptomatic FMD carrier state in challenged, clinically immune ruminants. Limited evidences suggest that high potency vaccine can reduce the acquisition of the carrier state (Doel, 1994). Further research is needed to clarify a number of these issues.

Picornaviruses are among the most elemental of parasites in that the genome – a single molecule of RNA – also serves as the messenger (mRNA), which redirects the cellular machinery to make viral protein. During the process of viral replication, FMD virus is initially produced as a single polypeptide chain which is subsequently

broken down into a number of structural proteins, which form the virion itself, and a number of non-structural proteins (NSP's), which have biological activity either on the FMD virus polypeptide or on the host cell. A number of these NSP's have been shown to be immunogenic. Theoretically therefore, the detection of antibody to NSP's should indicate infection rather than vaccination. The FMDV RNA molecule carries the genetic information for 12 viral proteins, which have been given the names L, 1A, 1B, 1C, 1D, 2A, 2B, 2C, 3A, 3B, 3C, and 3D. These proteins are "reeled off" in one long string, such that many of them also exist in combinations, like 3ABC. Viral proteins 1A, 1B, 1C, and 1D make up the protein shell of the virion, which also contains traces of non-structural proteins, some of which, such as 3D cannot be purified away. Current serological tests are able to distinguish animals that have had previous contact with FMD virus antigen from naive animals that have not. However, they cannot distinguish animals that have been merely vaccinated from those which have been infected, nor between recovered animals that have eliminated the virus and persistently infected carrier animals. Conventional FMD vaccines consist of inactivated whole virus preparations with a suitable adjuvant. Vaccination therefore results in the production of antibodies to the structural proteins on the surface of the virion, and should the animal subsequently be exposed to infection, these antibodies will inactivate live virus and provide protection. In principle, the immune response to infection with FMD virus differs from the response to vaccination.. However, in practice, trace amounts of NSP's can be found in commercial vaccines that also induce the production of antibody, particularly following repeated vaccination. The NSP which provokes the strongest immune response and which has consequently been the best studied is the viral RNA polymerase (protein 3D, also known as the Virus Infection Associated Antigen (VIAA). This protein, like most NSP's, is highly conserved between strains and even between serotypes of FMD virus, holding out the possibility of a single serological test capable of detecting infection with any of the seven serotypes of the virus. Unfortunately, a reliable, sensitive and specific assay for antibody to VIAA has proved elusive and despite the fact that the first test for antibody to VIAA was reported over 25 years ago (Cowan, 1966), no VIAA test has yet found general acceptance. Conventional assays for antibody to VIAA use a semi-purified antigen prepared from the virus grown in tissue culture. When used for immunodiffusion, the antigen results in a test with poor sensitivity and specificity (Mcvicar, 1970) and, when used in ELISA, there are problems of inadequate reproducibility. Molecular biological techniques have now been applied to clone the genes coding for the NSP's into a number of different vector systems and work is underway, both at the WRL and other laboratories in Europe and South America, to explore the potential of these expressed products as antigens in ELISA. The potential use of these antigens is considerable as it should be possible to develop a test, which can detect infection with any serotype in a single assay and differentiate animals that have been infected from those which have been vaccinated. Furthermore, it should be possible to identify the carrier animal, as animals which have been infected and subsequently eliminate the virus, produce a different spectrum of response to NSP's from animals which go on to become carriers. An ELISA using an expressed

protein has the added advantage that the antigen presents no biological hazard. Initial work using an expressed VIAA (Villinger, 1989) was disappointing as the test had poor specificity and hence could only be used as a screening test to evaluate whether or not a population of animals had been exposed to FMD infection. Subsequently, expressed proteins have been used successfully in radioimmunoprecipitation (Tesar, 1989) and immunoblotting studies (Neitzert, 1991) to differentiate from vaccinated animals and also tentatively to differentiate carriers from non-carriers.

At the WRL, the major NSP's have been expressed in *E coli* as fusion proteins attached to glutathione s-transferase (GST). Following purification and either with or without cleavage from the GST, these recombinant NSP's are recognized by immune sera from animals infected with a range of serotypes of FMD virus. When used in a simple indirect ELISA, recombinant 3D is able to differentiate infected from naive cattle. The sensitivity of the test is only slightly lower than the conventional liquid phase blocking ELISA of Hamblin et al. (1986) and the specificity is approximately 95 percent. Vaccinated animals, especially those that have received more than one dose of vaccine, give a positive reaction, as up to 5% of normal bovines. It therefore appears that the recombinant (and possibly the native) 3D protein shares epitopes with other antigens, which are encountered by cattle, perhaps the polymerase of other enteroviruses. Further work is required to characterize the recombinant NSP's and the immune response against them. A range of ELISA techniques are currently being evaluated with the intention of producing ELISA's for routine diagnostic use which are capable of detecting antibody to FMD virus NSP's.

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Biochemical magic of Salmonella

Borah Partha Pratim, Borah Probodh and Sharma R. K.

Department of Microbiology
College of Veterinary Science, Khanapara
Guwahati-781022, Assam.

Introduction

Salmonella is one of the most important bacteria of people concern, as this infection is the most frequent food borne gastrointestinal disease that is transmitted from animals to humans. Salmonella species are facultative, intracellular bacteria that can invade the mucous membrane of our body. The basic route of transmission of these bacteria to human is mainly through water, meat, egg and poultry products. Therefore one needs to be careful while handling and eating different foods and food products. Typhoidal as well as non-typhoidal salmonellosis are major food borne diseases worldwide and are estimated to be responsible for the death of more than 500 people per year (Research report).

It is very much difficult to isolate Salmonella from clinical samples. Out of 100 clinical samples, there has been little possibility to get 10 Salmonella isolates. More over, some other bacteria like Proteus, Klebsiella, Serratia etc. also shows some similar characteristics of Salmonella, which are very much confusing. Therefore one needs to be very much careful while isolating Salmonella from suspected samples and need to take all the precautionary measures to avoid chance of contamination.

Isolation and identification of Salmonella

Immediately after getting the sample, one needs to inoculate the same in Rappaport-Vassiliades broth (RV broth). It is an enrichment broth (Selenite broth can also be used instead of RV broth). This inoculated broth should be kept in an incubator at 42-43° C for 24hours. After complete incubation, one loopful of this inoculum should be taken with the help of a metallic inoculation loop. This should be immediately transferred to Brilliant Green Agar plate (BGA). BGA is a selective media for Salmonella and alike species. It consists of different sugars, phenol red, brilliant green, yeast extract and agar. The plate should be incubated aerobically at 37° C for 24 hours. If the colonies grown after 24 hr of incubation show pinkish color without hazy appearance, then it can be suspected as Salmonella. Pink colour with hazy appearance is the positive indication for Proteus organism. Pink colour is developed because of presence of phenol red in alkaline pH.

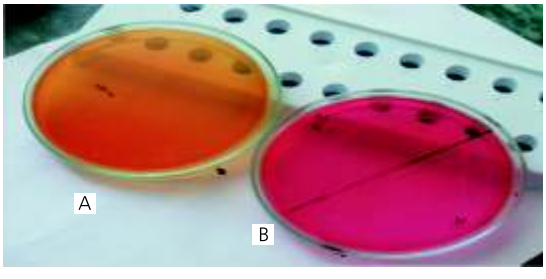

Figure: A = Normal BGA plate and B = BGA plate takes pink colour after overnight incubation

Biochemical confirmation of Salmonella

For confirmatory diagnosis of Salmonella, one needs to perform different biochemical tests. Biochemical tests required for identification of Salmonella are performed as per the methods described by Cruickshank et al. (1975) and Edwards and Ewing (1986). Interpretation of different tests will indicate whether the suspected isolate is Salmonella or not. The tests are based on the principle of pH change and substrate utilization. On incubation, organisms undergo metabolic changes which are indicated as a colour change in the media that can be either interpreted visually or after addition of the reagent.

(a) Indole test:- The culture is incubated in peptone water for 2-4 days. Addition of one to two drops of Kovac's reagent over the incubated peptone water.(Kovac's reagent contain p-dimethylaminobenzaldehyde in a mixture of concentrated HCl with either ethyl or amyl alcohol) develops a red colour which indicates the presence of indole, which has been formed by the bacterial decomposition of Tryptophan. A yellow colour indicates negative reaction. For Salmonella, this test should be negative.

(b) Methyl red test:- Culture should be inoculated in 5ml of glucose phosphate peptone water medium (GPPW) containing peptone, dipotassium hydrogen phosphate, glucose and water for 48 hr at 37° C or for 5 days at 30° C. Addition of few drops of methyl red reagent containing methyl red, ethanol and water. The development of red colour will indicate positive result where as yellow colour indicates negative results. For Salmonella, this test should be positive.

(C) Voges-Proskauer (VP) test:- Culture should be inoculated in 5ml of glucose phosphate peptone water medium (GPPW) containing peptone, dipotassium hydrogen phosphate, glucose and water for 48 hr at 37° C or for 5 days at 30° C. Addition of 1 ml of 40 per cent KOH and 3ml of 5 per cent α-naphthol in absolute ethanol over the GPPW. develops a pink colour within 2-5 min and indicates positive result, whereas, no colour change or slightly copper colour denotes a negative reaction. For Salmonella, this test should be negative.

(d) Citrate utilization test:- The basic principle is the detection capability of organism to utilize citrate as a sole carbon source. The change in pH causes a change in the colour of the indicator dye.

For positive organism, the slant colour becomes blue and for negative organism colour remains green. For Salmonella, it is positive.

(e) Sugar fermentation test:- Acid production is indicated by colour change of the pH indicating dye added to the liquid medium. If gas production occurs, a bubble appears in the inverted vial in each tube.

Development of yellow colour denotes positivity of the reaction, where as red colour indicates negative results.

(F) Triple Sugar Iron Agar (TSI):- It is a conventional diagnostic test for enteric

bacteria in TSI agar. The medium is inoculated both on the surface of the slant and by stabbing into solid agar butt. The medium contains a small amount of glucose and large amount of lactose and sucrose. Organisms able to ferment only the glucose cause acid formation only in the butt (yellow colour), where as lactose or sucrose fermenting organisms also cause acid formation throughout the slant. As Salmonella is non lactose fermenter, there will be no acid formation throughout the slant leading to pinkish colour. Gas formation is indicated by the breaking up of the agar in the butt. Hydrogen Sulphide (H_2S) formation is indicated by a blackening due to reaction of H_2S with ferrous ion (Fe2+) in the medium.

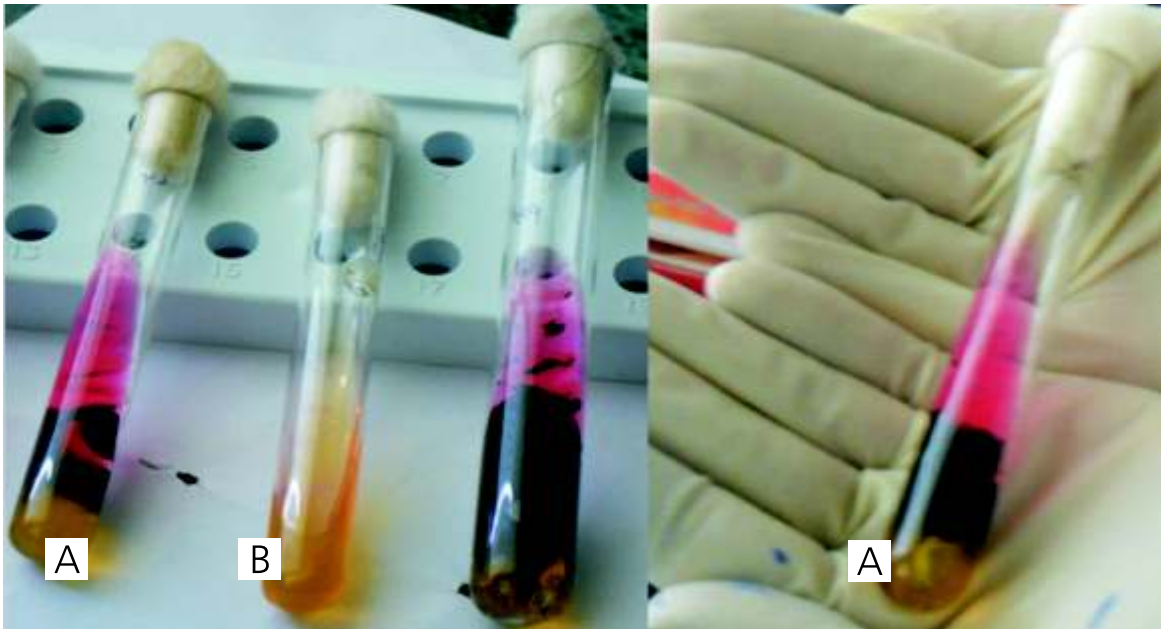

Figure: A= TSI Positive i.e. Salmonella +Ve and B= TSI -ve i.e. other than Salmonella

Media kit: Now a days media kits (Hi-Media pvt. Ltd, India) are used for rapid detection of clinical isolates. The principle is same as that of individual test, but the whole arrangement has been miniaturized so that a number of tests can be run at the same time.

1= Indole test (-ve) , 2= Methyl red (+ve), 3 = Voges- Proskauer's test (-ve), 4 = Citrate utilization(+ve), 5 = Glucose (+ve), 6 = Adnitol (-ve), 7 = Arabinose (+ve), 8 = Lactose (-ve), 9 = Sorbitol (+ve) 10 = Mannitol (+ve), 11= Rhamose (+ve), 12 = Sucrose (+ve).

On the basis of these colourful biochemical tests, one can give confirmatory diagnosis that the suspected isolate is Salmonella only. It's like a magic playing with Salmonella.

Conclusion

Salmonella infections remain a significant worldwide public health concern that affects not only the livestock population but also children and adult human beings. The genetic make-up of Salmonella spp. allows the bacteria to adapt to a variety of environments, including mammalian and non-mammalian hosts as well as non animated reservoirs, making their eradication by conventional means difficult. Furthermore, the high frequency of multidrug-resistant Salmonella strains is making treatment of focal and disseminated infections a health challenge. Therefore it is concluded that the necessary steps be taken further to strengthen the surveillance programmes to limit the high rate of morbidity and mortality among the population due to salmonellae infections.

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Studies on Gastrointestinal Parasitic Infections in Goats

Tookhy Nazir Ahmad and D'Souza Placid E.

Centre of Advanced Faculty Training, Department of Parasitology,
Veterinary College, KVAFSU, Bangalore-560024 (Karnatak)

Introduction

Gastrointestinal parasitic infections in small ruminants are of considerable economic importance because small ruminant rearing has been a major source of income especially to the marginal farmers and labourers (Bandyopadhyay, 1999). Some studies have been conducted on the incidence of gastrointestinal parasites of goats in different parts of India (Thapar 1956; Thangathurai and Rao 2002; Endrejat 1964; Krishna et al., 1989).Schistosomosis is one of the three important fluke infections along with fasciolosis and immature amphistomosis in domestic animals. The disease causes body weight loss, stunted growth and delayed puberty in animals. In India, there are few reports of *Schistosoma indicum* schistosomosis in sheep and goats (Singh et al., 1984; Agrawal et al., 2004; Rao 1934; Cherian and D'Souza 2009). Hepatic schistosomosis is wide spread in South-East Asia but is under-estimated due to poor sensitivity of coprodiagnostic methods employed (Agrawal, 1999).

The present study was undertaken to observe the gastrointestinal parasitic infections in goats.

Material and Methods

An attempt was made to assess the prevalence of gastrointestinal parasites in slaughtered goats. During dressing of carcasses, the gastrointestinal tract representing different flocks were collected fresh from the Bruhat Bangalore Mahanagara Pallike (BBMP) slaughterhouse at Bangalore. The worms that were recovered from the stomach, intestine and mesenteries were further processed. The mesenteries were chopped into 2-3 cm long pieces and then placed in lukewarm normal saline and were kept for 6-8 hours at 37 °C. Later, the mesenteric pieces were removed and saline was filtered through a black muslin cloth, which in turn was inverted into a petri dish containing normal saline, to recover the blood flukes from the mesenteric veins. No recovery could be made by this method. Hence the collected mesenteries were observed in front of light and worms which were present were clearly visible (Plate 1) and then the blood vessels were dissected to remove the flukes. Nematodes such as strongyles and whip worms were cleared in lactophenol and later identified. Schistosomes, tapeworms and amphistomes were pressed between two slides, secured with a thread and kept in formalin for two days and then they were washed in water to remove traces of formalin. After washing, the worms were transferred into Borax carmine alcoholic stain (Grenacher's, Nice chemicals. Pvt.Ltd, Cochin India) and kept for overnight. Then the worms were destained by using acid alcohol (1ml. Hcl in 99 ml. of 70 per cent alcohol) for a short time till the excess stain was removed. They were dehydrated in ascending grades of ethyl alcohol – 70 per cent, 80 per cent, 95 per cent and 3 changes in absolute alcohol for 15 mins. each. The specimens were cleared in clove oil and mounted in Canada balsam on a glass

slide and cover slip was placed on the top.

Results and Discussion

The details of gastrointestinal parasites recovered are presented in Table 1. Out of a total 74 gastrointestinal tracts of goats from the BBMP slaughter house examined, 39 (52.7%) were found to be positive for parasitic infections. 1.3% revealed *Schistosoma indicum* (Plate 1and 2), 20.2% had *Oesophagostomum columbianum* (Plate 3), 13.5% had *Moniezia expansa*, 9.4%revealed Trichuris globulosa worms, 2.7% had *Haemonchus contortus* and 5.4% had *Paramphistomum epiclitum* and *Cotylophoron cotylophorum* (Plate 4). Thangathurai and Rao (2002) had reported the prevalence rate of 51.33% with predominant infection of Oesophagostomum (16.67%), coccidiosis (10.67%), and Bunostomum (9.33%) in Bidar district of Karnataka state. Rao (1947) reported the presence of *S. indicum* in goats of Poona. Arora and Iyer (1968) reported the presence of *S. indicum* in goats in Uttar Pradesh. Cherian and D'Souza (2009) reported *S. indicum* in sheep along with *S. spindale* infections in Karnataka state. This happened to be the first report of *Schistosoma indicum* from goats in Karnataka state. It is also the first documented report on gastrointestinal parasites in goats slaughtered at the BBMP abbatoir. Incidentally, the goats belonged to Kankapura (Karnataka), Kolar (Karnataka), Chittoor district (A.P), Kurnool (A.P), and Kadapa district.(A.P).

Table 1. Gastrointestinal parasites recovered from goats

Number	Name of the parasite recovered	Positive	Percentage
1	Paramphistomum epiclitum Cotylophoron cotylophorum	4	5.4
2	Schistosoma indicum	1	1.3
3	Moniezia expansa	10	13.5
4	Oesophagostomum columbianum	15	20.2
5	Haemonchus contortus	2	2.7
6	Trichuris globulosa	7	9.4

Plate 1: Schistosoma indicum in the mesenteric blood vessels in situ

Plate 2: Schistosoma indicum recovered from the blood vessels of mesentery

Plate 3: Oesophagostomum worms in intestine of goats in situ

Plate 4: Amphistomes recovered from the rumen of goats

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Control of Poultry Diseases in India: An integrated management protocol

Roy Kabita, Shukla P.C. and Gupta D.K.

Department of Veterinary Medicine
College of Veterinary Science and Animal Husbandry
Madhya Pradesh Pashu Chikitsa Vigyan Vishwa Vidyalaya, Jabalpur-482001 (MP)

Introduction

The incidence of poultry diseases - some with serious transnational zoonotic concerns in recent years in the Asia Pacific region, has increased markedly with intensified commercial operations. Virtually no effective therapeutic remedy for any of the several poultry diseases of viral aetiology is available yet. In perspective, a packaged improved management and preventive vaccination protocol is furnished as ready reference for the field Veterinarians.

Viral diseases

Ranikhet/New Castle Disease: This important disease is characterized by greenish-yellow diarrhoea, loss of appetite, depression, prostration, signs of neural involvement, and sudden heavy mortality. Diagnosis is based on demonstration of characteristic pinpoint haemorrhages in the glands of proventriculus, prominent haemmorhagic lesions in the caeca on necropsy, +ve haem-agglutination inhibition (HI) test, and the clinical symptoms.

Infectious Bronchitis (IB): A tentative diagnosis, based on demonstration of catarrhal exude in the nasal cavity and caseous plugs in the bronchi in chicks, urate deposition in the enlarged kidneys and egg peritonitis in layers (on necropsy) is confirmed by ELISA.

Infectious Bursal Disease (IBD): Also known as Gumboro disease, IBD is a highly contagious viral disease of young chicks. Bursa of Fabracius is specifically targeted, leading to immuno-suppression and enhanced susceptibility to secondary infections. The clinical profile is characterized by dullness, depression, whitish diarrhoea, and heavy mortality in the initial outbreaks. Markedly enlarged bursa, haemorrhages in the thigh/ pectoral muscles, and mottling of kidneys are the prominent necropsy findings. Diagnosis is based on characteristic bursal lesions and conspicuous muscle lesions in the chicks.

Avian Influenza: Because of its zoonotic propensity, avian influenza has assumed much public health significance in recent years. Sudden heavy flock mortality (approaching 100%) virtually without any clinical signs, and facial oedema, cynosis of the comb and wattles, and neural involvement in the occasional survivor are noteworthy.

Fowl pox: Associated with a significant drop in egg production, fowl pox is clinically manifested by nodular lesions in the comb and wattles, mild respiratory involvement, and unthrifty condition. Diphtheritic yellow lesions in the mouth, oesophagus, and upper trachea may also be observed on necropsy. The clinical signs, lesions and mortality pattern are useful in diagnosis.

Marek's disease: Chicken below 3 to 4 months are more susceptible to this neoplastic viral disease, clinically characterized by dullness, depression and sudden death in the acute form, in-coordination, staggering gait, and paralysis in the classical neural form. Blindness may also occur occasionally. Diagnosis is based on progressive paralysis with nervous lesions in the immature birds.

Lymphoid leucosis: Lymphoid leucosis is wide spread. More commonly affects sexually mature chicken and exhibit clinical symptoms of inappetence, weakness and emaciation. Visceral tumors (liver, spleen, and bursa) are the characteristic necropsy findings.

Bacterial diseases

Fowl cholera: An acute septicaemic disease causal agent, *Pasturella multicoda*, fowl cholera is associated with morbidity and high mortality rate. Clinical profile in the chronic form is marked by pyrexia, anorexia, mucous discharge from the mouth, diarrhoea, dehydration, oedema of the comb and wattles, sinusitis, increased respiratory rate, and arthritis. Diagnosis is based on the sudden onset, high mortality rate, and observation of septicaemic lesions in necropsied birds. Demonstration of the typical bipolar organisms in Giemsa-stained blood films is confirmatory. For therapeutic management, sulpha drugs are the better choice, as they can be easily administered in water.

Colibacillosis: Opportunistic *Escherichia coli* pathogenic strains are implicated in a number of diseases in poultry. Abundance of *E. coli* organisms in the environment (aseptically collected soil, water, and atmospheric air samples) indicates farm management below par. This mandates immediate attention in view of the real risk of superimposed secondary viral/ respiratory infections. Colisepticaemia is characterized by diarrhoea, loss of appetite, dysponea, fibrinous pericarditis, hepatitis, air saculitis, congested liver, and heavy chick mortality. *E. coli*-associated other poultry diseases include sinusitis, swollen head syndrome, synovitis, salpingitis, peritonitis, and enteritis. Clinical signs vary markedly. Diagnosis is based on demonstration of lesions and laboratory isolation. The preventive measures include improved managerial practices with strict enforcement of the hygiene and sanitation protocol, and effective measures to avoid stress to birds. *E. coli* are susceptible to many drugs. However, for best results, antibiotic sensitivity test is strongly recommended.

Mycoplasmosis

Avian mycoplasmosis: Caused by *Mycoplasma gallisepticum* and commonly known as chronic respiratory disease (CRD) is usually complicated by secondary bacterial or viral (infectious bronchitis) infection. Infectious synovitis in growers is, however, caused by *Mycoplasma synoviae*. The clinical profile includes tracheal rales, nasal discharge, coughing, facial oedema, lacrimation, drop in egg production, and joint affections. Diagnosis is based on the clinical signs and ELISA. Tylosin or Tiamulin is used in treatment and prevention.

Fungal diseases

Aspergillosis: Aspergillosis or brooder pneumonia is an acute respiratory disease, primarily involving growing chicks < 10 d post-hatch, caused by the genus *Aspergillus.* Outbreaks are common under wet humid

conditions and with contaminated wet litter. Thus, the disease clearly reflects an avoidable managerial lapse. The clinical profile includes dyspnoea, depression, emaciation and diarrhoea in the later stages. Diagnosis is based on demonstration of characteristic lesions: whitish loci in the air sac membranes/ pinhead-sized nodules in the lungs on necropsy. Occurrence of typical fungal hyphae in the wet mount of lesions may be confirmed by cultural isolation. Provision of dry litter, proper ventilation, and strict avoidance of moldy feeds like improperly stored GNC are strongly recommended.

Endoparasitic diseases

Round worm infestation: *Ascaridia galli*, the most common poultry nematode affects the growth and production potential significantly. The clinical observations include subnormal feed intake, growth inhibition, diarrhoea, anaemia, and occasional intestinal blockage with mortality. Prophylaxis involves regular deworming.

Coccidiosis: Caecal coccidiosis, caused by *Eimeria tenella* and the intestinal form, caused by *Eimeria* spp. together inflict considerable economic losses to the poultry industry. Severity of infection varies primarily with the immune status of birds. The salient clinical features are depression, loss of appetite, emaciation, poor growth, bloody diarrhoea, and caeca filled with blood-tinged contents or caecal wall exhibiting characteristic patchy haemorrhages. Diagnosis is based on demonstration of the typical macroscopic lesions, and detection of large number of oocysts in the faecal contents/ scrappings of the damaged mucosa. For prophylaxis, incorporation of coccidiostats in feed, in the recommended dose levels, is very essential. Therapeutic management involves use of suitable anticoccidial agents such as sulpha drugs, especially during outbreaks.

MANAGERIAL TIPS

Protocol for the summer season

- Lay out of the new poultry house must permit adequate cross-ventilation with exhaust and ceiling fans configured suitably.
- Provision of adequate shade with carefully selected canopied tree species.
- Cool water with added dextrose and suitable electrolyte mixture, provided liberally to newly introduced chicks.
- Clean wholesome water, freely accessible to birds.
- Low energy-high nutrient diet, preferably in the form of wet mash.
- All left-over feed may be systematically disposed off.
- Strict enforcement of the daily sanitary schedule to prevent contamination, especially, colibacillosis.

Protocol for the rainy season

- All repairs/ renovation work completed and plastic curtains arranged well before the onset of rains.
- Store adequate quantity of dry litter in advance.
- Wet litter changed regularly to prevent coccidiosis.
- Avoid the use of sugarcane baggase to prevent aspergillosis.

- Store all feeds including GNC in a dry place (moisture content < 10%).
- All water points/ wells disinfected with bleaching powder or potassium permanganate, periodically.
- Sanitize the entire poultry house/ surroundings.
- Prophylactic doses of selected therapeutic agents against colibacillosis, coccidiosis, mycotoxicosis, administered uniformly mixed in feed/ water.

General

- No stranger permitted to enter the poultry house.
- Attendants of one shed may not enter another sheds.
- Biosecurity protocol mandated on all authorized visitors.
- At the entry point, all vehicles permitted only through the well-maintained disinfectant bath.
- Prompt disposal of carcasses and contaminants in the incinerator/ deep pit containing quick lime.
- Systematic fast garbage disposal.
- High quality non-contaminated feeds/feed additives adequately fed to birds in all age groups.
- Regular visits by the Veterinary pathologist for disease surveillance and postmortem examination.
- Discourage the use of gunny bags as wind shields.
- Get all birds insured from any reputed General Insurance Company.

Preventive measures

Time-bound vaccination schedule, using properly chilled potent vaccines and diluents, purchased from only reputed manufactures of immunological products is important. All vaccines need to be stored and used strictly as per the recommendations. A variety of potent vaccines (single/ combined) against common poultry diseases are now commercially available. A brief resume' follows for ready reference:

Ranikhet/ New Castle disease vaccines

1. F strain

   Lypholyzed (freeze dried) lentogenic (mild) virus strain, cultivated in specific pathogen free (SPF) chick embryo.

   Intraocular/ intranasal.

   Primary vaccination: 4 to 10 days post-hatch.

2. Lasota strain

   Lypholyzed (freeze dried) lentogenic, Lesota strain virus, cultivated in SPF chick embryo.

   Intraocular/ intranasal/ oral, extended in chilled d.w. with added skimmed milk powder @ 3g/ L.

   4-8 weeks (100 doses/ 2 L), 9-10 weeks (100 doses/ 3 L), 11-20 weeks (100 doses/ 3.5 L).

3. Inactivated virus vaccine in oil emulsion
   Primary vaccination: at the point of lay @ 0.5 ml s/c in the neck region, or i/m in thigh region.

   Booster dose: mid laying cycle.

4. Live R2B strain

   Lypholyzed mesogenic R2B Mukteswar strain vaccine of SPF chick embryo origin.

   Primary vaccination: 8-10 weeks post-hatch @ 0.5 ml s/c or i/m. Booster dose: 1 6 weeks post-hatch @ 0.5 ml s/c or i/m.

5. Attenuated Ranikhet disease vaccine, Chicks up to 4 weeks post-hatch @ 0.2 mll s/c or i/m.

   Adults @ 0.5 ml s/c or i/m.

Infectious bronchitis (IB) vaccines

1. Lypholyzed mild Massachusets type avian infectious bronchitis live virus, serially passaged in SPF chick embryos.

   Primary vaccination: 7 weeks post-hatch, in drinking water.

   Booster dose: 16 weeks post-hatch, in water.

2. IB vaccine

   Lypholyzed mild Massachusets type avian infectious bronchitis live virus, of chick embryo origin.

   Chicken: 4-6 weeks post-hatch, oculo-nasal drops/ in drinking water.

3. IB H-120

   IB vaccine, serially passaged (120-times) in SPF embryonated eggs with heterologous cross protection.

   Primary and booster doses through spray/oculo- nasal/oral route.

Infectious Bursal Disease /Gumboro disease vaccines

1. Lypholyzed live vaccine containing invasive intermediate strain IBD virus.

   Oculo-nasal, 1 drop/ bird.

2. IBD inactivated vaccine

   In oil emulsion for booster vaccination in t h e layers and breeders

   Chicken: 0.5 ml s/c or i/m

Fowl Pox vaccines

1. Lypholyzed fowl pox vaccine cultivated in SPF chick embryos.

   Primary vaccination: 6-8 weeks post-hatch @0.2 ml i/m

   Booster dose: 16-18weeks post-hatch @0.2 ml i.m

2. Lypholyzed fowl pox vaccine of chick embryo origin.

   Primary vaccination: 6-8 weeks post-hatch in wing web (with lancet)

   Booster dose: 18-20 weeks post-hatch.

3. Lypholyzed fowl pox live vaccine (tissue culture)

   Primary vaccination: 6 weeks post-hatch.

   Booster dose: 12-14 weeks post-hatch.

Field evaluation of Amitraz (Taktik®) sensitivity in ticks using adult immersion test

Deshpande P. D. , Karabasanavar Nagappa , Kolhe R. P. and Bhong C. D.

Department of Veterinary Public Health & Epidemiology
K. N. P. College of Veterinary Science, Shirwal Dist-Satara, 412801 Maharashtra

Introduction

India has a highest number of livestock in the world and being an agrarian country, animal husbandry is a basic occupation and major contributor to the agricultural GDP. However, poor sanitary conditions, tropical climate and lack of awareness among farmers have led to the menace of acariosis in livestock. Tick infestation in productive animals has got severe economic considerations owing to loss of production, reproduction and health. Ticks of various genera infest productive animals; suck blood leading to anemia, transmit economically important diseases such as Anaplasma, Babesia, Ehrlichia, Borrelia, Eperythrozoon, Theileria, etc; cause tick paralysis or toxicosis and physical damage to hide and skin.

In order to control ticks, chemicals broadly known as 'acaricides' are used by various modes viz. dusting, spraying, dressing, dipping, pour-on and systemic applications. However, rampant use of acaricides has led to the emergence of resistance in ticks. Resistance is a phenomenon, where, even though ticks are exposed to the acaricide, they remain unaffected. Such resistance can even get transmitted vertically from generations to generation in the tick population. Therefore, there is a need to routinely monitor the resistance in tick and also to understand the mechanism of acaricide resistance. Amitraz (Taktik®) is one of the widely used acaricide which is presently in use. Therefore, the present study was undertaken to determine the efficacy of Amitraz (Taktik®) against cattle ticks.

Material and Methods

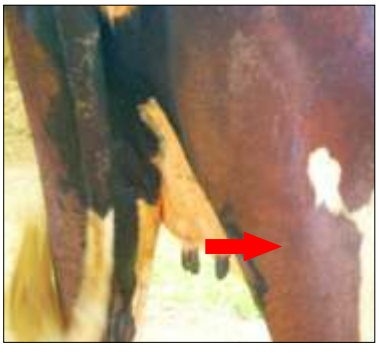
Collection of ticks: Engorged female ticks were collected from cattle of both sex irrespective of age from different places of Davangere (Karnataka) and Satara (Maharashtra) districts during summer months, 2010. Care was taken not to damage mouth parts during de-ticking and intact live ticks were placed in a tube, covered with washed muslin cloth and secured by a rubber band so as to allow aeration. The tubes were placed in a tray containing moistened absorbent cotton balls so as to maintain required humidity. The samples were then transported to the laboratory at 18-25°C within 24 hr of collection.

Procedure of AIT-DD: Adult immersion test with a discriminating dose was followed to evaluate the efficacy of Amitraz (Taktik®) against ticks. Briefly, 10 adult engorged female ticks weighing >35 mg collected within 24 hours were first cleaned by immersing in triple distilled water. Cleaned ticks were dried over filter paper and dipped in 20 ml Amitraz

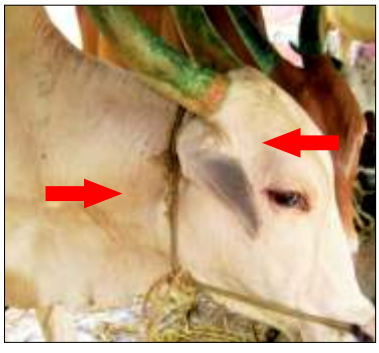
(Taktik®) solution (0.25% w/v) prepared in distilled water (Discriminating Dose for ticks, FAO, 2004) for 30 minutes at 25°C with gentle shaking. Ticks were then sieved-off, dried over blotting paper and fixed (ventral side up) to a double sided adhesive tape in a petri plate for 7 days. The plates were placed in a tray having damp paper towel to maintain humidity at room temperature and each tick was checked for egg laying. Simultaneously, two sets of ticks were prepared (n = 10 each) using Amitraz (Taktik®) (5% EC) at a recommended dose of 6 ml/L (0.18 g/L) as per the manufacture's instructions and distiiled water was used as control.

Calculation: The ticks treated with acaricide and not laying eggs were considered suseptible and those laying eggs inspite of exposure to acaricide were considered to be resistsnat. The pecentage of resistance was calculated as;

1. Major sites of tick infestation over the animal body



(Udder)



(Head & Neck)

(Dewlap)

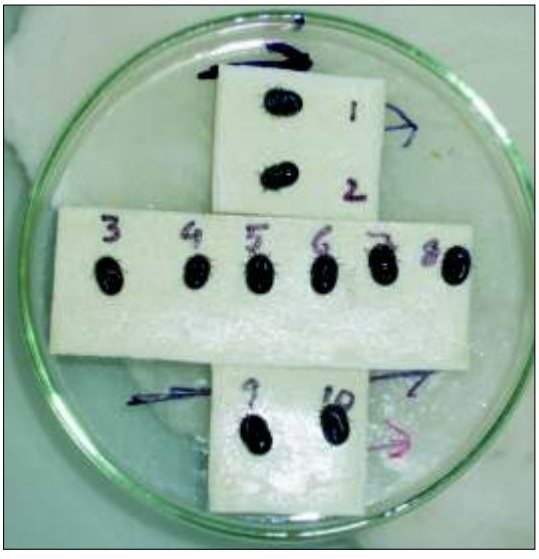
$$\text{Resistance (\%)} = \frac{\text{No. of treated ticks laying eggs}}{\text{No. of untreated ticks laying eggs}} \times 100$$

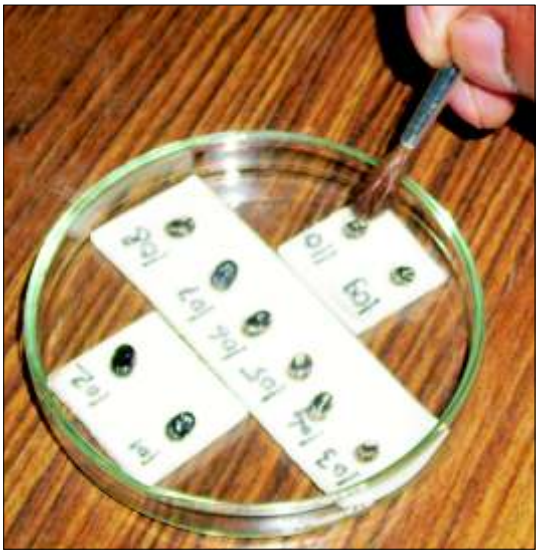
Results and Discussion

All the ticks in control group treated with distilled water laid eggs in bunch by 3-4 days indicating their status as live, healthy, engorged and reproductive. However, none of the ticks treated with Amitraz (Taktik®) at DD laid eggs; indicating 100% sensitivity of Amitraz (Taktik®) to ticks. Further, ticks treated with Amitraz (Taktik®) as per the dose recommended by manufacturer were also 100% sensitive. Based on the results of present study, it was concluded that Amitraz (Taktik®) is effective against ticks collected from the area under study.

Ticks have a complex life cycle, they attack animals and after blood meal they dropout, lay eggs in cracks and crevices. Eggs hatch, transform to larvae and then adults. From the life cycle, it is evident that, mere application of acaricide on the animal body is not sufficient. The intermediate forms of ticks must be

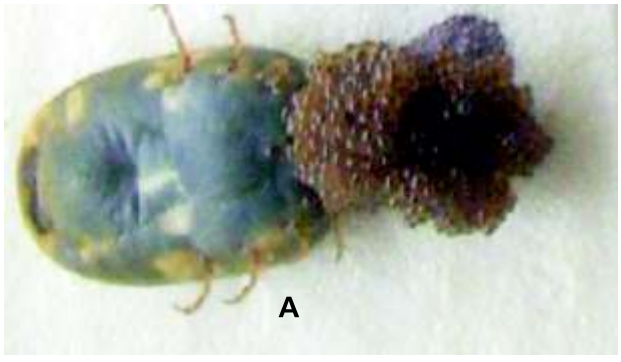
2. After labeling, each tick of treatment and control group was pasted separately over the tape using a paint brush

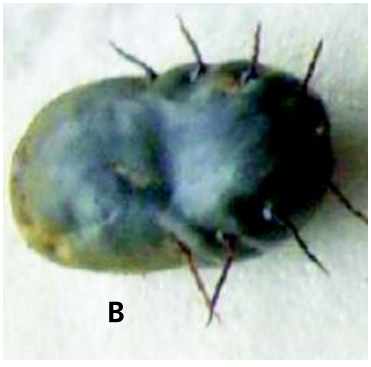




destroyed in the environment off the animal body. Therefore, it is suggested to apply acaricide in the shed, premises and surrounding the shelter. It is further stated that upon repeated use of an acaricide over a prolonged period, ticks may evolve a mechanism of resistance where even though they are exposed to acaricide they will not be affected in terms of fecundity, metabolism and survival. Therefore, integrated approach is needed for smooth implementation of tick control strategies.

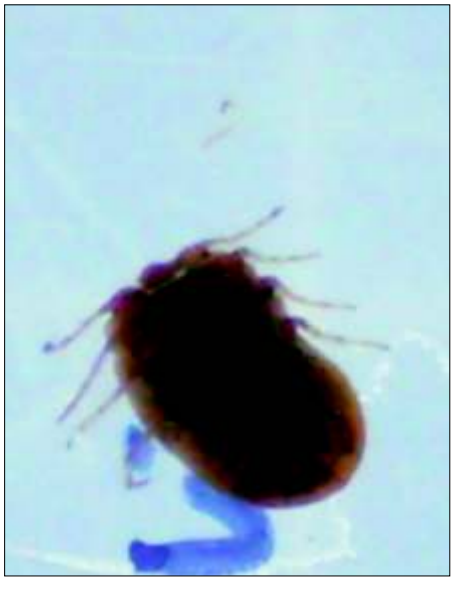
3 Under ideal conditions (temperature & humidity) the ticks laid eggs within 7 days (A-ticks laying eggs & B-ticks not lying eggs)





A

B



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Antibiogram pattern and therapeutic efficacy of ciprofloxacin in Bacillary White Diarrhea in poultry in Jammu region

Tiwari S, Soodan J S, Kotwal S K, and Singh M

Division of Teaching Veterinary Clinical Complex
SKUAT-J, Jammu-181002 (J & K)

Pullorum disease is an acute or chronic infectious, bacterial disease affecting primarily chickens and turkeys, but other domestic and wild fowl can be infected. Retteger (1899) was the first to isolate *Salmonella pullorum* and describe the disease as "fatal septicemia of young chicks, in 1990, designating the disease as "White diarrhoea". Retteger and Stoneburn (1909) expanded the term to "Bacillary white diarrhoea" to distinguish it from other diseases that might be classified under a common term of white diarrhoea.

Salmonella pullorum is primarily egg transmitted, but transmission may occur by other means such as infected hen to egg, egg to chick, or chick in incubator, chick box, brooder, or house (Aiello et al 1997). Survivors become infected breeders. Mechanical transmission carried around on clothes, shoes or equipment is also possible. Apparently healthy carrier birds also shed the disease organisms. Previously contaminated premises also serve as source of infection. The organisms may enter the bird through the respiratory (as in the incubator) or digestive systems. Most outbreaks of acute pullorum disease in chickens or turkeys result from infection while in the hatchery.

Pullorum disease is highly fatal to young chicks or poults and they often die soon after hatching without exhibiting any observable sign. However, mature birds seem to be more resistant. Most acute outbreaks occur in birds under three weeks of age with mortality upto ninety percent, if untreated. Survivors are usually stunted and unthrifty. Young birds may show droopiness, ruffled feathers, a chilled appearance, huddling near a source of heat, labored breathing and presence of white diarrhoea with a "pasted-down" appearance around the vent.

Thus far, no systematic study seems to have been carried out in this region about the antibiogram pattern and therapeutic application of different antibiotics against this disease. The present study was carried out to understand the antibiogram pattern and therapeutic application of newer antibiotics against this disease.

Material And Methods

Six cases showing greenish white diarrhoea had been referred to referral Veterinary Hospital, R S Pura, Jammu, consisted the treatment group. Six other cases of birds brought for routine checkup, comprised of healthy group. A thorough clinical examination was carried out

to know the temperature, colour of mucous membrane, dehydration and defecation. Fecal swabs, from healthy and treatment groups were collected and processed for cultural isolation and antibiotic sensitivity testing. Treatment comprised of Ciplox TZ syrup @ 1

Table 1: Clinical signs, fecal characteristics and antibiogram pattern of birds of treatment group

Case no	Sex	Age (months)	Clinical signs and symptoms	Temp. (^{0}F)	CST		
					Sensitivity	Interme dially sensitive	Resistant
1	M	3.5	White green diarrhoea (+ve for coccidia)	106	Tobramycin Norfloxacin, Amikacin	Ciproflo xacin kanamy cin, streptom ycin,	Penicillin G, Oleandromycin, Methicillin, Lincomycin, Kanamycin, Cephaloridine, Carbenicilline, Co-trimoxazole, Nitrofurantoin,Tetracycline
2	M	2	Greenish diarrhoea	104.8	Gentamicin, Chloramphenicol, Streptomycin, Lincomycin, Amikacin	-	Amoxycillin, Tetracycline, Co-trimoxazole, Ciprofloxacin, Erythromycin, Cephalexin, Carbenicilline, Nitrofurantion,
3	M	1.5	Greenish diarrhoea	107	Amikacin	-	Vancomycin, Amoxycillin, Tetracycline, Ciprofloxacin, Erythromycin, Carbenincillin, Nitrofurantoin, Streptomycin, Kanamycin, Oxytetracycline, Bacitracin, Cephalothin, Novobiocin, Co-trimoxazole,
4	M	6	Greenish white diarrhoea	105.4	Chloramphenicol, Nitrofurantoin , Kanamycin, Amikacin	-	Co-trimoxazole, Cephalexin, Cefotaxime, Oxytetrecycline, Norfloxacin, Furazolidine, Nalidixic acid, Co-trimoxazole, Ciprofloxacin, Carbenicillin, Tetracycline, Streptomycin,
5	F	3.5	Greenish white diarrhoea	108	Gentamicin, Cefotaxime, Chloramphenicol	-	Carbenicillin, Nitrofurantoin, Norfloxacin, Streptomycin, Amikacin, Kanamycin, Oxacillin, Ampicillin
6	F	1	Diarrhoea	Out of range	Cafotaxime, Streptomycin, Amikacin, Chloramphenicol	-	Tetracycline, Ciprofloxacin, Carbenicillin, Oxacillin, Ampicillin, Nitrofurantoin, Kanamycin, Norfloxacin, Co-trimoxazole

Table 2: Antibiogram pattern of diarrheal cases in birds of treatment group

Antibiotic	Concentration(ug)	% of isolates Sensitive	% of isolates intermedially Sensitive	% of isolates resistant
Nalidixic acid	30	00.0	00.0	16.6
Furazolidone	50	00.0	00.0	16.6
Norfloxacin	10	16.6	00.0	50
Penicillin	10 units	00.0	00.0	16.6
Tobramycin	10	16.6	00.0	00.0
Amikacin	30	83	00.0	00.0
Gentamicin	10	33.33	00.0	00.0
Chloramphenicol	30	66	00.0	00.0
Oxacillin	5	00.0	00.0	33.33
Streptomycin	10	33.33	16.6	50
Lincomycin	2	16.6	00.0	16.6
Nitrofurantoin	300	33.33	00.0	83
Kanamycin	30	16.6	16.6	66
Cefotaxime	30	33.33	00.0	00.0
Oleandromycin	15	00.0	00.0	16.6
Methicillin	5	00.0	00.0	16.6
Cephaloridine	30	00.0	00.0	16.6
Carbenicillin	100	00.0	00.0	83
Co-trimoxazole	25	00.0	00.0	83
Tetracycline	30	00.0	00.0	83
Amoxycillin	10	00.0	00.0	33.33
Ciprofloxacin	10	00.0	00.0	66.6
Erythromycin	15	00.0	00.0	33.3
Oxytetracycline	30	00.0	00.0	33.3
Bacitracin	10 units	00.0	00.0	16.6
Cephalothin	5	00.0	00.0	16.6
Novobiocin	5	00.0	00.0	16.6
Cephalexin	30	00.0	00.0	33.3
Vancomycin	30	00.0	00.0	16.6

ml/4kg bwt for 5 day along with appetizer like ostopet given @ 1 ml/kg bwt orally for 1 month.

Results And Discussion

Prevalence of infection was found highest i.e. 80% and 20% in 1and 2 months age group. Sex wise prevalence was 80% and 20% in male and female respectively. Fecal consistency was normal in birds of healthy group whereas greenish white diarrhoea was reported in all cases of treatment group. Similar findings were also observed by Chouhan and Roy (2001). Temperature was normal in half of the birds, whereas, fever (> 1000F) was observed in 50% of treatment group. In one case of treatment group, faecal sample was positive for coccidian parasite. Dehydration was absent in birds of both the groups.

Salmonella species causes diarrhoea by invading the bowel wall and in later stages, invasion spreads to the large bowel. Leukocytes may be noted in the stool. A distinguishing feature of salmonellosis is that the leukocytes are often mononuclear cells (Chouhan and Roy, 2001).

From fecal samples of healthy group, Salmonella could not be isolated whereas 5 isolates of Salmonella sp. had been isolated from sixth sample of treatment group. Antibiotic sensitivity study revealed eighty three percent of isolates to be sensitive to Amikacin followed by Chloramphenicol (66%), Gentamycin, Streptomycin, Cefotaxime and Nitrofurantoin (33.3%), Lincomycin, Kanamycin, Tobramycin and Norfloxacin (16.6%). Sixteen percent of isolates were intermedially sensitive to Streptomycin and Kanamycin. Eighty three percent of isolates were resistant to Carbenycillin, Co-trimoxazole,Tetracyclin and Nitrofurantoin. Sixty six percent of isolates were resistant to Kanamycin. Fifty percent of lsolates were resistant to Norfloxacin and Streptomycin. Resistance to Cephalexin, Amoxycillin, Oxytetracycline, Erythromycin and Oxacillin was shown by 33.3% of isolates. Sixty six percent of isolates were resistant to Nalidixic acid, Furazolodine, Penicillin G, Lincomycin, Oleandromycin, Methicillin, Cephaloridine, Becitracin, Novobiocin, Cephalothin and Vancomycin.

Fluoroquinolones and third-generation cephalosporins are the drugs of choice for invasive Salmonella infections (Angulo et al 2000). Birds under treated group were treated with Ciprofloxacin along with liver stimulant. Out of 6 birds, 4 (66.6%) recovered clinically, indicating therapeutic efficacy of Ciprofloxacin.

Conclusions

Greenish white diarrhoea is a consistent finding in all cases of *Salmonella pullorum* disease. Temperature may or may not be present. Highest sensitivity was found against Amikacin. Therapeutic efficacy of ciprofloxacin was 66% indicating that it can be used as therapeutic agent against bacillary white diarrhoea cases.

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Neoplasms in animals: an overview.

Moregaonkar S. D., Bamne S. S. and Gangane G. R.

Department Of Pathology, College Of Veterinary And Animal Sciences, Udgir-413517 (MS)

Introduction

A neoplasm (neo = new + plasma = things formed) is a growth of new cells that proliferate without control, serves no useful function and has no orderly arrangement. Oncology (Oncos = tumor + Logos = study) is a branch of Pathology, which deals with study of tumors or neoplasms.

Neoplasms are common in Indian domestic animals. However, they are rarely reported. By using suitable surgical interventions, the field Veterinarians routinely remove neoplastic growths. But due to lack of availability of ready to refer material and guidelines, many a times valuable material is wasted after successful surgical removal. The information presented below would be beneficial to the field Veterinarians and students to handle the cases of neoplasms in a more useful way.

Important Points:

Neoplasia literally means a new growth, whereas, Tumor (swelling) literally means a swelling. All swellings, however are not the tumors, such as haematomas, cysts, nodules or granulomas in chronic inflammation (in tuberculosis, glanders etc.), cold abscesses, parasitic nodules etc. All these swellings may subside after removal of the causative agent, whereas, neoplasms grow continuously and indefinitely. Neoplasm must be differentiated from the inflammatory, reparative processes and also from hyperplasia.

As in inflammation and repair, cells proliferate but then there is a purpose for proliferation i.e. to protect and replace the lost tissue. Therefore, in these conditions, as soon as the need is fulfilled, proliferation ceases and the growth even regresses.

Hyperplasia results from proliferation of cells from a definite demand in terms of work. Thus, hyperplasia of erythropoietic tissue occurs in cases of anaemia. Hyperplasia of thyroid occurs in iodine deficiency. Hyperplasia is purposive. It progresses only so long as the functional need or hormonal stimulus, which evoked it, persists.

Definitions proposed by different authors:

Sastry (1983) defines neoplasms as a new growth of cells, which proliferates continuously without control, bear considerable resemblance to the healthy cells from which they arise, have no orderly structural arrangements, serves no useful function and have no clearly understood cause.

Vegad (1995) suggests that a neoplasm is a growth of new cells that proliferates without control, serves no useful function and has no orderly arrangement.

Chauhan (2003) states that a tumour or neoplasm is a new growth of cells which proliferates without control, retains

considerable resemblance to the parent cells from which they arise and serves no beneficial function to the body.

Gopal Krishanarao (2005) states that a tumour or neoplasm is an autonomous new growth, unlimited, progressive, uncontrolled, purposeless and stems from a variety of causes that alter the molecular events involved in the control of normal cell proliferation and differentiation.

Classification of Neoplasm:

Different authors have classified animal neoplasms in different ways as under,

A) According to Chauhan (2003)

1) Based on shape:

   The shape of different neoplastic growth vary and may be round or oval, elliptical, villous, fungoid, spinous, polypoid, wart like, spherical, expansive, infiltrative, multiobulated and pedenculated. This method of classification is not appropriate considering the clinical course and prognosis of the particular growth.

2) Based on cell or tissue of origin or histogenic:

   This classification has been recognized since the early days and still is widely practiced by the Pathologists. It is highly accepted method of classification by the WHO. On this basis, all neoplasms are classified as epithelial, connective tissue (including muscles), lymphoid, haemopoietic, neural and other tissue neoplasms according to cells / tissues of origin.

3) Based on behavior pattern:

   From the clinical point of view, this method of classification is of practical value and clinically neoplasms are divided into (1) Benign (innocent) and (2) Malignant (potentially harmful).

B) According ti Vegad (1995)

1) Epithelial: Tumors derived from epithelial surfaces, either squamous or glandular. These tumors are further classified as,

   A) Benign (meaning innocent):

      a) Papilloma: involves the squamous epithelial surface.

      b) Adenoma: involves glandular epithelium.

   B) Malignant:

      a) Carcinoma: involves either squamous or glandular epithelium.

2) Non epithelial: these tumors are derived from connective tissue in general (fibrous tissue, cartilage, bone, muscle etc.). They are further classified as,

   A) Benign: The name of the tissue with suffix as "OMA" (fibroma, chondroma, osteoma etc.).

   B) Malignant: indicated by the term sarcoma. (fibrosarcoma, chondrosarcoma, osteosarcoma etc.).

3) Dermal cyst tumor: This tumor arises from an embryonic defect in growth. It is composed of one germ layer only, the ectoderm, contains teeth, hair and other derminal structures.

4) Teratoma: This tumor also arises from an embryonic defect in growth and is composed of two or more germ layers. Teratomas

originate from totipotential cells (I.e., capable of differentiating into all three germ layers). Such cells are normally present in the ovary and testis. These cells have the capacity to differentiate into any type of cell found in the adult body. Therefore, they can give rise to neoplasms that have bits of bone, epithelium, muscle, fat, nerve and other tissues. When all the components are well differentiated, it is known as a teratoma, when less well differentiated, it is a malignant teratoma.

Further, frequently tumor cells are composed of more than one type of tissue. This is particularly true for neoplasms of the mammary gland of the dog. In such a case the tumor is a mixed tumor, e.g., a mixed mammary gland tumor.

Macroscopic / gross description:

Many a times, neoplastic growth can be a museum of different pathological conditions such as, degenerative conditions, necrosis, calcification, gangrene, cystic condition, different stages of inflammatory conditions etc. Therefore, in description of gross and microscopic changes of a neoplastic growth, a basic knowledge of Pathology is highly essential.

The following points should be taken into consideration while writing gross description of an organ/ structure / part thereof during post-mortem examination. (1) Shape (2) Size (3) Surface (4)Colour (5) Consistency (6) On section (appearance of a cut surface), (7) Examination of fluids/ exudates/secretions etc. (8) Relationship to surrounding i.e. position (9) Measurement of fluids / exudates. (10) Description of tubular structures (11) Weight of the tumor mass (occasionally) etc.

1) Shape: Generally one has to be familiar with the overall appearance (geometric appearance or pattern) i.e. pyramidal, oval, egg shaped, stellate, round, spherical, elliptical, triangular, flattened, nodular, tortuous, lobulated, spindle, wedge-shaped, dome-shaped, mushroom-shaped, punctuate etc. It can be compared with the popular objects:, berry shaped, coconut shaped etc.

2) Size: It is often described as a subjective judgment. More emphasis is placed on the objective observations. The objective quality is best indicated by actual measurements, weight, linear dimensions, sometimes volume etc. whichever is most appropriate to the particular structure or a lesion.

   The terms such as enlarged, small, shrunken, concentrated have no absolute value. They represent interpretations and are used only in a comparative sense or when more accurate references to size are inapplicable to convey the overall impression.

   Focal changes in an organ, when numerous, often very in size and shape. In such cases the range and the modal characteristic is stated. The popular objects are compared to depict the changes, for example football sized, tennis ball sized etc. These descriptions depict the approximate idea about the changed size as well as shape in the minds of readers. For scientific description of size of a tumor, an abscess, inflammatory growth etc., it is better to measure length, breadth and height of it accurately.

3) Weight: In order to have more correct idea

about change in size/shape of the organ, it is essential to weigh the neoplastic mass. The complete mass is removed and weighed on weighing scale, preferably on electronic weighing balance. The weight should be recorded in standard metric measurements. Photographs of the tumor mass before removal (at situ) and after removal / on section etc. should also be taken to support the gross observations.

4) Surface : For description of surface of an organ, terms such as hairy, ulcerated, covered with exudates, smooth, irregular, eroded, pitted, elevated, depressed, glistening, dull, undulant, scaly, membranous etc. are used.

5) Colour: The description of color offers no difficulties, provided one refers only to the names of the colours in the spectrum i.e. red, orange, yellow, green, blue, and violet together with brown black, white and gray. Combination of any two of these adjectives covers the entire colour tints likely to be encountered e.g. green-blue means more green than blue. Light (pale) and dark (deep) suffice as modifying adjectives. Red colour indicates accumulation of haemoglobin - as in haemorrhages. White to yellow colour is seen in cellular infiltrates accumulated in an area. Black colour of an organ is seen in melanosis or exogenous pigmentations. Green colour can be seen in pseudomelanosis, bile imbibition or in exogenous pigmentations.

6) Distribution of lesions: It indicates the pattern of lesions such as focal, multifocal, widespread, coalescing, miliary, segmental and diffuse. For recording more appropriate distribution of lesions, one can draw a rough sketch of an organ and mark the lesion spots on it.

7) Extent of lesions: How much of the tissue\organ is affected is measured in terms of percentage.

8) Consistency (texture): This is the description of 'How does it feel?'. It is referred to as soft, hard or tough, friable, gelatinous, wet or dry, inspisseted, pliable, pits on pressure (fluid filled),crepitating, firm or resilient, fragile, gritty, adhesive, granular etc. with usual modifications of slightly, moderately, very slightly and very moderately, should be added. The consistency of an organ can be described correctly after feeling it by hand.

9) On section (appearance of cut surface / contour of an organ): Describing the appearance of cut surfaces of an organ include the statements of the appearance, distribution of changes, changes in their relation to anatomical landmarks as well as colour and consistency. It is useful to distinguish between the generalized, diffuse and focal i.e. between distribution throughout the organ or distribution within one part of the organ or small part of a portion is affected. For example, generalized pulmonary emphysema, diffuse emphysema in the apical lobe, emphysema of a part of apical lobe (focal). The characteristics of the cut surface such as colour, consistency, whether it is homogenous or focal should be described as they are the comments about the contour of the organ whether it is raised (something is added) or it is depressed (something is removed).

In order to have documentary evidence about the gross description of a neoplastic growth, it is necessary (rather mandatory) to have gross photographs of the growth from all angles.

Terms used for neoplastic conditions of different tissue/ organs

As has already been stated that different authors have classified neoplasms in different ways, the terms used for description of a particular neoplasm may vary slightly. It is also interesting that in a particular tissue, depending upon the involvement of its particular component (mucosa, connective tissue, blood vessels etc.), multiple neoplastic conditions are possible. In order to have precise information about the widely accepted terms for description of different neoplasm of different organ (s), the precise and handy list is given below.

Name of the organ/ tissue involved	Benign neoplasm	Malignant neoplasm
CENTRAL NERVOUS SYSTEM		
Meninges (Dural endothelium)	Meningioma	Meningiosarcoma
Spinal cord	----	Astrocytoma
Choroid plexus/ Ependyma	----	Ependymoma
Meninges	Meningioma	Meningeal sarcoma (invasive meningioma)
Nerve, Neurons	Neuroma, Neuroblastoma (neuroblasts), Ganglioneuro-ma.	----
Nerve sheath / Fibrocyts	Neurofibroma/ Schwannoma	Neurofibrosarcoma
Oligodendrocytes	Oligodendroma	----
Ependyma	Ependydoma	----
Sympthatic ganglion	Ganglioneuroma	----
Adrenal medulla	Pheochromocytoma	Malignant pheochromocytoma
Schwann cells/ nerve sheath cells	Schwannoma/ neurilemmoma	Neurofibrosarcoma
Medulary epitheluim	Astrocytoma Glioblastoma multiforne	
Glial tissue	Glioblastoma	Gliosarcoma
Pineal cells	Pinealoma (rerely seen)	----
MUSCULOSKELETAL SYSTEM		
Skeletal system		
Bone (in general)	Osteoma	Osteosarcormas

Name of the organ/ tissue involved	Benign neoplasm	Malignant neoplasm
Dental tissue	Odontoma /Enameloma	Mesothelioma
Dental epithelium		Adamantinoma
Cortex of tibia and femur	Osteoma	Osteosarcoma
Cartilage	Chondroma	Chondrosarcoma
Horn coreum (Squamous cell)	-------	Squamous cell carcinoma
Muscles		
Smooth muscles	Leiomyoma/ fibrolimyoma (more fibrous tissue component)	Leiomyosarcoma
Striated (cardiac muscle)	Rhabdomyoma	Rhabdomyosarcoma
SENSORY ORGANS (Eye)		
Eye, Cornea, Sclera, Eyelids, Nictitans	-----	Ocular squamous cell carcinoma
Conjuctiva	Plaque (stratum spinosum)	-----
Conjunctiva or cornea	Ocular dermoid	-----
Iris	Hemangioma	-----
Uveal tract (in cat)	Chondroma	-----
Rod and concentric layers of the Retina	Retinoblastoma	-----
Skin and subcutaneous tissue		
Adipose tissue	Lipoma	Liposarcoma
Dermis and epidermis	Naevi	-----
Subcutaneous tissue	Fibroma	Fibrosarcoma
Hair follicles		
a) follicular sheath & hair matrix	Trichoepithelioma	-----
b) Limited to hair matrix	Pilomatricoma	-----
Epidermis/ sq. epithelium	Papilloma (warts)	-----
Basal call layer	----	Basal cell carcinoma/ basal cell epithelioma
Sebaceous gland	Sebaceous gland adenoma	Sebaceous gland adenocarcinoma

Name of the organ/ tissue involved	Benign neoplasm	Malignant neoplasm
Sweat gland (very complex tumor)	Sweat gland adenoma /dermoid cyst/ epidermoid	Sweat glad adenocarcinoma
Perianal gland	Perianal gland adenoma	Malignant perianal gland tumor
Melanin producing cells or melanoblasts	Melanoma	Mailgnant melanomas/ melanocarcinoma
Sub-cutaneous tissue of head, neck and abdomen	Histiocytoma	-----
Mast cells of c.t. of skin	Mastocytoma	Mastocytosarcoma
Keratin or stratified squamous epithelium	Keratoacanthoma	Squamous cell carcinoma
ALIMENTARY TRACT		
Tongue	-----	Sqamous cell carcinoma
Dental enamel / cuboidal or columnar epithelium	Ameloblastoma / adamantinoma	
Dental pulp, dentin, enamel	Odeontoma / ameloblastoma / fibroameloblastoma	-------
Gums / gingiva	Epulis	Fibroepithelioma
Hard palate near teeth	Euplides	Euplides
Oral mucosa	Oral papillomatosis / Melanomas / mastocytoma	Mastocytosarcoma
Stomach	Adenoma	Adenocarcinomas
Salivary glands	Mixed salivary neoplasm	Maliglant mixed salivary neoplasm
Intestine	Adenonomas	Adenocarcinomas
Caecum		Lymphosarcoma
Small intestine	Mastocytoma	---------
Oesophagus	Oesophageal tumour / Fibromas / Chondromas / Osteomas.	Squamous cell carcinoma / Fibrosarcomas / Chondrosarcomas / Osteosarcomas.
Liver		
Hepatocytes / hepatic cells	Hepatoma / liver cell adenoma	Hepatocellular carcinoma

Name of the organ/ tissue involved	Benign neoplasm	Malignant neoplasm
Intra-hepatic bile duct / inter-hepatic bile duct	Cystadenoma	Cholangiocarcinoma
Serosal epithelium	Mesothelioma	
URINARY SYSTEM		
Kidney epithelium / pelvis	Nephroma / Nephroblastoma	Renal carcinoma (Hypernephroma)
Urinary bladder	Transitional cell papilloma	
Urethra		
Pelvis		
Adrenal cortex		
RESPIRATORY SYSTEM		
Nasal epithelium (ethmoid region)	----------	Ethmoid carcinoma
Bronchial epithelium	----------	Bronchogenic carcinoma or adenocarcinoma
Lung	Myxoma / chondroma / papillaryadenoma	Squamous cell carcinoma
Alveoli	----------	Adenocarcinoma (bronchial alveolar cell carcinoma)
Pleura	Mesothelioma	----------
REPRODUCTIVE SYSTEM		
Testicles	Leidig cell tumor	Interstitial cell tumor
Ovary	Teratoma	Malignant teratoma
Ovary (germinal epithelium)	Dysgerminoma	----------
Sertoli cells	Sertoli cell tumor	Malignant sertoli cell tumor
Ovary (granulosa cell)	Granulosa cell tumor	---------
Ovarian surface epithelium	Cystadenoma	Cystadenocarcinoma
Mucosa of vulva / vagina	Veneral granuloma	CTVG (contagious transmissible venereal carcinoma)
Vulva / penis / prepuce	Bovine genital fibropillomas	
Uterus	----------	Adenocarcinoma
Seminiferous tubules	Seminoma	Seminoma / adenocarcinoma
Mammary gland		
Mammary gland	Benign mixed mammary gland tumor	Mammary carcinoma/malignant mixed mammarygland tumor

Name of the organ/ tissue involved	Benign neoplasm	Malignant neoplasm
Rare mammary gland tumors	----------	Mammary sarcomas Osteosarcomas Chondrosarcomas
Cells of acini of mammary gland		Lobular carcinoma
Epithelium of teat canal	Papilloma	Malignant duct papilloma
CARDIOVASCULAR SYSTEM		
Endothelial cells of blood vessels	Haemangioma	Haemangiosarcoma
Pericytes (cells present in the walls of capillaries & venules)	Haemangiopericytoma	----------
Lymph vessels	Lymphangioma	Lymphangiosarcomas
Mesothelium	Mesothelioma	
Lymphoid cells / lymphocytes	Lymphoid lukaemia / Lymphoma	Lymphosarcoma / malignant lymphoma
Myeloid cells		Myeloid lukaemia
Plasma cells	Multiple myeloma (differentiated and undifferentiated)	
Erythroblasts	----------	Erythroid lukaemia
Myeloblasts	---------	Myeloid lukaemia
Leukocytes	Myelocytoma	Myelocytic leuckemia
OTHER GENERAL TUMORS		
Glandular epithelium (any where in the body)	Adenoma	Adenocarcinoma
Adrenal medulla	Phenochromocytoma	----------
Thyroid gland (follicular cells)	Follicular adenoma	Follicular carcinoma / solid carcinoma / papillary carcinoma / medullary carcinoma
Pituitary tumors	Adenomas	Adenocarcinomas
Pancreatic tumors	Adenomas	Adenocarcinomas

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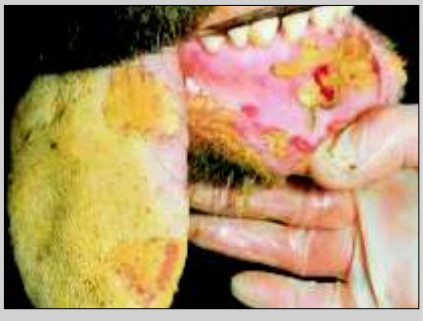
FMD in India - an update

History of Research: Post-independence



- Presence of Serotype Asia 1 in India was confirmed on material obtained from an outbreak in 1956 - 57.
- During 1963-64, Compliment Fixation Test (CFT) was adopted for FMD virus serotyping in place of cross-immunity test in guinea pigs.
- In order to strengthen the research activity on FMD, the ICAR launched a pilot project "All India co-ordinative Research Project (AICRP) for FMD virus serotyping" in 1968 with a Central Laboratory at Mukteshwar and three Regional Centres, located at Hisar, Hyderabad and Kolkata.
- The scope of the above project was expanded in July 1971 to "All India Co-ordinated Research Project (AICRP) for epidemiological studies on Foot and Mouth Disease" with increased outlay and inputs with additional Regional Centres and Epidemiological Units for extensive surveillance throughout the country.
- During the year 2001, the Central Laboratory was upgraded to the level of 'Project Directorate' on FMD with expanded network of Regional Laboratories and Network Units. Presently, the Project Directorate is functioning with a Central Laboratory at Mukteshwar and a network of 8 Regional Centres and 15 Network Units located across the country. The 24th Centre is coming up in Bhubaneshwar to function as the International Centre for FMD research.

Body Condition Score in relation to health performance of Murrah buffaloes

Anitha Alapati and Sarjan Rao Kapa

College of Veterinary Science, Proddatur - 516 360,(AP)

Introduction

Body condition is the reflection of the fat reserves carried by the animal. The ability to estimate the body condition more accurately and relate it to milk production and health performance would help the farmers to increase the overall efficiency of dairy animals. It is, therefore, essential to evaluate the body condition of dairy animals based on body conformation points to understand the present status and accordingly suggest the feeding and managemental practices for optimal performance in future. Body Condition Score (BCS) has been recognized as a valuable tool in predicting the health performance of dairy cattle (Gearhart et al., 1990). Although, relationship between BCS and health performance in dairy cattle have received attention in the international literature, studies are meager in buffaloes. The present work was carried out to study the relationship between BCS and health performance in Murrah buffaloes.

Material and methods

The study was carried out on the Murrah buffaloes maintained at Buffalo Research Station, Venkatramannagudem, West Godavari District (AP). BCS system developed by Anitha et al (2010) was used to score the buffaloes. The buffaloes were scored in a 1 to 5 scale using 0.5 increments, examining eight skeletal check points (Fig. 1 and Chart 1) which include:

1. Tail head to pin bones.
2. Spinous processes of the lumbar vertebrae.
3. Depression between the spinous and transverse processes.
4. Transverse processes of lumbar vertebrae.
5. Point between 12th and 13th ribs.
6. Sacral crest.
7. Depression between sacral crest and hooks
8. Depression between hooks and pins.

Each check point was observed by vision and palpation. The scores were recorded and average BCS was assigned to the buffaloes.

To study the clinical condition of Mastitis in relation to the BCS, 17 buffaloes affected with Mastitis during the study period were scored. To study the incidence of anoestrum in relation to the BCS, 18 buffaloes were scored. The data regarding anoestrum was obtained from the data records from the farm. The BCS scores were assigned to 20 cases of retention of placenta in the farm and in the surrounding villages during the study period to study the incidence of Retention of Placenta in relation to BCS.

Results

The relationship of BCS to the health parameters studied are presented in Table 1. The results showed that buffaloes with BCS of below 3.5 were more affected with Mastitis (11)

than buffaloes with BCS of above 3.5 (6) . Buffaloes with BCS of below 3.5 were more prone to anoestrum (12) than buffaloes with BCS of above 3.5 (6). Buffaloes with BCS of below 3.5 were more prone to retention of placenta (13) than buffaloes with BCS of above 3.5 (7).

Discussion

BCS is a subjective measure of body energy reserves and is used as an indirect indicator of energy balance status i.e. an increasing BCS indicates a positive energy balance, and vice versa . Earlier studies (Markusfeld et al., 1997, Heuer et al., 1999, Gillund et al., 2001, Roche and Berry, 2006) reported that the relationship between BCS and health performance was less consistent. In some studies, there has been a tendency for thin cows to have a greater incidence of post calving uterine disorders (Markusfeld et al., 1997), thin cows or cows in negative energy balance may be more susceptible to infection (Collard et al., 2000). In contrast, more body condition at calving or greater fat mobilization postcalving has been reported to increase the incidence of ketosis (Gillund et al ., 2001), metritis (Markusfeld, 1985, Kaneene et al., 1997) and milk fever (Heuer et al., 1999, Roche and Berry, 2006). Further more, some studies have failed to identify a significant effect of BCS at calving on diseases (Gearhart et al., 1990, Ruegg and Milton, 1995) or reported that the association between postpartum BCS loss and health was not biologically important (Ruegg and Milton, 1995). One potential mechanism underlying the reported effects of BCS mobilization on animal health is an alternation in lymphocyte function. Lacetera et al., (2005) reported lower secretions of IgM and IFN-γ in peripheral blood mononuclear cells isolated from over conditioned cows at calving.

The results of the present study indicated that buffaloes with BCS of below 3.5 were more affected with mastitis (11) than buffaloes with BCS of above 3.5 (6). These results were in accordance to the findings of Suriyasathaporn et al. (2000) who reported a greater risk of clinical mastitis in cows with an average BCS of 1.0 to 1.75 units compared with the reference group of 3 to 3.75 units indicating that cows of poor body condition were more prone to mastitis. Similarly Anitha et al. (2005) reported that crossbred cows with BCS of below 3.5 were more affected with clinical mastitis than cows with BCS of above 3.5. In contrast, Berry et al. (2007) reported that BCS was not significantly related to clinical mastitis.

Prolonged postpartum anoestrus is a main factor limiting the reproductive efficiency as it prevents the achievements of ideal calving interval. During anoestrus, ovulation does not occur despite ovarian follicular development, as growing follicles do not mature. It was observed that buffaloes with BCS of below 3.5 were more prone to anoestrum (12) than buffaloes with BCS of above 3.5 (6) which was well supported by the report of Ramirez Iglesia (1992) that body condition reflecting the nutritional status of the cows favored the onset of sexual activity. These findings were reflected in the postpartum resumption of ovarian activity and postpartum estrus period observed in the present study. Similarly, Montiel and Ahuja (2005) reported that undernutrition contributed to prolonged postpartum anoestrus, particularly among cows dependent

CHART 1: Body condition scoring chart for Murrah and Graded Murrah buffaloes in a 1 to 5 scale using 0.5 increments

BODY CONDITION SCORE	TAILHEAD TO PINS	SPINOUS PROCESSES OF LUMBAR VERTEBRAE	SPINOUS PROCESSES TRANSVERSE PROCESSES	TRANSVERSE PROCESSES	BETWEEN 12th AND 13th RIBS	SACRAL CREST	BETWEEN SACRAL CREST AND HOOKS	BETWEEN HOOKS AND PINS
1.0 (Emaciated)	bone extremely sharp with 'V' shaped cavity under tail	sharp individual processes	deep depression	distinct >½ length visible	severe depression	extremely sharp	severe depression	severe depression
1.5	'V' shaped cavity under tail	individual processes distinct	definite depression	½ length of the processes visible	prominent depression	sharp appearance	prominent depression	prominent depression
2.0 (Thin)	bone prominent, 'V' shaped cavity under tail	individual processes evident	clear depression	½ to 1/3 length of processes visible	definite depression	prominent convexity	definite depression	definite depression
2.5	evidence of fat under tail	sharp ridge	obvious depression	between 1/3 to 1/4 visible	moderate depression	definite depression	moderate depression	thin flashy covering
3.0 (Average)	bone smooth, shallow cavity under tail	prominent ridge	smooth concave curve	< 1/4 visible	depression evident	clear convex ridge	depression evident	depression evident
3.5	slight fat filled depression under tail	smooth ridge	smooth slope	distinct ridge, no individual processes discernable	slight depression	convexity evident	obvious depression	slight depression
4.0 (Fat)	bone rounded with fat	flat spinous processes not evident	nearly flat	smooth rounded edge	flat in appearance	smooth appearance	slight depression	sloping
4.5	bone buried in fat	no spinous processes discernable	flat appearance	edge barely discernable	barely discernable	covered appearance	flat appearance	flat appearance
5.0 (Obese)	cavity filled with fat forming tissue folds	buried in fat	rounded appearance	buried in fat	rounded appearance	flat appearance	rounded appearance	rounded appearance

upon forages to meet their feed requirements and it apparently interacts with genetic, environmental or management factors to influence the duration of anoestrus. Inadequate nutrient intake results in loss of BCS and finally cessation of oestrous cycles.

Buffaloes with BCS of below 3.5 were more prone to retention of placenta (13) than buffaloes with BCS of above 3.5 (7). Pedron et al. (1993) also reported that of the cows belonging to BCS class of 3, 3.5 and 4 at calving, the cows calving at BCS 3 showed the highest incidence of retained placenta, whereas, Waltner (1993) and Gallo (2002) reported that the occurrence of relative risk of retained placenta was not related to BCS.

It was observed that buffaloes of BCS below 3.5 were more prone to mastitis, anoestrum and retained placenta indicating that thin buffaloes in negative energy balance were more susceptible to health disorders. It is suggested that an ideal BCS of 3.5-3.99 be maintained to minimise health disorders and maximize economic returns.

The breeding and feeding programs should be put in place to prevent underconditioning and overconditioning of buffaloes. Thus, BCS system can be used to fine-tune the dairy animal health.

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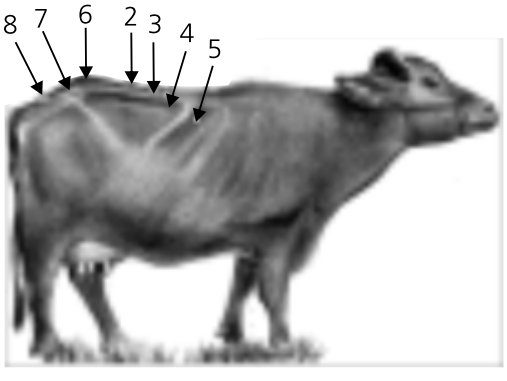
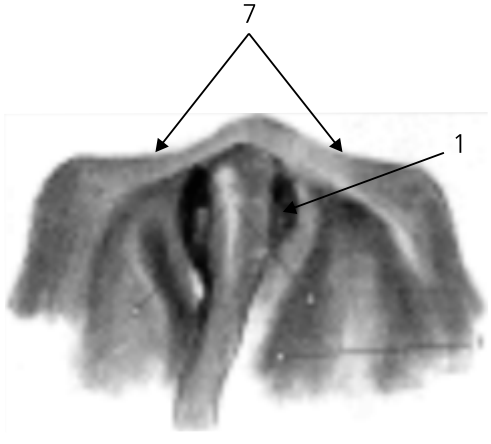




Buffalo showing this skeletal check points for BCS

1. Tail head to pin bones
2. Spinous processes of lumbar vertebrae
3. Depression between the spinous and transverse processors
4. Transverse processes of lumbar vertibrae
5. Space between 12th and 13th ribs
6. Sacral crest
7. Depression between sacral crest and hooks
8. Depression between hooks and pins

Rinderpest Eradication Memorial Pillar at IVRI, Mukteswar Campus

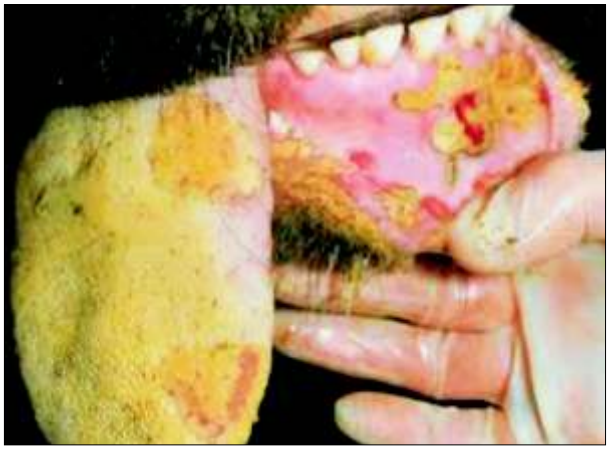
Mukteswar (Uttarakhand) - A golden chapter was added to the glorious history of Indian Veterinary Research Institute (IVRI), when a "Memorial Pillar" was unveiled on 2nd June 2012 at Mukteswar Campus to commomorate the work of Indian Veterinary Scientists, who, along with World Veterinary Community celebrated the joy of global freedom from the deadly disease-***Rinderpest***.

The dreadful disease that has plagued the animals since 4th Century, is the "FIRST" animal disease being eliminated from the planet through eradication programme. The impact of Rinderpest Eradication has provided a major economic benefit to developing and underdeveloped countries by curtailing the heavy mortality, characteristic of an Rinderpest epidemic.

Source: ICAR News

FMD Control Programme in India - 12 th Plan

The Government of India is planning to launch a Rs. 4000 crore programme to tackle Foot and Mouth Disease in the 12 th Plan. FMD is presently considered the most dreaded bovine disease in India, responsible for a huge loss of Rs. 20,000 crores to the livestock sector in terms of reduction in milk and meat production.



The programme would be initiated in the Southern Peninsular states during next five years. The Project Directorate on FMD at Mukteshwar anticipates that by the year2025, the Southern states would be free from FMD and by 2030 the entire country would be free from this economically important disease.

Source: Internet

Know the prestigious institutes

HSADL

(High Security Animal Disease Laboratory, Bhopal, MP)

High Security Animal Disease Laboratory (HSADL) is country's premier institute located at Bhopal, working under auspices of Indian Veterinary Research Institute (IVRI) of Indian Council of Agricultural Research (ICAR). This facility was created during late 1990s and dedicated to the nation on 23rd June 2000 for handling exotic and emerging pathogens of animals by virtue of its bio-safety level-IV containment laboratory and animal experimentation facility.

In the past, many animal diseases of economic importance have entered into India through the import of livestock and livestock products or through legal or illegal entry of animals at national borders. Non-availability of the containment technology and facility to rapidly diagnose such exotic animal diseases was the major hurdle in early detection and control of these exotic and emerging diseases. The animal health laboratories existing then had neither the expertise nor the facilities to handle such high-risk group organisms. Hence it was considered necessary to establish a containment laboratory in India to carry out research and develop diagnostics and prophylactics for the effective and timely control of exotic/emerging animal diseases. The concept of containment/bio-safety laboratory dedicated purely to animal health was realized with the active support of Indian Council of Agricultural Research and other international agencies like FAO, UNDP and World Bank.

The laboratory has the primary and secondary containment facilities to protect, not only the people working in the laboratory, but also the environment outside the laboratory. The entire laboratory including the animal wing functions under gradient negative pressure (-50 Pascal to –200 Pascal) to prevent the possibility of escape of pathogens to the environment. The first outbreak of H5N1 was promptly diagnosed by HSADL in 2006 and this led to immediate control of the disease. It is also recognized as

National Referral Laboratory for Avian Influenza and Bovine Viral Diarrhoea. In view of HSADL achievements towards diagnosis and control of bird flu (HPAI H5N1) the Office des International Epizooties (OIE)-World Organization for Animal Health, recognized HSADL as OIE reference laboratory for avian influenza in May 2009. The laboratory is also engaged in diagnosis of other dangerous pathogens like Nipah virus, Crimean Congo Haemorrhagic Fever & other Bunyaviruses, swine influenza, Malignant Catarrhal Fever, Porcine Respiratory and Reproductive Syndrome, West Nile Virus, Rabbit Haemorrhagic Disease, Caprine Arthritis and Encephalitis etc. The laboratory is engaged in basic and applied research through several externally funded projects for development of new generation diagnostics and vaccines.

The institute imparts quality post graduate education and research to IVRI students. The HSADL is having International linkages with OIE, FAO, WHO, SAARC countries and National linkages with Animal Husbandry and other departments of Govt. of India, ICMR, DST, DBT, NABARD, 5 RDDLs and all the Animal Quarantine centres in India. The laboratory is imparting training to the Scientists of SAARC countries, RDDLs and other organizations involved in the disease diagnosis.

HSADL has laid the foundation for laboratory biosafety and biosecurity in India and has contributed significantly in spreading the awareness about laboratory bio-safety. As the only biocontainment lab of this type in the subcontinent, HSADL has the authority and capacity for imparting training on biosafety and biosecurity at national as well as international level for various organizations, institutions and field/lab officers working in the field and since last 5 years several training programmes are being successfully conducted.

Highlights of achievements

- HSADL catered the need of the Nation for screening of samples under biosafety conditions suspected for exotic and emerging high risk pathogens including avian influenza virus (AIV) from all over the country.
- The diagnostic capability and services of HSADL for Avian Influenza led to its recognition as ***OIE Reference Laboratory for Avian Influenza*** in 2009.
- A complete range of tests for diagnosis of AIV as per OIE mandate have been developed and standardized in the laboratory. These include AGID for detection of type A influenza virus, HI tests for sub typing of the virus & RT-PCR for identifying the sub type of the virus. The NA-inhibition test which is the requirement for
- FAO/WHO regional referral laboratory was standardized and is being used for identification of the NA subtype.
- HSADL has been engaged in **validation** of field AI diagnostic kits. As an OIE Ref Lab, HSADL participated in **"OIE Proficiency Testing (PT) for Diagnosis of AI."** The PT panel was from FLI, Germany and was tested using molecular and sub-typing assays. Only 8 labs throughout the world were selected for this program.

- Molecular characterization of HPAI viruses to uncover **critical zoonotic aspects of AIV isolates** e.g. Transmissibility to human; antiviral resistance etc.
- Investigations on **Crow mortality** in India in 2011-12 revealed **involvement of H5N1** and absence of WNFV.
- Nationwide surveillance from pigs revealed 115 sero-reactors to swine influenza along with two H1N1 virus isolates. Sequence analysis of HA and NA genes confirmed that both these isolates of H1N1 influenza virus are closely related to pandemic H1N1 2009 isolates.
- For detection of Bovine Viral Diarrhea virus in clinical samples, single tube RT-PCR was developed and a multiplex PCR was developed for diagnosis and typing of BVDV isolates. An immunoperoxidase monolayer assay was developed to detect viral antigen & neutralizing antibodies.
- BVD virus was isolated from cattle, buffaloes, sheep, goats and yak for the first time in India. Prevalence of pestivirus infection was found in small ruminants in thirteen states of India. Indian isolate of BVDV 1b produced moderate clinical disease in experimentally infected calves and glomerulonephritis resulting from acute infection was first time recorded in the world. Molecular epidemiology revealed prevalence of BVDV 1b in cattle, BVDV 1b, 1c in buffaloes, BVDV 1b, 1c and BVDV 2 in sheep and goats.Attempts are being made to obtain recognition of HSADL as OIE Reference Centre for BVDV.
- In addition, HSADL has developed diagnostics against Malignant Catarrhal Fever, Porcine Respiratory and Reproductive syndrome, Rabbit haemorrhagic disease, Caprine arthritis-encephalitis infection, Nipah virus, West Nile virus, Border disease virus, Crimean Congo haemorrhagic fever virus, Rift Valley fever virus, Nairobi sheep disease
- Extending **lab diagnosis and confirmation facility for AIV to Bhutan** (member country of SARC) on regular basis.
- **Generation and management of SPF facility for Influenza research**- The only Govt. sector SPF facility was commissioned in year 2007-08 and is being used for raising SPF chicken for influenza testing (IVPI test) and SPF eggs for AI virus isolation and research. SPF chickens are being regularly monitored for disease-free status by testing against 23 different pathogens.

Guidelines To Contributors

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

The manuscript should be arranged in the following order:

Title:

Name/s of author/s:

Place of work :

Introduction :

Material and Methods : In details

Results and Discussion :

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 either through CD or by 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:

Dr. P. W. Borgaonkar, "The Blue Cross Book",
MSD Animal Health,
Intervet India Pvt. Ltd.
Intervet House, 33, Pune-Nagar Road, (Behind Eden Gardens), Pune - 411 014, India
Tel. (Direct): +91-20 66050434. Fax: +91-20-66050403,
Mobile : 09890623470. Email: padmanabh.borgaonkar@merck.com
: ananda.koppunuru@merck.com

MSD Animal Health India Product Range

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	
	Improvement of post partum fertility (10-15 days post-calving)	5ml, IM	

CHORULON®

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each vial contains human Chorionic Gonadotrophin (hCG) as a white freeze-dried crystalline powder (1500 IU)	• Improvement of conception rate (cows/buffaloes)	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	

FOLLIGON

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each vial contains Pregnant Mare Serum Gonadotrophin (PMSG) as a white freeze-dried crystalline powder (1000 IU)	Females:	Cow/Buffalo	Box containing 5 vials (1000 IU each) with 5 vials of solvent
	• Anoestrus	Anoestrus : 500 - 1000 IU IM	
	• Super ovulation	Super ovulation: 1500-3000 IU, IM between day 8-13 of cycle	
	• Increase of fertility rate after progestagen pre-treatment	300-700 IU, IM, at the end of a progestagen treatment	

CRESTAR™

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each application comprises: • One Crestar implant, containing 3.3 mg Norgestomet for subcutaneous implantation in the outer face of the ear. • Two ml Crestar injection, containing 3 mg Norgestomet and 5 mg Oestradiol Valerate for intramuscular Injection.	Oestrus control in cattle (heifers and cows).	Day 0 = Crestar implant insertion + Two ml Crestar injection IM Day 9 or day 10= Implant removal + PMSG 300 to 400 IU IM (if non cyclic) AI = Dairy heifers : 48 hours after implant removal. Dairy cows : 56 hours after implant removal	25 sets (5 x 5'S) per box

ANTI-INFECTIVE

COBACTAN® 2.5% ACHIEVE MORE

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
An injectable suspension for intramuscular administration, containing 25 mg cefquinome per ml.	Cattle Respiratory disease caused by *Pasteurella multocida* and *P. haemolytica* Digital dermatitis, infectious bulbar necrosis and acute interdigital necrobacillosis (foul in the foot) Acute *E. coli* mastitis with signs of systemic involvement Calf *E. coli* septicaemia	1 mg cefquinome/kg bw (2ml/50 kg bw) 1 mg cefquinome/kg bw (2ml/50 kg bw) 1 mg cefquinome/kg bw (2ml/50 kg bw) 2 mg cefquinome/kg bw (4ml/50 kg bw)	50 ml multidose vial. *New Introduction*

COBACTAN LC ACHIEVE MORE

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each syringe contains 75 mg Cefquinome sulphate as active ingredient.	For the treatment of clinical mastitis in lactating cows caused by *Staphylococcus aureus, Streptococcus uberis, Streptococcus dysgalactiae, Escherichia coli* & other entero-bacteria susceptible to cefquinome.	Gently infuse the contents of one syringe into the teat canal of the infected quarter every 12 hours after each of 3 successive milkings. Milk out the affected quarter (s). After thoroughly cleaning & disinfecting the teat & teat orifice, gently infuse the contents of one syringe into affected quarter. Disperse the product by gently massaging the teat & udder of the affected animal.	Box of 3 injectors with 3 isopropyl alcohol soaked towels

Floxidin® VET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Floxidin 10% injection : Each ml contains - Enrofloxacin 100 mg	- Alimentary canal e.g. Enteritis, calf scours. - Respiratory tract e.g. Pneumonia - Urogenital system e.g. Metritis, cystitis - Skin e.g. Bacterial dermatitis, pyodemra. - Mastitis, & Haemorrhagic Septicaemia.	Floxidin can be given once daily, for 3-5 days. Cattle, Sheep & Goat 2.5-5 mg/kg body weight IM Dog/Cat (adult) 5 mg/kg body weight IM Camel 2.5 mg/kg body weight IM	15 ml, 50 ml *Now also available 100 ml*

Tetracycline WSP VET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each gm contains Tetracycline Hydrochloride WS I.P. 50 mg	In Sheep & Goat : Pneumonia, Joint ill, Anthrax, Septicaemia, Contagious Caprine Pleuro-Pneumonia, Scours, Acute Mastitis, Acute Metritis, In Cattle : Infectious diseases like Haemorrhagic septicaemia, Anthrax, Black Quarter, Leptospirosis, Foot Rot & Contagious Bovine Pleuro-Pneumonia, Calf Scours, Calf Diphtheria, Pneumonia, Septicaemia, Acute Metritis, Acute Mastitis.	Sheep & Goat : 5 gm/15 kg body weight Cattle : 2.5-5 gm/15kg body weight for 5 days	Sachet of 100 grams

METRICEF™

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each single dose syringe of 19 g contains: Cephapirin - 500 mg(as benzathine) Excipient to - 19 g	• Subacute/chronic endometritis in cows over 14 days postpartum • Repeat breeders (3 or more unsuccessful inseminations).	Single dose syringe to be administered intra-uterinely	Single dose (19 g) syringe provided with a separate disposable catheter and a glove.

PARASITE CONTROL

butox® Vet

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

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Deltamethrin BP 12.5mg	To control the ectoparasites in cattle, sheep, goats, horses, camels, dogs & farm houses.	Spray or dip : Ticks : 2 ml/lit Mites : 4 ml/lit Flies : 2 ml/lit Lice : 1 ml/lit	Aluminium container of 5 ml, 15ml, 50 ml, 250 ml and 1 lit with plastic measuring cup

Taktic® 12.5% EC

Broad spectrum ectoparasiticide against ticks, mites, lice & keds

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

Berenil® VET 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

Panacur® VET

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The active ingredient of Panacur is Fenbendazole which is the research product of Intervet/Schering-Plough Animal Health. Each 1.5 g Bolus contains 1.5 g of active Fenbendazole. Each 150 mg tablet contains 150 mg of active Fenbendazole.	Infestation of cattle, buffaloes, sheep, goat & horses with gastro-intestinal nematodes, lungworms & tapeworms such as *Haemonchus spp., Ostertagia spp., Trichostrongylus spp., Cooperia spp.* and *Nematodirus spp.*	Recommended for cattle, sheep, goat, horses & pigs. Panacur 150 mg table per 30 kg body weight & Panacur 1.5 gm bolus per 300 kg body weight (5 mg Fenbendazole per kg body weight). Dose for horses : 7.5mg/kg bw	Box of 5 x 2'- 1.5 gm bolus Box of 5 x 2'- 3 gm bolus Box of 5 x 10'- 150 mg tablets.

PARASITE CONTROL

Panacur® VET Suspension

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml of Panacur 2.5% suspension contains 25 mg Fenbendazole in 90 ml and 1 lit pack. Each ml of Panacur 10% suspension contains 100 mg of Fenbendazole in 450 ml pack.	Infestation of cattle, buffaloes, sheep & goats with gastrointestinal nematodes lungworms & tape worms such as *Hoemonchus spp., Ostertagia spp., Trichostrongylus spp., Cooperia spp., Nematodyrus spp.,*	Dose recommended for cattle, buffaloes, sheep, goats & pigs' infestation with gastrointestinal nematodes & lungworms: (5 mg Fenbendazole per kg body weight)	90 ml and1 lit plastic bottle pack of Panacur 2.5% suspension. 450 ml plastic bottle pack of Panacur 10% suspension.

Panacur® VET Powder

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

Tolzan® F VET

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

Tolzan® Plus-L

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Oxyclozanide ....3.4% Levamisole Hydrochloride....2.5%	• Tolzan Plus-L treats the round worms and liver flukes in cattle, sheep and goats • Tolzan Plus-L controls adult and immature stages of conical flukes also (Paramphistomum spp.) • Tolzan Plus-L can be used safely in pregnant animals during all stages of pregnancy. • Tolzan Plus-L can safely be given to all cattle, sheep and goats without any pre-dosing, starving or change of diet.	Cattle: 90 ml for 300 kg live mass PO Sheep and goats: 9 ml for 30 kg live mass PO	120 ml plastic bottle, 1 Ltr can *New Introduction*

SUPPORTIVES

Tonophosphan® VET

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

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Sodium salt of 4-dimethylamine, 2-methylphenyl-phosphinic acid 0.2 g	As a tonic in general metabolic disorders, debility, exhaustion, repeat breeding & infertility due to phosphorus deficiency. For disorders of bone formation as in rickets & osteomalacia. To promote callus formation in fractures in combination with calcium & vitamin D. For treatment of tetany & paresis resulting from calcium, magnesium & phosphorus imbalance (as in milk fever).	In acute conditions- Large Animals : 5-20 ml. Small Animals : 1-3 ml. In chronic conditions- Large Animals : 2.5-5 ml Small Animals : 1-2 ml.	Vial of 10 ml and 30 ml Now also available 100 ml

VM all™

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each Kg contains a nutritional value of : Cobalt 120mg, Copper 1000mg, Magnesium 5000mg, Iron 2500mg, Potassium 100mg, Manganese 2000mg, Flourine 60mg, Calcium 150g, Selenium 10mg, Vit A 1200000 IU, Vit D3 120000 IU, Sulphur 0.70%, Vit E 1200 IU, Iodine 300mg, Zinc 5000mg, Phosphorus 60g, Niacinamide 4g, Vit K 200mg, Sodium 8mg.	To improve on fertility. To safeguard health and growth. To optimize milk yield and fat.	Ruminants Mix 100-200 g per 10 kg of feed depending on the availability of other fodder/feed. For direct feeding, Cow and Buffalo: 25-30 g/head/day Calf, Sheep and Goat: 15-20 g/head/day Aqua: Mix 100g to 10 kg of fish feed.	1 kg Zip-Locked pouch with measuring spoon. 5 Kg & 25 Kg bag

VM all™ - P

COMPOSITION				INDICATIONS	DOSAGE	PRESENTATION
Each KG contains a nutritional value of (When packed):				• To improve on fertility • To safeguard health and growth. • To optimize milk yield and fat.	*Ruminants* Mix 100-200 g per 10 kg of feed depending on the availability of other fodder/feed. *For direct feeding,* Cow and Buffalo: 25-30 g/head/day Calf, Sheep and Goat: 15-20 g/head/day *Aqua*: Mix 100g to 10 kg of fish feed.	25 kg Sealed bag New Introduction
Cobalt	150 mg	Vit A	1200000 IU			
Copper	2200 mg	Vit D3	120000 IU			
Iodine	325 mg	Vit K	200 mg			
Iron	2500 mg	Vit E	500 IU			
Magnesium	2500 mg	Calcium	225 g			
Manganese	2200 mg	Phosphorus	90 g			
Potassium	100 mg	Niacinamide	1000 mg			
Sodium	8 mg	Biotin 2%	500 mg			
Sulphur	1%	Bioactive chromium	65 mg			
Zinc	9000 mg					

LactAid™ Oral

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each 100 ml oral solution contains nutritional value of : Calcium - 3400 mg Phosphorus - 1700 mg Vitamin D3 - 16000 IU Vitamin B12 - 200 mcg	Improved milk production Improvement in growth and performance Stronger bones and resistance to diseases	For Large Animals 25ml to 40ml twice daily For Small Animals 10 ml to 20 ml twice daily	1 ltr & 5 ltr jars

SUPPORTIVES

Rumicare® Vet

Normalises milk production by restoring ruminal activity.

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each gm powder contains : Calcium Propionate 480.00 mg Methionine 40.00 mg Picrorhiza Dry Extract 2.00 mg Cobalt Gluconate 0.32 mg Vitamin B6 IP 0.32 mg Dextrose Anhydrous IP 428.00 mg	Bloat, digestive disorders caused by decreased activity of reticulum & rumen or sudden dietary changes &/ or intoxication. As a supportive therapy in diseases caused by foreign bodies & hypo-glycaemic conditions in cattle, calves, sheep & goats.	Adult Cattle : 125 gm sachet twice daily, (once in 12 hours Young Animals : 62-63 gm (approx) once or twice daily Sheep & Goat : 32 gm once or twice daily	125 g & 500 g sachet

Avilin® VET

For quick relief from allergic manifestations.

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Chemically, Avilin is 1-Phenyl-1-Pridyl-(2)-3 dimethyl aminopropane maleate (Pheniramine maleate). 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

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

Vetalgin™ VET

Highly effective analgesic, antispasmodic, antirheumatic & antipyretic agent.

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Analgin I.P. (Metamizole) 0.5 gm	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

RUMINANT BIOLOGICALS

BOVILIS™ Clovax

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

BOVILIS™ HSBQ

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

BRUCELLA ABORTUS STRAIN 19 VACCINE LIVE IP

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

BOVILIS™ ET

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

Clostridium Perfringens Vaccine Inactivated IP

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

COMPANION ANIMAL

Nobivac:Puppy DP

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each dose contains live attenuated strains of : Canine Parvo virus (strain C 154) $\geq 10^{7}$ $TCID_{50}$ Canine Distemper virus (strain Onderstepoort) $\geq 10^{5}$ $TCID_{50}$	Vaccination against CDV and CPV. Efficacious in puppies with maternal antibodies.	Reconstitute one vial of Nobivac Puppy DP in one vial of Nobivac Solvent & inject subcutaneously.	One box contains 10 vials of 1 dose.

Nobivac:DHPPi

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each dose contains live attenuated strains of : Canine Parvo virus (strain C 154) $\geq 10^{7}$ $TCID_{50}$ Canine Distemper virus (strain Onderstepoort) $\geq 10^{4}$ $TCID_{50}$ Canine Adeno virus type 2 (strain Manhattan LPV3) $\geq 10^{4}$ $TCID_{50}$ Canine Para-influenza virus (strain Cornell) $\geq 10^{5.5}$ $TCID_{50}$	Vaccination against CDV, CAV2, CPV & CPi. Besides providing protection against CAV2 disease entities such as respiratory tract infections, the vaccine also protects against infectious canine hepatitis (ICH) caused by CAV1.	Reconstitute the contents of one vial of Nobivac DHPPi in one vial of Nobivac Solvent, Nobivac Lepto, Nobivac Rabies or Nobivac RL immediately prior to use & inject subcutaneously.	One box contains 10 vials of 1 dose.

Nobivac:Lepto

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

Nobivac:Rabies

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each dose contains Rabies strain Pasteur RIV inducing more than 3 IU in the potency test. The virus is grown on the BHK-21 clone CT cell line inactivated with β-propiolactone, and adsorbed on aluminium phosphate.	For the active immunisation of healthy dogs, cats, cattle, sheep, goats, horses and in principle all healthy mammals against Rabies.	1 ml by subcutaneous or intramuscular injection. Shake well before use.	One box contains 1 ml x 10 vials or one box contains 10 ml x 10 vials

Nobivac:RL

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

COMPANION ANIMAL

Taktic® 5% EC

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

San Coat™

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Essential Fatty Acids (Linoleic Acid, Alpha Linolenic Acid, Gamma Linolenic Acid, Eicosapentaenoic Acid and Docosahexaenoic Acid) Vitamins (Vitamin A and E, Biotin and Pyridoxine) Zinc and Inositol Omega 6 and Omega 3 fatty acids in 6:1 ratio	San Coat is indicated as an aid in the management of allergic and inflammatory skin conditions like alopecia, dull and dry hair coat, pruritis, atopic dermatitis, *Malassezia pachydermatis*, pyoderma, mange etc. in dogs.	Pour measured dose on food once daily according to the following schedule. 0.3 to 1.0 ml per kg body weight. Under 7 kg - 3.75 ml 7 - 23 kg - 7.5 ml Over 23 kg - 15.0 ml	Container of 150 ml (bettix shape)

VM 365™

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

DELVOSTERON™

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains 100 mg proligestone	Suppression & postponement of oestrus in the bitch, treatment of pseudo pregnancy in the bitch, suppression and postponement of oestrus in the queen and suppression and postponement of oestrus in the ferret.	Dogs Body weight — Dosage < 3 kg — 1.0 ml 3-5 kg — 1.0-1.5 ml 5-10 kg — 1.5-2.5 ml 10-20 kg — 2.5-3.5 ml 20-30 kg — 3.5-4.5 ml 30-45 kg — 4.5-5.5 ml 45-60 kg — 5.5-6.0 ml > 60 kg — 1 ml/ 10 kg	20 ml Vials

4CYTE™

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

POULTRY PRODUCTS

Nobilis® Gumboro 228E

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

Nobilis® Gumboro D78

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

Nobilis® ND Clone 30

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

Nobilis® IB H120

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

Nobilis® MG 6/85

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

Nobilis® MG inac

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

Nobilis® E. coli inac

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

Nobilis® Salenvac T

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : Inactivated Salmonella enteritidis PT4 and Inactivated Salmonella typhimurium Dt104.	For the active immunisation of chickens against S. enteritidis and S. typhimurium and to give passive immunity against these agents in the progeny.	0.1 ml for day-old chicks and 0.5 ml for older birds.	500 ml bottles.

Nobilis® Newcavac

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

Nobilis® ND Broiler

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : ND virus Clone 30	The vaccine is recommended for the vaccination of day-old chicks against Newcastle Disease in areas where ND is endemic.	Each bird: 0.1 ml.	200 ml (2000 doses) & 500 ml (5000 doses) bottles.

Nobilis® Corvac

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

Nobilis® Coryza

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

Nobilis® Reo inac

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

Nobilis® G + ND

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : - ND virus Clone 30. - Gumboro virus strain D78.	The vaccine is recommended for the booster vaccination of future breeders to protect against Newcastle Disease throughout the laying period, and to induce high maternal antibody levels against Infectious Bursal Disease in their offspring.	Each bird: 0.5 ml.	500 ml (1000 doses) bottles .

Nobilis® IB multi + ND

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

Nobilis® IB + G + ND

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The vaccine contains : - Inactivated IB strain M41. - Inactivated Gumboro strain D78. - Inactivated ND Clone 30.	The vaccine is recommended for breeding stock: as a booster vaccination to protect against Newcastle Disease and the Massachusetts serotype of Infectious Bronchitis, and to induce high maternal antibody levels against Infectious Bursal Disease in their offspring.	Each bird: 0.5ml	500 ml (1000 doses) bottles.

Nobilis® Reo + IB + G + ND

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

Enradin

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

Amnovit

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

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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.

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Intervet India Pvt. Ltd.
33, Pune-Nagar Road, Viman Nagar, Pune-411014. India
Ph. No.: +91 20 66050400/01, Fax: +91 20 66050403
E- mail : info.india@merck.com www.msd-animal-health.co.in

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