

The Blue Cross Book

For the advancement of the veterinary profession



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

From Editor's Desk

The Editorial Board of Blue Cross Book is happy to place before its esteemed readers the 28th volume of this professional publication of MSD Animal Health. Since its relaunching from the 25th volume, the Blue Cross Book has been widely accepted by the Veterinary fraternity working in the field as well in the research and academic institutions as evidenced by the flow of articles on various topics of livestock health, management and disease control.

The Blue Cross Book has kept open its pages not only for the information based on clinical trials and reports, but also for the topics related to upcoming diagnostic and therapeutic procedures. The present volume of Blue Cross Book introduces Tocolysis (furthering parturition process) and Nutraceuticals in Veterinary practice, which are in vogue in Western Countries since last decade. Use of sexed frozen semen to produce progeny of desired sex has already gained entry and popularity among elite dairy farmers in India. Use of general anaesthesia in large ruminant surgery, though practiced in Veterinary Hospitals and Polyclinics with advanced instrumentation and human resource, needs to be handled by field veterinarian with increased confidence. The article on monitoring general anaesthesia in large ruminants with essentials of pre-medication and post operative management shall help field Veterinarians in this direction. Considering the importance of the topic, it is being published in two parts (volume 28 and 29).

Infertility among dairy animals is a matter of concern to all stake holders in dairy industry and it has been amply proved till now that use of hormones and antibiotics alone is not an answer to this problem. The new concept of 'Preventive aspect of infertility and nutritional management of reproductive health' needs to be infused in the minds of dairy owners through field Veterinarians. The articles on this concept bear the full practical utility.

The Editorial Board of Blue Cross Book appeals to its readers once again to contribute immensely their experience and expertise on varied topics of livestock health and productivity to make Blue Cross Book not merely informative, but more educative to advance the professional knowhow.



Dr. Yash Goyal
Managing Director,
MSD Animal Health

Fellow Professionals,

With its sole thrust on “The Science of Healthier Animals”, MSD Animal Health is happy to bring out the 28th edition of ‘Blue Cross Book’ with its mission to enlighten its readers regarding advanced scientific discoveries and new techniques in disease diagnosis and therapeutic management. I hope that field Veterinarians shall utilize this opportunity to keep country’s livestock healthy and productive. Indian economy, basically dependant on Agriculture, and livestock being an important component of this sector, continuous update of knowledge emerging in livestock sub-sector is the need of the day to help livestock keepers in getting regular and assured income from the livestock. This aspect has more relevance in dairy industry as productivity of the dairy animals can be effectively enhanced only by adopting the advanced and scientific techniques in breeding, nutritional and health management. MSD Animal Health has been trying to update the field Veterinarians in this direction.

Apart from dairy animals, MSD Animal Health is also focusing on well-being of small ruminants, pigs, equines, canines and felines besides poultry and aqua-culture. Though this livestock has its own importance in Agriculture economy, the spread of zoonotic diseases through these species is rising to alarming proportions. The role of field veterinarians is amply recognized and considered pivotal in controlling the zoonotic diseases through well-being of these species of animals.

MSD Animal Health through the Blue Cross Book, shall endeavor in future to enlighten fellow veterinarians on health management of all species of livestock.

Wishing the readers “A Happy Festive Season” .

Best wishes,

Yash Goyal



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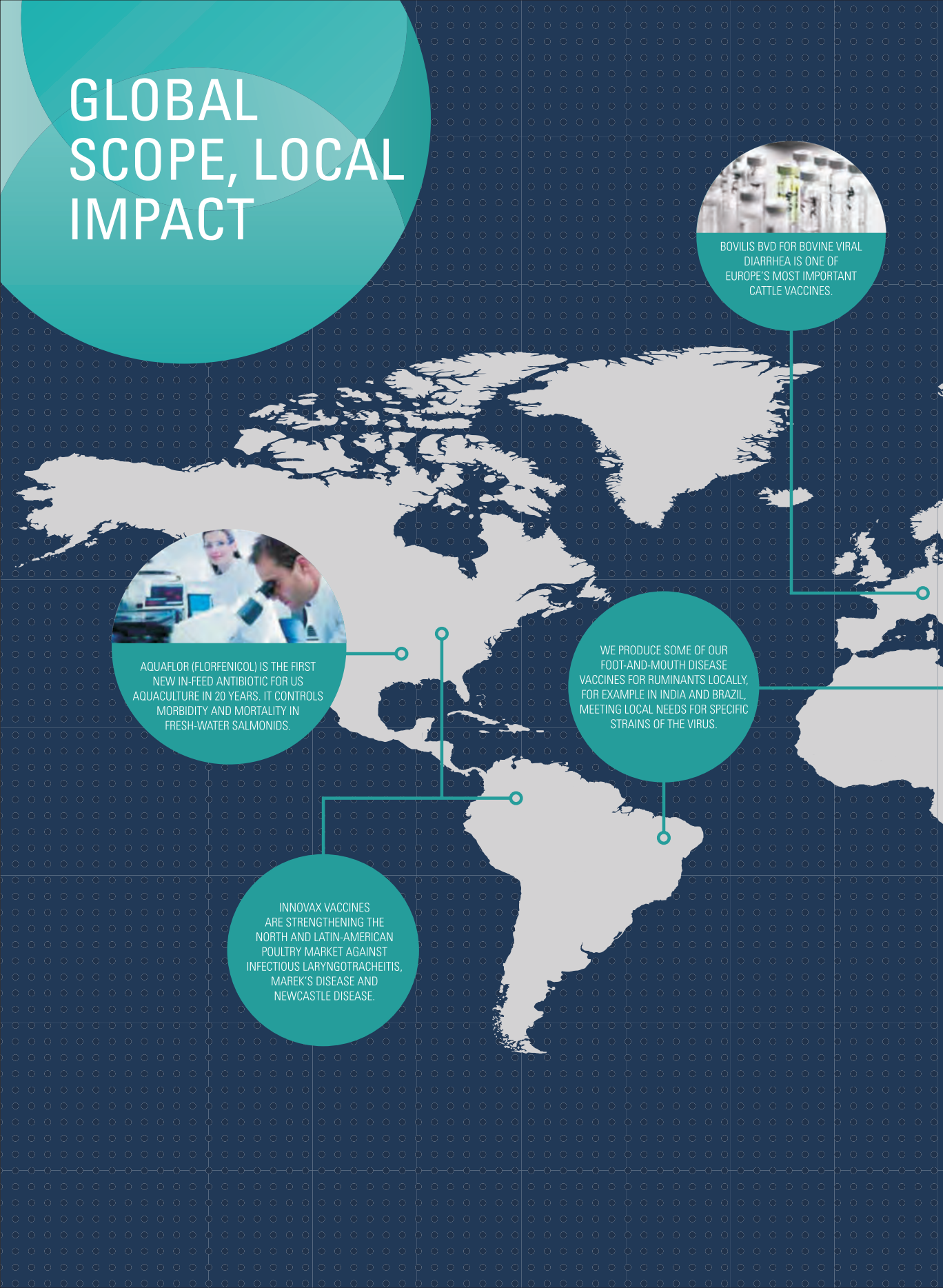
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General Anaesthesia: Considerations and Monitoring for Large Ruminants - Part I

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Introduction

A variety of surgical procedures in large ruminant is usually performed under combinations of physical restraint, sedation and local or regional anesthesia. However, there are situations where demands of technical and anatomical aspects of surgical procedures exceed the capabilities of sedative drugs and local analgesia, making general anesthesia a necessity. For complex surgical procedures like repair of diaphragmatic hernia, ventral hernia, prepubic tendon rupture, keratoplasty and orthopaedic surgery, maintenance with an inhalant anesthetic is must. Large ruminants present the veterinary anesthesiologist with more number of clinical problems than do any other species that's why bovine general anesthesia is more challenging job. Different parameters like cattle's anatomic and physiologic characteristics influence the decision to induce general anesthesia. Local or regional anesthesia is often sufficient to perform many clinical procedures in bovines. More complex surgical procedures where local analgesia and sedation fail to meet the requirements of the concerned surgical procedure, general anesthesia is a pre-requisite. Earlier times, bovines were considered as poor subjects for general anesthesia which do not hold true in present scenario. With the development of better anesthetics, monitoring

and delivering equipments, a revolution has come in the field of bovine anesthesiology. The present article reviews current knowledge and techniques of general anesthetic management of bovine.

Anesthetic considerations in bovine

- **Regurgitation**

Regurgitation with subsequent aspiration of reticulo-ruminal contents and aspiration pneumonia is always a potential hazard during general anesthesia in bovine.

- **Ruminal Tympany/bloat**

Large volume of rumen and constant production of fermentation gases leads to bloat resulting in impingement on both cardiovascular and pulmonary systems

- **Copious Salivation**

Continuous outflow of saliva and regurgitation of reticulo-ruminal contents leads to alteration in the fluid, electrolyte and pH status of the patient. Airway obstruction by large volumes of copious saliva is also not uncommon in bovines

- **Prolonged Recumbency Leading to:**

Hypoxia/hypoventilation: In cattle, due to heavy weight of abdominal viscera and its contents, diaphragm is prevented from moving freely on inspiration and thus ventilation



becomes shallow, rapid and inefficient for gas exchange within the lungs. Cattle restrained in both lateral and dorsal recumbency often suffer from hypoxia, which gets exacerbated by heavy sedation and general anesthesia.

- **Myopathies and Neuropathies**

General anesthesia of ruminants has often been considered relatively 'high risk' due to their large size, myopathies and neuropathies. The risk of myopathy is best minimized by preventing hypotension, correctly padding and positioning the patient, and minimizing down time.

Preanesthetic Preparation

- **FASTING AND WATER DEPRIVATION**

Adult animal should be fasted for 18 -24 hours and deprived of water for 12-24 hours. Fasting and water deprivation will decrease the incidence of tympany and regurgitation by decreasing the volume of fermentable ingesta. Along with that pulmonary functional residual capacity may be better preserved in the fasted anesthetized ruminant.

- **PREOPERATIVE LABORATORY EVALUATION**

It provides useful prescreening information about the general health status of patient and about procedures that need to be carried out prior to anesthesia. A physical examination must be done to determine any abnormalities. Animal

should be stabilized well before administration of anaesthesia. Stabilize animal's physiology in debilitated animals (e.g. gastrointestinal disorder, dystocia) Hematological and blood chemistry values should be determined and evaluated as appropriate before induction of anesthesia.

- **INTRAVENOUS CATHETER PLACEMENT AND FLUID THERAPY**

Intravenous line through jugular vein catheterization, should be performed prior to anesthesia. For Jugular catheterization catheter up to 18 G for calves and 14-16 G for cattle is appropriate. Fluid, electrolyte and pH status of patient is altered during surgical interventions therefore intravenous crystalloids @5-10 ml/kg/hr should be administered during anaesthesia.

- **TRACHEAL INTUBATION**

Tracheal intubation with a cuffed endotracheal tube is recommended in cattle to provide a patent airway and to prevent aspiration of salivary and ruminal contents if passive regurgitation occurs. Blind, digital palpation, or direct laryngoscopy techniques can be used to accomplish intubation. In blind method appropriate size endotracheal tube is inserted and manipulated into the larynx with hands. Different size tubes suitable for appropriate body weights are listed in the table (Table 1).

Table 1 : Endotracheal tube size for cattle/buffaloes of various body weight

Body Weight (kg)	<30	30-60	60-80	100	100-200	200-400	400-600	>600
Endotracheal Tube Size (mm id.)	4-7	8-10	10-12	12	14-16	16-22	22-26-	>26



PATIENT POSITIONING

The risk of hypoxia, myopathy and neuropathy is greatest in heavy weight cattle under prolonged recumbency. Proper patient positioning with sufficient padding and avoiding undue prolonged recumbency can reduce these complications

Agents Used For Premedication, Induction And Maintenance Of Anesthesia In Bovines.

PREMEDICATION

Premedication plays a very crucial role in bovine anesthesia. Preoperative use of sedatives improves the quality of induction and decreases drug related adverse effects by reducing the amount of anaesthetics required for induction and maintenance of general anaesthesia. Sedative/opioid combination (neuroleptanalgesia) is most popular (e.g. xylazine and butorphanol; acepromazine and morphine), and provides better restraint and analgesia.

ANTICHOLINERGICS

Not routinely used in cattle because these drugs do little to control salivation, tend to make salivary secretions more viscid, and have only short durations of action. Furthermore, these agents tend to decrease gastrointestinal motility and may predispose the development of ileus or bloat. Use of anticholinergics is not recommended in cattle prior to induction of anesthesia because they do not consistently decrease salivary secretions unless used in high doses and repeated frequently. In fact, saliva becomes more viscous leading to obstruction of the airways. Anticholinergics also reduce the mucociliary function so there is a delay in

clearance of materials from respiratory tract. The usual dose of atropine used to prevent bradycardia in cattle (0.06-0.1 mg/kg IV) does not prevent salivation during anesthesia. Glycopyrrolate (0.005 -0.01 mg/kg IM or 0.002 - 0.005 mg/kg IV) may be substituted for atropine.

PREANESTHETICS/SEDATIVES/TRANQUILLIZERS

The alpha-2 agonist drugs are currently most commonly used for induction and / or sedation in cattle. Other drugs such as acepromazine, chloral hydrate, and pentobarbital have long history of use with cattle and continue to be commercially available. However, their contemporary importance has become mostly limited to special circumstances.

Phenothiazenes

Acepromazine

Recommended dose in cattle is 0.025 – 0.05 mg/kg IV. In healthy cattle, a premedication dose of 0.04 mg/kg IV has minimal cardiovascular effect. Effects are seen after 20 min of IV injection and 30 to 45 min after IM injection. Acepromazine is associated with dose dependent hypotension, paralysis of retractor penis muscle, penile protrusion and a decrease in oesophageal sphincter tone, increasing the likelihood of regurgitation in ruminants. It has now been replaced mainly by alpha 2 agonists for sedation.

Alpha 2 Agonists:

Xylazine

Xylazine is the most widely used α -2 agonist used for sedation in bovines. It produces a dose dependent degree of sedation, muscle



relaxation, and analgesia. Intravenous administration of xylazine provides a faster onset and more intense level of chemical restraint and analgesia compared to intramuscular administration. The intramuscular dose is typically twice the IV dose. Onset of action following IV injection is 2 min, reaching peak effect in 5 minutes.

- In cattle recommended dose: 0.01 – 0.1 mg/kg IV (1/10th of equine dose).
- Low doses: 0.015 -0.025 mg/kg IV or IM: provide sedation without recumbency in cattle
- Higher doses (0.1 mg/kg IV or 0.2 mg kg IM): provide recumbency and light planes of general anesthesia in cattle for approximately one hour. Higher doses can be expected to induce longer periods of recumbency.
- Slight higher dose (0.05-0.1 mg/kg IV): produces recumbent sedation in the cattle.
- Xylazine alone (0.02-0.03 mg/kg IV or 0.04-0.06 mg/kg IM): produces standing sedation in normal healthy cattle with a low risk of recumbency

Duration of xylazine sedation and analgesia is dose dependent, generally lasting about 30-40 minutes following IV administration. There appears to be some variation in response to xylazine within a species. Hereford cattle have been shown to be more sensitive to xylazine than Holstein cattle and anecdotal evidence indicates that Brahmans are the most sensitive of the breeds.

Detomidine

This drug is comparatively cheaper than

xylazine. Recommended dose as a “sedative” in cattle is 10 to 40 mcg/kg IV. Lower doses (2.5 - 10.0 mcg/kg IV) provides standing sedation of approximately 30-60 minutes duration in cattle while higher doses of detomidine (40 mcg/kg IV) produces profound sedation and recumbency in cattle.

Romofidine

Romofidine is a long acting drug having more sedative effect than xylazine or detomidine. It is given at a dose rate of 20 - 50 mcg/kg in cattle. Its epidural efficacy is studied with lot of promise in cattle these days.

Medetomidine

In calves a dose rate of 30.0 mcg/kg IM produces recumbency lasting 60-75 minutes duration.

α -2 Antagonists:

α 2 antagonists have been one of the most significant advances in veterinary anesthesiology during the last decade. Most notable in this area of investigation has been clinical application and investigation of α -2 antagonists such as yohimbine, tolazoline, idazoxan and atipamezol for reversal of actions induced by α -2 agonists. These have become valuable tools in the anesthetic management of large domestic and wild species. Recommended dosages of these agents in bovine are:

- Yohimbene @0.2mg/kg
- Tolazoline@1-2mg/kg
- Idazoxan@0.3-1.0mg/kg
- Atipamezol @ and 0.1 mg/kg.

When dosed properly the effects of reversal



starts to become evident about ten minutes following IM administration of α -2 agonists

Benzodiazepene:

Diazepam

Diazepam at a dose rate of 0.02 - 0.50 mg/kg IV is very effective in calves; produces excellent muscle relaxation and mild sedation but lacks analgesia. Diazepam becomes too expensive for use in adult cattle at the high end of dose range, limiting its routine use in calves only. Flumazenil can be used to reverse the effect of diazepam (expensive, use not established in cattle).

Midazolam

Midazolam is a benzodiazepine having anticonvulsant, anxiolytic, sleep inducing, muscle relaxant, and sedative properties. Unlike other benzodiazepens, midazolam is water-soluble, has rapid onset with short duration of action, short elimination half-life period with total body clearance and 3 to 4 times more potent than diazepam. Due to its rapid non-painful action and lack of venous irritation, it is preferred over diazepam. Recommended dose for restraint in cattle is 0.5 mg/kg.

OPIOIDS

Butorphanol

Opioids possess excellent analgesic properties and are the preferred drugs used for alleviation of moderate levels of pain during general anesthesia. Butorphanol is an opioid agonist-antagonist with good analgesic, antitussive, and sedative effects. Butorphanol at the dose rate of 0.05-0.1 mg/kg IV or IM in small ruminants and 0.02-0.05 mg/kg IV or IM in large ruminants provides adequate relief from moderate levels of

pain. Apart from excellent analgesia, butorphanol has minimal effect on heart rate, blood pressure and cardiac output when given alone. The quality of sedation is improved when combined with xylazine (or other sedatives), along with improved analgesia.

Xylazine-butorphanol Combinations:

Combinations of xylazine and butorphanol have been used in cattle to provide neuroleptanalgesia. Doses are 0.01 - 0.02 mg/kg IV of each drug given separately in cattle. Duration of action is approximately 1 hour.

Detomidine - Butorphanol

Combinations: Combinations of detomidine (0.07 mg/kg) and butorphanol (0.04 mg/kg) have also been used to immobilize free ranging cattle.

Medetomidine - butorphanol

Combinations: Combination has good analgesic, sedative and muscle relaxing effects. Medetomidine (2.5 g/kg, i.v.) and butorphanol (0.05 mg/kg, i.v.) combination in water buffaloes has been found to provide better sedation, analgesia and muscular relaxation and more dose sparing effect on anaesthetics along with shorter recovery times.

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Bovine Mastitis in India - hurdle in dairy development



Milk production in India has registered a phenomenal growth during last 60 years, achieving the production of 122 million tonnes during 2011 - 12 from 19.4 million tonnes during 1951-52, with the annual growth rate between 3.5 - 5% during last 20 years. The demand for milk and milk products, however, is increasing at the two digit level per annum, stretching the requirement of milk to 180 - 200 million tonnes at the turn of this decade, which would be possible only if the present rate of milk production is raised between 6 - 7 percent. Though various productivity enhancement programmes are underway, the biggest hurdle in achieving the targeted production is Mastitis in Indian milch animals - be it sub-clinical or clinical



Tocolysis in Veterinary Obstetrics

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Introduction

Drugs capable of reducing uterine hypermotility are called tocolytics and may be useful for preventing premature labour. Tocolysis is derived from Greek word (tokos = child birth and labour; lyses = dissolution) that means in practical term, inhibition of labour. The suppression of contractions is often only partial and tocolytics can only be relied on to delay birth for several days (Crowther et al., 2007). Suppression is obtained by the use of substance able to induce a state of myometrial paralysis. Hence, drugs that produce this effect are termed uterine myorelaxants, tocolytic drugs or simply tocolytics. Tocolytic drugs were originally designed for human therapeutic purposes and are now being used in Veterinary obstetrics. This paper briefly reports the aim and mechanism of tocolysis, properties of tocolytics, drugs used as tocolytics, clinical usage and contraindications of tocolysis and conclusion on the issue.

Motility and innervations of uterus

Uterine muscles contract rhythmically both in vitro and in vivo. These contractions originate in the muscle itself and are not abolished by interference with the nerve supply. Both force and frequency of contractions of uterine muscle vary greatly during different phases of oestrus and pregnancy. In early pregnancy, uterine movements are depressed but towards the end, the contractions become fully co-ordinated during parturition. The fundus is the origin of

these co-ordinated contractions; myometrial cells in this area function as pacemakers and give rise to conducted action potential. The waves of contractions take about 10 – 20 seconds to pass from the fundus to the cervix. The electrophysiological activity of the myometrial pace maker cells is regulated by the sex hormones.

Mechanism of action

All the β_2 -adrenergic agonists relaxe the uterus by stimulating the β_2 -adrenergic receptors of the uterine muscle, which causes a decrease in the intensity and frequency of uterine contractions. It decreases uterine myometrial contractility by increasing cellular cyclic adenosine monophosphate (cAMP) and increasing cell membrane cytokines that increase and sequester intracellular calcium. Without intracellular calcium, the activation of contractile protein of smooth muscle is prevented and the uterus relaxes.

Aim of tocolysis

The aim of tocolysis is to delay preterm delivery to allow time for maternal administration of corticosteroids and in-utero transfer to a tertiary perinatal centre, thereby reducing neonatal morbidity and mortality. In other circumstances, tocolysis should be used only rarely and for period not exceeding 48 hours, as there is no clear evidence that prophylactic or maintenance



tocolytic drugs improve outcome following threatened preterm labour.

General contraindications of tocolysis

1. Inappropriate gestational age, i.e. <23 weeks or >34 weeks gestation.
2. Internal medical disease, such as:
 - Severe gestational hypertension
 - Uncontrolled diabetes mellitus
 - Cardiac disease (recent myocardial infarction, pulmonary hypertension, tachyarrhythmia)
 - Chorioamnionitis
 - Impaired renal circulation.
3. Active antepartum haemorrhage.
4. Fetal complications:
 - Intrauterine fetal demise or non-viable condition
 - Fetal compromise (which may include fetal anomalies and/or suspected intrauterine growth restriction)
 - Non-reassuring fetal assessment.
5. Known allergy to the tocolytic agent chosen (Abramov et al. 2000).

Drugs used as tocolytics (Table 1 and 2)

1. β -Sympathomimetics / Adrenoreceptor Stimulants: like Isoxsuprine, Ritodrine, Terbutaline, Salbutamol, Orciprenaline, Fenoterol, Clenbuterol, Meluadrine Tartrate.

(a) *Isoxsuprine hydrochloride*: It is non-catecholamine that relaxes uterine muscle by stimulating β -adrenoceptors. Diminished uterine contractility can be maintained for long periods provided cardiovascular system tolerates the dose administered. It is administered orally, IM or IV to inhibit

premature labour. It has 1-2 h of duration of action and 15 min as latent period. Dose 0.5 mg/kg repeated after 2 h.

(b) *Ritodrine hydrochloride*: It is a more specific β -2 adrenoceptor stimulant and produces fewer cardiovascular reactions. It relaxes the uterus and delays the onset of labour. It can be administered by oral, IM or IV routes.

2. Calcium antagonists : Nifedipine, Verapamil, Nicardipine, Nitrendipine.

3. Oxytocin antagonists: Atosiban, All β -sympathomimetic.

4. Prostaglandin antagonists : Indomethacin

5. Other agents : Glyceryl trinitrate, extracts of Bryophyllumpinnatum, Omega-3 long chain Polyunsaturates, Magnesium sulfate, Ethyl alcohol, Tranquilizers, Barbiturates.

(a) *Ethyl alcohol*: Intravenous infusion reduces uterine contraction during premature labour by (i) inhibiting the release of oxytocin and vasopressin from posterior pituitary (ii) releasing adrenaline through sympathetic activation and (iii) inhibiting prostaglandin synthesis

(b) *Magnesium sulphate*: High concentration of magnesium depresses uterine activity. It is usually not preferred in cases of premature labour. It is used as IV infusion to inhibit uterine contractions.

(c) *Tranquilizers*: Perphenazine or other phenothiazine derivatives suppress uterine contractions.

(d) *Barbiturates*: On the basis of in vitro studies, full anaesthetic dose of barbiturates are believed, to depress uterine contractions during parturition. While using barbiturates, care should be taken that phenobarbital and



thiopental in concentrations that fail to produce maternal anaesthesia will completely inhibit fetal respiratory movements without maternal

hypoxia. However, thiopental is not as depressant to the foetus as pentobarbital.

Table 1: Commercially available tocolytic drugs:

S. No.	Ingredients	Proprietary name	Mechanism of action
1	Isoxsuprine lactate	Duphaspasmin duvadilan	Selective β_2 inhibitor
2	Clenbuterol hydrochloride	Ventipulmin, planipart	Selective β_2 inhibitor
3	Terbutaline sulfate	Brethine	Selective β_2 inhibitor
4	Salbutamol hemisulfate	Ventolin	Selective β_2 inhibitor
5	Orciprenaline sulfate	Alupent	Selective β_2 inhibitor
6	Fenoterol bromide	Beroter	Selective β_2 inhibitor
7	Ritodrine chloride	Yutopar	Selective β_2 inhibitor

Properties of ideal tocolytics

- Highly effective
- Rapidly acting, long lasting
- Safe for dam & fetus
- Cheap
- Target myometrium exclusively
- Non-invasive mode of administration
- Good side effect profile & tolerability

Factors affecting tocolysis

- Stage of labour
- Cervical dilatation & fetal position
- Parity of animal
- Pelvic area of dam

Clinical usage of tocolytic drugs

(1) Threatened abortion / Preterm labour

It is a major clinical problem and the role of tocolytic therapy in the prevention of preterm labour is still controversial. Spontaneous preterm labour and delivery account for approximately one-third of preterm births,

which is the predominant cause of perinatal mortality and morbidity (Tan et al., 2006). The management of threatened preterm labour with first line tocolytic therapy can prolong gestation, but the time gained in-utero need to be optimized.

Progesterone therapy is generally advocated for the treatment of premature labour, but it has some adverse effects e.g. when labour pain has reached to its maximum amplitude, the drug does not work or is ineffective and it prolongs gestation length. When the drug is administered during advanced pregnancy, chances of dystocia increase due to additional weight gain of the fetus. A newly synthesized β -sympathomimetic agent KUR-1246 is a very potent tocolytic agent compared with ritodrine hydrochloride on oxytocin induced uterine contraction in pregnant sheep (Kiguchi et al., 2002). Efficacy is adjudged on cardiovascular parameters of dam and general metabolism of dam and fetus.



Table: 2 Proprietary names of beta adrenergics for Human and Veterinary use in their respective marketing countries

Drugs	Human	Veterinary
Isoxsuprine (Caa 40)a	Chloride: Vasodilan Canada(Bristol) Hydrochloride:ISO-Prine (Neogen) Hydrochloride (Tablet):ISO-Prine (Neogen)	Lactate: Duphaspasmin Holland (Philips-Duphar)
Ritodrine (DU 21220)	Chloride: Yutopar United Kingdom (Philips-Duphar)	-
Terbutaline (KWD 2019)	Sulfate: Bricanyl Canada (Astra)	Sulfate:Brethine USA (Novartis Pharmaceuticals)
Salbutamol (AH 3365)	Hemisulfate: Ventolin Canada (Allen & Hanbury's)	-
Orciprenaline (Th 1 52)	Sulfate: Alupent Canada (Boehringer-Ingelheim)	Sulfate: Alupent Canada (Boehringer-Ingelheim)
Fenoterol (TH I 165)	Bromide: Berotec Canada (Boehringer-Ingelheim)	-
Clenbuterol (NAB 365)	Chloride: Spiropent Germany (Boehringer-l)	Chloride: Ventipulmin; Planipart Canada (Boehringer-1.) Germany (Boehringer-1.)

Xylazine increases the frequency and intensity of uterine contractions significantly and the value of the area under the contraction curves is significantly higher than that observed under basal conditions i.e. before drug treatment. Clenbuterol and Nifedipine can be used as potent tocolytic agents in order to prevent the uterine side effects of Xylazine (Perez et al., 1997).

(2) Controlled calving /Nocturnal delivery

Tocolytic drugs are also used to reduce economic losses associated with “night – time” parturition in cattle by allowing a better management of labour period. Clenbuterol (300 µg I/M) suppressed uterine contractions

and delayed parturition in 95 cattle on an average 5 - 8 hr without any ill effect on cow or calf, expulsion of placenta and fertility of cow (Ballarini, 1978). Terbutaline (5 mg/kg I/M) has potential as a tocolytic drug to delay parturition and was helpful in various bovine obstetrical maneuvers (Melanie et al., 2007).

In porcine, tocolytic drugs are mainly used for interruption of parturition and nocturnal delivery. Clenbuterol @ 150 µg IV was helpful for postponing parturition in 13 sows, it interrupted labour for several hours, and resulted into unhindered farrowing without affecting piglet vitality (Zerobin and Kundig, 1980).



(3) To reduce neonatal morbidity and mortality in dystocia

Clenbuterol and Isoxsuprine consistently provided ease for manual corrections of full term dystocia cases and produced no adverse effects. Therefore, it can be considered as an efficacious drug for use in the management of dystocia in cow, mare, ewe, sow, queen, doe and bitch. Clenbuterol given @ 300 µg I/M to cows in dystocia cases required less epidural anesthesia (Menard, 1994).

(4) To aid obstetrical operations; cesarean section and fetotomy

Advantages of tocolysis in obstetrical maneuver (Menard, 1994) are:

- Less requirement of epidural anaesthesia
- Easy and correct diagnosis of obstetrical defects
- Facilitate obstetrical maneuvers
 - Repositioning of head and neck deviations
 - Corrections of malpresentations and malpostures
 - Repulsion and rotation of fetus
 - Correction of forelimb retension, hock flexion, and breech presentation
- Low incidence of retained placenta
- Low incidence of genital prolapse

Caesarean section

Advantages of using tocolytic drugs in cesarean section are

- Facilitates Veterinarians' work.
- Easy extra-peritoneal lifting of the uterus
- No risk of anaesthetic induced recumbancy.

- Impermeable closure of uterine muscles
- Easy suturing of uterus and no incidence of retained fetal membrane
- Prevent post-operative adhesions.
- Reduce mortality of dam and calf.

Very good uterine relaxation, improved ease of manipulation and exteriorization of uterus were noticed during caesarean performed in ewes (n=3) using clenbuterol@ 0.8 µg/kg I/M (Menard and Diaz, 1987).

(5) Uterine prolapse and Uterine torsion

(a) Uterine prolapse: Prolapse of the uterus may occur in any species. However, it is most common in dairy and beef cows and ewes, less frequent in sows and rarely in mares, bitches and queens. For proper and easy repositioning, it requires relaxation of uterus. The relaxation of uterus occurred after 10-20 minutes and reposition of uterine prolapse was good after injection of clenbuterol and isoxsuprine at different dose rates in domestic animals (DeNooij, 1984; Menard and Diaz, 1987).

(b) Uterine torsion: Uterine torsion is more common in buffaloes and cows than any other domestic species. It was studied that after injecting clenbuterol to the cows, the uterine relaxation and detorsion was found good with rapid onset of action (Menard, 1994).

(6) Embryo transfer

Clenbuterol causes relaxation of uterine smooth muscles and this has led to its application in controlling parturition and managing dystocia and attempts were made to reduce manually stimulated contractions of the uterus during nonsurgical embryo transfer also (Walton et al., 1986).



Conclusions

- Among the β -sympathomimetic drugs used in animal reproduction, only clenbuterol and isoxsuprine have been used widely in clinical management of obstetrical disorders apart from embryo biotechnology with encouraging post therapeutic results.
- The use of tocolytic agents should be individualized, based on maternal condition, potential side-effects and gestational age.
- There is no clear first-line tocolytic agent in Veterinary field.
- The management of threatened preterm labour with first line tocolytic therapy can prolong gestation.
- Evidences that this treatment confers overall benefits are still lacking.
- The efficacy of these drugs is mostly assessed clinically and pharmacokinetics of each drug needs to be studied in detail to ensure wide use with awareness of adverse effects of drug metabolites, if any.

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Equine Seasonal Allergic Dermatitis

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Introduction

Equine seasonal allergic dermatitis is an intensely pruritic dermatitis of horses caused by hypersensitivity to insect bites and is also known as Queensland itch and Sweet itch .

Etiology

The disease is caused by type I (immediate) hypersensitivity to salivary antigens introduced into the skin by the bites of sandflies and other insects. There may be a lesser role for type N (cell-mediated) hypersensitivity in the disease. *Culicoides brevitarsus* is the cause in Australia, *Culicoides pulicaris* in United Kingdom and Europe, and *Culicoides obsoletus* in Canada. *Stomoxys calcitrans*, the stable fly, and *Simulium spp.* also cause the disease. The distribution of the skin lesions is related to the feeding habits of the inciting insect. For instance, *Culicoides pulicaris* has a predilection for landing at the mane and tail, where the lesion is most commonly seen.

Epidemiology

The prevalence of the disease varies depending on environmental factors, and possibly characteristic of the local horse population. Up to 60% of horses are reported affected in areas of Queensland, Australia, 22% in Israel, and 18% of Icelandic horses in Norway. The prevalence in Switzerland is very low in regions

above 1000 m and 1.6% in lower areas. The disease is quite common in areas where hot and humid summer weather favours the causative insects as in Sweden, the United Kingdom, Japan, Israel, Hong Kong, North America, Australia, the Philippines, India, and France. Most cases occur during summer and lesions disappear during cooler weather. Lesions disappear when the horses have been stabled in insect-proof barns for several weeks or are moved outside the geographical range of the inciting insect. The disease is characteristically sporadic. The prevalence of the disease increases with age; 3.4% of Icelandic horses during 1-7 years of age compared to 32 % of horses older than 14 years were affected.

Pathogenesis

Reaginic antibodies (IgE) produced in response to exposure to proteins in insect saliva bind to mast cells in the skin and, when exposed to the antigen, are associated with degranulation of the mast cells. Horses with sweet itch have IgE antibodies that react with constituents of the salivary gland of *Culicoides spp*, whereas, horses that do not have the disease have IgG, but not IgE, antibodies against *Culicoides* salivary gland antigens. Horses that have not been exposed to *Culicoides spp*. do not have antibodies to the insect salivary gland antigen. Degranulating mast cells and intradermal or subcutaneous lymphocytes release various



vasoactive substances and cytokines that cause inflammation and accumulation of eosinophils in the skin of affected areas and eosinophilia. The distribution of the lesions on patients reflects the insects's preferred feeding sites.

Clinical Findings

Lesions are usually confined to the base of the tail, rump, along the back, withers, crest, poll, ears and, less commonly, ventral midline. In severe cases, the lesions may extend down the sides of the body and neck and onto the face and legs. Pruritus is intense, especially at night, and the horse scratches against any fixed object for hours at a time. In the early stages, slight, discrete papules, with the hair standing erect, are observed. Constant scratching may cause self mutilation, severe inflammatory lesions, and loss of hair. Scaliness and loss of hair on the ears and tail-base may be the only lesions in mildly affected horses.

Clinical Pathology

Affected animals have eosinophilia and thrombocytosis. Diagnosis is facilitated by skin biopsy, fungal culture, and parasitological examination of skin scrapings, and intradermal sensitivity testing. Skin biopsy of early lesions, before trauma masks the true picture, reveals oedema, capillary engorgement, and eosinophilia and mononuclear perivascular infiltration. Fungal culture and parasitological examination of skin scrapings are useful only in that they rule out dermatophycosis, onchocerciasis, and strongyloidosis. Intradermal skin testing demonstrates immediate and delayed sensitivity reactions to extracts of *Culicoides* and *Stomoxys Spp.* Infection with larvae of *Onchocerca spp.* or *Strongyloides spp.*, or *Dermatophilus congolensis* can

produce similar lesions. Alopecia of the tail head may be caused by *Oxyuris equi*.

Treatment

The principles of treatment are removal of the inciting cause and suppression of the hypersensitivity reaction. Removal of the inciting cause is achieved by preventing horses from being exposed to the inciting insects. This can be achieved by relocating the horse to a geographical region where the insects do not occur, stabling of the horse in an insect-proof stable during the periods of the day (early evening) when the insects are most active, or applying agents that kill the insect or otherwise prevent them from alighting on and biting the horse. Suppression of the immediate hypersensitivity reaction or its sequelae can be achieved by administration of corticosteroids (prednisolone, 1 mg/kg every 24 hours initially, then reducing to as low a maintenance dose as possible). Theoretically, hyposensitization may be effective, but the only controlled clinical trial to date did not demonstrate a beneficial effect, although the placebo effect on the owners was impressive.

Control

1. Prevention of the disease necessitates protection against sandfly bites by stabling in insect-proof quarters.
2. Continuous spraying of the horses with insecticides or repellents may be of some value.
3. A 4%permethrin pour-on gives effective protection. Most horses need only one application a week, others need an application every second day.



Future Prospects of Sexed Semen of Dairy Animals in India

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Introduction

Artificial Insemination (AI) has been accepted as most important technology worldwide for the animal improvement programmes and being widely used for breeding dairy cattle and buffalo in India. AI is a popular, simple and inexpensive treatment of infertility in farm animals, in which the sperms from male is collected and introduced artificially into the reproductive tract of the female for conception. The history of the development and use of artificial insemination in domestic animals is very old and varied. An Italian physiologist reported first successful use of AI in dog during 1780. In India, the first AI was done in Halliker cows with semen of Holstein Friesian and got 33 cows pregnant on livestock farm at Mysore during 1939. During 1950s, key village schemes were introduced by Govt of India to improve animals through AI. The biggest advantages of AI are to utilize quality sires effectively for a large population of females and prevent the transfer of venerable diseases which can otherwise transfer in natural course.

Present status of AI

With a breedable population of 199.1 million cattle and 105.3 million buffaloes (Annual report 2011-12, Ministry of Agriculture, Govt of India), a scientifically planned programme is required to improve milk production to meet

the demand for milk by the rapidly growing population in India. At present, there are more than 50 semen stations in the country producing approximately 70 million doses which are not enough to breed more that 25% breedable population of the country. To cover the whole dairy animal population, it is necessary to increase and strengthen present sperm stations, produce sufficient breeding bulls for AI and replace old bulls regularly. Theoretically, the frozen semen produces 50% male and 50% female progenies. However, to increase milk production to fulfil the per capita





requirement, more female births are needed ,and that can only be achieved by the sexed semen.

Conventional methods used for sexing of semen

In normal condition, the male progeny producing sperm bears Y chromosome whereas and female producing sperm bears X chromosome. The quest to identify or separate male and female producing sperms created great interest among research communities for many years and various methods were adopted in the past. Scientists worldwide tried to sex the sperms by size, weight and density (Bhattacharya et al 1996); swimming capability/speed (Erricsson et al., 1973) electrical surface charges (Shirai et al., 1974) surface macromolecular proteins, differential effects of pH etc. Scientists also tried to separate male and female sperms by atmospheric pressure; such as sedimentation, electrophoresis, centrifugation, sephadex filtration etc. However, none of these methods was able to significantly separate the viable sperms capable to fertilize. Hence, none of these methods became popular to achieve the goal of separation of X and Y bearing sperms.

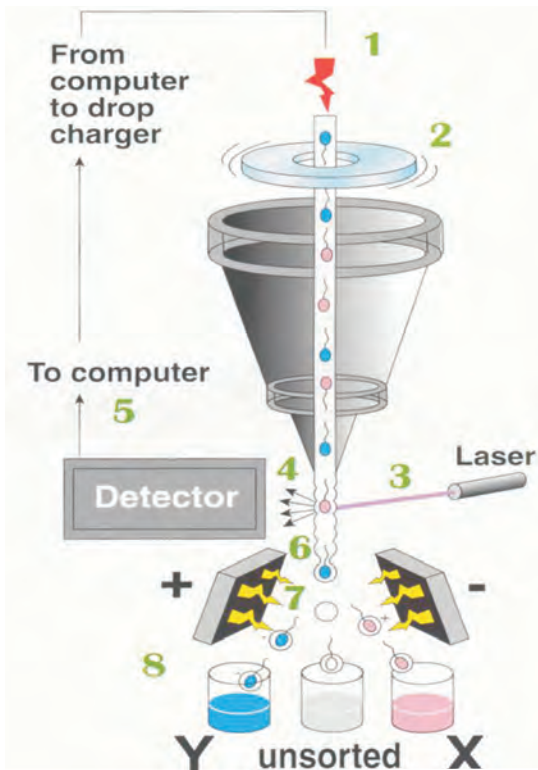
Current status of sexed semen

It is now possible to predetermine the sex of offspring in number of species with the accuracy of 85-95% (Shidel et al., 1999; Johnson, 2000). Thousands of offsprings have been produced now by using AI with sexed semen (Seidel and Garner, 2002). Many companies, institutions, American cooperatives and breeders are producing, practicing and commercializing the sex semen worldwide. However, in India, Puschim Banga Go-Sampad

Bikash Sanstha (PBG SBS), Haringhata (WB) initiated sorting of semen by semen sorter installed during 2009. It is now producing 40-50 frozen semen straws of sexed semen per day. They claimed to produce the first predetermined sexed male calf named Shreya born on 1st January 2011. They also have claimed to produce three female calves at bull mother farm of PBG SBS. Some of America's largest artificial insemination cooperatives are in collaboration with dairy farmers in Punjab providing a breeding solution that promises 90 per cent production of cows. The State Government has imported 5,000 sexed semen straws to produce female calves (source: Mail Today, Chandigarh, May 16, 2012). Last year, Worldwide Sires partnered with the Punjab Animal Husbandry Department, the Punjab Dairy Development Board and the Ludhiana-based Dairy Farmers Association to supply 88,000 doses of sexed semen to Punjab farmers. This year, the American Cooperatives are reaching out directly to dairy farmers in the state for their requirement of sexed semen doses.

Sperm sexing by Flow Cytometry

The most advanced, very effective and viable sexed sperms producing method is flow cytometry. The basic principle of the flow cytometry is based on the differences in the DNA contents of X and Y bearing spermatozoa as Y chromosome in most species is smaller than X chromosome. Therefore, the content of DNA of X chromosome is more than Y chromosome. The difference in the DNA contents differ among species (Moruzzi, 1979) and it varies from 3.6-4.2% (Johnson and Welch, 1999). Ram, Rabbit, Bull and Boar spermatozoa have a difference of 4.2%, 3.9%, 3.8% and 3.7%



respectively. In *Bos indicus*, the average X-Y sperm difference is 3.73%. whereas, differences in DNA content for Murrah and Nili-Ravi buffalo were 3.59% and 3.55% respectively (Lu et al., 2006; Mir and Kumar, 2012).

For sorting of the spermatozoa by flow cytometry, two kinds of dyes or stains are used; i) Hoechst 33342 which is fluorescent dye binds with DNA of live spermatozoa and ii) non toxic food dye that penetrates into the non-viable spermatozoa due to damaged membrane and reduces the binding intensity of the fluorescent dye in the dead. The food dye thus helps to eliminate the non-viable spermatozoa from the sorted population and increases the viable count in the gender selected spermatozoa. The stained spermatozoa after incubation at 34°C

are passed through a miniature nozzle in thin stream under pressure (40-50 psi) which is equipped with laser beam (blue light). The laser beam fluoresces the stain bound to the DNA of the spermatozoa. X chromosome-bearing sperm fluoresce with 4% more intensity than Y-chromosome bearing sperm and that is the principle of separation of sperms. Droplets carrying viable spermatozoa are charged (+/-) depending on the amount of DNA before passing between the oppositely charged plates. The droplets contain more than one sperm. Dead sperm stained by food dye, or those where DNA content could not be measured accurately or not charged are not sorted and goes as waste as shown in figure. Samples are then collected in three containers, X and Y- chromosome bearing and unsorted. This process allows sexing and collection of about 40% of the sperm going through the sorter at a speed of approximately 90-100 km/h when they exit the nozzle. Discrete fluorescence signals from two detectors at 90° angles to each other are produced, and the information is processed by computer. Thus, at an event rate of 20,000-25,000 total sperms/second, nearly 4,000-5000 live sperms of each sex can be sorted simultaneously. The current system can produce approximately 10-13x10⁶ live sperm/hr of each sex with 85-95 % accuracy (Seidal et al., 1999).

Strengths and risk factors of flow cytometry

Strength: i) Thousands of offspring have already been produced worldwide via artificial insemination with spermatozoa sexed by flow cytometry and cell sorting. ii) Accuracy of sexing can be obtained up to 95% in most species iii) Sorted semen can produce progeny of desired



sex; females for milk production, males for beef production and genetically superior males for improved breeding and iv) Demand of sorted semen including India is very high as no organization is supplying the same commercial basis.

Risk factors: i) Approximately 40-50% losses of spermatozoa during sorting processes; residual loss of spermatozoa in staining tube, spermatozoa discarded due to malorientation, discarded dead spermatozoa, losses of spermatozoa in the supernatant (15%) after centrifugation, loss of spermatozoa during filling and sealing and ii) poor insemination practices using sorted frozen semen may question the technology.

Conclusion

As animal breeders have already exploited genetic potential of milch animals with the help of artificial insemination, upgrading, selection of pedigreed animals, improved breeding practices, crossbreeding and marker assisted selection (molecular techniques) etc., no options are now left with the scientists/breeders to increase milk production to meet the demand of ever growing population worldwide. Increase in the population of high yielding milch animals (females) to produce milk many folds is the only option left. Using sexed semen in India would be a boon for milk production.

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Peri-parturient Udder Edema in Ruminants

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Periparturient udder edema in highly developed dairy animal is basically result of selective breeding with emphasis on udder function and secretion (Vigue, 1963). Udder edema being a periparturient disorder can occur before and after calving (Thomas, 2008), but commonly seen in post parturient period. Incidences of post parturient udder edema ranging from 18 to 96% in different herds (Al-Ani and Vestweber, 1986) with more severity in pregnant heifers than in cows (Erb and Grohn, 1988 and Dentine and McDaniel, 1983) are observed. It is characterized by an accumulation of lymph like fluid in the intercellular tissue spaces of the mammary gland (Ghodasara et al., 2012). Fluid begins to pool in the extravascular spaces of the udder and in severe cases the entire udder is affected. In extreme cases there is swelling in front of the udder, the underside of the belly and above the back of the udder towards the vulva.. It is physiological phenomenon, which is



usually, nonpitting, non-painful and develops symmetrically and disappears within a day or two of calving (Vestweber and Al-Ani, 1983), but if it is extensive and persistent it may interfere with sucking and milking as teats tend to strut outward (Radostitis et al., 2006) and sometime poses a risk for the development of clinical mastitis and metritis (Thomas, 2008). Also, there may be physical damage such as cracking of the skin on teats and harm to suspensory ligaments, leading to broken down udders. Severe mammary enlargement makes walking and lying down difficult and causes discomfort to the animal (Ghodasara et al., 2012). In few cases, it becomes a chronic condition that persists throughout lactation in spite of vigorous treatment. Permanent thickening of the skin (scleroderma) of lateral aspect of udder occurs if mild udder edema persists repeatedly over a number of lactations (Radostitis et al., 2006). It is frequently seen in primiparous cows because of immaturity in the vascular structure of the udder and makes it vulnerable to fluid retention. (Ghodasara et al., 2012). Primiparous cows with udder edema are more likely to develop udder edema in the subsequent lactations (Melendez et al., 2006).

Etiology

The developing bovine mammary gland undergoes extensive growth and physical changes during late gestation which likely



contributes to edema development (Vestweber and Al-Ani, 1983). Udder edema does not seem to be caused by just one factor but rather a combination of factors. Genetic factors may also play a role, as disease is common in crossbred animals. Some dairy animals tend to have edema annually regardless of feeding program while some studies suggest that feeding practices like prepartum grain or concentrate feeding plays pivotal role in pathogenesis of edema in heifers (Emery et al., 1969 and Hemken et al., 1960). Radostitis et al., (2006) and Nestor et al., (1988) suggested that incidence and severity of udder edema increase with high sodium or potassium intake, while immaturity of the vascular structure of the udder was suggested as predisposing factor by Ghodasara, et al., (2012). As concentrations of protein and globulin in blood fall when animal approaches parturition. Vestweber and Al-Ani, (1983), suggest the possibility that vascular permeability to proteins may have increased in this period (Larson and Hays, 1958). Severe or pathologic edema in individual cows should be examined to rule out conditions like heart problems, cardiac vena caval thrombosis, mammary vein thrombosis, and hypoproteinemia due to number of diseases that could lead to ventral or udder edema (Thomas, 2008). The increase in edema during the last week of pregnancy was accounted for by association with prepartum concentrations of hormones in plasma. Malven et al (1983) reported that a complicated interaction among the sex steroids of late pregnancy occurs where some steroids may promote edema and other steroids may inhibit edema in heifers. Some studies have demonstrated that larger heifers, gestating male calves and calving in winter season are more likely to develop udder edema.

Besides, above mentioned potential causes, large fetus size (Radostitis et al., 2006), obesity (Vague, 1963) and calving with too heavy body condition and high prepartum intake of energy was also accounted for predisposing factors of udder edema. Severity of udder edema was greater when pregnant heifers were fed additional potassium bicarbonates or sodium chloride separately, but not when both salts were fed together (Nestor et al., 1988). Oxidative stress also plays important role, which results when partially reduced metabolites of oxygen produced during normal metabolism and increased by prooxidants, such as excess dietary Iron, exceed the cow's antioxidant defense mechanisms.

Pathogenesis

Relative concentrations of solute in intracellular and interstitial fluids markedly influence colloidal pressure, fluid retention, and edema (Mobarhan, 1988). Movement of fluid between blood vessels and interstitial fluid is controlled by a balance between hydrostatic and osmotic pressures (Staub, 1978). When both pressure and permeability are normal, the endothelial barrier restricts transfer of both fluids and solutes from intravascular to interstitial spaces. More comprehensively, decreased plasma colloidal pressure, increased capillary blood pressure, obstruction of lymphatic drainage, and retention of sodium and water were listed as basic causes of generalized edema. When increased capillary pressure or obstruction of lymphatic drainage is localized, edema may also be localized as in udder edema.

Greater incidence and persistence of udder edema in first-calf heifers may result from the less developed vascular circulation in heifers



(Emery et al., 1969) and mammary blood flow increases at least three-fold during the two weeks before calving (Al-Ani and Vestweber, 1986). Elevated arterial blood flow to the udder in association with decreased venous blood flow from the udder would elevate capillary hydrostatic pressure. The opposing force of hydrostatic pressure is osmotic pressure, resulting from the higher protein mainly albumin content of blood serum relative to interstitial fluid. Increased hydrostatic pressure without a corresponding change in osmotic pressure could increase interstitial fluid volume if additional fluid is not removed by the lymph system. Overall, increases in either hydrostatic pressure or vascular permeability and decrease in osmotic pressure could result in edema (Thomas, 2008), but vascular permeability has a less important role than hydrostatic pressure in development of udder edema (Vestweber and Al-Ani, 1983). Evidence suggests that oxidative stress may also contribute to udder edema, when partially reduced metabolites of oxygen produced during normal metabolism and increased by prooxidants, such as excess dietary Fe and exceed the animal antioxidant defense mechanisms. When reactive oxygen metabolites are not safely controlled, lipid peroxidation, damage to critical molecules, and ultimately disease conditions may result. Possible changes relative to udder edema include injury to membrane integrity or damage to specific steroidogenic enzymes, thereby altering synthesis of steroid hormones. Avoidance of potential prooxidants when possible and supplementation with all known nutrients required for antioxidant defense are thus important. Vitamin E, vitamin A, and β -carotene must be supplied through the diet, whereas vitamin C and glutathione may be of

endogenous or dietary origin. Most other antioxidant molecules are produced endogenously, but dietary nutrients essential for their manufacture include protein, energy, Cu, Zn, Mn, Se, and Mg. The Fe and Mo are also essential but can be prooxidants when present in excess amounts.

Clinical picture

Physiologic udder edema may start in the rear udder, fore udder, in the left or right half of udder, or symmetrically in all four quarters and floor of udder. In mild form of udder edema in heifers after parturition, there is presence of a hard localized plaque along the ventral abdomen immediately cranial to the udder which is common and relatively innocuous but may interfere with milking. Cows with severe to moderate udder edema usually have a variable degree of ventral edema extending from the fore udder towards brisket. Clinical examination reveals normal rectal temperature, respiration rates and feeding and watering. Milk from affected quarter had no abnormal colour and had normal consistency and normal pH ranging from 6.4 to 6.7. On palpation, edematous area shows pitting on pressure and pain in some animals. Pronounced udder edema interferes with complete milkout because of discomfort and milking may accentuate that discomfort, therefore, chronic or pathologic edema may have a negative effect on the lactation potential as cattle never reach their projected potential. Post milking leakage of milk in cows with severe udder edema poses the risk of mastitis (Thomas, 2008). Clinical mastitis in early lactation is more common in cows with udder edema during the peri-parturient period (Waage et al., 2001). Udder edema is also positively correlated to the incidence of metritis and cystic ovaries (Van et



al., 1999). In cases where udder edema is severe or continues for long periods of time, damage to the suspensory apparatus of the udder can cause permanent damage, such as a pendulous udder, thus leading to a more chronic form of the disorder (Vestweber and Al-Ani, 1983). The cause is thought to be severe udder edema at calving, with excessive weight on the udder, causing breakdown of the udder attachments, particularly the median suspensory ligament. Chronic udder, edema also is associated with anemia and hypomagnasemia (Hicks and Pauli, 1976).

Management and Prevention

For therapeutic purpose, acetazolamide (1-2 gm BID, PO or parenterally for 1-6 day), chlorothiazide (2 gm BID, PO or 0.5 gm BID I/V or I/M, for 3-4 day) gives excellent results in a majority of cases and the edema often disappears within 24 hours (Radostitis et al., 2006). Furesimide has been proved better to reduce the cranial superficial epigastric vein (milk vein) than hydrochlorothiazide and acetazolamide (Vestweber, 1987), but prolonged use can result in hypokalemia, hypochloremia and metabolic alkalosis. The use of diuretics before calving may be dangerous if considerable fluid is lost (Ghodasara, et al., 2012). Hot fomentation of udder, salt restriction (Thomas, 2008) and increase frequency of milking are other suggested therapeutic methods.

Reduced cation-anion differences prepartum have been related to reduced severity of udder edema, likely related to increased renal loss of water and unchanged water intake (Elliot, 1994). In balancing rations, the term fixed ions refers to bioavailable ions that are not

metabolized, namely, Na_+ , K^+ , and Cl^- . These fixed ion balance plays a major role in determining acid base balance in biological fluids. Dietary Cation Anion Difference/ kg DM (DCAD) can be calculated as milliequivalents of $(\text{Na}^+ + \text{K}^+) - (\text{Cl}^- + \text{S}^-)$. The anions Cl^- and S^- should be balanced in a ration against the cations Na^+ and K^+ to optimize the physiological functions of the animal. Ultimately the cells of the body would be presented with these minerals that will have to be utilized in metabolism. Particular minerals have been chosen to calculate DCAD because their importance in ruminant metabolism lies in their indirect participation in osmotic balance, acid-base balance, integrity, and pumping mechanisms of cell membranes. Diets with anionic salt supplementation and those with added antioxidants may show tendency to diminish udder edema (Thomas, 2008). Hence feeding high anionic and low cationic diets prepartum can be a useful nutritional tool to minimize or prevent the incidence of udder edema. While problem of udder edema encountered more in animals kept on low anionic and high cationic diet (Muhammad et al., 2011), Al-Ani and Vestweber (1986) suggest management practices to minimize udder edema include limiting prepartum intakes of salt and high-potassium feeds and avoiding excessive prepartum conditioning. Severity of udder edema may also be increased by prooxidants such as excess Fe, but decreased by antioxidants such as vitamin E and Zn. Modern management practices may expose dairy cows to excessive pro-oxidants, so antioxidant requirements may be higher than generally recognized. Oxidative stress of mammary tissue resulting in reactive oxygen metabolites may play a role in udder edema (Mueller et al., 1998), thus diet must



supply adequate vitamin E, copper, magnesium, zinc, manganese and selenium for prevention of udder edema (Bacic et al., 2007).

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Therapeutic Management of Diabetes in a Dog

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Fig : 1 Before treatment

Introduction

Diabetes is a disorder of carbohydrate, protein, and fat metabolism caused by an absolute or relative insulin deficiency. Metabolism refers to how the body digests and uses food for growth and energy, and this process is largely dependent on a sufficient amount of insulin in the body. Diabetes mellitus is a diseased state by which the body suffers from either an absolute shortage of insulin (type i), or from an incorrect response from the cells to the insulin that is being produced, a condition termed as insulin resistance (type ii). Both these conditions prevent the muscles and organs from converting glucose to energy, and will result in excessive amounts of glucose in the blood (hyperglycemia). Diabetes, a common condition in humans, is also relatively common in domestic animals like dogs. Type I diabetes is the more severe form of the disease, as it is

dependent on daily insulin injections for maintaining blood sugar balance (insulin dependent diabetes mellitus – iddm).

History and clinical examination

A german shepherd dog aged about eight yr was presented to state Veterinary Hospital, Bhopal, with complaint of ocular discharge, frequent urination, drinking lot of water (approximately 10liter per day), a large appetite and rapid loss of weight in spite of good appetite. The clinical examination revealed pyrexia (104° F), discharge from eyes, dullness and sub-mandibular oedema (Fig: 1).

Diagnosis and treatment

Diagnosis was based on estimation of fasting and postprandial glucose level. In this case, unusually high concentration of glucose i.e. 604mg/dl was found in the blood and there was presence of sugar in urine with high levels of



Fig : 2 First week of treatment



liver enzyme. Abdominal x-ray and ultrasound did not reveal any marked abnormality. Thyroid profile also did not reveal any abnormality. The treatment was initiated with immediate administration of injection insulin. Mixtard @0.5 to 1mg per kg body weight 30 minute before meal by s/c route i e 20 unit per day for one week. After one week, glucose level, came down to 390mg/dl. From second week onwards, treatment was continued with 15units of insulin per day along with deworming and tablet lasix 50mg/day. At the end of next week, glucose level came down to 196.6mg/dl and submandibular oedema subsided (Fig:3). From third week onwards, treatment was continued with Tab. Daonil (sulphonil urea) 5mg b d for next 7days. At the start of the 4th week, sugar level was within the normal range.

Result and discussion

Diabetes mellitus, is a common disease in dogs. Golden retrievers, German shepherd dogs, Miniature Schnauzers, Keeshonden, and Poodles show the highest incidence, but all



Fig : 3 Dog recovered after treatment

breeds are affected. females with the disease outnumber males by three to one. the average age of onset is 6 to 9 years. diabetes is a result of inadequate production of insulin by the islet cells in the pancreas. There may be a genetic predisposition for this in some dogs. Islet cell destruction also occurs in some cases of pancreatitis. Insulin enables glucose to pass into cells, where it is metabolized to produce energy for metabolism. Insulin deficiency results in hyperglycemia and glycosuria. Glucose in the urine causes the diabetic animal to excrete large volumes of urine. In turn, this creates dehydration and the urge to drink large amounts of water. Initially, dogs who do not metabolize enough sugar have an increase in appetite and a desire to consume more food. Later, with the effects of malnourishment, the appetite drops.

In summary, the signs of early diabetes are frequent urination, drinking lots of water, a large appetite, and unexplained loss of weight. The laboratory findings of high glucose levels in the blood and urine are diagnostic.

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Fetal Maceration and Adhesion of Uterus to Ventro-lateral Abdominal Wall secondary to Uterine Torsion in a Crossbred Cow

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Introduction

Fetal maceration can occur in any species, but it is described most frequently in cattle. It occurs as a consequence of the failure of an aborting fetus to be expelled, due perhaps to uterine inertia. Bacteria enter the uterus through the dilated cervix, and by a combination of putrefaction and autolysis, the soft tissues are digested, leaving a mass of fetal bones within the uterus (Noakes et al., 2001). In case of early fetal maceration, the cervix may be tightly sealed or some discharge of pus may be evident in the vagina or from the vulva. Fetal maceration in cattle usually occurs after the third month of gestation, by which time fetal bones are fairly well developed. More commonly, fetal emphysema and maceration follow fetal death and the cervix is dilated but the fetus is not expelled due to a failure of the genital tract to dilate sufficiently or contract normally or because the fetus is dead and in an abnormal position and posture. In rare instances, fetal emphysema and maceration may be associated with uterine torsion during gestation (Roberts, 1971). This case report describes a rare

occurrence of fetal maceration and adhesion of uterus to ventrolateral abdominal wall secondary to uterine torsion in a crossbred cow.

Case presentation:

A 3-year old crossbred primiparous cow weighing about 280 kg was presented to the outpatient department of Veterinary Teaching Hospital, with a history of extended gestation (10.5 months) and no signs of onset of parturition. Per vaginal examination revealed post-cervical left sided uterine torsion. On transrectal examination, rectal tears were present and uterine horns and the fetus could not be palpated nor could they be visualized on transrectal ultrasonography. Therefore, exploratory laparotomy was performed to make a confirmatory diagnosis. The operation was performed with ventrolateral oblique incision in the left lower flank after proper anesthesia (linear infiltration with Lox® 2%, Neon Laboratories Ltd, Mumbai, India) and peri-operative fluid therapy (4 litres of Normal saline and 3 litres of Dextrose normal saline IV), antibiotic (4.5g of ceftriaxone-tazobactan IV; Intacef-Tazo®, Intas Pharmaceuticals Ltd,



Figure 1: Fetal maceration in a crossbred cow

Ahmedabad, India), anti-inflammatory (75 mg of meloxicam IM; Melonex®, Intas Pharmaceuticals Ltd, Ahmedabad, India), 100 mg chlorpheniramine maleate IM (Anistamin®, Intas Pharmaceuticals Ltd, Ahmedabad, India), calcium magnesium borogluconate infusion (Mifex®, Novartis India Ltd, Gandhinagar, India), and 10 ml multivitamin injection (MVI®) were administered. After performing exploratory laparotomy, the uterus was found adhered to left side ventro-lateral abdominal wall as a contracted structure over a hard fetal mass. The fetal bones were palpable along with crepitation. The uterus was tightly adhered and could not be separated from the abdominal wall. The uterus was incised and fetid sero-sanguinous fluid along with fetal bones (Figure 1) was removed. The uterus was flushed with normal saline and metronidazole (Metris®) thoroughly. The incised uterus, musculature and skin were sutured using standard methodology.

Discussion:

The fetal maceration and severe uterine adhesion in the presented case could have resulted mainly from uterine torsion and late presentation of case. The prognosis for future fertility of the cow is very poor, due to the extent of endometrial damage. Therefore, treatment is usually not an economically viable option, and the cow should simply be culled. However, the cow may be condemned at slaughter if the foul smelling odor, due to bacterial putrefaction, has permeated the entire carcass. If the individual value of the animal warrants treatment, a luteolytic dose of PGF₂α can be given to induce estrus and attempt to evacuate the contents of the uterus. However, some bones may be partially embedded in the wall or lodged sideways, preventing their expulsion. As a last resort, in the case of a few isolated bones, they can be removed surgically. Surgery is best performed via a midline abdominal incision, to provide optimal access to



the small, contaminated uterus. The prognosis of induced abortion in the case of macerated fetuses is always poor because of the severe endometrial damage (Drost, 2007). In this case, although the prognosis was poor, it was decided to perform a cesarean section purely for diagnostic purpose. From this case, it can be concluded that any accident such as torsion occurring during gestation period should be brought to the knowledge of a Veterinarian for prompt treatment and management. Early diagnosis and prompt treatment in such cases can prevent severe conditions like fetal

maceration.

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Bovine Mastitis in India - hurdle in dairy development

Prevalence

The average prevalence of mastitis in India during 1960-1990 was reported to be less than 30 percent. However, after 1990, it has increased to more than 60 percent. Between 1992 to 2010, the average incidence of clinical mastitis in India was 1 to 10%, with sub-clinical mastitis ranging between 10 to 50% in cows and 5 to 20% in buffaloes.

Subsequent studies after 2010, about 100, spread over 32 States in India reported high incidence of sub-clinical mastitis ranging from 20 to 83% in cows and 45% in buffaloes. The overall prevalence of mastitis has been reported to range between 25 to 97% with an average prevalence of 45 percent.

Recent evidences further indicate that prevalence of mastitis is highest in high yielding crossbred dairy cows.





Onion Poisoning in Bovines

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Fig 1 : Coffee coloured urine in affected animal

The onion plant is a perennial herb growing to about 1.2 meters height with 4-6 hollow, cylindrical leaves. Greenish white flowers are present on top of the long stalks in the form of solitary umbels growing to 2.5 cm wide. The

alkaloid N-propyl disulphide is a toxic substance present in onions. Onions are generally used for human consumption and grown in fields in a wide area. Sometimes the animals gain access accidentally or due to lack of adequate green fodder. When large amounts of onion leaves and onions are consumed, animals succumb to the toxicity and may develop associated clinical symptoms.

Clinical History and Observations:

Five cases of bovine (2 cows and 3 bullocks) with the history of consumption of large amounts of onions and onion leaves, were presented to the Veterinary Dispensary, Devanakonda, Kurnool district, AP, exhibiting the following symptoms.

Table 1: Symptoms observed in onion poisoning

S. NO	Kind of animal	Temp. °F	Pulse	Respiration	Ruminal motility	Conjunctival mucous membrad	Urine	Dung
1.	Cow	100	Rapid	Rapid	2/3min	Slightly pale	Dark red	NAD
2.	Cow	102	Weak	Rapid	1/3min	Pale	Brownish red	NAD
3.	Bullock	101	Weak	Rapid	1/3min	Pale	Dark red	NAD
4.	Bullock	100	Weak	Rapid	1/3min	Pale yellow	Dark red	NAD
5.	Bullock	101	Weak	Rapid	1/3min	Pale yellow	Dark red	NAD

Leukocytosis with shift to the left and thrombocytosis were also observed on blood smear examination.



Fig 2 : Animal Showing sign of haemoglobinuria

Clinical Observation:

Clinical signs included inappetance, tachycardia, staggering and collapse, with jaundiced conjunctivae and haemoglobinuria. Carbery JT, 1999, also observed the same clinical symptoms. Haemolytic anaemia with Heinz bodies in the red cells and leucocytosis were demonstrated (Verhoeff et al., 1985). Leukocytosis with a left shift may be due to movement of cells from the marginal granulocyte pool to the circulating granulocyte pool, and thrombocytosis due to increased bone marrow activity (H A Rae, 1999).

Treatment:

1. Advised to stop feeding onions
2. Advised to minimize the stress
3. Tonophosphon 20 ml IM for 3 days and 15ml IM till symptoms disappeared
4. Iron and Liver extract injections 10 ml. IM Daily for 3 days.

Discussion:

It has been reported that cattle are most susceptible to onion poisoning, whereas, horses, cats and dogs are less susceptible. Goats and sheep are fairly resistant to poisoning (Verhoeff et al., 1985). Diets containing more than 25% dry matter of onion can cause clinical signs of anaemia. Onions containing N-propyl di sulphide affect the enzyme glucose-6-phosphate dehydrogenase in RBC and interferes with the hexose monophosphate pathway (1,2). Oxidation of hemoglobin results, as there is insufficient phosphate dehydrogenase or glutathione to protect the RBCs from oxidative injury. Thus, onion poisoning leads to insufficient glucose-6-phosphate dehydrogenase or glutathione to protect RBC from oxidative damage. Oxidation of haemoglobin occurs and Heinz bodies are formed by precipitation of oxidized haemoglobin in RBC (Hutchison T W 1977). Anemia may be proportional to the number of Heinz bodies formed (Lincoln et al



1992) and the ability of spleen to remove the damaged RBC. New illnesses continued to occur for five days after the withdrawal of onions from the diet.

Spontaneous recovery was seen once the access of the animals to onions was stopped. However, symptomatic relief was obtained by using supportive drugs like haematinics and phosphorous injections. Phosphorous strengthens the erythrocyte membrane or reduces the fragility and hence it might have bestowed early clinical recovery.

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Bovine Mastitis in India - hurdle in dairy development

Alarming phase today

The prevalence of mastitis is increasing in parallel with the development of new high milk producing strains of cows and buffaloes in India. Other contributing factors are

- ★ lack of awareness among dairy owners regarding udder health and clean milk production
- ★ delay in the detection of sub-clinical mastitis in the absence of visible signs of abnormal milk
- ★ unhygienic environment in cattle sheds and making practices
- ★ delayed and incomplete treatment of clinical and chronic mastitis
- ★ unawareness about the extent of economic classes due to sub-clinical and clinical mastitis

The overall prevalence of bovine mastitis is about 45% today, sub-clinical mastitis being 3 to 40 times more common than the clinical mastitis





Hypothyroidism with Concurrent Infection of *Hepetozoon canis* in dog and its Therapeutic Management

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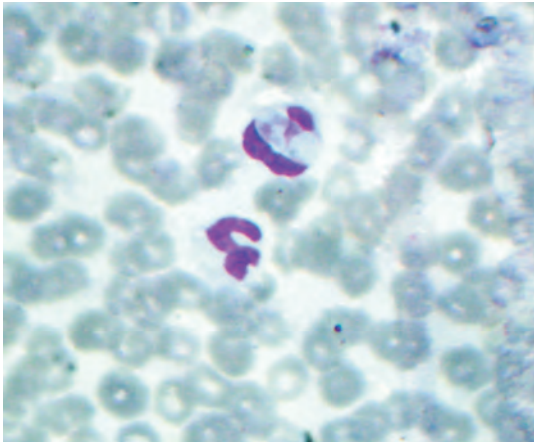


Fig. 1: Leishman stained blood smear showing gamonts in leucocyte

Introduction

Hypothyroidism is a clinically important disorder in dogs, characterized by variety of signs and symptoms (Capen, 2001; Catherine *et al.*, 2005). Owing to its variable signs and symptoms, it is often challenging to diagnose this condition (Catherine *et al.*, 2005). Although, disease can occur in any adult pure bred and mixed breeds of dogs, certain breeds are at high risk to develop hypothyroidism (Capen, 2001). Hypothyroidism results primarily due to lesions in thyroid gland, particularly lymphocytic thyroiditis and idiopathic follicular collapse (Capen, 2001). Hepatozoonosis is an arthropod born infection, commonly seen in dogs and is transmitted by ticks (Soulsby, 1982). Present paper puts on record the occurrence of

hypothyroidism with concurrent infection of *H. canis* in female mixed breed of dog.

Case History

A nine year old female dog of mixed breed was presented to College Hospital with the complaint of alopecia and skin ailments. After routine physical examination, dog was suspected for hypothyroidism on the basis of clinical signs and symptoms and screened for further laboratory investigations.

The serum sample and blood was collected for estimation of T₃, T₄, TSH (Thyroid stimulating hormone), serum biochemical analysis, liver and kidney function tests and complete blood count (CBC). In addition, the skin scrappings were collected for screening of mange and fungal infection, if any. The biochemical parameters included serum glutamic oxaloacetate transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), blood urea nitrogen (BUN) and serum creatinine.

Result and Discussion:

Hypothyroidism was confirmed by estimation of serum levels of T₃, T₄ and TSH, which were found below normal range. The serum levels of T₃, T₄, and TSH were 0.24 ng/dl (0.45 - 1.5 ng/ml), 0.80 µg/dl (1.5 to 3.4 µg/dl) and 0.22 uIU/dl (0.35 - 5.50) respectively, which were similar to the observation of Capen (2001), who



has stated that T₄ is generally below 0.80 µg/dl, and T₃ level is below 0.50 ng/ml in hypothyroidism. Similar findings have also been reported by various researchers (Ingole et al., 2011a; Catherine *et al.*, 2005).

Clinically, dog showed lethargy, alopecia, seborrhoea, increase in weight and inappetence. Similarly, Ingole et al. (2011a) who studied 24 cases of hypothyroidism in dogs and observed itching (83.33%), alopecia (75%), obesity (58.33%), lethargy (45.83%), hyper pigmentation of skin (41.66%), seborrhoea (37.5%), bradycardia (33.32%), weakness (20.83%), anaemia (16.66) and pyoderma (12.5%). In their study, few dogs also showed generalized alopecia with rat tail appearance. However, in the present case, there was no hyperpigmentation or rat tail condition. Various researchers (Nelson and Couto, 1996; Gaikwad, 2002; Panciera, 1994) have also reported clinical signs described above. The biochemical parameters viz. serum SGOT (37 IU/L) and SGPT (95 IU/L), BUN (9.4 mg/dl) and serum creatinine (1.2 mg/dl) were within normal range.

Complete blood analysis revealed normal levels of haemoglobin (16 gm %), packed cell volume (49%), red blood cell count (RBC; 7.10 millions/cmm), erythrocyte sedimentation rate (8 mm/hour) and platelet count (2.30 lakhs/ ul). However, there was leucocytosis (19.60 thousand/ cmm). Differential leucocyte count (DLC) revealed mild neutrophilia (72%) and normal range of lymphocytes (21%), monocytes (03 %) and eosinophils (04%). The RBC picture was normocytic normochromic. Blood smear stained with Leishman's stain revealed cigar shaped, pale-staining cytoplasmic bodies (gamonts) in the leucocyte

(Fig. 1). These bodies were identified as gamatocytes of *Hepatozoon canis*, based on their morphological characteristics (Soulsby, 1982). The parasitemia of leucocytes was one per cent. Skin scrapping examination did not reveal parasite or fungus of any significance. In this case, the parasitemia due to *H. canis* was low. This finding was similar to those of Baneth and Weigler (1997) and Baneth *et al.* (2003), who have reported asymptomatic to mild canine hepatozoonosis with a low level of *H. canis*, infecting 1 to 5 per cent of the circulating leucocytes. Ingole *et al.* (2011b) reported two separate cases of *H. canis* infection with 7.25 and 2 per cent of parasitemia in canine hepatozoonosis, respectively.

Therapeutic management

The dog was treated with Sodium levothyroxine (Synthetic T₄, Eltroxin*) at the rate of 20 µg/kg b. i.d. for every twelve hour for one week. After a week of initial treatment, dog showed increased mental alertness and improved appetite. A noticeable improvement in skin coat was observed within one month. Improvement in hypothyroidism due to sodium levothyroxine has also been observed by various researchers (Ingole et al. 2011a; Gaikwad, 2002; Nelson and Couto, 1996). Clindamycin @10 mg/ kg b. wt. (I/M, twice daily) for 14 days has been suggested for the treatment of *H. canis* infection by Ingole *et al.* (2011b).

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Bovine Mastitis in India - hurdle in dairy development

Economic losses

Mastitis accounts for 88% of the total direct losses in milk production due to various disease problems and hence it is economically the most important disease of dairy animals.

The economic losses in mastitis are attributed to reduction in milk yield (upto 70%), milk discard during the disease and after the treatment (9%), cost of Veterinary attendance (7%) and premature culling or removal of the animal from the milch herd (14%), if the disease is not cured.

The estimated loss due to mastitis annually during 1962 was Rs. 52.9 crores, Rs. 700 crores during 1994, Rs. 6053 crores during 2001 and Rs. 7165 crores during 2011.

Economic losses due to mastitis (2011) (Rs. crores)

Type of mastitis	Cattle	Buffaloes	Total
Subclinical mastitis	2012	2139	4151
Clinical mastitis	1638	1376	3014
Total	3650	3515	7165





Dystocia due to *Schistosoma reflexus* in a Crossbred Cow

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Introduction

Schistosoma reflexus is a rare type of fetal monstrosity seen primarily in cattle (Knight, 1996). This fatal congenital syndrome is characterized by the presence of exposed abdominal and sometimes thoracic viscera, and marked spinal inversion producing a distinctive ventral convex curvature (Roberts, 1971). The condition belongs to the family of defects involving incomplete closure of the ventral body wall. The schistosomus aspect of the syndrome, i.e. the presence of a congenital schistocoelia, is manifested in many species (Bishnoi et al., 1987; Pivnick et al., 1998). Conversely, the reflexus component of the disorder is limited to only a few species. Manifestation of schistosoma reflexus appears to thus far preclude humans; however, the human thoracoabdominal syndrome (TAS) displays striking similarities (Pivnick et al., 1998). The highest prevalence of schistosoma reflexus is believed to occur in cattle (Roberts, 1971), ranging from a low of 0.01% (Sloss and Johnston, 1967) to a high of 1.3% (Knight, 1996) of bovine dystocias. Such occurrences are costly to the cattle industry because of the reduction in the number of viable



Figure 1: Schistosoma reflexus in a crossbred cow

offspring, loss of milk production, and cost of fetal extraction (Morrow, 1986). Schistosoma reflexus has been recorded in births of twin bovine offspring (Knight, 1996; Cavalieri & Farin, 1999). The monstrosity has been reported in cattle (Jana & Ghosh, 2001) and river buffalo (Murthy et al, 1999; Singla & Sharma, 1992). The present communication puts on record a case of dystocia due to Schistosoma reflexus in a crossbred cow.



Case presentation

A 3-year old crossbred primiparous cow weighing about 300 kg was presented to the outpatient department of Veterinary Teaching Hospital, with a history of complete term, straining since about 24 hours and unsuccessful pre-handling by a local Veterinarian. Per-vaginal examination revealed complete cervical dilatation and one forelimb along with one hindlimb and fetal intestine were present in the birth canal. The fetus was emphysematous and uterine wall was adhered on to the fetus. The case was diagnosed as dystocia due to Schistosoma reflexus. Due to postural abnormality along with lack of space, mutation and retropulsion of the fetal monster was not possible. Therefore, cesarean section was indicated. The operation was performed with ventrolateral oblique incision in the left lower flank after proper anesthesia (linear infiltration with Lox® 2%, Neon Laboratories Ltd, Mumbai, India) and peri-operative fluid therapy (4 litres of Normal saline and 3 litres of Dextrose normal saline IV), antibiotic (4.5g of ceftriaxone-tazobactan IV; Intacef-Tazo®, Intas Pharmaceuticals Ltd, Ahmedabad, India), anti-inflammatory (75 mg of meloxicam IM; Melonex®, Intas Pharmaceuticals Ltd, Ahmedabad, India), 100 mg chlorpheniramine maleate IM (Anistamin®, Intas Pharmaceuticals Ltd, Ahmedabad, India), calcium magnesium borogluconate infusion (Mifex®, Novartis India Ltd, Gandhinagar, India), and 10 ml multivitamin injection (MVI®) were administered. A dead male monster calf (Figure 1) along with its fetal membranes was removed after craniotomy and amputation of two limbs, owing to difficulty in removing the oversized fetus. The incision of uterus, muscles and skin was sutured in a standard fashion. The cow was kept under

observation for four days in the in-patient unit of the teaching hospital till it showed a complete recovery.

Discussion

Schistosoma reflexus is a congenital monstrosity, usually seen in ruminants mainly the large ruminants (Fig.1). There is severe curvature of the dorsum which makes the head and limbs very near to each other, the visceral organs usually pop out of the ventral opening, where the ventral body is not completely formed. The structural deformity makes such cases more difficult to handle. These cases usually result into dystocia and cesarean section is indicated for resolving them. Occasionally, the fetal abnormalities are very severe and fetotomy along with cesarean section have to be performed. Since Schistosoma reflexus has a genetic predisposition, the dam should not be mated with same sire again to control the occurrence of the condition. In most of the cases, availability of proper early veterinary aid makes the prognosis fair to good. Delayed case with severe fetal emphysema and toxic condition of dam should be considered as hopeless cases and should be disposed off (Knight, 1996).

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Bovine Mastitis in India - hurdle in dairy development

Etiology

Mastitis is one of the oldest diseases of cattle known to the mankind, since domestication of cattle as a milch animal 5000 years ago. Traditionally, the disease was attributed to poor management and incomplete milking. With the advent of Louis Pasteur's "Germ theory of diseases" in 1860, scientific research on mastitis was initiated and by end of 1887, an association between mastitis and pathogenic organisms was established. Most major pathogens were identified by 1940. Presently, more than 200 infectious causes of mastitis are known.

The commonest pathogens are *Staph. aureus*, *Strept. agalactiae* (contagious pathogens), *Coliform* (environmental pathogens) and recently identified Coagulase-negative *Staphylococci*. *Staph aureus* is ubiquitous and colonizes the udder skin and udder. It is capable of producing per acute, acute, sub acute, chronic, gangrenous and subclinical type of mastitis. CNS *Staphylococcus* is associated with mild, subclinical mastitis.

CNS Staphylococcus prevalence was 9% in 2003 and 72% in 2009.





Granulomatous Parasitic Enteritis in a flock of Jamunapari Goats

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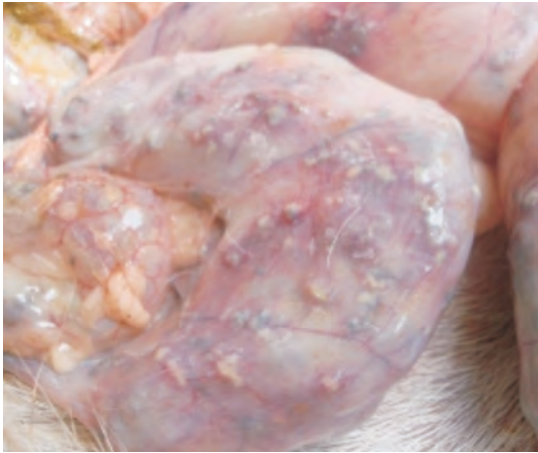


Fig 1: Showing hard, raised nodules throughout the intestine

Introduction:

Parasitic enteritis is a disease complex associated with number of parasites. It is characterized by diarrhoea, suboptimum productivity, seasonal appearance and hypo albuminemia. The tropical environment is suitable for the development of these diseases which cause severe economic losses to the farmers (Jatau et al., 2011). These parasites reduce appetite with concomitant reduction of food intake, an increased passage of food through the digestive tract, indirectly may be the cause of decreased food utilization and eventually decreased synthesis of proteins in the skeletal muscles (Soulsby, 1965).

Materials and methods:

Five 9 months old female Jamunapari goats were presented for post mortem examination to the Department with a history of profuse diarrhoea. External examination revealed pale visible mucous membranes and dehydrated carcass (hide and bone condition). Visceral organs in 10 % neutral buffered formalin, intestinal contents, heart blood and liver swabs were collected for histopathological, parasitological and microbiological examination, respectively.

Results and discussion:

Grossly, yellow, hard, raised nodules measuring 0.5 x 1 cm were noticed throughout the intestine (Fig. 1) and worms were seen in the caecal contents. Mohanta et al., (2007) had reported nodule formation in *Oesophagostomum columbianum* infection. In their study, nodules were hard, raised, slightly yellowish to green in color, measuring 0.25X0.50 cm in size. The authors were of the opinion that the larvae penetrate the mucosa at any point from the pylorus to the anus in order to reach the deeper parts of the sub-mucosa, where they encyst and undergo moulting. Local tissue sensitivity develops in animals due to repeated exposure to these parasites and the



subsequent entry of the larvae into the submucosa provokes an intense tissue reaction leading to nodule formation. Smith et al., (1992) and Lapage, (1962) were of the opinion that the parasites produce some glandular secretions (Cephalic and oesophageal) which can be considered responsible for the chronic inflammation in the intestinal wall resulting in proliferation of the fibrous connective tissue.

in the present study, examination of the intestinal contents revealed the presence of oocysts of *Coccidia*, eggs of *Trichuris* spp, eggs of *Strongyles* spp, eggs of *Strongyloides* spp. and adult stages of *Trichuris* spp, *Oesophagostomum* spp, *Moniezia* spp. It was a typical multiple parasitic infection. Post mortem examination revealed pale heart with white areas indicating myocarditis. Liver was enlarged with petechial hemorrhages. Spleen showed atrophy while kidneys were pale in color.

Histopathological examination of the intestinal nodules revealed infiltration of large numbers of lymphocytes, macrophages and proliferation of fibrous tissue leading to formation of granulomas in submucosa and diffuse desquamation of the epithelium (Fig. 2). Smith et al., (1992) and Lapage, (1962) also reported the granuloma characterized by mononuclear cell infiltration in the intestinal mucosa due to various parasites. In addition, they noticed foreign body giant cells in the granulomatous reaction. Besides, destruction and desquamation of epithelial cells of intestinal wall, hyperplasia of the goblet cells and infiltration of plasma cells were noticed by them. However, in the present study, hyperplasia of goblet cells and foreign body giant cells in the granulomatoid lesions of intestinal nodule were

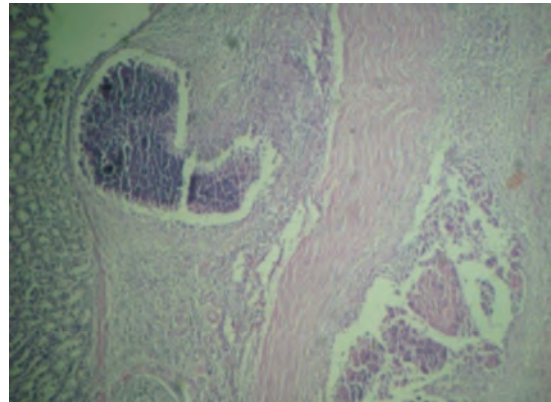


Fig 2: Section of intestine showing granulomas in submucosa

not observed. Mohanta et al., (2007) reported moderate infection of *T. ovis*, slight catarrhal inflammation along with the anchored parasites, petechial haemorrhages on the mucosa, cellular infiltration such as infiltration of lymphocytes, eosinophils and macrophages on the caecum and colon and proliferation of goblet cells. In trichurosis, lymphoid nodules on the lamina propria were enlarged from which it can be assumed that the parasite may produce some chemical mediators that cause lymphoid proliferation locally. Our study supports this observation as fecal examination revealed presence of eggs of *Trichuris* spp.

Histopathological examination of heart revealed myocardial necrosis, diffuse fibrosis of the endocardium and moderate number of sarcocysts at multifocal areas in myocardium. Spleen showed moderate lymphoid depletion with inflamed and thickened capsule. Liver showed diffuse distortion of hepatic cords, coagulative necrosis, bile duct hyperplasia and mild fibrous tissue proliferation at the periportal area. Kidneys showed diffuse tubular degeneration and necrotic changes, increased



bowman's space, diffuse cystic dilatation of the tubules and hyaline casts in the tubular lumen. These lesions are non-specific and could be due to secondary bacterial infection. However, microbial isolation from liver, heart and intestinal nodules did not reveal any microorganism. This could be due to the fact that the ailing goats were under treatment with broad spectrum antibiotics.

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Bovine Mastitis in India - hurdle in dairy development

Susceptibility and Risk Factors

Among the species of milch animals, cows are more prone to udder infections compared to buffaloes. Among cattle, exotic breeds of cattle like HF and Jersey, and their crosses with Zebu cattle are at higher risk (94.54%) than local Zebu cows (31.25%).

The high resistance of buffaloes to mastitis is attributed to tightly closed teat orifice due to presence of well developed circular muscles, thicker stratified squamous keratinized epithelium of streak canal lining, which provides extra resistance to penetration of organisms through epithelium and higher amount of keratophylin granules in the stratum granulosum, which contributes in the formation of large amount of keratin in the lumen of the streak canal .

With mechanization in dairy farming, use of milking machines in high yielders is increasing. Use of milking machine, though important for efficient and complete milking, has inherent disadvantages if not used properly, to develop mastitis.





Conjoined Twins : a cause of dystocia in Ruminants

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Introduction

Conjoined twins are monozygotic twins imperfectly formed and are classified as free or attached symmetrical, or free or attached asymmetrical (Potter, 1961). A congenital defect results from a disruptive event at one or more stages in the complexly integrated process of embryonic or foetal development (Dennis and Leipold, 1979). During development, organs develop from different organ primordia and its splitting leads to duplication (Arey, 1965 and Shumway, 2001). Duplication of germinal area in fetus will give rise to congenital fetal abnormalities with partial duplication of body structure. Regardless of the causative agent affecting embryo, embryonic age is the predominant factor in teratogenicity (Rajani et al., 2010). Conjoined twins are believed to be more common in cattle than in other domestic animals (Arthur, 1956) and usually affect the anterior part of the body (Arthur, 1956 and Doza, 1966).

Incidence

Foetal anomalies and monstrosities is a common cause of dystocia in bovines (Roberts, 1971 and Shukla et al., 2007). Embryonic duplications are rare and occur about once in 100,000 bovine births (Roberts, 1971). Fetal duplication nearly always causes dystocia. Duplication of cranial parts of fetus is more than of caudal parts and also duplication can occur at both cranial and caudal end with the middle

area of monster remaining single (Roberts, 1971).

Twin monsters are characterized by duplication of anterior, posterior or both parts of foetal body and are common in ruminants (Shukla et al., 2007). Dipygus twins associated with monocephalus, tetrapus, dibrachius and cyclopia was reported in sheep by Dennis (1975a). Leipold and Dennis (1972) reported tetrapus and tribrachius in dicephali calves. Najume et al. (1990) reported polypia, tetrabrachius, tetrapus, monocephalus dipygus twins in red Sokoto goat. However, few cases of dipygus twins especially in goats were reported (Najume et al., 1990 and Buhari et al., 2008).

Etiology

The definitive etiological agents for the conjoined twins are unknown (Leipold et. al., 1972). Information on definitive etiology of





embryonic duplication is very rare. It is assumed to be caused by genetic or environmental factors, or by their interaction or by ageing ova (Dennis, 1975a). Until 1960 most congenital defects were considered genetic, but now environmental factors are recognized as major cause (Hatley, et al., 1974; Dennis, 1975b; Inaba et al., 1975).

Conjoined twins in which each component is complete or nearly so include: Thoracopagus, sternopagus, or ziphopagus twins which are joined at or near the sterna region. The internal organs are usually duplicated. The components are face to face. Pygopagus monsters are connected at the sacrum and the components are back to back. Craniopagus twins are united at the heads. Components may be facing in the same or in the opposite direction. Ischiopagus fetus are joined at the lower pelvic region and the bodies extend in a straight line and the heads in the opposite directions. The two components equal one another in this group but each is less than an entire individual. This is usually associated with lateral fusion. These may vary from single normal individuals to those of two normal individuals.

Duplication may lead to doubling of the cranial end of body while the caudal end remains single, or caudal part may be doubled and the cranial part single. Duplication can occur at both cranial and caudal ends with the middle area of the monster remaining single. Duplication of the cranial part of the foetus is more common than that of the caudal portion.

- a. Duplication in the caudal region: Monocephalus includes those monsters with partial duplication of the frontal region, nose and mouth called Diprosopus or double face. Dicepalus or two heads, with distomus or

monostomus occasionally seen. Dicepalus dipus dibrachius monster has two forelimbs and two hind limbs with partial duplication of the spine and one or two tails, dicaudatus.

- b. Duplication in the caudal region is designated as Dipygus. Monocephalus tripus dibrachius has 3 rear limbs. Monocephalus tetrapus dibrachius has 4 rear limbs. Cephalo-thoracopaus has a single neck and more or less complete fusion of the heads to form an almost single face. Syacephalus has one face, four ears, and a single or partially doubled cerebrum.
- c. Duplication of both cranial and caudal regions is Dicephalus dipygus. Unequal and asymmetrical conjoined twins are composed of one very imperfect and incomplete twin, called the parasite, dependent on the other twin, the autosite. This is called a heteropagus monster. The autosite is nearly normal and the parasite is attached to it as a dependent growth (Roberts, 2004).

Management

In handling of dystocia due to conjoined twins, each case is an individual problem. The operator must rely on a careful examination of the foetus and birth canal and on his own ingenuity. If the condition is severe and complicated, extra assistance and even consultation should be obtained. The conjoined twins can be managed by two different ways such as, fetotomy and caesarean section (Roberts, 2004).

Fetotomy, including evisceration, is usually indicated to reduce the size of the monster to the point where the fetotome wire may be placed around conjoined twins at the point of attachment and separate them for removal (Roberts, 2004).



Caesarean section undoubtedly is the method for choice for delivery (Sakthivel and Mathew, 2000 and Shukla et al., 2011). Caesarean section is usually indicated when it is difficult to relieve foetus due to large size. Caesarean section requires large abdominal incision that may complicate the operation and aftercare. Caesarean operation should be performed as per the standard procedure (Roberts, 2004).

Conclusion

Conjoined twins arise from a single ovum and are monozygotic. They result from the incomplete subdivision of embryonic axis which occurs at a relatively later phase of development. Fetotomy are usually done to remove the conjoined twins. If fetotomy does not guarantee promising result, caesarean section could be indicated. In caesarean section, the abdominal incision will necessarily be large to remove the foetus from the uterus. Most of these animals conceive on subsequent breeding and produce normal young one, unless complications following the dystocia cause pathological conditions that delay or prevent subsequent conception.

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Oestrous ovis infestation in a lamb- A case report

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Figure 1: Lamb with unilateral nasal discharge

Introduction

Oestrosis is a world wide infection caused by the larvae of the fly *Oestrous ovis* (Diptera, Oestridae), that develops from the first to the third stage larvae. This is an obligate parasite of the nasal and sinus cavities of sheep and goats (Gunalan et al 2011). The adult female lays larvae near external nares and the larvae crawl towards ethmoid region where they develop for some months and from there go to the frontal sinus or maxillary sinus where they become mature in few weeks. Altogether larvae may be in sheep for about 10 months. They leave the host during the spring and are sneezed out and drop on to the ground and pupate (Sastry,2000). The present paper describes the *oestrous ovis* infestation in a lamb and its management.

Case History and Observations:

A six month old male lamb presented to Veterinary Ambulatory clinic, Mylardevpally ,CVSc, Rajendranagar with the history of sneezing, head shaking, pressing the nose against wall, restlessness and slight inappetance for a week. Upon clinical examination, there was unilateral mucoid nasal discharge (Fig 1), mild respiratory distress with normal temperature and pulse rates. Upon sneezing, nasal bot (*Oestrous ovis*) were sneezed out (Fig 2) which were identified as per (Soulsby, 1982).Morphological examination revealed that bot was mature stage of larvae of *Oestrous ovis* which was creamy in color with dark transverse bands on the dorsal aspect indicating typical characteristics of *Oestrous ovis*. Faecal examination revealed presence of strongyle eggs. Hematological parameters were normal except for increase in eosinophilic count. Based on history, clinical manifestations of head shaking, mucoid nasal discharge and morphological characteristic of the nasal bot confirmed the infestation of *Oestrous ovis* larvae.

Treatment

The affected lamb was treated with Ivermectin 0.2 mg/kg body weight subcutaneously once , followed by Inj. Vit. B1,B6,B12, 1ml intramuscularly and Inj. Chlorphenamine maleate 1ml intramuscularly for 3 days. On day



Figure 2: Nasal bots (*Oestrus ovis*)

2, there was reduced sneezing, nasal discharge and improvement in appetite. The lamb made an uneventful recovery within 7 days post therapy.

Discussion

Clinical signs such as breathing difficulties, nasal discharge, emaciation together with annoyance caused by adult flies leads to production and economic losses (Dorchies et al 1998) which are in agreement with the present findings. *Oestrus ovis* impair breathing because it induces tenacious nasal discharge to which grass, straw and dust adhere, clogging the air passages (Dorchies et al 1993). The first stage larva (L1) stage is commonly found in sheep less than one year of age due to existence of a period of hypobiosis. Respiratory distress such as loud, noisy breathing, poor body scores (severe emaciation), ill thrift and unproductive with poor kidding rates. (Gunalan et al 2011). The spiny surface of the larvae causes irritation of the nasal mucosa resulting in catarrhal rhinitis with sneezing, mucopurulent discharge and snoring respiration (Radostits, 2000). The *Oestrus ovis* has immunosuppressive effects with

consequent association with respiratory pathogen (Dorchies, 1993). Prompt use of Ivermectin/ Doramectin reduces the oestrous ovis burden in sheep together with other sheep parasites or helminthiasis. Treatment with closantel @7.5 mg/kg and Ivermectin @0.2 mg/kg are effective in controlling nasal bots (Radostits, 2000).

Conclusion

All unilateral nasal discharge may be suspected for *Oestrus ovis* infestation, which will respond well to the treatment with Ivermectin.

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Successful Management of Theleriosis in a Cross Bred Cow

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Introduction

Theleriosis are those tick borne protozoan diseases caused by *Theileria* spp in cattle, sheep and goats as well as in wild and captive ungulates. The diseases are characterized by fever and lympho disorders, which may be associated with leucopenia and or anemia (Radostits, 2000). The *Theileria* undergoes sequential development in leucocytes, erythrocytes of the mammalian host and causes an acute, often fatal disease (Singh et al, 2012). In India, the disease has assumed paramount importance with the intensification of cross breeding programmes aimed at enhancing milk production (Benewal et al, 1997). The present case report deals with the successful management of theleriosis in a cross bred cow.

Case History and Observations

A three year old cross bred cow was presented to Campus Veterinary Hospital, College of Veterinary Science, Rajendranagar with the history of anorexia, dullness, depression and sudden drop in milk yield. Clinical examination of the cow revealed rise in body temperature (103.5°F), pallor of mucous membranes, reduced ruminal motility (1 per 3 minutes) and salivation. Physical examination revealed severe tick infestation and enlarged superficial lymph node. Blood was collected for complete blood count and blood smear was

prepared and stained with Giemsa stain.

Treatment

The affected animal was treated with the single dose of Buparvoquone @2.5 mg/kg b.wt deep intramuscularly, Inj. Iron sorbitol citric acid complex @10 ml intramuscularly at 3 days interval for 2 weeks, Inj. Vit. B1, B6, B12, 10 ml intramuscularly for one week, Inj. Chlorpheniramine maleate @10 ml intramuscularly for 3 days and Deltamethrin (2ml in one litre of water) was used externally. There was marked improvement in the condition within 3 days of treatment and blood smear was found negative.

Results and Discussion:

Clinical findings such as rise in body temperature, enlarged superficial lymph nodes, anaemia are in agreement with (Radostits, 2000). However, severe anaemia, jaundice, drop in milk production and abortion in advanced pregnancy was seen in buffaloes suffering with Theleriosis (Dayaram and Pavan, 2012). On microscopic examination of thin blood smears stained with Giemsa stain revealed round to oval piroplasms in the erythrocyte resembling theleria organisms (Soulsby, 1982). Hematological examination revealed low haemoglobin (5.8 gm%) and RBC count (3.18 millions /cumm), PCV 16% and



Total leucocyte count ($8700 \times 10^3/\text{cumm}$) indicating anaemia. Marked anaemia of varying intensity was with anisocytosis, poikilocytosis and polychromacia with no significant change in monocyte and eosinophil count. On the basis of history, physical, clinical examinations and finding the schizonts in the blood smear, the case was diagnosed as thelariosis. Single dose therapy with Buparvoquone was considered to be most effective for controlling bovine thelariosis (Singh et al, 2012., Sumathi and Veena 2012). However, Combination of Buparvoquone and Oxytetracycline along with supportive therapy was found to be most effective in treatment of thelariosis (Jayanna et al 2012).

Conclusions

A three year old crossbred cow was presented with the history of anorexia, dullness, depression and decreased milk yield. Clinical examination of the animal revealed high temperature, pale visible mucous membranes and swelling of superficial lymph nodes. Thelariosis was microscopically diagnosed by determining the presence of piroplasm in erythrocytes in Giemsa stained blood smears. Treatment with Buparvoquone along with

supportive therapy was effective leading to the improvement in the clinical condition of the animal.

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First service Conception Rate following the application of improved Estrus Detection and AI techniques in Bovines

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Introduction

The fact that about 70% households in rural India are engaged in rearing of livestock suggests their key role in the success of various livestock developmental schemes (Misra *et.al*, 2007). In the current scenario, the holistic growth of rural dairy animals appears difficult. A survey conducted on the rural smallholder dairy farms of Punjab revealed the lack of farmer's awareness about accurate and efficient estrus detection procedures (Ghuman and Singh, 2009). Farmers were not aware of the importance of record keeping, use of heat abatement devices during summer, appropriate estrus detection schedule and estrus detection signs to be looked for before taking the animal for artificial insemination (AI). Moreover, the persons engaged in AI were using faulty AI procedures, especially faulty semen tank management, handling semen within the tank, thawing semen and semen motility check. The objective of present study was to evaluate the impact of improved estrus detection and insemination practices adopted by the rural smallholder dairy farmers on the conception rate of cattle and buffaloes.

Materials and methods

The present study was conducted on rural smallholder dairy farms in Poadh region (30.79°N, 76.5°E) of Punjab, India. Before the

start of this study, the farmers were educated at the village level camps about the importance of estrus detection and inseminators were taught and urged to adopt the accurate semen handling and AI procedures. Thereafter, the farmers and inseminators willing to adopt the recommended procedures were included in the study. A total of 335 inseminations over a period of 8 months (November to June) were carried out in the cattle and buffaloes after adopting the recommended procedures of estrus detection and AI. First service conception rate (FSCR) was noted by diagnosing pregnancy on 90th day post-insemination. Differences ($p < 0.05$) in FSCR between different months was recorded by two sample Student's t-test (Dyham, 1999) using MINITAB release 13.2 statistical software.

Results and Discussions

In the present study, the observed first service conception rate (FSCR) in cattle and buffalo was 79.7 and 71.0%, respectively. This was much higher compared to earlier reports in which FSCR was reported around 45-55% (Singh and Nanda, 2007). This could be the impact of education of farmers about the importance of record keeping, accurate estrous detection procedures and the importance of external estrus signs to be looked at before taking the animals for insemination. Moreover,



improvement by inseminators in semen tank management, semen straw thawing procedures and hygienic AI could have lead to better FSCR observed in this study. The removal of these flaws in relation to AI procedures can cause a significant decrease in repeated failure of conception (O'Connor, 2004).

Moreover, no seasonal variation ($p>0.05$) was observed in FSCR of cattle and buffaloes inseminated in the present study. During November, December, January, February, March, April, May and June, the FSCR in cattle was 82.5, 76.9, 80, 88.9, 80, 75.8, 77.8 and 72.7%, respectively. The respective values for inseminated buffaloes were 60, 50, 85.7, 80, 60, 87.5, 70 and 75%. This could be due to the adoption of heat abatement practices for the dairy animals by the farmers. In fact, the environmental conditions in Poadh region of Punjab are adverse between April to June, when maximum ambient temperature and relative humidity is 36-45°C and 30-40%, respectively. These heat stress conditions can affect the fertility rates (De Renzis and Scaramuzzi, 2003). This was observed in a previous study conducted on cattle and buffaloes in Punjab state (Singh *et.al*, 2009). The farmers in the present study had adopted heat abatement devices such as sprinklers and coolers for their dairy animals. Thus, education of rural farmers about improved estrus detection procedures and of inseminators about use of appropriate insemination procedures can lead to improvement in the FSCR of cattle and buffaloes. Moreover, seasonal suppression in conception rate as in the summer, can be alleviated through the use of heat abatement devices. This study confirmed the need of improvement in commonly used fertility management practices in rural dairy farms.

Conclusions

This study involved analysis of about 335 artificial inseminations (AI), in cattle and buffaloes, after the farmers and inseminators were educated about the importance of estrus detection and adoption of the accurate semen handling and AI techniques. After adopting the recommended procedures of estrus detection and AI, the first service conception rate (FSCR) in cattle and buffalo was 79.7 and 71%, respectively. Moreover, there was no seasonal variation ($p>0.05$) in the FSCR. In summary, appropriate use of heat abatement devices during summer and improved estrus detection and AI procedures can lead to improvement in FSCR in bovines. This study confirms the importance of educating rural smallholder dairy farmers for adopting improved fertility management practices.

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Bovine Mastitis in India - hurdle in dairy development

Indian scientists' fight against mastitis



A project has been initiated by ICAR at ADMS, Bangalore (2008) through its National Agril. Innovation project (NAIP): **Bovine mastitis: Unraveling molecular details of host-microbe interaction and development of molecular diagnostic methods**

The objectives of the project are :

- isolation, identification and genotyping of bacterial pathogens : *E. coli*, *Staph. aureus* and *Streptococcus spp.*
- development of molecular diagnostic methods for mastitis
- analysis of mobilization of immunocompetant cells and inflammatory mediators during specific intra-mammary infection by *E. coli*, *Staph. aureus* and *Streptococcus spp.*
- to study the response of mammary tissue to specific infection by *E. coli*, *Staph. aureus* and *Streptococcus spp.* at cellular and molecular level
- to find out the most predominant bacterial pathogens associated with SCM/CM and the clonality/genetic diversity of the isolates within a species
- to find out how the udder tissue reacts to the invasion by specific pathogen in mastitis
- to define gene ontology profile and biological process pathways in specific intra-mammary infection

A comprehensive modern biological approach will be adopted to study different aspects in lab experimental model (mice/rabbits) and *in vitro* cell culture system



Advanced Diagnosis and Therapeutic Management of Malassezia Dermatitis in Dogs

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Introduction

Common multi-faceted skin disease syndrome of pet dogs, Malassezia dermatitis, mainly of fungal (yeast) aetiology is triggered by a variety of contributory factors: genetic, immunological, hormonal and environmental. The iotrogenic factor, namely excessive and erratic use of antibiotics, corticosteroids and immunosuppressive drugs is also engaging increasing attention of pet physicians (Jand et al., 2003). While various microbial agents including harmful bacteria, especially *Staphylococcus spp.* appear to be involved in the pathogenesis, highly lipophilic yeasts belonging to the Malassezia genus have attracted special attention. Part of the normal skin flora, these organisms are capable of inducing immunoglobulin, Ig E- and T-cell mediated immune response, contributing to chronic inflammatory process in the stratum corneum of skin. Thus, in the common head and neck

pattern of dermatitis, specific antifungal therapy is effective (Anderson, 2004). Malassezia pachydermatis is a normal inhabitant of the skin and ears of dogs, but mycotic overgrowth (MOG), often with concurrent bacterial overgrowth (BOG) may precipitate dermatitis. Dogs of certain breeds like Terrier, Poodle, Cocker Spaniel, German shepherd and Daschund exhibit increased predisposition. High humidity combined with high ambient temperature, besides food allergy, may increase the incidence of young onset (Carlotti, 2009).

Symptoms

- Persistent itching
- Scaly skin
- Patchy alopecia
- Erythema
- Perceptible greasiness



- Characteristic foul rancid smell
- Hyper-pigmentation
- Lichenification (epidermal thickening)

Diagnostic panel

1. Anamnesis

On presentation at the Clinics, detailed case history is systematically recorded by the attending physician. This includes the name of the dog, patient, age, breed, sex, reproductive status, diet, dog's life style/ occupation/ psychological profile (aggressive/ docile), interventions (veterinary medicare/ restrictions/level of exercise/surgery/training by professionals, etc.), estimated costs incurred per month on maintenance, vaccination and deworming protocols, flea control measures being adopted, details of housing (separate kennel/sharing of human habitation/state of sanitation and hygiene in the premises, owner's profile name/social status/ residential address, contact phone number, etc.).

1. Physical examination

Appearance, gait, visible mucous membranes, barking mode/ behavioural profile, level of consciousness, coat/skin condition, dermatosis, otitis externa, pruritis with erythema/ exudates, ectoparasites, tendency of licking the flanks/ belly region, self-inflicted wounds are carefully recorded.

2. Cell cytology

Recent additions to the conventional diagnostic panel, Mean Yeast Count, MYC in skin scrappings (Sickafoose et al., 2010), and Visual Analogue Score, VAS (Rybnicek et al., 2009) are very useful.

The initial pre-treatment and progressive post-treatment MYC is determined, and the per cent

reduction in the value at each follow-up visit is calculated. All body surface areas with lesions suggestive of *Malassezia* dermatitis are sampled with clear cello tape strips and examined under the microscope. The overlying hair are carefully parted. A strip of tape is applied firmly on the affected skin, removed gently and reapplied three times in succession and then gently pressed on top of a clean dry grease-free glass slide. The resulting impression smear is stained with modified Wright's stain and examined under the oil immersion lens (x 1000) to identify *Malassezia*: oval or elongated yeast cells of 3-5 μ diameter with the typical unipolar budding. For each body area, the number of yeast cells - visualized in 15 successive fields within a defined area of 1.25 cm² of the tape - are tallied (Rosales et al., 2005). MYC for the four body areas prone to the maximum population density: head-neck, axillae, ventrum and the inguinal region is calculated pre-treatment, and progressively till the end of treatment. If less than these most vulnerable body parts harbour *Malassezia* organisms, then the lower lip, chin, and the inter-digital region in a front paw may be explored in decreasing order of preference (Kennis et al., 1996).

3. Semi-quantitative indices

(i) Clinical index score (CIS)

The CIS value (Sickafoose et al., 2010) is computed at the pre- and post-treatment intervals. The same body areas, sampled for the yeast counts are used also for the semi-quantitative evaluation of clinical resolution of dermatitis of fungal/ bacterial origin. Each body area is assigned an arbitrary value ranging from 0 to 3 (0 = absent, 1 = mild, 2 = moderate, and 3 = severe) for each of the five cardinal signs of *Malassezia* dermatitis, namely (i) erythema, (ii) greasy exudate, (iii) scaling, (iv) hyper-pigmentation, and (v) lichenification or



thickening of skin (Morris, 1996; Outerbridge, 2006). The score for each location is tallied against the maximum 15 points, and the total score for the four sites (4 x 15 = 60 Max.) represents the pre-treatment CIS. Further, the patient is evaluated at each visit to determine the extent of clinical resolution of fungal/bacterial dermatitis on the basis of per cent reduction in the CIS. Clinical resolution of *Malassezia* dermatitis is further corroborated by the visual appraisal of suppression of seborrheic dermatitis with concomitant remission of erythema and hyper-pigmentation. On the other hand, bacterial dermatitis is considered to be clinically resolved on the basis of virtual disappearance of the skin lesions such as pustules, epidermal collarettes, crusts or papules. This simple clinical criterion may also be employed for deciding continuation/suspension of the systemic anti-fungal and/or anti-bacterial therapy in individual patients (Sickafoose et al., 2010).

(ii) Visual analogue scale (VAS)

To permit prompt visual appraisal of the dog patient's present status in regard to severity of pruritis, the owner is asked to participate by marking a visual analogue scale (Rybnicek et al., 2009) at the initial and each successive follow-up visit. Whereas the left end of the 0 to 100 mm line represents total absence of pruritis, the right end signifies unmitigated inflammatory process. Thus, the intensity of severity increases proportionately from left to right of the scale, and a score in the range of 0 to 100 is easily determined by measuring the distance from the left end of this linear scale. For both the CIS and VAS scores of each patient, the progressive % reduction at a given post-treatment interval vs. the respective initial score is calculated.

(iii). Haemato-pathobiochemical index

score (HPIS)

The clinico-haemato-pathobiochemical profile: Rectal temperature, RT (OC), pulse rate, PR and respiratory rate, RR; PCV%, haemoglobin, Hb concentration (g dl-1), TLC (x 10³µl-1), DLC (%), absolute eosinophil count (x 10³µl-1), platelet count (x 10³µl-1) are determined. Serum alanine aminotransferase, ALT assay (U l-1), total protein and albumin (g dl-1) and A/G ratio, blood sugar (mg dl-1/ m mol l-1) and serum total bilirubin concentration (mg dl-1) are recorded, using standard procedures and high precision instruments such as Auto Blood Cell Counter and Clinical Auto Analyzer.

A new 15 point (5 parameters x 3) arbitrary haemato-pathobiochemical index score, HPIS card aimed to facilitate objective evaluation of restoration of homeostatis post-therapy is proposed by us, subject to further validation. Haemoglobin concentration is a reliable index of the over-all nutritional status. Platelet count would reflect faithfully drug-induced thrombocytopenia. Absolute eosinophil count is intended to monitor the allergic condition. Serum total bilirubin serves as renal function test, and serum ALT titre as a highly dependable liver function test in dogs.

1. Other parameters

Presence of ectoparasites (eg. demodectic mange mites) and total faecal egg count may also be recorded.

Combination therapeutic regimens

Systemic therapy is often recommended when the clinical signs are severe and widespread. Currently, cases of *Malassezia* dermatitis, with or without concurrent otitis are managed with the anti-fungal drugs: azole derivatives: generic Ketoconazole or Itraconazole. However,



HPIS Card

S. No	Parameter [®]	Magnitude of change (\pm) cf. the Initial value recorded at the time of registration	Score
1.	Haemoglobin concentration in peripheral blood circulation (g dl ⁻¹)	> 15% increase 10-15% increase < 10% increase No change or decrease	0 1 2 3
2.	Platelet count (x 10 ³ μ l ⁻¹)	> 15% increase 10-15% increase < 10% increase No change or decrease	0 1 2 3
3.	Absolute eosinophil count (x 10 ³ μ l ⁻¹)	> 15% decrease 10-15% decrease < 10% decrease No change or increase	0 1 2 3
4.	Serum total bilirubin concentration (mg dl ⁻¹)	> 15% decrease 10-15% decrease < 10% decrease No change or increase	0 1 2 3
5.	Serum ALT titre (U l ⁻¹)	> 15% decrease 10-15% decrease < 10% decrease No change or increase	0 1 2 3
Total HPIS(Out of Max.15) Per cent reduction			

[®] These are carefully selected on the basis of pathophysiological role:

another azole derivative, Fluconazole - with minimal hepatic involvement during in vivo drug metabolism - unlike the drug of choice, Ketoconazole merits increasing acceptance in view of its equivalent therapeutic efficacy (Sickafoose et al., 2010). Concurrent oral administration of the potent hepatoprotective-cum-antioxidant herbal preparation, Silymarin (*Silybum marianum*, Linn., Milk thistle seed extract) is expected to be a highly beneficial adjuvant.

Topical therapy per se may be adequate in localized skin lesions and external ear afflictions. Different commercial formulations

in the form of creams, gels, lotions, sprays, and ear drops are often used as supportive to systemic anti-microbial therapy. However, in an evidenced-based recent systematic review (Negre et al., 2009), the use of only miconazole nitrate 2% in combination with chlorhexidine 2% is highly recommended.

In the light of long-term experience at the Teaching Veterinary Clinical Complex, TVCC, regular interactions with the leading local private veterinary practitioners, and extensive survey of the published reports, we recommend the combination therapeutic regimen to provide guidelines to physicians.



A. Systemic

Anti-fungal (azole derivative) + anti-bacterial (Cephalexin) + hepatoprotective (Silymarin)

Azole derivative (main component)		Cephalexin	Silymarin
Generic name	Formulated brand name		
Ketoconazole	Nizoral [®] (J&J) or Fungicide [®] Torrent @ 5-10 mg kg ⁻¹ o.d.with food daily for 21 days	20 mg PO, b.i.d.	Bexoliv [®] (Binova) 5 ml PO b.i.d.
Fluconazole	Zocon [®] (FDC) @ 5 mg kg ⁻¹ o.d. with food daily for 21 days	20 mg PO, b.i.d.	Bexoliv [®] (Binova) 5 ml PO b.i.d.

B. Topicals

Dog patients also receive need-based judicious topical therapy on detailed clinical evaluation of each individual case:

1. Miconazole nitrate 2% in combination with chlorhexidine 2%
2. Sampoos, eg. SherulitesR (Virbac)/spray with hamales extract (Indian Herbs)
3. Where absolutely necessary, steroid formulations in the form of cream/gel.
4. Concurrent otitis externa may be treated with suitable topical formulations.

Note: Strict flea control measures and also hypoallergenic diet may be continued uninterrupted.

Conclusions

Malassezia pachydermatis yeast assumes an opportunistic pathogenic role when the cutaneous micro-environment is rendered propitious to exponential fungal growth. Cytological evaluation with semi-quantitative

estimates: Mean Yeast Count, MYC concurrent with clinical assessment of pruritis through Clinical Index Score, CIS and Visual Analogue Scale, VAS facilitate diagnosis.

Holistic systemic therapy comprises anti-fungal azole derivatives like generic Ketoconazole or Fluconazole in combination with anti-bacterial Cephalexin and hepato-protective, Silymarin. The recommended best topical is Miconazole nitrate 2% in combination with Chlorhexidine 2%. It is of utmost importance to pinpoint and eliminate any underlying predisposing factor, responsible for atopy. Further, each case being virtually different, tailored therapeutic management protocol: whether topical or systemic therapy, or combination of both is recommended.

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Bovine Mastitis in India - hurdle in dairy development

Five Points Control Plan

In Western Countries, where dairying is a highly commercial venture, the five point mastitis control program is advocated and scrupulously followed to reduce the economic losses.

- udder hygiene and proper milking methods
- proper installation, functioning and maintenance of milking equipments
- dry cow management and therapy
- appropriate antibacterial therapy of mastitic cases during lactation
- removing of chronically infected cows from the herd

The five point plan has been reported to be highly successful for the control of contagious mastitis (*Staphylo/Strepto* infections), but is considered inadequate for environmental mastitis (*Coliform* infections). The success of the plan heavily depends on the motivation, education and financial commitment of the dairy owner.





Necropsy Techniques in Poultry

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Enlarged liver with pale white foci –
Salmonellosis

Introduction:

In spite of prompt vaccination, skillful management and useful medications, poultry diseases are still occurring even at an organized farm. Poultry owners, poultry pathologists and field veterinarians are usually facing the challenges like on the spot (on farm) diagnosis, prompt treatment of bacterial, parasitic, protozoal, mycotic & fungul diseases in general and supportive treatment in viral diseases. Field Veterinarians have to play a double role of necropsist (pathologist) and physician in order to control these diseases promptly. Lot of information is available regarding characteristic signs, symptoms and gross lesions suggestive of these diseases. However, concise information, ready to use and refer at field level is lacking. The information presented below would be beneficial to the field veterinarians, students &

poultry owners to handle different poultry diseases.

Clinical history: It plays an important role in disease diagnosis of poultry. The following information is absolutely necessary to arrive at a conclusion.

1. Hatchery location
2. Strain of the bird
3. Source of feed
4. Age of the birds
5. Source of water
6. Medications given
7. Morbidity pattern
8. Mortality pattern
9. Egg production data
10. Flock size
11. Management
12. Climate prevalent
13. Source of hatchery
16. Vaccination schedule

Selection of birds:

- Choosing the appropriate birds for conducting necropsy plays an important role in achieving correct diagnosis. Birds are selected on the basis of the following:
 - a. Birds that are found dead and those that are about to die. Acute form of the disease are noted in these birds and generally no specific lesions are present. Intensity of the outbreak can be judged from opening these birds.
 - b. Birds that are apparently ill are opened and specific lesions may be observed since adequate time has lapsed for body reaction to become apparent.



- c. Apparently normal birds are also opened to evaluate the health status of the farm.
- PM examination of all the birds presented/ brought for necropsy should be performed. If a particular farm is visited, PM examination of all the dead birds be conducted.
 - Diagnosis on the basis of postmortem examination plays an important role in poultry diseases since the tentative diagnosis can be made on the spot/on the farm, so that quick and adequate preventive and treatment measures can be implemented immediately. The diagnosis can further be confirmed by laboratory tests.
 - The necropsy procedure can be employed with the following methodology

I. External Examination

External organs/ body parts of the birds died/diseased should be observed closely and keenly (may be with lens) in order to note changes, if any.

Eyes: of the birds are to be observed for fowl pox, infectious coryza, aspergillosis and Marek's Disease.

- In fowl pox small wart like growths are seen on the eye lids but eye balls as such may not be swollen.
- In infectious coryza and aspergillosis, eyes are very much swollen, red with profuse lacrimation. Swelling of the face can also be observed.
- Marek's disease causes grey eye and narrowing of the pupils with or without mark enlargement of the eyes.

From this, it can be concluded that, many birds affected with swelling of the eyes, redness and lacrimation suggests mainly the possibility of

infectious coryza, which is a bacterial disease.

Oculo-nasal Discharge: Such discharge is generally indicative of respiratory infection. Colour and consistency of the discharge varies.

- It may be mucous, purulent or blood tinged in nature. It is seen in RD, infectious bronchitis, infectious coryza and CRD.
- Corneal opacity is generally seen in Marek's disease and avian encephalomyelitis. Corneal granuloma are seen in fowl typhoid.
- Facial edema is seen in *E.Coli*, pneumo virus and RD. Conjunctivitis is noticed in RD, ILT, IB and high ammonia built up in farm.

Comb and Wattles: are usually pink in colour and wattles are wrinkled.

- In fowl pox, small warts or/and scabs are developed on the comb or may contain hyperplastic areas.
- Necrosed/ black colored tip of wattle is seen in RD, AI and cold environment.
- Wattles get swollen and turn blue along with comb in chronic fowl cholera (Pasteurellosis).
- Diseases of lungs, heart, liver and kidneys can also develop different shades of colour on combs and wattles.
- Comb and wattles may be pale as in anemia and diseases like RD, coccidiosis, ALC and *Leucocytozoon cauleri* infection.

Feather Follicles:

- The base of the feather follicles and skin is generally site for Marek's Disease virus to develop small nodules, which are seen at the base of the feathers. (This is also taken as a good source of MD antigen)



- Several ticks and mites are also responsible to develop red colored spots on skin particularly under feathers.

Skin quite often turns blue and swollen with rancid odor due to CIA, MD, IBD with secondary complications of *Clostridia* and *Staphylococcus* infection.

Vent:

- Pasty vent (vent smeared with fecal matter) indicates gastrointestinal affection.
- Colour of the feces may be red, indicative of possible coccidial infection,
- Sulphur yellow feces are indicative of spirochaetosis and white feces indicate White Bacillary Diarrhoea, gout or infectious bursal disease.
- Greenish diarrhoea is generally seen in fowl typhoid and new castle disease.
- Vent block is generally seen in Reoviral infection.
- Vent may also show presence of wounds indicating vent pecking. This lesion may be noted due to excess of heat or light, deficiency of proteins, overcrowding or due to irritation caused in Infectious Bursal Disease.

Skeletal Muscles:

- These muscles become pale or fish flesh like during exposure to excess heat(heat stroke) or due to deficiency of selenium or vitamin E.
- Bluish discoloration along with sero-sanguinous exudates is indicative of gangrenous dermatitis, CIA and Vit. E deficiency.

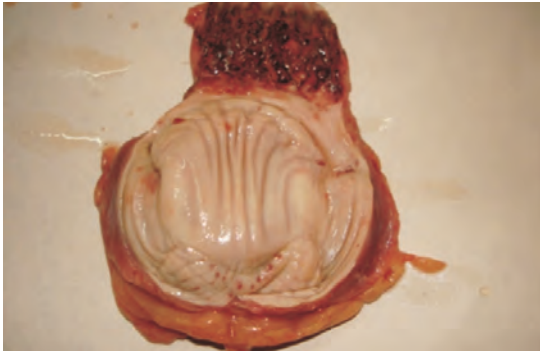
- Muscular haemorrhages are noted due to adenoviral, IBD, MD and CIA infection.

II. Internal Examination: (Necropsy Technique)

- Place the bird on its back and stretch both the legs. With sharp scissors, expose the nasal cavity and cut open the body. The exudates present in the respiratory tract act as a rough guideline for differentiating different diseases of the respiratory tract. In infectious coryza, the inflammation is restricted to upper respiratory tract and eyes also show discharge.
- Expose the oesophagus by a cut at the junction of beaks. Presence of small white nodules on oesophageal mucosa and pharynx generally indicate deficiency of Vit. A. Expose the tracheal mucosa membrane by cutting through the cartilaginous rings. Mucous membrane of trachea is severely inflamed or eroded in infectious laryngo tracheitis and the lumen of trachea contains blood-tinged exudate. Fibrinous inflammation is found adhering to the lumen of tracheal mucosa in diptheretic (wet) form of fowl pox.

Wind Tube (trachea): It is the target of I.L.T., I.B., C.R.D., and Pasteurellosis (fowl cholera).

- In I.L.T., trachea is invariably red and blood clots are seen in the lumen.
- In C.R.D. whitish masses are seen obstructing the trachea.
- I.B. causes acute tracheitis but is not usually seen in grown up birds. Chicks suffer from I.B. and the lesions developed can not be differentiated from that of Pasteurellosis on post-mortem examination.



Hemorrhages at orifice of proventricular glands – ND

Lungs: when inflamed, turn brownish and solid. The pieces when put in water get submerged. On pressing, frothy fluid comes out and becomes dark coloured and solid. Such lungs are pneumonic.

- On chest side, lungs may be covered by whitish thick layer of fibrin (fibrinous pneumonia), wherein these membranes become translucent or opaque and have a dull white colour. The lesions (abnormalities) indicated above are suggestive of *E. coli* infection, Salmonellosis, Pasteurellosis, C.R.D. infectious bronchitis, AI and RD.
- When pneumonia is accompanied by the presence of caseous exudates on the serous membranes and air sacs, it is indicative of Chronic Respiratory Disease.
- Aspergillosis, which is caused by fungi, develop small whitish or yellowish nodules on and in the lungs. The disease is also known as brooder's pneumonia and is mainly observed in chicken. Yellow coloured granulomatous nodules are noted in brooders pneumonia.

Air sacs. In healthy birds, they are thin and transparent.

- In colibacillosis, Salmonellosis and Pasteurella infections, they turn cloudy and thick.

- In C.R.D., cheese like mass gets accumulated within the air sacs giving it a beaded appearance.

Heart:

- Pericardium becomes opaque in most bacterial infections.
- It turns ball shaped and is covered with whitish layer in *E. coli* (fibrinous pericarditis), salmonellosis (suppurative pericarditis), C.R.D. (fibrinous pericarditis), uremic pericarditis, spirochaetosis and Pasteurellosis.
- In addition to translucency, if there is a gritty feel, this indicates visceral gout.
- Surface of the myocardium shows numerous large ecchymotic haemorrhage giving it a leechy heart appearance in adenoviral infection.
- Pericardial sac contains large amount of transudate due to salt toxicity.
- Pin point haemorrhages on epicardium are seen in fowl cholera (Mostly at epicardial groove)
- Grey white nodules are seen in Salmonellosis and Marek's disease.

Liver: It is a very important organ of the body and is affected in almost all the diseases. In some of the conditions, the changes in the liver are characteristic and hence used for getting tentative diagnosis.

- Liver is moderately enlarged, pale coloured due to degenerative alterations caused by nutritional deficiencies and certain fungal toxins. Surface of liver remains smooth in these cases.
- Liver shows petechial haemorrhages that are surrounded by pale areas (reticular pattern) due to adenoviral infections. In this case, the



enlargement of the liver is minimal.

- Liver is excessively enlarged in Marek's disease and avian leucosis complex. The colour of the liver is, however, not altered to a great extent. Surface of the liver is generally granular or nodular in Marek's disease (discrete and diffuse) whereas it is smooth in ALC (discrete nodule). Liver, in both these diseases, is friable and tends to rupture.

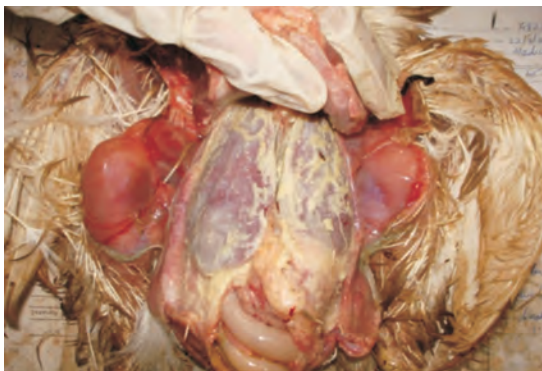
- Liver is bronze coloured (greenish or brownish in colour) due to fowl typhoid (*Salmonella gallinarum*),

Circumscribed areas of focal necrosis is the prominent lesion in most bacterial infections like Pasteurellosis, Salmonellosis, etc.

- Circular grey white nodules with depressed centres (Saucer shaped depressions) on liver are seen in histomoniasis.

Intestines:

- Presence of exudate with a lot of mucus is the characteristic feature of necrotic enteritis.
- The intestinal contents are red in coccidial infections,
- Enteritis with yellowish exudates is seen in spirochaetal infections, greenish in Ranikhet



Enlarged liver along with perihepatitis – CRD

disease or Salmonellosis.

- Peyer's patches and caecal tonsils become necrotic, haemorrhagic and hyperplastic in Ranikhet disease and AI. These lesions are pathognomonic for this disease. Ulcers may also be noted in these areas.
- Ranikhet disease (R.D.) can also be speculated by observing haemorrhage and ulceration in the intestines along with red spots on the proventricular papillae.
- Haemorrhages on the mucosa in between (at the junction) the gizzard and proventriculus are seen in Avian influenza (Streaks of haemorrhages), IBD and in addition to this, gizzard erosions are seen in CIA infection.
- Many a times, the birds show diarrhoea but the intestines are normal to look at. This can be the indication of excess salt, molasses or and fibers in the compounded feed. Infectious diseases of per-acute nature can also have this feature.
- Linear rectal hemorrhages are seen in RD and AI.

Spleen:

- Spleen is enlarged to a very great extent (about 10 to 15 times the normal size) with grey white nodules (looks like table tennis ball) in Avian Leucosis complex and Marek's disease.
 - It is moderately enlarged with mottling in spirochaetosis.
- Splenic atrophy along with congestion is noted in most viral immunosuppressive diseases like Inclusion Body Hepatitis and Infectious Bursal Disease.
- Presence of pale circumscribed necrotic areas is generally indicative of bacterial infections.



Hemorrhages and cecal core formation in caecum- Caecal coccidiosis

- Red and white spots are seen on the surface in Ranikhet, Salmonellosis, *E. coli* infection and in several other bacterial diseases.

Kidneys:

- Kidneys are pale and enlarged in a diffuse manner in Fatty Liver Kidney Syndrome (FLKS), IBH and Salmonellosis (with petechial hemorrhages).
- In gout, kidneys are pale and granular with petechial haemorrhage. The ureters become prominent and are white due to the presence of urates in them. Serous membranes lose their transparency and are smeared with bright white coloured crystals (tophi) and have a gritty feel.

BURSA is seen just above the anus (vent) in the birds. Usually it is marble (glass) sized in young birds and decreases in its size as the birds grow. (Usually regresses in about 9 weeks)

- In avian leucosis complex, it gets extensively enlarged, whereas, exactly opposite is

observed in Marek's disease.

- The wall of the bursa appears red and swollen in Ranikhet.
- Bursa is greatly enlarged and edematous in Infectious Bursal Disease, in addition to this, in Gumboro disease whitish caseating round masses are seen in the lumen
- It is atrophied in adenoviral infections, mycotoxicosis and in more chronic stages of Infectious Bursal Disease, CIA and MD.
- Bursa is greatly enlarged in size in Avian Leucosis complex (ALC) with discrete nodules, whereas, in Marek's disease, it is diffusely enlarged, which is a point of differentiation between Marek's disease and ALC.

SCIATIC NERVES are found hidden in the muscles of the legs. They are white in colour and transversely striated when not affected by any disease condition.

- In Marek's disease, the nerves are greatly enlarged, look cloudy and striations are lost.
- In 'B' complex deficiencies, similar kind of alterations are seen on the nerves.
- It is greatly enlarged unilaterally in the classical form of Marek's Disease (MD), look cloudy, yellowish as against white and shining normally and the striations are totally lost. Brachial, proventricular and vagus nerves also may show similar alterations.
- Diagnosis is done by comparing the size with that of normal. Similar enlargement of nerves is seen in peripheral neuropathy.

OVARIES in normal bird, ovaries are made up of several round to oval yolk of an egg with no blood spots on them. The birds having such a



normal ovary would have expected egg production desirable egg size and egg weight.

- In I.B., salmonellosis and EDS (Egg Drop Syndrome), the eggs are without shell or with very thin shells. Sometimes eggs are like small glass marbles and have several ridges on them.
- The egg drop usually is sudden and this can be observed in Ranikhet and Avian Viral encephalitis with or without ovarian lesion.
- Transient egg drop without ovarian changes is detected when the farm is poorly managed with improper lighting programme and when mineral, vitamins and other nutrients are not provided according to the need of the birds.
- The affection of this organ is predominantly noted in salmonellosis, infectious bronchitis, RD etc. Ovaries become flaccid, irregular in shape and size, haemorrhagic or pedunculated. The contents of the ova become caseous.
- Nodular appearance may be noted in Marek's disease.

BRAIN is located in the cranium (skull) and the gross lesions in the brain are not very conclusive.

- The brain assumes round shape and is wet in Avian encephalitis and Vit. 'E' deficiency. Also, haemorrhagic spots are seen.

Cranial cavity is opened by removing the overlying skin and cutting the bones on either side of occipital foramen with the help of thin, sharp scissors proceeding laterally to the midpoint at the anterior edge of cranial cavity. The cut portion of the bone is lifted to expose the entire brain. Care must be taken not to damage the brain.

- The blood vessels appear prominent in encephalitis, which occurs in diseases like Ranikhet Disease, Avian Encephalomyelitis etc.
- In salt toxicity, the surface of the brain appears shaggy and contains watery fluid.

BONES are strong normally and on application of external pressure, they get fractured by making characteristic sound.

- In Vit. 'D' and calcium deficiencies, the bones become very soft like rubber and can be very easily twisted. The joints are enlarged.
- Aflatoxicosis and Avian encephalitis may secondarily develop soft bones, as the birds are forced to undergo starvation.
- Adenoviral infection causes rarefaction of bones and depresses bone marrow. Birds therefore suffer from anaemia and weakness.
- Excess phosphorus in feed is another reason for causing rickets in birds characterized by enlarged joints.
- Insecticides and pesticides cause paralysis without any apparent abnormalities but the lame birds later show signs of starvation with soft bones and enlarged joints.

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Preventive Aspects of Infertility

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Introduction:

The application of preventive measures in reproduction is limited to mainly sexually transmitted diseases, like Vibriosis, Brucellosis and Trichomoniasis. However, they are not considered in an important area of infertility. The cycle of reproduction starts from conception, followed by gestation, parturition, growth of a young one, puberty, sexual maturity and further conception, completing the reproductive cycle. At every step, disturbances in the rhythm of reproduction can lead to infertility. To maintain this reproductive rhythm, the concept of prevention can be applied at every stage, which mainly focuses on correcting systems, not the symptoms.

If the profitability of dairy herd is to be improved by efficacious and cost effective intervention in the processes of reproduction, goals for reproductive performance must be established. A farmer's critical role along with Veterinary intervention will decide the profitability of dairy herd. The reproductive goals in herd start with early age of puberty and ends with successful lactation and subsequent conception again to get calf a year.

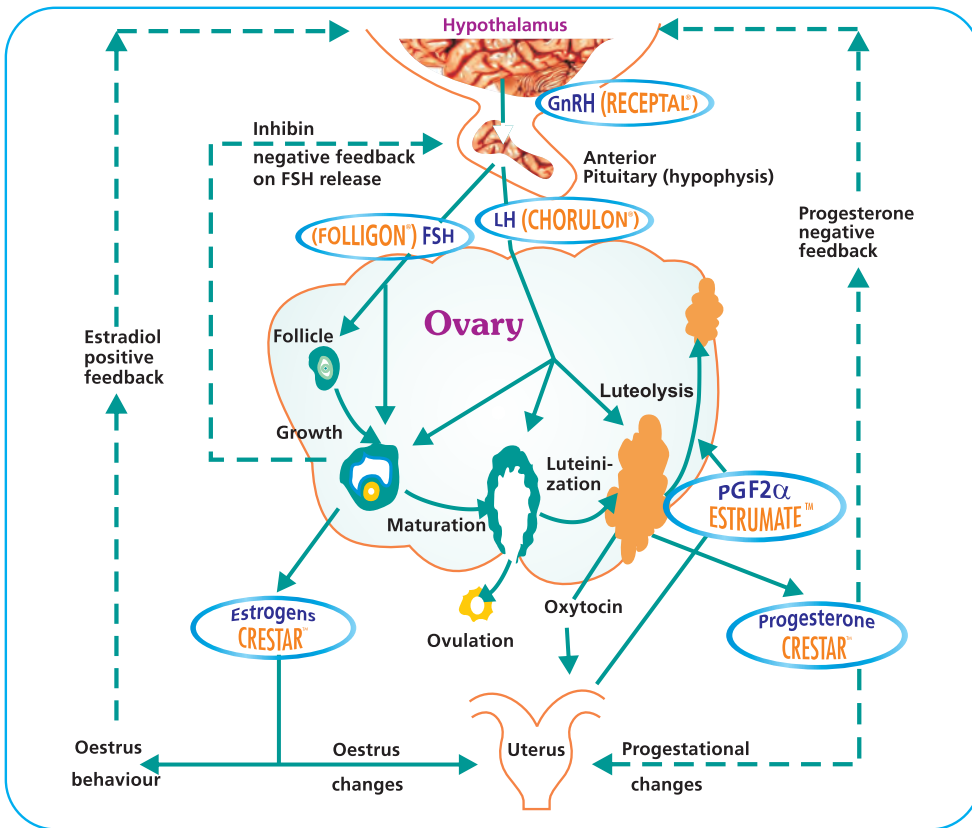
Puberty

The heifer is said to have attained reached puberty when she is able to express estrous behavior and ovulates fertile oocytes. The onset

of puberty is influenced primarily by genetic factors governing age and weight at onset, specific to the breed. The age at puberty can be lessened by selecting breeds with younger age at puberty or cross breeding with another breed that has a similar or lesser age at puberty.

A comprehensive health and vaccination programme starting at or before weaning should be initiated. The health programme is focused on maintaining good health and providing adequate protection against the major diseases that cause reproductive losses. From the birth till first three months of life, the emphasis needs to be given on prevention of infections by providing vitamins and mineral supplementation, specifically Vitamin A and Calcium. Regular de worming decreases internal parasitic load leading to better weight gains in heifers. After weaning, optimum feeding standards need to be met to cope up with demands of growth. The growth curve is sigmoid in nature. The period of maximum growth rate is followed by retardation in growth rate which coincides with puberty, therefore known as pubertal deflection. The nutritional requirements during the maximum growth period i.e. from six months onwards are very critical. Any disturbance in the health and feeding during this period leads to delayed pubertal age.

Pre-breeding examination serves as a monitoring point to evaluate the post weaning



to pre-breeding health of heifer to achieve early age of puberty. This examinations should include determination of weight, assessment of body condition and assessment of reproductive tract score (RTS).

To ensure that the target weight and body condition score are met, a subgroup of heifers should be weighed and scored for body condition at reasonable intervals as at 0-3. 3-6. 6.9. 9-12 months. The body condition scores (BCS) are measured in 1 - 5 scale. Ideal BCS should be in the range of 3 to 3.5. Any drop in weight or BCS should be reviewed seriously and corrective measures need to be implemented. After heifers have achieved their target weights, close monitoring is necessary for estrus

detection. The heifers not exhibiting estrus, need to be evaluated for Reproductive Tract Scores. RTS is in the scale of 1-5, starting from inactive ovaries with atonic uterus to ovaries with CL and tonic uterus. Heifers from score three onwards with active ovaries need to be evaluated for reproductive tract status every 8-10 days interval. When ovaries are activated per rectal examination, it not only helps in identifying missed oestrus but also increases blood flow to reproductive organs stimulating ovarian activity.

Oestrus Detection and Insemination:

“Improve observations and improve the observer” is the key to optimum estrus



detection. The problem of anoestrus is usually associated with poor heat detection. The owners and herdsmen often need to be trained in how to observe cows/buffaloes in estrus. The cows should be grouped and watched carefully for 20 to 60 minutes twice or more per day especially during periods of activity such as before and after milking, Observing cows during feeding period is not satisfactory. Cooling with sprinklers/foggers during peak periods of heat helps in estrus exhibition in silent heat. The use of heat expectancy charts is very helpful if records of previous estrous are accurately recorded. Per rectal examination on the expected day prevents silent heat from going unnoticed. Use of teaser bulls can improve heat detection especially in buffaloes, where behavioral symptoms are inconspicuous.

Correct estimation of time of breeding by Veterinarian by rectal and vaginal examination is crucial to optimize conception rates. Simple aids like fern pattern, spinbarket test can help in improving conception rates. Correct thawing and gun loading, handling of frozen semen and its deposition from mid cervix to body of uterus with all hygienic precautions is a must. These typically routine procedures need to be executed with utmost care. Minor errors like short thawing, cutting, preservation, air bubble after cutting could potentially lead to adverse results. Routine semen evaluation of randomly selected straws at regular intervals may ensure semen quality.

Pregnancy Diagnosis:

Early pregnancy examination should be scheduled to determine the success of breeding programme and to determine the fetal age. It not only helps in identifying open animals for

corrective actions, but also helps in identifying potential repeat breeders due to early embryonic mortality. Reliably pregnancy can be diagnosed by 25 to 30 days by ultrasonography. In repeat breeders with irregular estrus cycle, early embryonic mortality is diagnosed by absence of embryo in second examination. Ultrasonography also helps in diagnosing post insemination anoestrus cases due to infections. which may otherwise be missed till routine per rectal diagnosis after two months.

Gestation:

In first trimester of gestation, maximum losses can occur due to embryonic mortality. Any accidental use of drugs which affects life of CL and increases uterine motility (oestrogen, PGF2 α , feed supplement like papaya, banana stem) may threaten the pregnancy. In the last trimester of gestation, fetus gains maximum weight increasing nutritional needs. However, since animal is either in drying stage or is non-lactating, is given least attention for nutritional needs. Many studies have indicated that cows with BSC from 2.5 to 3.5 at parturition in the scale of 1-5 had least difficulties at parturition, better weight gains post partum and early post partum estrus. Concurrent to increased nutritional demand, cow experiences a marked decrease in dry matter intake. Imbalance in nutrient intake at this stage predisposes animal for metabolic diseases, dystokia, retained foetal membranes and ketosis. Retained foetal membranes and dystokia in turn cause uterine infections with retained milk yield and days open. Selenium and vitamin E are associated with retained foetal membranes. Recent studies have shows that zinc is associated with PGF2 α and protein synthesis and can affect oestrogen



mediated response, which can affect initiation of parturition. Enhanced energy, proteins and mineral intake in pre-parturient period helps in achieving reproductive goal of post partum fertility.

Parturition:

The reproductive goal at the parturition is achieving eutokia with least intervention and expulsion of foetal membranes within permissible intervals. If the nutritional needs are met with BCS of 2.5 to 3.5, calving is usually smooth. Too low or too much BCS can lead to maternal dystokia. Dystokia may be potentially reduced by selecting service sires for negative EPD for birth weight and calving ease. Parturient cows should be observed at least every 2 to 3 hours. Delivery should be assisted, if first and second stage of parturition prolonged. However, over zealous intervention, Handling genital tract should be avoided to minimize the post parturient infections.

Theoretically, cows which expel placenta after twelve hours are treated for retained placenta. However studies have shown that in older cows, fourth parity onwards reproductive performance is best when placental expulsion was within 6 hours. Whenever retained placenta is reported and immediate attention by Veterinarian is not possible, farmers should be advised to cut placenta at vulval lips level using sterilized scissors to avoid bacterial contamination, self mutilation and canine attacks. The treatment for retained placenta has been controversial when it comes to manual removal, antibiotic treatment and use of hormones. Recent studies have indicated

infusion of collagenase solution (2,00,000 U, calcium chloride 40 mg, sodium bicarbonate 16 gm dissolved in IL saline) in umbilical artery of retained placenta within 12 to 96 hrs after parturition facilitates placental separation and placenta can be removed easily by gentle traction.

Post Partum period and Involution:

The reproductive goals in post partum period are faster involution, early first estrus exhibition and conception. To achieve these goals, close monitoring of involution along with nutritional need of the dam is important.

Examination of the uterus by palpation through the rectal wall is commonly used to evaluate the degree of involution. Palpation may not be useful to diagnose abnormalities of uterine involution during the first two weeks post partum, however, when involution is delayed, the uterine wall may be atonic and lack the longitudinal rugae (involution lines) typical of a normal uterus. Lochial discharge can be observed carefully to detect postpartum infections. If involution is normal, fluid should not be palpable within the uterine lumen by 14 to 18 days after calving. Cows in which a uterine lumen is palpable at the postpartum examination, are likely to have pathologic changes that suggest delayed uterine involution. Larger cervical diameter after 20 days post partum or a mucopurulent discharge after 26 days post partum are associated with cows having delayed involution and post partum infections.

Real time ultrasonography has been used to monitor uterine involution. Uterine diameter measurements, fluid volume and its echogenicity can be used as indicator to



differentiate normal and abnormal involution associated with postpartum infections. The intrauterine fluid associated with uterine infection contains echogenic particles and is easily distinguished from clear nonechogenic fluid associated with estrus and pregnancy. In addition, the uterine wall of cows affected with uterine infections is variably thickened.

Most of the contaminating bacteria are merely transient residents during post partum period and are promptly eliminated by the uterus defense mechanism during the puerperium. In some cases, however, pathogens persist in the uterus and cause disease. In cows with a normal puerperium, the uterus is nearly free of bacterial, contamination after 4 weeks of calving. However uterine infections are usually associated with retained foetal membranes, dystokia, delivery of twins, over-conditioning, long term feeding of urea to dry cows. manual removal of retained membranes, unsanitary calving conditions and traumatic obstetric procedures.

A variety of hormones have been administered to cows in attempts to prevent or treat post partum uterine infection. Oxytocin causes contraction of the myometrium if the organ is dominated by oestrogen. Thus, oxytocin is expected to be effective in aiding uterine evacuation if administered within 48 to 72 hours after calving. Doses of 20 to 40 U repeated every 3 - 6 hours have shown beneficial effects. Several clinical trials have shown that administration of prostaglandin during the postpartum period may enhanced the reproductive performance of dairy cows that are otherwise unaffected by peri-parturient diseases. Likewise, cows affected with dystokia, RFM, or both and treated with PGF 2α , early post partum, followed by a second treatment of

PGF 2α 14 days later, experienced a higher conception rate to first service than did untreated cows experiencing a normal or abnormal parturition.

In the early post partum, typically there is loss in body weight and BCS. One of the most important factors that determine when energy nadir will occur is post partum intake of dry matter (energy and protein) and mineral. The interval to first ovulation is shortest in cows which achieve positive energy balance reflected by weight gains improved BCS in second month post partum. The negative energy balance in these animals increases the incidence of anoestrus, regardless of therapeutic attempt of intervention during the post partum. The incidence of cystic ovaries is higher in cows with high milk yield in combination with negative energy balance.

Where energy deficiency has caused anestrus, it is unlikely that a rapid response can be achieved by suddenly increasing energy intake. It requires 3-4 weeks of improved feeding for stimulation of ovarian activity thereby getting a response. Where micronutrients deficiencies have caused anestrus, appropriate dietary supplementation will resolve it quite rapidly. Improvement of overall energy levels in diet usually has to be part of a long term strategy for the farm.

Presently, the emphasis is being given on treatment of various disorders. Essentially, treatment may not be correcting body systems to achieve reproductive goals consistently throughout life span of animal. In contrast preventive measures at every stage of reproductive cycle can help in achieving reproductive goals consistently throughout reproductive span.



Nutraceuticals in Animal Health

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Introduction

The term "Nutraceutical" was coined by combining the terms "Nutrition" and "Pharmaceutical" in 1989 by Dr Stephen DeFelice, Chairman of the Foundation for Innovation in Medicine. "Nutraceutical" is a marketing term developed for nutritional supplement that is sold with the intent to treat or prevent disease and thus has no regulatory definition. Hence a "nutraceutical" is any substance that may be considered a food or part of a food and provides medical or health benefits, encompassing, prevention and treatment of diseases.

Veterinary Nutraceutical:

As defined by the newly created North American Veterinarian Nutraceutical Council,

Inc. (NAVNC), "A substance which is produced in a purified or extracted form and administered orally to patients to provide agents required for normal body structure and function and administered with the intent of improving the health and well-being of animals.", is termed as Veterinarian Nutraceutical. These products are widely available and can be purchased in many forms, including capsules, tablets and powders, and are often included in animal feeds. A number of nutraceuticals are currently being used in the prevention and treatment of many common diseases in animals, with clinical trials providing evidence of their efficacy in a variety of animal species. Nutraceuticals have been claimed to have a physiological benefit or provide protection against the following diseases



- Cardiovascular dysfunction
- Obesity
- Diabetes
- Cancer
- Osteoarthritis
- Periodontal diseases
- Immunosuppression
- Chronic inflammatory diseases
- Degenerative diseases

Cardiovascular disease

Polyunsaturated fatty acids: Mammals can synthesize saturated fatty acids but are unable to produce n-6 and n-3 polyunsaturated fatty acids (PUFAs) and must ingest them in their diet. Both n-6 and n-3 fatty acids are required for cell membrane phospholipids and act as substrates for various enzymes, which make them important for skin and hair texture, and for joint, cardiovascular, eye and mental health. The most commonly ingested n-6 PUFA is linoleic acid (LA) which is found in seeds, nuts and vegetable oils. The n-3 PUFA alpha-linolenic acid (ALA) is also readily available in animal meat and vegetable oils. These essential fatty acids are precursors for longer chain polyunsaturated fatty acids

Fish oils are known to be rich in both DHA and EPA, with both DHA and AA also found in high concentrations in many mammalian organs, including the brain, where they are vital for normal functioning. In dogs, rats and primates, n-3 PUFAs can prevent fatal cardiac ventricular ischaemia-induced arrhythmias. Since the prevalence of ventricular fibrillations increases as animal ages, supplementation may be of particular benefit to old animals.

L-Carnitine: L-Carnitine is found mainly in the heart and the skeletal muscles. A high proportion is secreted in the bile and can undergo enterohepatic recirculation. Acyl-carnitine can help with removal of fatty acids from the liver and these complexes are then eliminated from the body by glomerular filtration." If the concentration of L-carnitine in the body decreases, an animal can become deficient and susceptible to raised levels of triglycerides in the blood, decreased tolerance of exercise and myocardial disease. Carnitine can also be obtained from the diet, meat and dairy products provide the best sources, although the concentrations of carnitine can vary greatly after processing.

Obesity

A blend of glucomannan, chitosan, fenugreek, G sylvestre, and vitamin C in the dietary supplement significantly reduces body weight and promotes fat loss in obese individuals.

Diabetes

Diabetes mellitus is characterized by abnormally high levels of blood glucose, either due to insufficient insulin production, or due to its ineffectiveness. Diet therapy is the cornerstone for the management of gestational diabetes mellitus. Omega-3 fatty acids have been suggested to reduce glucose tolerance in patients predisposed to diabetes. Ethyl esters of n-3 fatty acids may be potential beneficial in diabetic patients.

Joint diseases

Glycosaminoglycans: The use of supplements to treat chronic diseases such as osteoarthritis (OA) can be beneficial in areas frequently not addressed by conventional



therapy such as the slowing of joint degeneration, the improvement of joint health and the general improvement of an animal's quality of life.' Most animals are affected by OA at some point in their lives, with 20 per cent of canines over one year of age affected. "This fact highlights the importance of reducing the symptoms and degeneration of the condition in the long term.

Glycosaminoglycans (GAGs) are essential for the production of cartilage in the joints of most animals. They are large sugar-protein complexes, which are negatively charged. As a result they can attract water molecules, to help improve bone cushioning and act as shock absorbers. Nutraceutical supplementation with GAGs can increase their availability in the joint where they are required and hence help to decrease inflammation and pain, and to increase cartilage repair by the chondrocytes in OA. GAGs may also decrease the activity of proteolytic enzymes in the joint and delay disease progression.

Glucosamine: A number of trials in animals have also shown strong evidence for glucosamine supplementation. Glucosamine sulphate is also useful in the treatment of canine hip displasias, osteochondritis, spondylitis and disc-degeneration conditions.

Chondroitin sulphate: Chondroitin sulphate occurs naturally in the extracellular matrix of animal connective tissue/articular cartilage. It is a large molecular weight glycosaminoglycan (GAG) with a similar action to that of glucosamine. Chondroitin is useful in the treatment of arthritis, tendon and ligament problems, and old age. It is of particular benefit in horses and larger dogs, where joint degeneration is most marked. It has been found

that chondroitin decreases interleukin-1 production, blocks complement activation, inhibits histamine-mediated inflammation, inhibits metalloproteinases and stimulates GAG and collagen synthesis.

Cetyl myristoleate: One non-peer-reviewed report by the company manufacturing cetyl myristoleate has been published. Very high doses of cetyl myristoleate have been shown to have antiarthritic properties in rats. It is commonly available as a nutraceutical supplement for the management of pain and inflammation in animals.

Methylsulfonylmethane: Methylsulfonylmethane (MSM) is found naturally in animal bodies and in some raw fruit and vegetables. It is a sulphur-containing compound and is essential for normal functioning of animal cells. In horses, high levels of sulphur are found in the joints, skin and hooves. Horses therefore require a large amount of sulphur in their diet, which they may not obtain from processed food. It has been suggested that MSM may have the potential to decrease inflammation and pain, and to act as an antioxidant, making it useful in the treatment of arthritis.

Conclusions

Nutraceuticals have provided a number of new leads on possible new drug therapies for future use in veterinary medicine. The use of nutraceuticals in animals is still in its infancy, with few clinical trials showing conclusive evidence for their efficacy. However, an increasing range of nutraceutical formulations, often combination products, are now available for domestic pets, particularly dogs and cats, with applications promoted for joint health, coat and skin wellbeing, and obesity.



Nutritional Management and Reproductive Health in Dairy Animals

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The veterinarians working in the field very well experience the problem of infertility & poor reproductive performance in dairy animals. In spite of the cost incurred on the treatment of infertility & other gynecological problems, there is no surety of the success. There are variety of reasons that influence the poor reproductive performance of animals including inborn errors, management, environment and the nutrition.

Under the present situation of livestock rearing the feeding of the productive animals is poorly managed resulting in reduced reproductive efficiency and consequently a poor production. This may be due to low feed and fodder resources available and gross negligence towards the nutritional needs of the animals. Majority of livestock farmers feed their animals on poor quality roughages like rice straw and kadbi with none or small amount of single concentrate ingredient. The practice of balanced concentrate mixture for livestock feeding has very poor adaptation. Besides general nutritional status, deficiencies, imbalance as well as absence of single critical component can have deleterious effects on various determinants of reproductive performance either directly or indirectly.

Dry Matter Intake

This has a profound impact on reproductive performance. Especially post-partum reproductive physiology has a positive correlation with DMI. The cows with higher DMI

have been found to show signs of estrus at first ovulation and become pregnant by 150 days of lactation. Reproductive performance of dairy cattle is influenced by the way cows are fed during the dry period and early lactation. After parturition, cows should be fed rations balanced to maximize dry matter intake so that body weight losses are minimized.

Energy

The important nutritional reason for poor reproductive performance is the lack of energy. In early lactation, the voluntary feed intake is usually reduced. This is where they are putting more energy into their milk than they can consume from feed and as a result cows experience in negative energy balance (NEB). Since the cow is in a negative energy balance she is losing weight in early lactation. It has been documented that the severity and duration of NEB are positively associated with the interval to first postpartum ovulation, high incidence of silent heat and lower conception rate. Minimizing the extent and duration of NEB in early lactation is an important factor for achieving optimum reproductive performance.

Good body condition at calving is also important so that they can draw on body reserves during this period. In order to compensate for this deficiency, cows must rely on their body stores of fat. The best way to get more energy into the cow is to improve the energy density of the feed. The more energy you



can get into the ration, the sooner they will come out of negative energy balance.

In order to increase the energy density of the ration, supplementation of vegetable oil (max. 2%) and feeding of cereal grains, whole cotton seed could be the options available. Unsaturated vegetable fatty acids have additive effects on reproductive parameters in the cow, including follicular size and hormone patterns. Linoleic acid, monoenoic trans fatty acids have been identified as important fatty acids that may have direct effect on reproductive function. Soybeans appear to deliver more linoleic acid to the small intestine than cottonseeds. Roasting of soybeans may be an effective way to reducing biohydrogenation in the rumen, thus increasing the delivery of EFA to the small intestine for absorption. The feeding of oil (unprotected and unsaturated fatty acids) in excess can cause reduction in fibre digestion. Similarly, excess grain feeding may lead to rapid fermentation leading to suboptimal rumen environment, acidosis and decline in milk fat. The careful inclusion of energy source is necessary. The rise of rumen protected fats (calcium salts of fatty acids), which also have shown to improve energy status of animals in better way are commercially available in the market can also be advocated for the purpose.

Protein

Protein is the next important factor in a cow's diet that needs to be monitored. The lack of crude protein in a ration will cause an increase in non-detectable heats as well as a lower conception rate. But most of the time, a protein deficiency is not the problem with a milking herd. It is overabundance of protein, especially degradable protein which causes most problems. The most visible effect with excess of

degradable protein is an increase in number of services per conception and more days open. But the hidden effect is the conversion of excess degradable protein to blood urea nitrogen which as been linked to a major decrease in fertility. In addition to feeding more energy in early lactation, perhaps more bypass protein is needed. The 1989 NRC nutrient requirement for dairy cattle has suggested 60 to 65% degradable and 35 to 40% undegradable protein (bypass) in the ration dry matter. The concentrate feedstuffs with high bypass protein (UDP) content includes bajra, cottonseed cake (solvent extracted), jowar, corn gluten meal, salseed meal, soy flakes etc. Also, a slightly higher level of protein has been suggested during the first few weeks of lactation due to less dry matter intake.

Minerals

The minerals that affect reproductive performance includes Ca, P, Cu, Zn, Se, I, Calcium deficiency can cause a whole host of problems such as uterus not returning to normal size after calving. The incidence of dystocia and prolapsed uterus can increase with the improper amount of calcium. Phosphorus has an adverse affect on fertility and feed intake that may lead to energy deficiencies. As far as the trace minerals are concerned, selenium plays a key role in preventing retained placentas. Lack of selenium also may play a role in early embryonic deaths. Copper also plays a role in early embryonic death as well as reduced estrus activity. Zinc can cause many fetal abnormalities, and finally cobalt plays a role in a delayed onset of puberty. Selenium deficiency has also been related to abortions, embryonic fetal loss, poor fertility, metritis in addition to wellknown incidence of retained placenta.



The feedstuffs used in animal's diet though contain appreciable amount of minerals but most of the time these elements are in a form that renders them unavailable and utilization.

The supplementation of mineral mixture/area specific mineral mixture has been found beneficial in improving mineral status of the animals resulting in enhanced reproductive performance with varied level of response. The commercially available chelated mineral (mineral-organic complex) preparations can give better response due to their better bio-availability.

Vitamins

Vitamin A is the most common vitamin, deficient in cows. Vitamin A is a key for healthy epithelial tissue that lines the reproductive tract. In vitamin A deficiency, the epithelial lining of reproductive tract becomes hard and cracks leading to an increased incidence of infections and abnormalities in the reproductive tract. Vitamin A is clearly needed in steroidogenesis. Higher vitamin A concentrations are found in non-atretic follicles and this might indicate a role of vitamin A in follicular development. It is known that vitamin A influences the Cholesterol Side Chain Cleavage Enzyme that converts cholesterol to pregnenolone and also the enzyme that converts pregnenolone to progesterone. Beta-Chrotene, a precursor of vitamin A is abundant in fresh green fodder. Vitamin D is necessary for normal calcium and phosphorus metabolism and thus affects reproduction indirectly. Vitamin E has definite interrelation with Selenium and thus has been found to cause reproductive failure in dairy

animals though the exact mechanism is still debated.

Salient Features

Reproductive performance is affected by how cows are fed during the dry period and throughout early lactation.

Balanced concentrate mixture/compounded feed be given in addition to roughage component of the ration.

The body condition of the cow should be monitored.

The feeding program be closely monitored

After calving, the feeding program be designed to maximize energy intake so a positive energy balance can be achieved early in lactation.

Cows and early lactating cows be fed rations containing 35 to 40% bypass protein.

High levels of degradable protein in early lactation that increase the amount of nitrogenous nutrients to ruminant tissues that may affect reproduction by toxic effects of ammonia on sperm cells, ova and embryo viability be avoided

Minerals and Vitamins supplementation be given. Use of chelated mineral preparations may be tried for better results due to their bioavailability.

Use of vegetable oils, whole cottonseed, bypass fats as a feed supplement can help in minimising effects of negative energy balance causing poor reproductive efficiency.



Herbal Supplements in the Treatment of Liver Diseases in Dogs

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Introduction

Experimental evidences have clearly established that herbal antioxidants effectively protect cell damage, induced by the reactive oxygen species: super oxide anion O₂⁻, reactive hydroxyl radical OH (Zielinska-Przyjemska et al., 2006; Agrawal, 2008; Sahni et al., 2010) and hydrogen peroxide, released in vivo by xenobiotics (Roy et al., 2009). An added advantage of herbal antioxidants is the total absence of their adverse side effects. As no potent synthetic hepatoprotective-cum-hepatogenic is available, till date, the medicinal properties of beneficial herbs and clinical application of herbal preparations in liver disorders in dogs are highlighted in this communication.

Milk Thistle (*Silibum marianum*, 'Bhatkattiya' in Hindi)

Milk thistle, a unique flowering herb belonging to the Compositae family is highly effective in the treatment of chronic liver ailments in dogs (Agrawal, 2008). Flavonoid cytoprotective ingredients: silybin or silibinin, isosilybin A and B, silichristine, and silidianin (collectively named 'silymarin') have since been isolated from milk thistle, also named St. Mary's thistle, holy thistle, or wild artichoke in European countries.

In vitro studies (Zielinska-Przyjemska et al., 2006; Kokasal et al., 2009) have revealed that silymarin acts as a powerful anti-oxidant, dislodging highly deleterious reactive oxygen species from the functional hepatocytes. Silymarin also inhibits the synthesis of deleterious inflammatory agent, leucotrienes concomitant with enhanced synthesis of glutathione (G-SH), the most potent intracellular redox agent. Further, it stabilizes the mast cells containing inflammatory granules, and stimulates hepatic regeneration by replacing the damaged hepatocytes. In view of these unique medicinal properties, silymarin is routinely employed at the TVCC as the supportive agent of choice in dogs, referred for suspected hepatic disorders (Dixit et al., 2010). Use of silymarin is especially recommended during chemotherapy, heartworm infection, long-term antibiotic or corticosteroid therapy, or recovery from parvovirus infection. Acting as a highly potent cholagogue, silymarin also aids in fat digestion by stimulating the flow of bile.

On presentation at the clinics, dog patients may be harbouring advanced liver diseases such as hepatitis, often with concurrent inflammatory bowel syndrome (IBS), hepatic lipidosis (fatty liver) and cholangitis/ pericholangitis, malignancy, or secondary skin problems. After



confirmation through clinical examination and evaluation of the case history and lab diagnostic test reports, administration of milk thistle extract (standardized to contain 70% silymarin, preferably bound to phosphatidyl choline, PC to ensure increased bioavailability) is recommended @ 20 to 40 mg kg⁻¹ body weight t.i.d, PO. In other patients, a lower dose level @ 15 to 20 mg kg⁻¹ b.i.d., PO is adequate. The drug may, however, be administered with caution in pregnant/nursing females.

Neutraceutical silybin-PC complex in combination with vitamin E and zinc (MarinR) in the form of once-a-day chewable tablets is available in the USA. Several oral pharmaceutical formulations, incorporating silymarin alone or in combination with vitamins, are available also in India (Table 1).

The recommended daily dose of silymarin in adult dogs with liver ailments is 140 mg, PO b.i.d. or t.i.d. Plain silymarin preparations include SilybonR 70 mg and 140 mg tablets, and 35 mg 5ml⁻¹ suspension, SilimarR 70 mg and 140 mg capsules, and SivylarR 70 mg and 140 mg tablets, and 35 mg 5ml⁻¹ suspension. Combination silymarin preparations include LivbelR syrup comprising silymarin 35 mg in combination with vitamin B-complex and D-pantethenol, and SilyrinR capsule containing silymarin 140 mg fortified with B-complex. However, these medicinal preparations should never be used as daily feed supplement/ liver tonic in healthy subjects, because the normal hepatic function may be markedly compromised.

Dandelion (*Taraxacum officinale*, 'Dudal' in Hindi)

Extracts, infusions, and decoctions of Dandelion, a common garden weed with attractive small yellow flowers, contain anti-inflammatory phytochemicals that tone up the liver as well as gall bladder. The root extract, a potent cholagogue, effectively relieves hepatic congestion and ameliorates gall stones.

Licorice (*Glycyrrhiza glabra*, 'Mulethi' in Hindi)

Licorice contains the unique glycoside, glycyrrhizin which acts as potent anti-inflammatory agent by stimulating the adrenal gland. It is also beneficial in relieving hepatic toxicity. The herbal extract tones up the digestive system: hypertrophy of the lining epithelial cells promotes healing of gastric ulcers.

Artichoke (*Cynaria scolymus*, 'Hathi chak' in Hindi)

Extracts of artichoke promotes the flow of bile, and arrests degenerative liver disease (cirrhosis).

Other beneficial drugs

Recent clinical trials (Agrawal, 2008) have shown that Indian Echinacia (*Andrographis paniculata*, 'Kalamegh'), and Punarnava (*Boerhavia diffusa*, 'Raktachandan') are effective in relieving impaired hepatic function in dogs. Indian gooseberry (*Phyllanthus spp.*, 'Amla') is beneficial in hepatitis of viral/ bacterial aetiology, evidenced by normalization of elevated serum alanine amino-transferase (ALT/ SGPT) titre, a dependable liver function test in dogs. Grape seed and turmeric extracts are also beneficial.



Table 1. Herbal and conventional prescription drugs for acute/ chronic liver diseases in dogs

I. Basic drugs: Appetite stimulants, digestive enzymes and general tonics				
Name	Prep	Composition	Route	Dose
Digiplex	Liq	Diastase 6.2 g, pepsin 20 mg 10 ml-1	PO	5-10 ml, b.i.d.
Sporolac	Tab	Lactobacillus spp. (6 x 10 ⁶ spores tab-1)	PO	2-4 tab, b.i.d.
Unienzyme	Tab	Diastase 20 mg, papain 30 mg,	PO	1 tab, b.i.d./t.i.d.
Unienzyme	Liq	nicotinamide 24 mg	PO	5-10 ml, b.i.d.
Digyton	Liq	Diastase 20 mg, papain 60 mg Indigenous herbal blend	PO	1-2 ml, b.i.d. (small breeds) 3-4 ml, b.i.d. (large breeds)
II. Hepatobiliary drugs: Acute or chronic liver disorders and associated clinical states*				
Name	Prep	Composition	Route	Dose
Brotone	Liq	Extr. of fresh liver 1.25 g (7.5 mg cynocobalamine), yeast extr. 0.4 g, thiamine-HCl 2.5 mg, nicotinic acid 24 mg	PO	5 ml, b.i.d.
Livoferol	Liq	Ferrous gluconate 200 mg, ferrous chloride 80 mg, thiamine-HCl 5 mg, nicotinic acid 20 mg, nicotinamide 45 mg, calcium lactate 100 mg, liver fractions 150 mg (from 3.75 g fresh liver) 30 ml-1	PO	5-10 ml, b.i.d.
Livadex Forte	Inj	Pyridoxine-HCl 5 mg, lactic acid 10 mg, nicotinamide 100 mg, cynocobalamine 50 µg, choline-Cl 100 mg, crude extr. of 8 g fresh liver (≡ 2 µg cynocobalamine activity), ligocaine-HCl 10 mg ml-1	Inj	1-2 ml, i.m.
Liv 52 Vet	Liq	Indigenous herbal blend	PO	5-8 ml, b.i.d. (small breeds) 10-15 ml, b.i.d. (large breeds)
Silyrin	Cap	Silymarin 140 mg, vit B-complex 100 mg	PO	1 cap, OD (adult dogs)
Livbel	Syrup	Silymarin 35 mg, thiamine-HCl 1.5 mg, riboflavin 20 mg, Pyridoxine-HCl 1.5 mg, nicotinamide 20 mg, D-pantethenol 5 mg, cynocobalamine 1 µg ml-1	PO	10 ml, b.i.d. (adult dogs) 5 ml, b.i.d. (puppies)



Summary

Herbal supplements: extracts (tincture, infusion or decoction) of seeds, roots, leaves, or bark of milk thistle (silymarin), dandelion, licorice, artichoke, punarnava, etc. are now receiving increasing attention by pet physicians in India and abroad because of proven hepatoprotective-cum-hepatogenic action in the holistic treatment of chronic liver disorders in dogs. Herbal prescription drugs may be conveniently used in combination with some basic drugs (appetite stimulants, digestive enzymes, and general tonics) and hepatobiliary drugs (whole liver extract, lipotropic factors, multi-vitamin, mineral formulations) for effective management of hepatic dysfunction.

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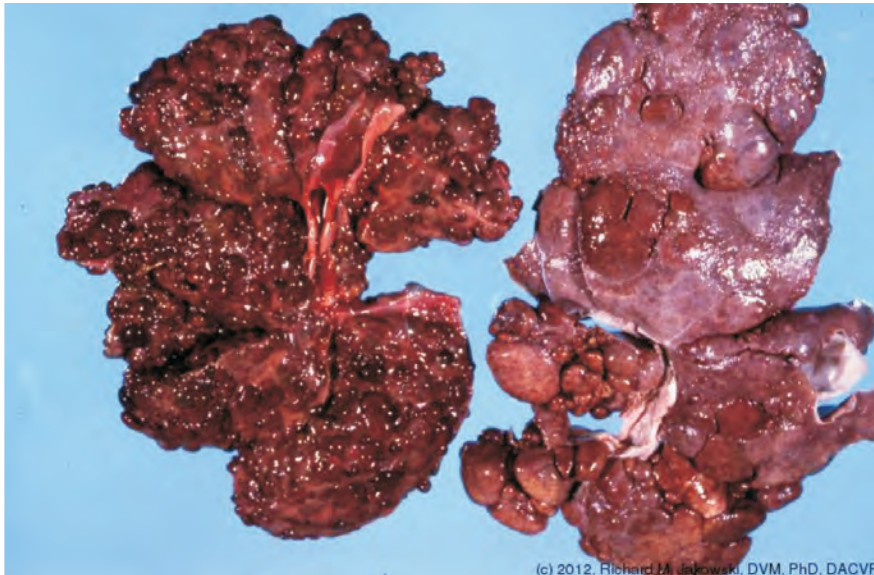
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Canine Liver - nodular cirrhosis



Studies on the Health Care Management Practices followed by the Sheep farmers in the North Coastal Zone of Andhra Pradesh

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Introduction

The sheep and goats in India are mostly reared by the landless labourers and marginal farmers, who are considered as the socially and economically disadvantaged sections in the rural society. About five million families are estimated to be engaged in various activities related to rearing of sheep and goats and utilizing their products. It provides gainful employment and income to the weaker sections especially to the rural poor. Many surveys had shown that on an average a small ruminant gives a return of Rs. 120-200 per animal. It provides meat for human diet, wool, skin and other products. They contribute about 0.77 million metric tones of meat in India which is 12.1 per cent of the total meat production in India (Integrated sample survey report 2007).

North coastal Andhra Pradesh comprising of Srikakulam, Vizianagaram and Visakhapatnam districts have the sheep population of 5.06, 3.92, and 2.7 millions respectively (Livestock census 2007) and their contribution is 4.5 per cent to the total sheep population of Andhra Pradesh. The mutton production of Andhra Pradesh is 117.2 million metric tones of which 9.16 million metric tones, (7.8 per cent) is contributed by North Coastal districts of Andhra Pradesh. However, the discouraging trend in growth of sheep population in India and

Andhra Pradesh over the four decades was mainly because of various reasons in sheep rearing like majority of the people involved in rearing of sheep are under age-old traditional systems of rearing without the knowledge of scientific methods, occurrence of epidemics, natural calamities and also mainly due to lack of feed resources. Knowledge about the health care management practices is necessary to identify the lacunae and to suggest for better health and performance of the animals. Keeping this in view, the present study was taken up to study the health care management practices of sheep in the North Coastal Zone of Andhra Pradesh of India.

Materials and Methods

The study was conducted in North Coastal agro climatic zone of Andhra Pradesh. The study was covered in hot humid areas of Srikakulam, Vizianagaram, and Vishakhapatnam districts based on sheep population according to livestock census of Andhra Pradesh 2007. The study location is given in Fig. 1. Selection of respondents was made by multistage stratified random sampling technique. In the first stage three districts of North coastal zone were selected. In the second stage, two divisions from each district were selected. From each selected division, four mandals and four villages were selected. From each village, 10



respondents were selected for the present study. On the basis of above classification, the study involved a total number of three districts, six divisions, twenty four mandals, ninety six villages, and nine hundred and sixty farmers forming the study group.

The structured and pre-tested interview schedules were filled on the spot by personal observations and face-to-face interview with sheep owners. The data on the health management of sheep was collected from the survey conducted during the period from 2008 - 2010 and analysed (Snedecor and Cochran 1994).

Results and Discussion

The sheep deworming details and the deworming agency in the study area is presented in Table 1. Majority of farmers practiced deworming at 6 months interval

(47.39%), followed at by 3 months (21.87%) and 12 months interval (16.97%), whereas 10.20% of sheep farmers do not deworm the sheep. Significant ($p < 0.01$) association was observed among the deworming frequency and districts. Pattanayak et al. (2003) observed a similar trend among Ganjam sheep rearers in Orissa. Sharma et al. (2007) reported that 74 per cent of goat rearers practiced deworming in Rajasthan. Majority (76.35%) of the sheep farmers, in the study area dewormed their sheep through Veterinarian, while 23.64 per cent of them practiced self deworming. Significant ($P < 0.01$) association was observed among the deworming agency and districts (X² test). The data clearly showed that only 1/4th of sheep farmers were clearly aware of the beneficial effects and need of deworming of the sheep whereas 3/4th of the farmers have dewormed on insistence of a Veterinarian only. Hence there is a need to create awareness on

Table 1 : Deworming details of sheep flocks in North Coastal Zone

Deworming frequency	Srikakulam n=320	Per cent	Vizianagaram n=320	Per cent	Visakhapatnam n=320	Per cent	North Coastal zone n=960	Per cent
3 months	75	23.43	69	21.56	66	20.62	210	21.87
6 months	172	53.75	212	66.25	105	32.82	489	47.39
12 months	49	15.31	39	12.18	75	23.43	163	16.97
Not practicing	24	7.50	0	0.00	74	23.12	98	10.20
Total	320		320		320		960	
Deworming Agency								
Self	39	12.18	90	28.12	98	30.62	227	23.64
Vet	281	87.81	230	71.87	222	69.38	733	76.35
Total	320		320		320		960	
Deworming cost Rs./dose/year	6.4^a ± 0.19		5.78^{ab} ± 0.13		4.88^b ± 0.21		5.69 ± 0.18	

a,b values with superscripts row wise differ significantly ($P \leq 0.01$)



regular deworming practice and selection of deworming drug in relation to topography and parasitic species prevalent in the Zone. This indicated that the farmers of the study area depend on Veterinarians for deworming their flocks.

The mean deworming cost (Rs) per sheep in a year in three districts ranged from 4.88 ± 0.21 to 6.40 ± 0.19 with a mean cost of 5.69 ± 0.18 in the North Coastal Zone. The deworming cost per dose was found to be significantly ($p < 0.01$) different among the three districts (Table 2). These findings were similar to the finding of Anthra Report, 1995 who reported the expenditure of Rs. 3.50-9.00 per sheep / annum.

The vaccination practices by the sheep farmers in the study area is presented in the Table 2. The sheep farmers of the North Coastal Zone

followed vaccination of sheep flocks mainly against Enterotoxaemia (87.60%) followed by Foot and mouth disease (71.87%), PPR (67.18%), sheep pox (43.54%). and Anthrax (10.31%). Significant ($P < 0.01$) association was observed among the vaccination practices and within districts. Wide coverage of vaccination programme by the Department of Animal Husbandry from the danger of certain infectious diseases of zoonotic importance like anthrax would have resulted in the protection of sheep flocks in Zone. The findings were well in agreement with Rajapandi (2005) who reported that Coimbatore sheep flocks were also vaccinated these diseases. A small portion of farmers (12.70%) in the North Coastal Zone were not following vaccination practice. Bose et al. (1999) and Pattanayak et al. (2003) observed a similar trend in their findings.

Table 2 : Vaccination of sheep farmers in North Coastal Zone

Diseases	Srikakulam n=320	Per cent	Vizianagaram n=320	Per cent	Visakhapatnam n=320	Per cent	North Coastal zone n=960	Per cent
Enterotoxaemia	279	87.18	311	97.18	251	78.43	841	87.60
Foot and Mouth Disease	265	82.81	265	82.81	160	50.0	690	71.87
Sheep pox	170	53.12	177	55.31	71	22.18	418	43.54
Anthrax	0	0.00	0	0.0	99	30.93	99	10.31
Blue tongue	0	0.00	0	0.0	0	0.0	0.0	0.0
Peste-des-petits ruminants	249	77.81	258	80.62	138	43.12	645	67.18
Vaccination not followed	9	2.81	0	0.0	113	55.31	122	12.70



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Biochemical Characterization of *Escherichia coli* Isolates from Primary Sources of Infection in Neonatal Calf Diarrhoea

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Introduction

In neonatal calf diarrhoea, whereas *E. coli* infection induces purgation early during the first 10 days post-partum, *Salmonella* spp. produces the malady subsequently (Naylor, 2005). Soiling of the dam's teats with entero-pathogenic bacteria appears to be a major source of infection. In this communication, the isolation and biochemical characterization of *E. coli* in a specific micro-environment, represented by three large dairy farms in and around Jabalpur city in Central India is reported.

Materials And Methods

Faecal samples from diarrhoeic calves on day 0 (before treatment) were obtained from the University Composite Livestock Dairy Farm, Adhartal, Military Dairy Farm, Cantt., and a privately owned dairy farm at Pariyat, located in and around Jabalpur, M.P. Water, soil, environment (calf shed atmospheric air), and randomly collected faecal samples were processed for the biochemical characterization (catalase, oxidase, citrate, indole, H₂S production, citrate, urease, M.R., V.P. and sugar fermentation reactions), and motility test.

Water samples from the calf dwellings were

collected in special glass bottles containing KO₂O Hi H₂STM Test strips for the simultaneous detection of *E. coli* and *Salmonella* spp. (Hi Media). Soil samples (deep mud scrapings) from the calf dwellings, collected in sterile zip lock bags, were mixed well (1:1) with pH 7.2 phosphate buffer saline (PBS) solution. Environmental samples, obtained by 15 minutes exposure of freshly prepared sterile blood agar plates to atmospheric air in the calf dwellings were kept chilled (40 C). Faecal samples (10% suspension in PBS solution), collected in sterile zip lock bags and kept chilled on ice packs were processed within 4-6 hours. Freshly prepared culture media for enrichment, isolation and screening of the entero-pathogens (Cheesebrough, 1994; Collee, 1996) were sterilized by autoclaving (7 kg, 15 minutes). Contamination was checked (incubating at 370





C, 24 hr), prior to culture. Standard procedures for the simultaneous isolation of *E. coli* and *Salmonella* spp. (Edwards and Ewing, 1972) were followed.

Water sample was collected up to the mark in the suitably labeled tube, allowing the chemically pre-treated paper strip (Hi Media) to soak well, shaken gently and stored (R.T.). Blackening of the paper strip was suggestive of the presence of *E. coli* and/or *Salmonella* spp. Each water sample/ haemolytic *E. coli* colony from the air sample was streaked on a fresh MCA plate. Each soil sample (50%)/ faecal sample (10%) suspension in PBS solution was streaked on a BA plate, and concurrently inoculated into TTB tube and then incubated (370 C, 24 hr). The primary colonies, obtained from all four possible sources of infection, were streaked individually on fresh MCA plates and incubated (370 C). Discrete pink colonies indicated the presence of *E. coli*; white to pale orange colonies suggestive of *Salmonella* species were absent. For the laboratory maintenance, coded primary bacterial isolates were sub-cultured by streaking on NA slants and

incubating (370 C, 24 hr) at regular 2-week intervals. Standard procedures, routinely followed for the morphological and biochemical characterization (Edwards and Ewing, 1972; Barrow and Felham, 1993) were followed. Grams method with the KOO1 kit (Hi Media) was used for staining.

Results And Discussion

Of total 70 samples, collected aseptically from four different possible sources of infection (Table 1), 48 (68.5%) yielded bacterial isolates. Characteristic lactose-fermenting pink colonies on MCA plates, suggestive of *E. coli*, were shown to be Grams -ve coccobacilli by staining and microscopic examination (1000 X). Further, these were characterized as *E. coli* on the basis of standard biochemical reactions (indole, MR, catalase, and nitrate +ve, and V.P. and oxidase -ve). Of these, 46 were motile. It is noteworthy that, in the present study, no *Salmonella* spp. could be detected in any of the four presumptive sources of infection: water, soil, air and faeces. Higher mortality rate in calf

Source of infection	No of samples tested	No of <i>E.coli</i> +ve samples	No of <i>Salmonella</i> +ve samples	Total number of +ve samples
Water	10	8 (80%)	Nil (0%)	8 (80%)
Soil**	10	7 (70%)	Nil (0%)	7 (70%)
Environment***	10	9 (90%)	Nil (0%)	9 (90%)
Faecal samples	40	24 (60%)	Nil (0%)	24 (60%)

* Lactose-fermenting pink colonies ** Deep mud scrapings *** calf shed atmospheric air

® In large dairy units in and around Jabalpur, M.P.



diarrhoea resulting from *E. coli* infection, compared to other aetiological agents (Moon et al., 1976) is primarily attributable to the systemic disturbances: deranged water and electrolyte homeostasis, often culminating in morbidity and mortality (Roy and Fernandes, 2007). In perspective, we recommend the regular use of water sprinklers, especially in the summer season with periodical microbiological monitoring of all likely sources of infection by veterinary specialists with lab back-up is recommended.

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News.... National....

Shrinidhi, a promising dual purpose poultry strain for backyard farming



Hyderabad: A new promising dual purpose poultry strain 'Shrinidhi' has been released for backyard poultry farming by Project Directorate on Poultry, Hyderabad in March 2013.

On evaluation twice for the full length production cycle of 2 weeks at the Institute Farm, the newly evolved strain had juvenile body weight of 650 gm at 6th week and males weighed 2553 gm at 15th week. The age at sexual maturity was 161 days. The egg production upto 40 weeks of age was 90 eggs and annual egg production of 228 eggs under intensive management. The survivability was more than 95%.

On testing under backyard conditions in Tripura, Jharkhand and Andhra Pradesh, the juvenile body weight at 6th week of age was 500-500 gm, the age at sexual maturity was 171 - 175 days, egg production upto 40 weeks of age was 50-60 eggs and the annual egg production of 150 eggs.

'Shrinidhi' has a beautiful multicolour plumage, larger shanks, coloured and bigger eggs (53-55 gm), all the characters favored under backyard poultry farming.

Source: ICAR Reporter

'Swaran'- World's 2nd cloned buffalo male calf born

Karnal : Subsequent to 'Shreshth', born in August 2010 as the first cloned buffalo male calf, the World's second cloned buffalo male calf 'Swaran' has been produced at National Dairy Research Institute, Karnal on 18th March 2013, through a new 'Hand guided cloning technique. The birth was normal and the birth weight of the calf was 55 kilograms.

Swaran is unique and is different from the earlier clone in the sense that the donor somatic cell used was obtained from the seminal plasma of a buffalo bull which is being currently used to obtain frozen semen doses at Animal Breeding Research Centre at NDRI, Karnal.

Scientists at NDRI feel that with the same approach, they would be able to recreate highly valuable progeny tested bulls by using the frozen semen of bulls which may have died long back.



90

Source: ICAR Reporter



Guidelines To Contributors

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

The manuscript should be arranged in the following order:

Title:

Name/s of author/s:

Place of work :

Introduction :

Material and Methods : In details

Results and Discussions :

Summary / Conclusions :

Acknowledgment : If necessary

References :

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

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

Tables and Figures: Tables are to be numbered in Roman numbers (1 II and so on). Each table should have a clear title. Figures should be of good quality and numbered in Arabic numbers (1,2,3 and so on).

Clinical articles and short communications: Not exceeding 3 to 4 typed pages. In case reports, history, observation, tentative and confirmatory diagnosis, line of treatment and follow up on the case should be given. Trade names of drugs should be given in the Material & Methods and their details like

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Authors are requested to confirm that the paper has not been published elsewhere and also to indicate details of postal address for communication with STD code, telephone/fax number, mobile & email.

All manuscripts should be mailed to the following address:

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MSD Animal Health,
Intervet India Pvt. Ltd.

Intervet House, 33, Pune-Nagar Road, (Behind Eden Gardens), Pune - 411014, India

Tel. (Direct): +91-20 66050434. Fax: +91-20-66050403,

Mobile : 09890623470. Email: bluecrossbook.india@merck.com



Project Directorate on Animal Disease Monitoring and Surveillance, Hebbal, Bengaluru



Proposed New Building of PD_ADMAS, Yelahanka, Bengaluru

India has the world's largest livestock population distributed in different geo-agro-climatic conditions with varying management, migratory, health care and zoo-sanitary practices. Animal health is the backbone of the rapidly growing livestock industry. Further, the current magnitude of animal disease situation in the country is a matter of concern due to considerable economic losses. Establishment of early warning surveillance systems, preparing for, investigating and responding to priority animal diseases is very much critical in reducing morbidity and mortality in vulnerable livestock populations, keeping in view of protection of animal health security. Delay in the detection of outbreaks and inadequate preparedness and response aggravates the impact of spread of diseases, leading to increased number of cases, longer duration of epidemics, excess mortality and the potential for spread to other areas regionally, nationally or globally. As there was no organized disease reporting, monitoring,

surveillance and forecasting system for a planned approach to livestock health care and production in the country, the Indian Council of Research (ICAR) initiated All India Co-ordinated Research Project on Animal Disease Monitoring and Surveillance (AICRP-ADMAS) in the VII five year plan and it became fully functional during the last quarter of 1987 with the establishment of four Regional Research Units (RRUs), located at Bengaluru, Hyderabad, Pune and Ludhiana. The Central Coordinating Unit (CCU) was established at the Institute of Animal Health and Veterinary Biologicals, Bengaluru to coordinate research activities of the regional units. ADMAS was further strengthened in the VIII plan with support of ICAR and European Union by giving the responsibility of the National Project on Rinderpest Eradication (NPRE) involving the participation of 32 state level diagnostic/disease investigation laboratories. Later, realizing the impact of animal disease monitoring and



surveillance on our entire livestock sector and to give a boost, ICAR upgraded this project to an independent status on 1st April, 2000 (during the IX plan) as –“Project Directorate on Animal Disease Monitoring and Surveillance (PD_ADMAS)” with ten AICRP –ADMAS centres. The directorate got further impetus

with addition of five more AICRP-ADMAS centres in the X plan. It is proposed to rename the directorate as National Institute of Veterinary Epidemiology and Disease Informatics (NIVEDI) with 31 AICRP-ADMAS centres across the country.

Research Achievements

1. Module for forecasting of livestock diseases – National Animal Disease Referral Expert System (NADRES) (www.nadres.res.in)

- It is a web based dynamic and interactive livestock disease relational database supported by Geographic Information System (GIS) which serves as Epidemiology software.
- A Forecasting module developed for predicting possible occurrence of 15 nationally important livestock diseases two months in advance in the country.
- Useful for field veterinarians, policy makers, administrators, technocrats, research personnel, farmers, veterinary colleges and students.

2. India.admas Epittrak (Offline epidemiological database software)

- This offline software is for epidemiological analysis. It has been included as curriculum for B.V.Sc. syllabus (Veterinary Council of India)

3. National Livestock Serum Repository (NLSR)

- Unique of its kind, NLSR has been developed for retrospective epidemiological studies.
- Microsoft access based software developed for cataloguing of livestock serum.

4. Livestock demography and development of disease related databases/softwares/models

- Twenty five years livestock demographic and disease related databases at district, state, regional and national levels have been computerized.
- Epidemiological analysis on disease morbidity and mortality profiles has resulted in prioritizing diseases at the above levels for instituting control measures.
- In-depth time and location specific geo-agro-met-ecological precipitating factors associated with several endemic diseases have been identified in terms of short and long term seasonal trends.
- Geographic Information System (GIS) maps were developed to indicate the intensity of diseases in the country.
- Sampling frame for epidemiological investigation of livestock diseases developed.
- Bluetongue disease mar for Karnataka state developed.
- Eco-pathozones for the economically important livestock diseases identified.
- Seroprevalence of Brucellosis, Infectious Bovine Rhinotracheitis (IBR), Peste des petits ruminants (PPR), Classical Swine Fever (CSF) and Neosporosis (*Neospora caninum*)



Commercial Technologies

▶ AB_ELISA kit for Infectious Bovine Rhinotracheitis

- Highly sensitive indirect ELISA kit for detection of antibodies against BoHV-1 infection in cattle and buffaloes.
- Widely used in population survey of IBR in India. User friendly kit and needs no specific training.
- The kit has been internationally validated by International Atomic Energy Agency (IAEA).

▶ AB_ELISA kit for Brucellosis

- Highly sensitive test for detection of antibodies against Brucella infection in cattle and buffaloes.
- The kit has been widely used throughout the country for population survey.
- The kit has been widely used throughout the for population survey.
- The kit has been internationally validated by International Atomic Energy Agency (IAEA).

▶ Protein-G ELISA kit for Brucellosis

- Common protein –G conjugate ELISA is used for screening of brucellosis in cattle, camel and horses.
- This is robust and stable with one conjugate and is highly useful in the field lab conditions.

▶ Indirect ELISA kit for Sheep and Goat Brucellosis

- For screening of brucellosis in sheep and goats.
- Indian patent has been granted to this technology (Patent No. 250709).

▶ Leptospira Staining kit

- Leptospira are extremely thin, elongate and thickly wound spiral organism (0.1 to 20µm). This kit can be used for demonstration of their morphological features including fine coils with clear background of stained slides.
- It can be utilized for identification / morphology of leptospira and diagnosis of the leptospirosis.

Technologies

Transport medium for sending clinical samples to the laboratory for isolation of leptospire.

- Multiplex PCR for detection of Streptococcus species directly from mastitic milk.
- Multiplex PCR for detection of Staphylococcus species directly from mastitic milk.
- Multiplex PCR (two tube format) assay for the simultaneous detection of ten most common mastitis pathogens.

- Multiplex PCR for differentiation of Brucella species.
- Multiplex PCR for detection and differentiation of leptospire.
- PCR based diagnosis for the detection of latent infection of surra.
- RT-PCR for detection for Classical swine fever.

The Science of Healthier Animals™





NEW INTRODUCTION

Estrumate™ *The Global Brand...*

Available in
20 ml vial



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

COMPOSITION

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

INDICATIONS

Induction of luteolysis in dairy cattle and horses-

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

DOSAGE AND ADMINISTRATION

Cattle - 2.0 ml by IM route Ponies - 0.5-1.0 ml by IM route
Thoroughbreds, hunters and heavy horses 1.0-2.0 ml by IM route

TEFROCEF *A Solution to Many Problems...*

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



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

COMPOSITION

Ceftiofur Sodium sterile powder equivalent to Ceftiofur.....1g
One ampoule of sterile water for Inj. IP20ml

INDICATIONS

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

DOSAGE AND ADMINISTRATION

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



NEW INTRODUCTION

LactAid™ Oral POWER

The **P**owerful Health Tonic...

COMPOSITION

Each 100 ml oral solution contains ...

Calcium ... 3500mg	Phosphorus...1750 mg	Zinc...100 mg
Vitamin D3...15000...	Vitamin B12...200 mcg	Chromium...4 mg
Carbohydrate...40,000 mg		

INDICATIONS

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

DOSAGE AND ADMINISTRATION

25-40 ml twice daily by Oral Route

PRESENTATION

1 ltr & 5 ltr jars



Ovilis® PPR



COMPOSITION

Live attenuated PPR virus with NLT 10^{2.5} TCID₅₀ per dose with suitable freeze drying stabilizer.

INDICATIONS

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

DOSAGE AND ADMINISTRATION

1 ml per animal by subcutaneous route.

PRESENTATION

Vials of 100/50/25 doses.



NEW INTRODUCTION

Nobivac[®] KC

COMPOSITION

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

INDICATIONS

Vaccination against “Kennel Cough”

DOSAGE AND ADMINISTRATION

Nobivac[®] KC aims to make administration as easy as possible:

- Low 0.4 ml dose
- Single nostril only
- Can be used with or without applicator

PRESENTATION

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



COMPOSITION

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

INDICATIONS

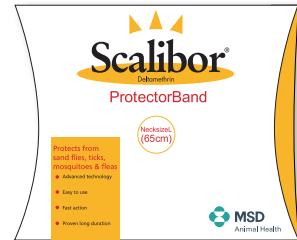
- Anti tick, anti flea, anti sandfly and anti sandfly.

DOSAGE AND ADMINISTRATION

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

PRESENTATION

6x65 cm and 6x48 cm.



Cell Associated Vaccine

Innovax[®] ND-SB1

COMPOSITION

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

INDICATIONS

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

DOSAGE AND ADMINISTRATION

0.2 ml injection subcutaneously per chick in the neck

PRESENTATION

2000ds & 4000ds ampoules





HORMONES

Receptal® VET.

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
			Each ml contains : Buserelin acetate 0.0042 mg equivalent to 0.004 mg buserelin.

CHORULON®

COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each vial contains human Chorionic Gonadotrophin (hCG) as a white freeze- dried crystalline powder (1500 IU)	<ul style="list-style-type: none"> • Improvement of conception rate (cows/buffaloes) • Enhancement of luteal function post AI • Cystic Ovarian Disease (anoestrus, prolonged estrus, nymphomania) • Induction of ovulation (mares) 	1500 IU at AI or mating, IM or IV 1500 IU, 4-6 days post AI, IM 3000 IU, IV 1500-3000 IU, IM or IV, 24 hours before AI/mating	Box containing 5 vials (1500 IU each) with 5 vials of solvent WITHDRAWAL PERIOD Milk : 0 (Zero) days Meat : 0 (Zero) days

FOLLIGON®

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

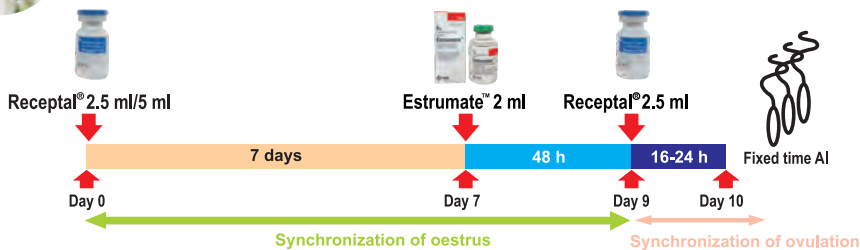


Making calf a year a reality




Oestrus Management in Dairy Cattle


Goal: One Calf per Cow per Year








ANTI-INFECTIVE

 COBACTAN[®] 2.5% <small>ACHIEVE MORE</small>				
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION	
Each ml of suspension contains 29.04 mg Cefquinome Sulphate (equivalent to 25 mg Cefquinome).	Cattle <ul style="list-style-type: none"> Respiratory disease caused by <i>Pasteurella multocida</i> and <i>Mannheimia haemolytica</i> Digital dermatitis, infectious bulbar necrosis and acute interdigital necrobacillosis (foul in the foot) Acute <i>E. coli</i> mastitis with signs of systemic involvement Calf <ul style="list-style-type: none"> <i>E. coli</i> septicaemia 	1 mg cefquinome/kg bw MI (2ml/50 kg bw) 1 mg cefquinome/kg bw MI (2ml/50 kg bw) 1 mg cefquinome/kg bw MI (2ml/50 kg bw) 2 mg cefquinome/kg bw MI (4ml/50 kg bw)	50 ml multidose vial. WITHDRAWAL PERIOD Milk : 1 day Meat : 5 days	

 COBACTAN[®] LC <small>ACHIEVE MORE</small>				
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 <i>Staphylococcus aureus</i> , <i>Streptococcus uberis</i> , <i>Streptococcus dysgalactiae</i> , <i>Escherichia coli</i> & other entero-bacteria susceptible to cefquinome.	Gently infuse the contents of one syringe into the teat canal of the infected quarter every 12 hours after each of 3 successive milkings. Milk out the affected quarter (s). After thoroughly cleaning & disinfecting the teat & teat orifice, gently infuse the contents of one syringe into affected quarter. Disperse the product by gently massaging the teat & udder of the affected animal.	Box of 3 injectors with 3 isopropyl alcohol soaked towels WITHDRAWAL PERIOD Milk : 84 hours Meat : 2 days	

Floxidin[®] VET				
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION	
 Floxidin 10% injection : Each ml contains - Enrofloxacin 100 mg	<ul style="list-style-type: none"> Alimentary canal e.g. Enteritis, calf scours. Respiratory tract e.g. Pneumonia Urogenital system e.g. Metritis, cystitis Skin e.g. Bacterial dermatitis, pyodermia. 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 <div style="border: 1px solid black; border-radius: 50%; padding: 5px; display: inline-block;"> Now also available 100 ml </div> WITHDRAWAL PERIOD Milk : 3.5 days Meat : 14 days	

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

METRICEF[™]				
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION	
 Each single dose syringe of 19 g contains: Cephapirin - 500 mg (as benzathine) Excipient to - 19 g	<ul style="list-style-type: none"> Subacute/chronic endometritis in cows over 14 days postpartum Repeat breeders (3 or more unsuccessful inseminations). 	Single dose syringe to be administered intra-uterinely	Single dose (19 g) syringe provided with a separate disposable catheter and a glove.	



PARASITE CONTROL

butox[®] Vet

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



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

Taktic[®] 12.5% EC

Broad spectrum ectoparasiticide against ticks, mites, lice & keds



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

Panacur[®] VET



COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
The active ingredient of Panacur is Fenbendazole which is the research product of Intervet/Schering-Plough Animal Health. Each 1.5 g Bolus contains 1.5 g of active Fenbendazole. Each 150 mg tablet contains 150 mg of active Fenbendazole.	Infestation of cattle, buffaloes, sheep, goat & horses with gastro-intestinal nematodes, lungworms & tapeworms such as <i>Haemonchus spp.</i> , <i>Ostertagia spp.</i> , <i>Trichostrongylus spp.</i> , <i>Cooperia spp.</i> and <i>Nematodirus spp.</i>	Recommended for cattle, sheep, goat, horses & pigs. Panacur 150 mg table per 30 kg body weight & Panacur 1.5 gm bolus per 300 kg body weight (5 mg Fenbendazole per kg body weight). Dose for horses : 7.5mg/kg bw	Box of 5 x 2'- 1.5 gm bolus Box of 5 x 2'- 3 gm bolus Box of 5 x 10'- 150 mg tablets. WITHDRAWAL PERIOD Milk : 0 (Zero) day Meat : 8 days


Panacur[®] VET Powder





COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each gram contains Fenbendazole I.P (Vet) 250 mg	Infestations of cattle, buffaloes, Sheep & goats with gastro-intestinal nematodes, lungworms & tapeworms such as <i>Haemonchus spp.</i> , <i>Ostertagia spp.</i> , <i>Trichostrongylus spp.</i> , <i>Cooperia spp.</i> , <i>Nematodirus spp.</i> , <i>Neoascaris vitulorum</i> , <i>Oesophagostomum spp.</i> , <i>Chabertia spp.</i> , <i>Bunostomum spp.</i> , <i>Gaigeria pachyscelis</i> , <i>Capillaria</i> , <i>Trichuris spp.</i> , <i>Strongyloides spp.</i> , <i>Dictyocaulus filaria</i> , <i>Dictyocaulus viviparus</i> , <i>Moniezia spp.</i> , Infestation of dogs with <i>Ancylostoma spp.</i> , Infestation of horses with <i>strongyles</i> , <i>Ascarids</i> , <i>Ascaris (Parascaris)</i> , <i>Oxyuris</i> & <i>Strongyloides</i> Infestation of pigs with <i>Hyostrongylus rubidus</i> , <i>Oesophagostomum spp.</i> , <i>Ascaris suum</i> , <i>Trichuris suis</i> & <i>Metastrongylus spp.</i>	Recommended for cattle, sheep, goat & pigs. Infestation with gastrointestinal nematodes & lungworms : (5 mg Fenbendazole per kg body weight) Suspension to be made by mixing clean water as: 6 g with 100 ml 60 g with 1 lit. 120 g with 2 lit.	6 g sachet, 60 g & 120 g container WITHDRAWAL PERIOD Milk : 0 (Zero) day Meat : 8 days




PARASITE CONTROL

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

Tolzan® Plus-L			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Oxyclozanide3.4% Levamisole Hydrochloride.....2.5%</p>	<ul style="list-style-type: none"> Tolzan Plus-L treats the round worms and liver flukes in cattle, sheep and goats Tolzan Plus-L controls adult and immature stages of conical flukes also (Paramphistomum spp.) 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. 	<p>Cattle: 90 ml for 300 kg live mass PO Sheep and goats: 9 ml for 30 kg live mass PO</p>	<p>120 ml HDPE bottle, 1 Ltr can</p>
			<p>WITHDRAWAL PERIOD Milk : 0 (Zero) days Meat : 14 days</p>

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

Berenil® VET 7% RTU			
As treatment & control therapy of Babesiosis, Trypanosomiasis and Theileriosis			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each ml contains : Diminazine Aceturate 70 mg Phenazone B. P. 375 mg</p>	<p>Babesiosis & Trypanosomiasis, Tenacious Trypanosomiasis, Theileriosis & mixed infections, Pyrexia of Unknown Origin</p>	<p>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)</p>	<p>Amber coloured vials of 20 ml, 30 ml and 90 ml</p>
			<p>WITHDRAWAL PERIOD Milk : 3 days Meat : 20 days</p>



SUPPORTIVES

Tonophosphan® VET

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



COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ml contains : Sodium salt of 4-dimethylamine, 2-methylphenyl-phosphinic acid 0.2 g	As a tonic in general metabolic disorders, debility, exhaustion, repeat breeding & infertility due to phosphorus deficiency. For disorders of bone formation as in rickets & osteomalacia. To promote callus formation in fractures in combination with calcium & vitamin D. For treatment of tetany & paresis resulting from calcium, magnesium & phosphorus imbalance (as in milk fever).	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

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): Cobalt 150 mg Vit A 1200000 IU Copper 2200 mg Vit D3 120000 IU Iodine 325 mg Vit K 200 mg Iron 2500 mg Vit E 500 IU Magnesium 2500 mg Calcium 225 g Manganese 2200 mg Phosphorus 90 g Potassium 100 mg Niacinamide 1000 mg Sodium 8 mg Biotin 2% 500 mg Sulphur 1% Bioactive Zinc 9000 mg chromium 65 mg	<ul style="list-style-type: none"> To improve on fertility To safeguard health and growth. To optimize milk yield and fat. 	Ruminants Mix 100-200 g per 10 kg of feed depending on the availability of other fodder/feed. For direct feeding, Cow and Buffalo: 25-30 g/head/day Calf, Sheep and Goat: 15-20 g/head/day Aqua: Mix 100g to 10 kg of fish feed.	25 kg Sealed bag




SUPPORTIVES

Rumicare® Vet			
Normalises milk production by restoring ruminal activity.			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each gm powder contains : Calcium Propionate 480.00 mg Methionine 40.00 mg Picrorhiza Dry Extract 2.00 mg Cobalt Gluconate 0.32 mg Vitamin B6 IP 0.32 mg Dextrose Anhydrous IP 428.00 mg</p>	<p>Bloat, digestive disorders caused by decreased activity of reticulum & rumen or sudden dietary changes &/ or intoxication. As a supportive therapy in diseases caused by foreign bodies & hypo-glycaemic conditions in cattle, calves, sheep & goats.</p>	<p>Adult Cattle : 125 gm sachet twice daily, (once in 12 hours) Young Animals : 65 gm (approx) once or twice daily Sheep & Goat : 32 gm once or twice daily</p>	<p>125 g & 500 g sachet</p>


Avilin® VET			
For quick relief from allergic manifestations.			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each ml contains: Pheniramine maleate IP 22.75 mg.</p>	<p>Itching due to eczema, dermatitis, urticaria, skin oedema, insect bites, photo-dermatitis, rhinitis, tail eczema in horses, stomatitis & inflammation of the hooves of cattle, serum sickness, paresis during pregnancy, toxæmia & retention of placenta, pulmonary oedema in cattle, pulmonary emphysema in horses.</p>	<p>Large animals : 5-10 ml. Small animals : 0.5-1 ml. or more. By IM or IV route</p>	<p>Amber coloured vial of Avil 10 ml and 33 ml</p> <p>WITHDRAWAL PERIOD Milk : 2 days Meat : 7 days</p>


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


Vetalgin™ VET			
Highly effective analgesic, antispasmodic, antirheumatic & antipyretic agent.			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each ml contains : Analgin I.P. Chlorbutal (as bacteriostat) 0.4% w/v</p>	<p>For relief from pain, fever, labour, spastic condition of cervix during parturition, rheumatic conditions, neuritis, neuralgia, retention of placenta, dysentery, bloat & gastritis in domestic animals.</p>	<p>Preferably intravenous, otherwise intramuscular or combination of IV/IM injection.</p> <p>Horse : 20-60 ml Cattle : 20-40 ml Foal, Calf : 5-15 ml Sheep, Goat : 2-8 ml Pig : 10-30 ml Dog : 1-5 ml</p>	<p>Vial of 33 ml</p> <p>WITHDRAWAL PERIOD Milk : 2 days Meat : Cattle 12 days/Pig 3 days & Horse IV 5 days</p>





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


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


	BOVILIS™ ET			
	COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
	The vaccine contains highly immunogenic toxoids of <i>Clostridium perfringens</i> 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 <i>Clostridium perfringens</i> 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 ana-cultures of <i>Clostridium perfringens</i> 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 <i>Clostridium perfringens</i> 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
 <p>Each dose contains live attenuated strains of : Canine Parvo virus (strain CPV 154) $\geq 10^7$ TCID₅₀ Canine Distemper virus (strain Onderstepoort) $\geq 10^5$ TCID₅₀</p>	<p>Vaccination against CDV and CPV. Efficacious in puppies with maternal antibodies.</p>	<p>Reconstitute one vial of Nobivac Puppy DP in one vial of Nobivac Solvent & inject subcutaneously.</p>	<p>One box contains 10 vials of 1 dose.</p>

Nobivac®:DHPPi			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each dose contains live attenuated strains of : Canine Parvo virus (strain CPV 154) $\geq 10^7$ TCID₅₀ Canine Distemper virus (strain Onderstepoort) $\geq 10^5$ TCID₅₀ Canine Adeno virus type 2 (strain Manhattan LPV3) $\geq 10^8$ TCID₅₀ Canine Para-influenza virus (strain Cornell) $\geq 10^{5.5}$ TCID₅₀</p>	<p>Vaccination against CDV, CAV2, CPV & CPI. Besides providing protection against CAV2 disease entities such as respiratory tract infections, the vaccine also protects against infectious canine hepatitis (ICH) caused by CAV1.</p>	<p>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.</p>	<p>One box contains 10 vials of 1 dose.</p>


Nobivac®:Lepto			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each dose contains inactivated strains of : <i>Leptospira canicola</i> (strain Ca-12-000) ≥ 40 hamster PD₈₀ <i>Leptospira icterohaemorrhagiae</i> (strain 820k) ≥ 40 hamster PD₈₀</p>	<p>Active immunisation against Leptospirosis caused by <i>L.icterohaemorrhagiae</i> & <i>L.canicola</i> of <i>Leptospira interrogans</i>. Animals are protected against clinical disease, & also against becoming renal carriers after challenge.</p>	<p>Inject 1 ml of Nobivac Lepto subcutaneously. Nobivac Lepto can also be used to reconstitute Intervet's freeze dried vaccines Nobivac Puppy DP & Nobivac DHPPi.</p>	<p>One box contains 10 vials of 1 dose</p>


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


Nobivac®:RL			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Each dose contains Rabies strain Pasteur RIV inducing more than 3 IU in the potency test, and inactivated strains of <i>Leptospira canicola</i> (strain Ca-12-000) ≥ 40 hamster PD₈₀, and <i>Leptospira icterohaemorrhagiae</i> (strain 820k) ≥ 40 hamster PD₈₀</p>	<p>For the active immunisation of dogs against rabies, and canine leptospirosis caused by <i>L.interrogans</i> serogroups <i>canicola</i> and <i>icterohaemorrhagiae</i>.</p>	<p>1 ml by subcutaneous injection. Can be used to reconstitute Nobivac DHPPi. Intended for dogs from 8 weeks of age onwards.</p>	<p>One box contains 1 ml x 10 vials.</p>




COMPANION ANIMAL

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

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

VM365®			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p>Vitamins and minerals</p>	Beneficial for all dogs as a daily vitamin-mineral supplement, and especially during periods of stress, convalescence, growth, pregnancy and lactation.	<p>For oral administration to dogs.</p> <p>Puppies and dogs under 10 lbs/4.54 kg – ½ tablet daily</p> <p>Dogs over 10 lbs/4.54 kg – 1 tablet daily</p>	Container of 60 tablets


DELVOSTERON™																					
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION																		
 <p>Each ml contains 100 mg proligestone</p>	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.	<p>Dogs</p> <table border="1"> <thead> <tr> <th>Body weight</th> <th>Dosage</th> </tr> </thead> <tbody> <tr> <td>< 3 kg</td> <td>1.0 ml</td> </tr> <tr> <td>3-5 kg</td> <td>1.0-1.5 ml</td> </tr> <tr> <td>5-10 kg</td> <td>1.5-2.5 ml</td> </tr> <tr> <td>10-20 kg</td> <td>2.5-3.5 ml</td> </tr> <tr> <td>20-30 kg</td> <td>3.5-4.5 ml</td> </tr> <tr> <td>30-45 kg</td> <td>4.5-5.5 ml</td> </tr> <tr> <td>45-60 kg</td> <td>5.5-6.0 ml</td> </tr> <tr> <td>> 60 kg</td> <td>1 ml/ 10 kg</td> </tr> </tbody> </table>	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
Body weight	Dosage																				
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> 60 kg	1 ml/ 10 kg																				


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





POULTRY PRODUCTS


Live Vaccine

	Nobilis® Gumboro 228E			
	COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
	<i>The vaccine contains :</i> Live I.B.D. virus strain 228E: $\geq 2.0 \log^{10}$ 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
	<i>The vaccine contains :</i> Live I.B.D. virus strain D78: $\geq 4.0 \log^{10}$ 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
	<i>The vaccine contains :</i> Live ND strain Clone 30: $\geq 6.0 \log^{10}$ EID ₅₀	Immunization of healthy chickens and turkeys against Newcastle Disease.	One dose per bird.	Vials each containing 1000 or 2500, 5000 doses in packs of 10 vials.


	Nobilis® IB H120			
	COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
	<i>The vaccine contains :</i> Live IB strain H120: $\geq 3.0 \log^{10}$ 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
	<i>The vaccine contains :</i> Live M. gallisepticum strain 6/85: $\geq 10^{6.9}$ CFU	Active immunization of future layers to reduce the clinical signs of Mycoplasma gallisepticum infection.	One dose per bird.	Boxes of vials each containing 1000 doses





Inactivated Vaccine

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




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

Nobilis® Coryza			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p><i>The vaccine contains :</i></p> <ul style="list-style-type: none"> 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
 <p><i>The vaccine contains :</i> Inactivated Reovirus strains 1733 and 2408.</p>	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
 <p><i>The vaccine contains :</i></p> <ul style="list-style-type: none"> Inactivated ND virus Clone 30. Inactivated Gumboro virus strain D78. 	The vaccine is recommended for the booster vaccination of future breeders to protect against Newcastle Disease throughout the laying period, and to induce high maternal antibody levels against Infectious Bursal Disease in their offspring.	Each bird: 0.5 ml.	500 ml (1000 doses) bottles .

Nobilis® IB multi + ND			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
 <p><i>The vaccine contains :</i></p> <ul style="list-style-type: none"> 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
<p><i>The vaccine contains :</i></p> <ul style="list-style-type: none"> - 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
<p><i>The vaccine contains :</i></p> <ul style="list-style-type: none"> Inactivated IBV strain M41. Inactivated NDV virus Clone 30. Inactivated IBDV strain D78. Inactivated Reo virus strains 1733 and 2408. 	The vaccine is recommended for the booster vaccination of breeding stock for protection against the Massachusetts serotype of Infectious Bronchitis and for protection against Newcastle Disease; and for immunisation against Reovirus infection and Infectious Bursal Disease virus, in order to protect the offspring of the vaccinated birds against Reovirus infections and Gumboro Disease by maternal antibodies for at least the first weeks of life.	Each bird: 0.5 ml.	500 ml (1000 doses) bottles.

Feed Supplement



Enradin™

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



Annovit®

COMPOSITION	APPLICATION	INCLUSION RATE	PRESENTATION
Scientificaly Balance formulation of vitamins and amino acids	<ul style="list-style-type: none"> - As a growth promoter - Stress conditions - Supportive therapy 	1gm/lit of water for 5-7 days or 500 gm for 5-7 days	1 Kg



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



Pharma Product

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



Cell Associated Vaccine

Innovax® ND-SB1			
COMPOSITION	INDICATIONS	DOSAGE	PRESENTATION
Each ampule contains per dose at least 1534 PFU of live Herpes virus of Turkey Strain HVT/NDV-F and 1514 PFU of live chicken Herpes virus strain SB-1 in the cell associated form	The active immunization of chickens against Marek's Disease (MD) and Newcastle Disease (ND)	0.2 ml injection subcutaneously per chick in the neck	2000ds & 4000ds ampoules



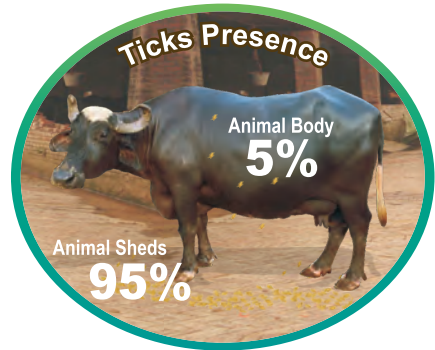
VAC-SAFE™			
COMPOSITION	APPLICATION	INCLUSION RATE	PRESENTATION
An effervescent tablet that dilutes easily and neutralizes the chlorine in the water	Improving quality of drinking water vaccination	1 tablet /100 Ltr water	Box of 30 tablet





Tick Eradication Program

Do You Know ?



For Application on Animal Shed

butox[®] Vet Power

WITHDRAWAL PERIOD

Milk : 0 (Zero) day
Meat : 20 days



For Application on Animal Body

Taktic[®] 12.5% EC

WITHDRAWAL PERIOD

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



Advantages

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



A step forward in the treatment of Mastitis

COBACTAN[®] LC

(Intramammary)

Control Measures for Mastitis

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

Advantages of Using Cobactan LC in Early Stages:

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

Withdrawal Period:

Milk- 84 hrs. (7 milking)

Meat- 2 days



Administration of Cobactan LC

Infuse COBACTAN[®] LC

(Intramammary)

At 0 hr.
1st tube



At 12 hr.
2nd tube



At 24 hr.
3rd tube





A trusted source for comprehensive animal health solutions

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

For more information,
visit www.msd-animal-health.com

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