

Research Article

REVIEW ON METALLIC AND NON-METALLIC FOREIGN BODIES A THREAT TO LIVESTOCK AND ENVIRONMENT

Ravindra Reddy Y., *Asha Latha P. and Sandeep Reddy S.

*Department of Livestock Production Management, NTR College of Veterinary Science, Gannavaram,
Andhra Pradesh, India*

**Author for Correspondence*

ABSTRACT

Disorder of the gastrointestinal tract of the dairy cattle is common due to indiscriminate feeding behavior. An ingested foreign body by cattle is divided into two main groups. The first category is foreign bodies of non-metallic origin and the second category is metallic origin. Entrance and migration of foreign bodies through the body tissue leads to many complications that differ according to the nature and the ways of its entrances into the tissue. Ingestion of foreign bodies is still extremely common in cattle especially in developing countries where the standard of animal management is unsatisfactory. Foreign body syndrome can be defined as various conditions originating from ingestion of foreign bodies, metallic bodies like nails or wires and non-metallic bodies like plastic bags. Prevalence of foreign bodies in cattle is the most serious problem not only because of its mortality and morbidity but also it contributes a lot for reduced production and productivity. This paper mainly reviews the factor attributed to incidence, etiology, clinical findings/observation, complications, diagnosis, biochemical profile, rumen profile of non-penetrating and penetrating foreign bodies and measures to counteract the menace to livestock.

Keywords: *Foreign Body, Blood Biochemistry, Hematology, Penetrating Foreign Body, Non-penetrating Foreign Body*

INTRODUCTION

Ingestion and lodgement of foreign bodies are common in the bovine primarily due to indiscriminate feeding habits (Singh and Nigam, 1981). Industrialization and mechanization of agriculture have further increased the incidence of foreign bodies in these animals (Misk *et al.*, 1984). Ingested foreign bodies by buffaloes and cattle are divided into two main groups; the first category is foreign bodies of metallic origin and the second is foreign bodies of non-metallic origin (Misk *et al.*, 2001). Foreign objects may be deposited into the body by a traumatic or iatrogenic injury. The bovine species does not have highly sensitive prehensile organs such as lips and tongue that discriminate sense of taste. As a consequence, cattle kept in farm yards, stables or at other sites close to human mechanical activities are prone to swallow metallic objects such as nails and pieces of wires that have been carelessly left in their feeding areas (Desiye and Mersha, 2012; Jones *et al.*, 1996). Entrance and migration of foreign objects through the body tissues lead to many complications that differ according to the nature of the foreign body and the way of its entrance into the tissues (Cheel and Sethi, 1999; Calfee and Manning 2002). Radiographic diagnosis of metallic foreign bodies is a helpful diagnostic technique (Spouge *et al.*, 1990; Hunt *et al.*, 2004). Ingestion of foreign body in dairy cattle is of great economic importance and causes severe loss of production and high mortality rate (Radostits *et al.*, 2007). Rumen tympany due to metallic or non-metallic (mostly polythene material) foreign bodies are among the most common cause of gastrointestinal disorders in ruminants (Radostits *et al.*, 1994). Plastics can be termed as wide range of chemical materials either synthetic or semi-synthetic solid materials like polyethylene, polyvinyl chloride, polystyrene largely used in plastics manufacturing industry, which pose a threat to livestock and environment. Plastic garbage continues to increase in the modern world, more concentrated in cities and towns. Rapid industrialization and mechanization of agriculture have further increased the incidence of foreign bodies threatening the life of poor, deprived, dumb animals at the cost of intelligent human beings.

Research Article

Incidence

Metallic Foreign Body

Cattle are more likely to ingest foreign bodies than small ruminant since they don't use their lips for prehension and are more likely to eat a chopped feed. The majority of affected cattle (87%) are dairy cattle and 93% are older than two years of age. It is hypothesized that dairy cattle are more commonly affected than beef cattle since they are more likely to feed a chopped feed, such as silage or hay (Kahn, 2005). According to Schipper (2000), there are a number of influencing factors. These includes remodeling of livestock housing, careless handling of baling wires, pins, feed sack bags and wires, using old buildings sites for hay fields, often occur in female shortly after calving, often occur in male shortly after or during extensive uses for breeding (Desiye and Mersha, 2012). The ingestion of foreign body is mainly related with nutritional deficiencies and feeding management and cause various problem in different organs of the animal, mainly in rumen and reticulum (Jones *et al.*, 1996). The problems that are caused vary with the duration that the foreign body has been present, the location of the foreign body, the degree of obstruction that is caused as well as problem associated with the material of the foreign body. Ingestion of non- dietary materials in mainly related to nutritive deficiency and feeding management of the animals causes various problems in different organs of the animals like glossitis, esophagitis, ruminitis, impaction of rumen, traumatic pericarditis (TP) and traumatic reticulo-peritonitis (TRP) are the possible health problems can be caused by the ingestion of foreign bodies in ruminants.

Non-Metallic Foreign Body

The incidence of non-metallic foreign bodies (mostly polythene material) was explored by various investigators mostly in cattle (Mehandale *et al.*, 1998; Sharma, 2006; Kohli, 1998; Kumar *et al.*, 2003; Boodur *et al.*, 2010; Khore *et al.*, 2000; Ishmail *et al.*, 2007) Buffaloes (Singh *et al.*, 1993; Singh and Sobliti, 1998; Semika, 2010; Athar *et al.*, 2010; Narasimha *et al.*, 2000; Ramprabu *et al.*, 2003) Small ruminants (Bakhiat, 2008; Mohammed, 2004; Pitroda *et al.*, 2010; Jana and Jana, 2006). In abattoir survey revealed astonishing facts that 77% of sheep and 20.7% of goats had indigestible garbage in Sudan (Mohammed, 2004). The factors that are responsible for higher incidence of non- metabolic foreign bodies are rapid industrialization, increase in the garbage disposal mostly in plastic bags, more urbanization, higher rise in deficiency of minerals like calcium and phosphorus and other micronutrients in the soil along with the management of animals in towns by letting the animal loose for grazing, insufficient feeding of the animals by the owners, deprived appetite, increase in the number of animals on the existing land space etc, increase in the construction activity in cities and towns, besides the indiscriminate habit of animals. The absence of recycling industries and increase in the number of units producing the plastics, frequent droughts force the animal to graze down closer to ground leading to increased incidence during the period, inappropriate disposal of wastes by humans, increased pollution of grazing land by plastic of some form at the road point near to highways.

Clinical Findings/Observations

Depression, anorexia, restlessness, tympany, ruminal atony, decline in milk production, displacement of abomasums, off feed, reduced dung quantity evacuation, rumen doughy in consistency, suspended rumination, dehydration, distended left para lumbar fossa, impacted rumen, constipated faeces in rectum. Clinical rumen indigestible foreign body impaction will be characterized by pale mucous membrane, complete cessation of rumination, reduced rumen motility, absence of stratification, hard pellet mucous coated dung, and inappetence.

Diagnosis

Metal Detection

Metal detectors were used at one time to aid in the diagnosis of traumatic reticuloperitonitis. Ferrous metallic foreign bodies can be detected with metal detectors but the instruments are of limited uses because most normal dairy cows are positive for metal over the reticular areas. An electronic metallic detector may identify metal object in the reticulum but does not distinguish between perforating and non perforating foreign body (Rahel, 2011).

Research Article

Laparoscopy

Laparoscopy in cattle is a promising tool for clinical diagnosis and treatment. The application of this tool during abdominal explorations biopsies allows the avoidance of invasive and useless surgical interventions and even diagnosis and prognosis of certain conditions. Athar *et al.*, (2010) reported that peritoneal fluid analysis has considerable potential as supplementary to the haematology and clinical findings of abdominal disorders.

Wither Pinch Test

Wither test by pinching withers to cause depression of back and eliciting grunt is effective diagnostic tool. Tympanic sounds usually heard 2-3 seconds before primary ruminal contraction can be felt through the left flank (William, 1956). The foreign body syndrome can be diagnosed by palpation on both sides of abdomen and with a stethoscope for evidence of grunt (Begg, 1950).

Ultrasonography and Radiography

In contrast to radiography, ultrasonography provides more precise information about the contour of the reticulum and reticular motility (Radostits *et al.*, 2007). In cattle with TRP ultrasonography can be used to identify morphological changes in region of cranial, ventral or caudal reticular wall. Radiography can help identify perforating foreign bodies in the reticular areas. With the animal standing, horizontal beam is centered on the reticulodiaphragmatic region in cranioventral/caudoventral. Radiography obtained allows the identification of radiopaque bodies and gas/ fluid interfaces typical of an intrabdominal abscess. The drawback of this technique is that not all heavy sharp objects will have sufficient density to show on an x-ray (Rahel, 2011). Athar *et al.*, (2010) performed ultrasonography in about 6 cases and observed that reticular motility gave a good sign of diagnosing the foreign body. Pitroda *et al.*, (2010) diagnosed the rumen impaction due to plastic material in a goat by B mode ultrasonography performed in standing non sedative goat using 7.5HKg probe placed directly in the canal with acouste gel by pointing the translumbar 7th to 11th left intra central space and observing a well distributed diffuse echogenic mass within the rumen just below the distinctly ecogenic ruminal wall.

Clinical Diagnosis

Turkar *et al.*, (2010) reported that tympanic sounds were heard on percussion with simultaneous auscultation of paralumbar fossa. Boodur *et al.*, (2010) reported that main diagnostic sign noticed was bilateral sunken flank region with doughy hard impaction of rumen (Kohli *et al.*, 1998). Boodur *et al.*, (2010) reported that alkaline pH can be important diagnostic tool under field condition for early detection of plastic indigestion cases. Dakshinkar (2005) and Sen *et al.*, (1989) opined that the plastic indigestion cases show alkaline pH. Oemha and Noordy (1970) reported that volume of the peritoneal fluid, cellularity and protein characteristics give an indication of inflammatory changes in peritoneal cavity. Tripathi *et al.*, (2010) observed low pitched reticular sounds audible on auscultation at 7th to 8th rib on left side with severe distention in left paralumbar fossa and slight distention in right flank for diagnosis in foreign body associated with plastics in 4 year old crossbred cow. Gyimes and Ames (1981) observed that rectal palpation is one of the most reliable methods of diagnosing the rumen impaction in cattle.

Hematological Findings

Kohera *et al.*, (2000) reported severe neutrophilia (shift to left) on blood smear examination. Tripathi *et al.*, (2010) observed that hematological examination showed a Hb-12.6%, PCV 28% TLC $7 \times 10^3/\text{cumm}$, DLC- Neutrophil 35%, Lymphocytes 60%, Monocytes 3%, Eosinophils 2%. Bakhtiat (2008) reported that sheep with non metallic foreign bodies had high WBC count and low RBC counts, PCV and Haemoglobin concentration. The MCV, MCH and MCHC values were high. Turkar *et al.*, (2010) observed that haemogram depicted anaemia and neutrophilic-leucocytosis (Hb-6.8gms), Total Leucocyte count- $20.0 \times 10^3/\text{cmm}$, Differential Leucocyte count-68% Lymphocyte count-28%, Monocyte-4%, Eosinophils-0%, Basophils-1% and adequate platelets in a crossbred cow. Athar *et al.*, (2010) reported mean haemoglobin of $10.44 \pm 1.31\text{g}$ with elevated packed cell volume of $41.2 \pm 2.0\%$ but total leucocyte differential count was within the normal range. This finding coincided with observations of Nagarajan and Rajamani (1973), and Misra and Singh, (1974).

Research Article

Hematological Parameters in Dairy Cattle with Rumen Impaction

Parameter	Control	Rumen impaction
Hgb (g/dl)	10.18	7.44
PCV (%)	29.75	21.91
RBC(x106/ µl)	7.24	4.55
MCV (fl)	42.20	50.02
MCHC(g/dl)	34.83	34.94
MCH(pg)	14.37	16.88
WBCx103/ µl	66.78	19.93
Neutrophils x103/ µl	3.19	5.22
Lymphocyte x 103/ µl	7.96	6.02
Monocyte x 103/ µl	0.32	0.39
Basophils	0.03	00.20

Sources: Vanitha et al., (2010)

Rumen Profile

Raidurg (2008) reported that rumen liquor examination revealed a pH of 7.0 and nil protozoal motility. Athar et al., (2010) reported that the mean rumen motility was found to be 0.83± 0.31 contractions per 2 minutes.

Biochemical Profile

Biochemical parameters of cattle with traumatic peritonitis caused by penetrating foreign bodies

Parameters	TRP group
Total protein (g/l)	Increase
Albumin (g/l)	Slightly the same
Globulin (g/l)	Increase
A/G ratio	Decreases
Total bilirubin (µ mole)	Increases
AST (U/L)	Increases
ALP (U/L)	Increases
Ca (mmol/L)	Decreases
P (mmol/L)	Increases

Sources: Gokce et al., (2007).

Athar et al., (2010) reported the mean value of plasma protein, albumin and A/G ratio as 7.6±0.31g/dl, 3.04±0.13gm/dl and 0.67±0.02 respectively in cattle. Turkar (2004) reported mean plasma albumin concentration of 3.10±0.18gm/dl in cows. Boodur et al., (2010) reported that the animals affected with rumen impaction due to indigestible plastic material showed mild hypocalcemia and hypophosphatemia. They further observed that plasma glucose, total serum proteins and aspartate aminotransferase levels improved significantly on 15th day after removal of plastic material from the rumen.

Biochemical Parameter in Dairy Cattle with Rumen Impaction Caused by Non-penetrating Foreign Bodies

Parameter	Control	Rumen impaction
BUN (mg/ dl)	25.62	46.85
Creatinin (mg/ dl)	1.66	1.57
Total protein (g/dl)	7.05	6.23
Albumin (g/ dl)	3.36	2.75
Calcium (mg/ dl)	10.92	8.36
Cholesterol (mg/ dl)	115.40	116.28
Glucose (mg/ dl)	62.10	42.78
Phosphorus (mg/ dl)	6.76	5.98

Source: Vanitha et al., (2010)

Methylene Blue Reduction Test (MBRT)

Boodur et al., (2010) observed increase in the MBRT in animals affected with rumen impaction due to plastics. The MBRT of 22.2±1.16 minutes was observed in animals before the treatment which improved

Research Article

to 4.80 ± 0.37 after removal of plastics. The MBRT of 19.16 ± 0.47 minutes before treatment of animals was improved to 8.2 ± 0.48 minutes after 15 days after rumenotomy with supplementation of symbiotics. Thus it shows an aid for diagnosis of the condition.

Sedimentation Activity Test

Boodur *et al.*, (2010) observed increase in the sedimentation activity time range 18.8 ± 0.8 to 20.66 ± 1.11 minutes which improved to 5.8 ± 1.8 to 7.8 ± 0.31 minutes after the treatment thus sedimentation activity time can be one more tool for diagnosing the condition.

Total Volatile Fatty Acids

Boodur *et al.*, (2010) observed that significant increase in range of total volatile fatty acids from 32.8 ± 1.28 to 8.83 ± 1.49 before removal of plastics from rumen to a range 68.2 ± 1.61 to 51.4 ± 61 after removal of plastic showing the test as a diagnostic laboratory test for detection of foreign bodies.

Necropsy Findings

Jana and Jana (2006) reported that rumen was shrunken, appeared as if the ruminal wall was adhering to the whole faeces of strangulated plastics, polythene material, rubber material, pieces of leather, nylon, and synthetic fibers with signs of ruminitis of ruminal pillars with congestion of ruminal mucosa and ulceration.

Treatment

Penetrating Foreign Body

In general, two methods of treatments are often used for TRP: conservatives (medical) treatment and rumenotomy (Radostits *et al.*, 2007). Conservative (medical) therapy comprises immunization of the animal by administration of antimicrobial for the inflammation for 3-5 days (Radostits *et al.*, 2007). A magnet administered orally falls into the cranial sac of the rumen, but normal ruminal contraction usually brings the magnet to the reticulum and foreign bodies still partially in the lumen of the reticulum that have injured the reticular wall are attracted to and fixed to the magnets, thus preventing their migration from continuing and most times returning the foreign body into the lumen of reticulum (Roman and Hiwot, 2010).

Non-Penetrating Foreign Body

Emptying the rumen by rumenotomy is considered as rapid and quick method of relieving the problem of the animals. Rumenotomy along with transplantation of fresh ruminal cud is the best technique for restoration of ruminal function at fluid level for ruminal impaction due to plastics in cattle and buffaloes (Boodur *et al.*, 2010). Boodur *et al.*, (2010) opined that the probiotic, prebiotic and growth stimulants act as an adjunct to rumenotomy for improved survival and reversal of rumen ecology. Jana and Jana (2010) reported that stray animals which are not fed properly, deficient and malnutrition animals show more tendency for ingestion of polythene and subsequent impaction. Boodur *et al.*, (2010) observed that pH of the ruminal fluid was 8.0 ± 0.28 in rumenotomy performed animals and 8.5 ± 0.13 in rumenotomy with supplementation of symbiotic preparations. The pH reduced towards normal in both the groups but more improvement (7.44 ± 0.08) was observed in rumenotomy with supplemented group from 15 day after administration of symbiotics.

RESULTS AND DISCUSSION

Discussion

Tripathi *et al.*, (2010) reported that indiscriminate feeding habit of animal coupled with insufficient feeding by the owner is forcing the animal to eat indigestible foreign material. Lack of dietary discrimination mostly in cattle, buffaloes and to less extent in sheep and goats is leading to the ingestion of foreign materials causing the ruminal impaction. The ingested polythene hinder the process of fermentation and mixing of the contents leading to indigestion. The polythene and other plastic material do not degrade in the rumen/reticulum and remain as causing hindrance in orifice. This whole process also affects the rumen microflora leading to indigestion of feed (Athar *et al.*, 2010). Hypo motility of rumen may be caused by either a reduction in excitatory drive to the gastric centres or an increase in inhibitory inputs (Leek, 1969). The quantity of the plastic material removed by rumenotomy in different animals varied from 15 kg to 55 kg. The smaller sized heifers contained lesser quantity of plastics but the

Research Article

severity of clinical sign were similar to larger animals containing ingested plastics. Boodur *et al.*, (2010) opined that removal of plastics from the rumen is not enough but restoration of the normal rumen ecology was important for speedy recovery of animals. Mohammed (2004) reported that soft foreign bodies cause life threatening adverse effects as grazing land is polluted with plastics, hoof, wool, hair, posing a major problem for grazing animals. Jana and Jana (2010) reported that congestion of the ruminal mucosae and ruminitis might be due to chemical reaction of polywastes or due to rubbing on ruminal wall. Shrunken rumen is due to replacement of air and water volume of rumen by the foreign materials. Zumpt (1971) reported that the tightly impacted rumen stops working because there are no contractions of sufficient force neither to move the contents forward along the normal digestive course nor to regurgitate them from chewing the cud.

Measures TO Counteract the Foreign Body Menace

Penetrating Objects (Nails)

Proper feeding management should be established in dairy farm.

1. Large dairy farm owners should install large magnets on feed handling equipments and chopping machines.
2. Keeping cattle away from the site of new construction and completely removing old buildings and fences.
3. Early treatment and diagnosis should be made to avoid complication.
4. Proper disposal of indigestible foreign bodies should be established in dairy farm, in order to save the life of animals.
5. Installation of large magnets on feed handing equipment and prophylactic administration of the fore stomach magnets to all animal at 6 to 8 month of ages prevent almost all cases caused by magnetizable object (Smith, 2009).



Figure: Animal consuming plastic bag containing vegetable waste

Non-Penetrating Objects (Plastic Bags)

1. Vegetable waste/ kitchen waste should not be disposed off in the plastic bags as the animals are forced to consume the plastic bags along with the vegetable waste.
2. Rearing of the livestock in urban and semi-urban areas near to market places, roadsides is to be discouraged as they attempt to eat foul and vegetable waste thrown in plastic bags.
3. Dietary ruminal impaction is usually encountered in animal fed in straw and poor quality hay with limited water access needs to be addressed and proper balanced ration is to be provided to the animals to reduce / avoid the incidence.

Research Article

4. Pollution of the grazing lands with plastic bags, hair, hoof, wool, is to be avoided and awareness level among the livestock keepers is to be increased.
5. Farmers / livestock owners should be cautioned against unsupervised grazing of animals as there is danger of accidental ingestion of polythene bags.
6. Popularize the slogan “No to carry bags when you can carry things in your hand” can be another way to avoid the incidence of the problem.
7. The municipal authorities in cities and towns and peri-urban areas should provide covered disposal bins for polythene materials separately to avoid ingestion by the animals.

Conclusion

Ingestion of metallic and non-metallic foreign bodies the most common problem encountered in dairy cattle not only because of its mortality and morbidity but also it causes decrease in productivity. It is common in developing countries where the standard of animal management is unsatisfactory. The most common problem encountered in dairy cattle due to the ingestion of the metallic and non-metallic foreign bodies are traumatic reticuloperitonitis/ pericarditis (hardware disease). It is the problem of both the small and large scale dairy farm. The non-metallic foreign body syndrome (polywastes, rubber, plastics, and leather materials, ropes, cement bags etc) is emerging as a silent killer disease affecting mostly bovines (cattle and buffalo) followed by sheep and goats as per the incidence of the cases examined. The incidence is observed more in animals fed with ration containing a substantial part of poor quality straws and hays during the months of feed scarcity. The diagnosis of the problem should have a holistic approach starting with physical examination/clinical sign/observations/haematological/biochemical profile/ultrasonography etc. The problem can be reduced/ avoided by strictly following not to dispose of the vegetable waste/ kitchen waste in plastic bags, sensitizing the livestock owners of accidental ingestion of plastic material in grazing area (highway road, town, cities, semi-urban area etc.), keeping cattle away from the site of new construction and keeping away from old and unclear grazing sites, animal owners should be advised to keep their cattle in intensified manner so that the owners could easily control their accessibility to foreign bodies.

REFERENCES

- Athar,H., Mohindra,J., Slingh,K. And Singh,T. (2010)** *Intas Polyvet* 119(2):180-183.
- Bakhiat,A.O, (2008)** *Scientific Research and Essay* 3(7) :294-298.
- Begg, H (1950).** *Vet.Rec*, 62:797-805.
- Boodur, P., Sivaprakash, B.V., Kasaralivar, V.R., and Dilip, D. (2010)** *Intas Polyvet* 11 (2):184-188.
- Calfee, T. and Manning,T.O. (2002):** Non healing subcutaneous wounds in the cats and proposed surgical managements techniques. *Clin. Tech. Small Anim.Pract.* 17(4): 162-167.
- Cheel, L.W. and Sethi, D.S. (1999):** Diagnostic and therapeutic approach to migrating foreign bodies. *Ann. Otol. Rhinol. Laryngol.* 108 (2): 177-180.
- Dakshinvar, M.P. (2005)** proceedings of the first round table conference on rumenology , 269 - 276.
- Desiye, T. and C. Mersha, 2012.** Study on Rumen and Reticulum Foreign Bodies in Cattle Slaughtered at Jimma Municipal Abattoir, South West Ethiopia. *American-Eurasian Journal of Scientific Research*, 7(4): 160-167.
- Eshone,S.M., Youri,M.I., Zangane,I.K. and Fitey,N.G. (1989)** *Ind.Vet.J.*,66(2):158-159.
- Gokce, H. I., G. Gokce and M. Cihan, 2007.** Alterations in coagulations profiles and biochemical and hematological parameters in cattle with traumatic reticuloperitonitis, *Veterinary Research Communication*, 31: 529-536.
- Gyme,J. and Ames, M.K., (1981)** *Education Practice. Vet* (3):311-318.
- Hunt ,G.B. , Worth ,A. and Marhevsky ,A (2004):**Migration of wooden skewer foreign bodies from the gastrointestinal tract in eight dogs. *J.Small Anim. Pract.* 45 (7): 362-364.
- Ishmail,Z.B., Mayali.A., and Aबाudh (2007)** *Am.J.Anim.Vet.Sci*(2):66-71.
- Jana Debaris and Jana Mourami (2010)** *Intas Polyvet* (2):253-255.

Research Article

- Jana Debaris and Jana Mourami (2006)** XII Annual conference of IAAVR and Round Table Conference on Ruminology 11:81-85.
- Jones, T.C., R.D. Hunt and N.W. King (1996).** Veterinary Pathology, 6th ed., USA, pp: 1060-1061.
- Kahn, C.M., 2005.** The Merck veterinary manual, 9 ed., USA, Merck and CO., INC., pp: 186-188.
- Khore, K. A., Jodhar, P.A and Mahjan, V.E. (2000)** Intas Polyvet 11 (2):189-190.
- Kohli, R.N., Naad,F and Ghadran,A (1998)** Ind.J.Vet.Surgry 19;105 – 106.
- Krishna Muathy, K., Radhakrishna Murthy, T.V., Janardhan and Sreenu, M. (1998)** Ind.vet.J.pp:347-348.
- Kumar Satish, K., Thyagaraya Naidu, P., Shakeela,S, and Viroiji Rao, S.T (2003)** Intas Polyvet 4:No.1:45-47.
- Leek, B.F (1969).** Vet Rec 84; 283-284.
- Mahandale,S.S., Puntambekar,P.M. Deopurkar,V.L., Patil,M.B., Hol,G.B., Nehete,S.B and Deshpande,A.K.,(1998)** J.Bomby Vet.coll 6(1):21-23.
- Misk, N.A., Semieka,M.A. and Ali, S. El- M.(2001):**Varieties and sequellae of ingested foreign bodies in buffaloes and cattle. *Assiut Vet. Med. J.* 46 (91): 250-273.
- Misk,N.A., Nigam, J.M. and Rifat, J.F. (1984):** Management of foreign body syndrome in Iragi cattle. *Agri. Practice* 5 (8): 19-21.
- Misra,S.K., and Singh,U. (1974)** Ind.Vet.J.(5):698-704.
- Mohammad, H.A., (2004)** M.V.Sc Thesis Sudan Veterinary Science and Techonology.
- Nagarajan,V and Rajamani,S. (1973)**Ind.Vet.J.50; 1147-1151.
- Narasimha Rao,M, Bhaskara Rao,T and Varaprasad,P (2000)** Intas Polyvet 2:No;1.
- Oemha,F.W. and Noordry,J.L . (1970).** Vet.Med.65; 54-59.
- Pitroda,A.H., Tiwari P.K., Melrajudendar Patil.D.B and Parikh.V (2010)** Intas Polyvet 11(2):251-252.
- Radostatis,O.M., Blail,D.C. and Gug ,G.C. (1994)** Veterinery Medicine 8th ed Baillierv Tindall, London 270-278.
- Radostits, O.M., C.C. Blood, K.W. Hinchclif and P.D. Constable, 2007.** Veterinary medicine a text book of disease of cattle, horse, sheep, pig and goat. 10th ed England, London. Saunders Elsevier, pp: 112-522.
- Rahel, M., 2011.** Study on fore stomach foreign body Science, in cattle Slaughtered Hawassa Municipal Abattoir. Ethiopia, DVM thesis Gondar University, Faculty of Veterinary Medicine, Gondar, Ethiopia.
- Raidurg (2008).**MVSc Thesis submitted to KVAFSU, Bidar, Kanataka: 3.
- Ramprabu, R., Dhangralan.P and Prabhu Ban, S (2003)** Irrrak.vet.rech.Alloc..58; 2-3.
- Ravi (2010)** Intas Polyvet 11(2):194-195.
- Roman, T. and Y. Hiwot, 2010.** Occurrence of rumen fibrinogen for the diagnosis of traumatic foreign bodies in Sheep and Goat slaughtered at Addis Ababa Municipal Abattoir. Ethiopia Veterinary Journal, 14(1): 91-100.
- Schipper, I.A., 2000.** Lecture outline of Preventive Veterinary Medicine 6th ed., Surgeet Publishing, pp: 166-167.
- Semika M.A (2010)** Vet World 3(10) 473-475.
- Sen, M. N., Shah,P.K ., and Raman, A C (1989).** Bangladesh J. Ani. Sci 18: 69 to 73.
- Sharma,M.S and Pankaj Kumar (2006)** Avian Journal of Animal and Veterinary Advances 1 (1):89-98.
- Singh, A.P. and nigam, J.M. (1981):** Radiography of the foreign bodies in the bovine. *Bovine Practice* 2 (6): 7-13.
- Singh,J., Singh,A.P and Patil,D.B (1993)** Ruminant Surgery.
- Singh,M, and Sobliti,V.K (1998)** Ind.Vet.J.,Sung.19(2):126.
- Smith, B.P., 2009.** Large Animal Internal Medicine 4 ed., USA. Mosby Elsevier, pp: 849-850.
- Spouge, A.R., Weisbrod, G.L., Herman, S.J. and Chamberlain, D.W. (1990):** Wooden foreign body in the lung parenchyma. *Am.J.Roentgenol* (154): 999-1001.
- Tripathi,A.K., Soodan,JS., Keeshawa.R.S and Shamodkumar (2010)** Indian Polyvet11(2):197-198.

Research Article

Turkar, S (2004) MVSc Thesis Submitted to Punjab Agricultural University, Ludhiana.

Turkar,S ., Sharma,A.k, Dhaliwal,P.S and Gopinathan,A (2010).Intas Polyvet 11(2):191 – 193.

Tyagi,R.P.S and J.Singh. CBS Bulletin on Distribution Delhi pp183-224.

Vanitha, V., A.P. Nambi B. Gowri and S. Kavitha, 2010. Rumen impaction cattle with indigestible foreign bodies Tamil Nadu S. Veterinary and Animal Science, 6: 138-140.

Williams,E.I (1956).Vet.Rec, 67:907 -911.

Zumpt (1971) J. South African Vet. Med Assoc.42:315-318.