



Original Research Article

## Rumen impaction in cattle due to plastic materials

Akraiem A.<sup>a</sup>, Abd Al-Galil A. S. A.<sup>b,\*</sup>

<sup>a</sup> Department of Veterinary Medicine and Surgery, Faculty of Veterinary Medicine, Omar Al-Mukhtar University, Elbeida, Libya

<sup>b</sup> Department of Veterinary Surgery, Faculty of Veterinary Medicine, Benha University, Egypt

### ABSTRACT

The present study was carried out on 22 cows suffering from ruminal impaction with plastic materials as foreign bodies and ten apparently healthy cows as a control group. Clinical examination included clinical signs, temperature, pulse, respiratory rate and ruminal motility were recorded prior to treatment. Hematological parameters such as hemoglobin (Hb), packed cell volume (PCV), erythrocyte count (RBCs), total leucocytes (WBCs) count and the glutaraldehyde test were performed. Ruminal fluid was evaluated for pH and the methylene blue reduction time (MBRT). The mean pH of rumen fluid, MBRT, total leucocytes count, and PCV were increased significantly ( $P<0.05$ ). Rumen motility was significantly reduced ( $P<0.05$ ) preoperative in the animals suffering from rumen impaction, but the mean value of pulse rate, respiration rate, temperature, glutaraldehyde test, haemoglobin and total erythrocyte count were non-significantly changed. On the 5<sup>th</sup> postoperative day the clinical and the laboratory parameters in the study group had largely become normalized. Six months after the procedure, 18 (81.9%) cows showed complete recovery and 4 (18.9%) animals were slaughtered within 3 months following surgery. This study concluded that the clinical and laboratory findings might be of diagnostic importance. Rumen impaction with plastic materials should be differentiated from anorexia, emaciation, ruminal hypomotility, tympany and dehydration in cows. The surgical removal of foreign body demonstrated positive effects on animal health.

### ARTICLE INFO

#### Article history:

Received 8 May 2016

Accepted 13 July 2016

Available Online 10 August 2016

#### Keywords:

Cattle, ruminal impaction, surgical elimination

\* Corresponding author: [ATEF.ABDELGALIL@fvtm.bu.edu.eg](mailto:ATEF.ABDELGALIL@fvtm.bu.edu.eg), Tel. (+2) 0123649989 (Dr. Abd Al-Galil ASA)

## **1. Introduction**

Rumen impaction due to metallic or non-metallic foreign bodies is among the most common cause of gastrointestinal disorders in ruminants (Mohammed et al., 2006; Ismael et al., 2007; Bakhiet, 2008). The absence of garbage recycling industries, especially the plastic materials are usually not disposed in a correct manner, and hence they were eaten by the grazing animals (Bakhiet, 2008; Ramaswamy and Sharma, 2011; Desiye and Mersha, 2012). The incidence of non-metallic foreign bodies (mostly polythene material) was explored by previous literature mostly in cows (Hailat et al., 1996; Kahn et al., 1999; Igbokwe et al., 2003; Mohammed et al., 2006; Boodur et al., 2010; Desiye and Mersha, 2012).

Rumen impaction with a foreign body is a disease that is highly correlated to the specific way of cows' eating and to the special anatomic conditions of the fore stomachs. Ingestion of non-metallic foreign bodies hinder the process of fermentation and mixing of contents leading to indigestion (Radostits et al., 2000; Braun et al., 2007). The polythene and other plastic materials do not degrade in the rumen/reticulum and remain causing hindrance in its orifice (Ramaswamy and Sharma, 2011). Moreover, it affects the rumen microflora leading to indigestion (Athar, 2010a).

Clinically, rumen impaction with a non-metallic foreign body is characterized by clear signs of emaciation, dehydration, abdominal distension and asymmetry of the abdomen. Affected animals showed a lack of feces in the rectum, foamy salivation, recumbency and inappetence (Blood and Radostits, 1994; Ismael et al., 2007; Athar, 2010b). The objective of this study was to evaluate some clinical, laboratorial, surgical parameters and their outcome in cows suffering from rumen impaction due to a non-metallic foreign body.

---

## **2. Materials and methods**

### **2.1. Animals**

The study included 22 cows suffering from rumen impaction due to a non-metallic foreign body and ten healthy cows (control group) aged 2-11 years during

the period from 2008 to 2015. The presence of the foreign body was diagnosed by external abdominal palpation, rectal examination and rumenotomy. Cows were clinically examined according to Resenbeger (1990), revealing respiratory rate, heart rate, rectal temperature, rumen motility. Filling of the rumen and feces (quantity and consistency) was daily determined. Approximately 100-200 ml of rumen fluid was collected using rumen fluid extractor and was immediately examined for colour, odour, consistency, pH and MBRT (Dirksen, 1969).

Blood samples were taken from each animal prior to the operation and on the 5<sup>th</sup> day post surgically. Five ml of blood was collected from each cow by venipuncture of jugular vein on EDTA for haematological examination including determination WBCs and RBCs (Schalm et al., 1975), PCV % (Coles, 1986), and Hb content (Wintrobe et al., 1976). In order to carry out glutaraldehyde test (Aslan and OK, 1991), 5 ml blood with EDTA was taken from the jugular vein of animals. Blood samples were centrifuged at 3000 rpm. Two ml of collected plasma was put in a 10 ml plastic injector, mixed with 2 ml of glutaraldehyde solution and was checked every 30 seconds to assess coagulation. The time of coagulation was recorded. A dose of procaine penicillin 30,000 IU /kg b.wt was intramuscularly administered to all affected animals. Foreign bodies were surgically removed by rumenotomy according to Götze technique, immediately weighed and their components were determined. Clinical, laboratory and surgical parameters were recorded and analyzed. Continuous follow up of animals for six months after discharging from the clinic were performed by questionnaire.

### **2.2. Statistical analysis**

Data of various parameters was presented as means with standard deviations. Results were analyzed by using one-way analysis of variance (ANOVA).  $P < 0.05$  were considered statistically significant.

---

## **3. Results**

### **3.1. Surgical findings**

Rumenotomy revealed the presence of large amounts of non-metallic foreign bodies consisting of plastic materials and ropes. The mean weight of removed foreign bodies was  $28 \pm 10.5$  kg (10-45 kg). Adhesions between reticulum and body wall/diaphragm was recorded in 2 (9.1%) cows. However, rumenotomy revealed no metallic foreign bodies in the reticulorumen. Ruminal contents in affected cows were sticky and foamy. Outcome: Twenty two animals were discharged to home 5 days after the surgical interference. Six months post operation, 18 (81.9%) cows were completely recovered and the other four cows (18.9%) were slaughtered within 3 months following the operation. Two animals culled due to disorders not related to the surgical interference (fertility disorders, mastitis).

### 3.2. Clinical and laboratory findings

Depression, anorexia, restlessness, tympany, ruminal atony, decline in milk production, off feed, reduced dung quantity evacuation, rumen doughy in consistency, suspended rumination, dehydration, distended left para lumbar fossa, impacted rumen, constipated feces in rectum were the most common clinical signs recorded among affected animals (Tables 1-3). The rectal body temperature of affected animals varied from  $37.5^{\circ}\text{C}$  to  $40^{\circ}\text{C}$ . Hyperthermia was recorded in 5 (22.7%) cows. The heart rate varied from 56 to 132 beats per minute. Four (18.2%) cows showed tachycardia and one (5%) cow had bradycardia.

The respiratory rate was recorded within the normal range in 18 (81.8%) affected cows while, 4 (12.2%) animals showed an increased respiratory rate. Mean values of rectal temperature, heart rate and the respiratory rate were within the normal range.

Ruminal motility and the amount of feces were reduced preoperative in all affected cows and return normal on the 5<sup>th</sup> day postoperative. Ruminal motility was absent in 12 (54.5%) examined cows, while 8 (36.4 %) cows showed rumen hypomotility with reduced strength of ruminal contraction. Fecal quantity in rectum was scanty in affected animals preoperatively. Mild tympany with inapparent respiratory distresses was found in 13 (59.1%) affected cows and in 2 (9.1%) of affected cows. Tympany was moderate to severe with varying degrees of respiratory distress. Pain test was negative in all affected cows. A significant decrease in ruminal motility and fecal quantity in the affected compared to healthy animals. The MBRT of  $17.4 \pm 2.45$  minutes before treatment of affected animals was improved to  $7.2 \pm 1.25$  minutes after 5 days. The pH of ruminal fluid before treatment was  $8.0 \pm 0.28$  and reduced towards normal gradually after 5 days post-surgery. A significant increase of MBR and pH of ruminal fluid in affected cows compared to the control group. The PCV and WBCs were significantly increased in affected cows while, there was no significant difference of Hb and RBCs compared to the control group. Dehydration was observed in all affected animals before the operation and disappeared within 5 days post-surgery and animals had largely become normal ( $P < 0.001$ ). Glutaraldehyde coagulation test showed reduced clotting time (3-6 minutes) in 4 (20%) affected cows. There was no significant difference in the mean value of glutaraldehyde test between of both groups was recorded. On the 5<sup>th</sup> day postoperative, clinical and laboratory parameters of affected animals were considerably normal ( $P < 0.01$ ).

**Table 1. Body temperature, respiratory rate, pulse rate, ruminal movement and pain test in both apparent healthy and those with ruminal impaction cows.**

Parameters	Healthy cows (Control group)	Affected cows	
		Preoperative	Postoperative
Rectal temperature ( $^{\circ}\text{C}$ )	$38.4 \pm 0.17$	$38.6 \pm 0.55$	$38.7 \pm 0.55$
Heart rate/min	$69.00 \pm 7$	$72.9 \pm 8$	$73.7 \pm 6$
Respiratory rate /min	$24.80 \pm 1.68$	$28.5 \pm 0.9$	$28.7 \pm 0.5$
Ruminal movement/min	$6.30 \pm 0.45$	$1.3 \pm 1.25^{**}$	$3.7 \pm 0.5^{**}$
Pain test	Negative	Negative	-

\*Significant different from control at  $P < 0.05$ , \*\*Significant different from control at  $P < 0.01$

**Table 2. Ruminal fluid pH and MBRT (minutes) in both apparent healthy and those with ruminal impaction cows.**

Parameters	Healthy cows (Control group)	Affected cows	
		Preoperative	Postoperative
Ruminal Fluid pH	7.1 ±0.3	8.0 ±0.28**	7.4±0.6*
MBRT	4.8±0.3	17.4±2.45**	7.2±1.25*

\* Significant different from control at  $P < 0.05$ . \*\*Significant different from control at  $P < 0.01$

**Table 3. Red blood cell count (RBC), packed cell volume (PCV), hemoglobin (Hb) and glutaraldehyde est (min) in both apparent healthy and those with ruminal impaction cows.**

Parameters	Healthy cows (Control group)	Affected cows	
		Preoperative	Postoperative
PCV (%)	29.4±0.5	38.7±3.5**	33.4±0.4*
Hb (g/dL)	9.5 ± 0.51	8.7 ± 0.6	8.9±0.5
WBCs ( $10^3/\mu\text{L}$ )	7.6±0.5	13.4±0.5**	8.7±0.5**
Glutaraldehyde test	Negative (above of 15 minute)	Negative (above of 15 minute)	-

\* Significant different from control at  $P < 0.05$ . \*\*Significant different from control at  $P < 0.01$

#### 4. Discussion

In the present study, clinical, laboratory findings, diagnostic procedures, treatment, and outcome were investigated in a series of cases of rumen impaction with plastic materials-foreign bodies. Rumenotomy was performed in 22 affected cows; 6 month follow up indicated that 18 (81.9%) cows were at their home farm and utilized as normal and the other four (18.9%) cows were slaughtered within 3 months following surgery. Two of the other 4 animals were culled because of disorders not related to the previous treatment (fertility disorders, mastitis).

Regarding findings of the respiratory rate and heart rate, body temperature, it seemed that the presence of the foreign body did not alter clinical findings, although hyperthermia and increased respiratory rate were noticed in some clinical cases. Increased temperature values might be attributed to peritonitis or septicemia accompanying concurrent parturition diseases, such as metritis, mastitis (Dirksen 1994; Braun et al., 2007; Athar et al., 2010 a, b). The increased respiratory rate is probably due to the increased pressure of the dilated rumen on the diaphragm (Kuiper and Breukink, 1986; Garry, 1996;

Bakhiet, 2008). In the present study, the most clinically observed findings such as complete anorexia, weakness, decreased milk production, scanty feces and recurrent rumen tympany were in accordance with those obtained by Reddy et al. (2004) and Ramaswamy and Sharma (2011). The absence of rumination and reduced ruminal motility were observed in all impaction- affected animals. However, non-metallic foreign body was found and the foreign materials were mostly plastic, ropes and pieces belonged to old clothes. Such materials were heavy (10-45 kg) and in some cases concreted and settled in the ventral aspect of the rumen and reticulum. The presence of impacted material may cause, partially or completely, block of the rumino-reticular orifices. The ingested polythene hinders the process of fermentation and mixing of contents might lead to indigestion (Lafi and Barakat, 1998; Radostits et al., 2007; Vanitha et al., 2010). Rumen contents were stinky, partially foamy, with decreased activity. Similarly, examination of the ruminal fluid showed alkaline pH and an increased reduction time of methylene blue (Boodur et al., 2010). The pH ruminal fluid and the MBRT reduced towards normal in

affected cows. The reduction time of methylene blue (RTMB) and pH ruminal fluid were significantly increased in affected animals, compared to the control group. The expected MBRT under normal conditions of ruminal function is often three minutes (Braun et al., 2007). An increase of pH ruminal fluid and MBRT are important diagnostic tool in field condition for the early detection of plastic indigestion in bovine (Boodur et al., 2010). The glutaraldehyde test is still an important diagnostic tool because the clotting time is shorter than normal in 90% of cattle (Braun et al., 2007). In the glutaraldehyde coagulation test, positive results were obtained only from those animals having adhesion (Dirksen, 1994). In the hematological profile, a significant increase of PCV and WBCs were reported in affected cows compared to healthy ones. Such values indicate a slight degree of dehydration in animals with rumen impaction (Jain, 1986; Reddy et al., 2004; Ismael et al., 2007). On the other hand, increased WBCs may be due to the stress reaction in some cases of the present study (Blood and Radostits, 1994). There was no significant difference in mean and standard deviation values of erythrocytic count and hemoglobin obtained in both groups in the current study. Erythrocytic count and hemoglobin concentrations were decreased in many affected cows. Haematological findings might be attributed to the penetration of the reticulum or chronic inflammatory process (Reddy et al., 2004; Braun et al., 2007).

### 5. Conclusions and Clinical Relevance

It has been found that clinical and laboratory findings might be of some diagnostic assistance. Rumen impaction with non-metallic foreign body should be considered as a differential diagnosis for anorexia, emaciation, tympany and poor milk production in cows. Good prognosis with elimination of foreign bodies was observed.

### References

Aslan V, OK M (1991): New and simple test glutaraldehyde in the diagnosis and prognosis of diseases characterized with inflammatory symptom. *Türk. Vet. Hek. Derg.*, 2: 24–47.

Athar H, Mohindroo J, Singh K, Kumar A, Randhawa CS (2010a). Clinical, haematobiochemical, radiographic and ultrasonographic features of

traumatic reticuloperitonitis in bovines. *Indian J. Anim. Sci.*, 80: 608–612.

Athar H, Mohindroo J, Singh K, Singh T (2010b): Clinical, haematobiochemical, radiographic and ultrasonographic findings in bovines with rumen impaction. *Intas Polivet.*, 11(2): 180–183.

Bakhiet AB (2008). Studies on the rumen pathology of Sudanese desert sheep in slaughter house. *Sci. Res. Essays*, 3(7): 294–298.

Blood DC, Radostits OM (1994). *Veterinary Medicine, A Text Book of the Diseases of Cattle, Sheep, Pigs, Goats and Horses*, 8<sup>th</sup> ed. Bailliere Tindall, pp: 265–272.

Boodur P, Sivaprakash BV, Kasaralivar V, Rand DD (2010). Methylene blue reduction test in cattle affected with rumen impaction due to plastics. *J. Ind. Poly Vet.*, 11 (2): 184–188.

Braun U, Schewizer G, Legune B (2007). Clinical findings of cattle with traumatic pericarditis. *Vet. Rec.*, 161: 558–563.

Coles EH (1986). *Veterinary Clinical Pathology*. 4<sup>th</sup> ed. W.B. Saunders Comp., Philadelphia, London, Toronto, Tokyo, Sydney, Hong Kong.

Desiye T, Mersha C (2012). Study on rumen and reticulum foreign bodies in cattle slaughtered at Jimma municipal abattoir, South West Ethiopia. *Am-Euras. J. Sci. Res.*, 7(4): 160–167.

Dirksen G (1969). Is the “methylene blue-reduction-probe” usable as quick-test for clinical examination of rumen fluid?. *Dtsch. Tierärztl. Wschr.*, 76: 305–309.

Dirksen G (1994). *Krankheiten des Verdauungsapparates. In: Krankheiten des Rindes.* (Rosenberger G ed.), 3. unveränderte Auflage, Blackwell Wissenschafts-Verlag, Berlin. pp: 173–351.

Garry FB (1996). Indigestion in Ruminants. In: *Large Animal Internal Medicine* (ed., B.P. Smith) Mosby-Year Book, St. Louis, Missouri, pp: 824–858.

Hailat N, South S, Darraji A, Majali A (1996). Prevalence and pathology of foreign bodies (plastics) in Awassi sheep in Jordan. *Small Rumin. Res.*, 24: 43–48.

Igbokwe I, Rolo M, Egwu G (2003). Rumen impaction in sheep with indigestible foreign bodies in the semi-arid of Nigeria. *Small Rumin. Res.*, 49: 141–146.

Ismael ZB, Al-Majabi A, Al-Qudah K (2007). Clinical and surgical findings and outcome following rumenotomy in adult dairy cattle



- affected with recurrent rumen tympany associated with non-metallic foreign bodies. *Am. J. Anim. Vet. Sci. J.*, 2: 66–70.
- Jain NC (1986). Schalm's Veterinary Haematology, Lea and Friesian cows. *Vet. Res.*, 99: 456–457.
- Kahn C, Habib G, Siddiqui M (1999). Prevalence of foreign indigestible materials in the reticulo-rumen of adult buffaloes. *Pak. Vet. J.*, 19(4): 176–177.
- Kuiper R, Breukink HJ (1986). Reticulo-omasal stenosis in the cow: differential diagnosis with respect to pyloric stenosis. *Vet. Rec.* 119: 169–171.
- Lafi S, Barakat S (1998). Pathology of the rumen in goats caused by plastic foreign bodies in Jordan with reference to its prevalence and evidence of partial degradation. *Small Rumin. Res.*, 30: 77–83.
- Mohammed A, Bakhiet O, Hayder A (2006). Retrospective study on the prevalence of foreign body in goat's Rumen: Omdurman Province, Khartoum State, Sudan (1998-2002). *J. Anim. Sci. Vet. Med.*, 5: 449–451.
- Radostits OM, Gay CC, Blood DC, Hinchcliff KW (2000). Diseases of alimentary tract – II. In: *Veterinary Medicine*. 9<sup>th</sup> ed. Book Power Publishers, Philadelphia, U.S.A. pp: 259–346.
- Radostits OM, Gay CC, Hinchcliff KW, Constable PD (2007). Impaction of the omasum. *Veterinary Medicine: A textbook of the diseases of cattle, horses, sheep, pigs and goats*. 10<sup>th</sup> ed. Elsevier Health Sciences, Philadelphia, PA, UA, pp: 352–353.
- Ramaswamy V, Sharma HR (2011). Plastic bags-threat to environment and cattle health: a retrospective study from Gondor city of Ethiopia. *IIOAP J.*, 2(1): 7–12.
- Reddy RY, Naidu TP, Viroji ST, Syama SN (2004). Foreign bodies in rumen and reticulum of Punganur cattle. *Indian Vet. J.*, 81:1063.
- Rosenberger G (1990). *Die Klinische Untersuchung des Rindes*. 3. Auflfl . Verlag Paul Parey, Berlin und Hamburg.
- Schalm OW, Jain NC, Correll EJ (1975). "Veterinary Haematology", 3<sup>rd</sup>, ed. P. 122.
- Vanitha V, Nambi AP, Gowri B, Kavitha S (2010). Rumen impaction in cattle with indigestible foreign bodies in Chennai. *Tamilnadu J. Vet. Anim. Sci.*, 6: 138–140.
- Wintrobe MM, Lee GR, Boggs DR, Bitheli TC, Athens IW, Foerster J (1976). *Clinical hematology*. 7<sup>th</sup> ed. Lea & Febiger Philadelphia.