International Journal of Advanced Multidisciplinary Research
ISSN: 2393-8870
www.ijarm.com
DOI: 10.22192/ijamr Volume 4, Issue 1 -2017

Research Article

DOI: http://dx.doi.org/10.22192/ijamr.2017.04.01.002

Study on rumen and reticulium foreign bodies in cattle slauthered at Wolaita Sodo municipal Abattoir, Ethoipia

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Keywords

Cattle;
Foreign Bodies;
Municipal Abattoir;
Prevalence;
Reticulum; Rumen.

Abstract

A cross-sectional study was conducted from November 2015 to March, 2016 at Wolaita sodo Municipal Abattoir, with the objectives of assessments of foreign bodies in rumen and reticulum and associated risk factors for the occurrences of foreign bodies. From the total of 600 examined cattle, 103 (17.16%) were found positive for the occurrence of indigestible foreign bodies in rumen and reticulum. From wich 495 male examined 85 (17.15%) and 105 female examined 18 (17.12%) were found Positive respectively. Prevalence of foreign body occurrence recorded in adult 30 (9.57%) and old 73 (25.6%) respectively while the prevalence rate recorded in thin, medium and fat cattle were 61 (46.9%), 29 (20.84%) and 13 (3.91%). The types of foreign bodies encountered in rumen and reticulum were plastic, nails, wires, needle, clothes and ropes. Out of 103 positive cases of foreign body, 65(63.72%) were occurred in rumen while 38 (36.27%) in reticulum. These aforementioned factors were considered as potential risk factors and found highly significantly associated ($p < 0.05$) with the occurrence of foreign bodies. The prevalence of rumen and reticulum foreign bodies was lower in local breed cattle (16.29%) than that of the cross breeds (22.78%). There was not spastically significant difference ($p= 0.432$) between local and cross breed. The highest frequencies of rumen and reticulum foreign bodies observed in cattle originated from Humbo (22%) while the lowest from Sodo (7.84%). There was not statistically significant differences ($p= 0.169$) among the origin of animals. Thus, appropriate solid waste disposal system need to implement in the study area to prevent health risk of ruminants and environment.

1. Introduction

In many developing countries, Like Ethiopia, domestic animals play a crucial role in they constitute as source for traction power, income, in provision of meat, milk, honey, eggs, cheese, and butter supply provide mainly the needed animal protein that contributes to the improvement of the nutritional status of the peoples (Mekonnen *et al*., 1989). Ethiopia is known for its high livestock population, being the first in Africa and tenth in the world. The recent livestock population estimate that the country has about 44.3 million cattle, 46.9 million sheep and goats, more than 1.0 million camels, 4.5 millions equine, and 40.0 million chickens (CSA, 2004).

Cattle play significant contribution in Ethiopian economy as source of meat, milk, drought prower, income and foreign exchange. However, as other livestock in the country their contribution is below their

expected potential due to prevalent livestock diseases, poor management system and poor genetic performance (Abebe, 1995).

Ingestion of foreign body in cattle was reported to be a condition of great economic importance and causes severe loss of production and high mortality rates (Radostitis *et al*., 2000). The problems that are caused vary with the duration that the foreign body has been present, the location of the foreign body and the degree of obstruction that is caused as well as problems associated with the material of the foreign body (Mc. Curin and Basser, 2006).

The ingestion of indigestible materials may occur during period of feed scarcity (Igbokwe *et al*., 2003). Reports from cattle and sheep reared within urban and sub-urban environments indicates that impaction of the rumen resulted from the accumulation of foreign bodies such as plastic bags interfered with flow of ingesta leading to the distention of rumen (Abdullahi *et al*., 1984; Igbokwe *et al*., 2003; Remi-Adewunmi *et al*., 2004). The presence of foreign bodies in the rumen and reticulum also hampers the absorption of volatile fatty acids and consequently reduction in the rate of animal fattening (Igbokwe *et al*., 2003).

The presence of foreign bodies in the rumen and reticulum also hampers the absorption of volatile fatty acids and consequently reduction in the rate of animal fattening. Cattle are more susceptible to foreign body syndrome than small ruminants because they do not use their lips for prehension and are more likely to eat chopped feed; lack of oral discrimination in cattle may lead to ingestion of foreign bodies would be rejected by other species (Desiye and Mersha, 2012).

Entrance and migration of foreign bodies through the body tissues lead to many complications that differ according to the nature of the foreign body and the way of its entrance in to the tissues. TRP relatively common disease in cattle caused by the ingestion of foreign bodies in the reticulum swallowed metallic objects such as nail or pieces of wire fall directly on the reticulum or pass into the rumen and subsequently carried over the rumeno-reticular folds in to the cranioventral part of the reticulum (Jones *et al*., 1997).

Non metallic foreign bodies in the reticulo-rumen cause recurrent rumen tympani in adult dairy cattle, over a period of time, these materials, form large tight balls inside the rumen leading to anorexia decreased production and progressive loss of body condition (Jafarazadeh *et al*., 2004). In Ethiopia, information regarding the magnitude and occurrence of forestomach foreign bodies is very limited. The fact that rumen impaction by these foreign bodies is mainly asymptomatic in nature and only diagnosed in live animals if the material is accumulated in large amount and thus, it can be adequately studied in abattoirs. Therefore, the objectives of this study are: to study the prevalence of rumen and reticulum foreign bodies in cattle; to identify the type of rumen and reticulum foreign bodies and to assess the risk factors associated with the ingestion of foreign bodies in cattle.

2. Materials and Methods

2.1. Study Area

The study was conducted in Wolaita Sodo Municipal Abattoir. Wolaita zone is located 390 km southwest of Addis Ababa following the tarmac road that passes through Shashamane to Arbaminch. Alternatively, it is located 330km southwest of Addis Ababa following the tarmac road that passes through Hosanna to Arbaminch. Wolaita Sodo is the town of the zone. It has a total area of 4,541km^2 and is composed of 12 weredas and 3 registered towns. It is approximately 2000 meters above sea level and its altitude ranges from 700-2900 meters. The area is divided into three ecological zones: Kola (lowland <1500m), Woina Dega (mid-altitude 1500-2300m) and Dega (highland >2300m). Most of the area lies within the mid altitude zone. Rainfall is bimodal, with an average amount of about 1000mm (lower in the lowlands and higher in the highlands). Mean monthly temperature vary from 26^{0}C in January to 11^{0}C in August. Soils (mainly Vertisols and Nitosols) vary in pH from 5-6. Primary occupation of the zone is farming. Mixed crop-livestock production predominates, but there are some pastoralists in the lowlands. Generally, the climatic condition is conducive to livestock production. The livestock population in the area is estimated to be 68,900 cattle, 1992 sheep, 382 goats, 121 horses, 131 mules, 488 donkeys and 55,191 chickens (WZAO, 2011).

2.2. Study Population

The animals were originated from different agro-ecological zones which have different management system. Animals were both local and cross breed cattle kept under extensive and semi intensive farming systems. Even though, the study animals were kept under broad range of management, animals in most of the rural areas were kept to graze pasture on grassland and supplementary feedings of crop residue when pasture is scarce especially during long dry season. In

Sodo town, semi intensive management system is practiced and animals were feed with concentrate and hay. The means of transport of animals to abattoir is by using trek.

2.3. Study Design

A cross sectional study was conducted from November 2015 to March, 2016 at wolaita sodo Municipality Abattoir to assess the prevalence of rumen and reticulum foreign bodies and to identify the type of foreign bodies and their associated risk factors in rumen and reticulum of cattle presented for slaughter. Cattle presented for slaughter was identified by sex, age and body condition score prior to slaughter. Age was determined based on dental eruption as previously described by Pace and Wakeman (2003). Body condition was evaluated based on scores ranging from Score 1 (physically thin), 2(medium) and 3(fat) were described by Pruitt (1994). After slaughter the rumen and reticulum was removed carefully from the abdominal cavity and opened, and any foreign body obtained was washed, dried, identified and weighed accordingly.

2.4. Sample Size Determination

As a scientific work the study should have to be carried out by determining the sample size according to Thrusfield (2005) for an infinite population with 95% confidence level, 5% desired absolute precision by considering expected prevalence of the rumen and reticulum foreign bodies in cattle in the area. There was no previous study on the occurrence of rumen and reticulum foreign bodies of cattle slaughtered at Wolaita Sodo Municipal Abattoir. Therefore, according to Thrusfield the sample size was as follows:

$$n = \frac{(1.96)^2 \, Pexp \, (1- Pexp)}{d^2} = 384$$

Where: n = required sample size, Pexp = Expected prevalence and d = desired absolute precision. The sample size for this work was determined using 50% expected prevalence and 5% absolute precision at 95% confidence level using the above formula, the minimum of 384 cattle are intended to be sampled. However, in this study, to maximize the precision 600 animals were examined.

2.5. Sampling Method

The animals were selected using systematic random sampling using regular interval to study the prevalence and types of the foreign bodies in rumen and reticulum of cattle presented for slaughter in abattoir.

2.6. Ante mortem Examination

Each animal selected for the study was further indentified by providing a unique identification number that could be used for both ante-mortem and post-mortem examinations of the animal and each animals mark for the identification by writing a code on its gluetal muscle by using ink. Ante mortem examination on individual animals was done for assessment of sex, age, breed, body condition and their place of origin (Sodo, Humbo, Gasuba, Bale and Areka). Epidemiological data is also determined including, the main categorization of the animals in the study area; sex (female and male) and age is categorized into young(<5 years), adult (5-10 years) and old (>10 years) based on dentition pattern, breed differentiation (cross and local) and also body condition (thin, medium and fat) (Mc Curin *et al.*, 2006).

2.7. Postmortem Examination

In the postmortem examination rumen and reticulum were examined. Immediately after the animal was slaughtered in the evisceration stage, the stomach is carefully removed from the abdominal cavity and open and explored for the prevalence of any foreign non dietary material by visualization and palpation. Any foreign bodies obtained during inspection was washed with water to remove adhering feed material and identified. When the finding was positive, the location and type of the foreign bodies was recorded otherwise recorded as negative in postmortem record sheet.

2.8. Data Management and Analysis

The data obtained was coded in Microsoft excel and subjected to descriptive statistics and chi square in order to assess the magnitude of the difference of comparable variables using SPSS version 20. Soft ware. Pearson chi square (x^2) test was employed to assess the existence of association between prevalence of the foreign bodies and different potential risk factors considered. For (X^2) test, p- value < 0.05 were considered significant where as p-value > 0.05 considered non significant. Descriptive statistical analysis such as table was used to summarize and present the data collected. The total prevalence of rumen and reticulum foreign bodies was calculated as percentage by dividing total number of positive cattle for foreign bodies to the total number of cattle examined.

3. Results

A cross sectional study was conducted from November 2015 to March, 2016 at Wolaita Sodo Municipality Abattoir. From the total of 600 cattle examined for the presences of any foreign bodies in their rumen and reticulum, 103(17.16%) of them were found positive. From 103 positive cases of foreign body, 65(63.72%) were occurred in rumen while 38(36.27%) in reticulum. The types of foreign bodies were plastic, nails, wires, needle, clothes and ropes. From this result, plastics 23(22.3%), nail 19(18.4%), wire 12 (11.65%), needle 9(8.74), cloth 24(23.3%) and rope 16(15.5%) were more frequently encountered of the positive cases in fore-stomach.

Table1: Sex distribution of rumen and reticulum foreign bodies in cattle at wolaita Sodo Municipal Abattoir.

Foreign bodies	Sex		Total
	Male	Female	
No foreign bodies	410(82.82%)	87(82.85%)	497
Plastics	15(3.03%)	7(6.69%)	22
Nails	19(3.83%)	2(1.92%)	21
Needles	4(0.80%)	2(1.92%)	6
Wires	11(2.22%)	2(1.92%)	13
Clothes	21(4.24%)	2(1.92%)	23
Ropes	15(3.03%)	3(2.85%)	18
Total	495	105	600

X^2=14.96, P=0.00

Foreign bodies were observed at the maximum of 17.22% in female cattle compared to male 17.15%. There was statistically strongly significant association (p= 0.00) in the frequency of occurrence between male and female (Table 1).

Table 2: Prevalence and frequency of rumen and reticulum foreign bodies in cattle slaughtered at wolaita sodo municipal abattoir in association with Age.

Foreign bodies	Age			Total
	Young(<5year)	Adult(5-10year)	Old(>10year)	
No foreign bodies	-	253(89.70%)	245(77.04%)	498
Plastic	-	5(1.78%)	15(4.72%)	20
Nail	-	4(1.42%)	15(4.72%)	19
Needles	-	4(1.42%)	5(1.57%)	9
Wires	-	4(1.412%)	12(3.77%)	16
Clothes	-	8(2.83%)	14(4.40%)	22
Ropes	-	4(1.42%)	12(3.77%)	16
Total	-	282	318	600

X^2=46.64, p=0.00

From 282 and 318 animals examined with the age of 5-10 year and >10 year, 29 (10.29%) and 73(22.95%) were found positive for foreign bodies ingestion respectively. There was significant difference (p= 0.00) between adult and old animals in the occurrence of foreign body in their fore-stomachs. Clothes and Plastics were more frequently encountered foreign bodies in the fore-stomach of adult cattle between 5-10 years whereas plastics, nail, clothes, wire and rope were more frequently recovered foreign bodies from the rumen and reticulum of old cattle between >10 year (Table 2).

Table 3: Breed distribution of rumen and reticulum foreign bodies in cattle slaughtered at Wolaita Sodo Municipal Abattoir.

Foreign bodies	Breed		Total
	Local	Cross	
No foreign bodies	436(83.68%)	61(77.21%)	497
Plastics	17(3.26%)	5(6.33%)	22
Nails	14(2.68%)	5(6.33%)	19
Needles	7(1.34%)	2(2.53%)	9
Wire	12(2.30%)	2(2.53%)	14
Clothes	22(4.22%)	2(2.53%)	24
Ropes	13(2.49%)	2(2.53%)	15
Total	521	79	600

X^2=5.92, p=0.432

Among the total 600 animals examined, 521 were local breeds and 79 were cross breed. In this study foreign bodies were detected in both breeds. The prevalence of rumen and reticulum foreign bodies was higher in local breed cattle 85(16.29%) than that of the cross breeds 18(22.78%). There was not spastically significant difference (p=0.432) between local and cross breed as shown in the above (Table 3).

Table 4: Prevalence and frequency of rumen and reticulum foreign bodies in cattle slaughtered at Wolaita Sodo Municipal Abattoir in association with body condition.

Foreign bodies	Body Condition			Total
	Fat	Medium	Thin	
No Foreign bodies	318(96.07%)	110(79.17%)	69(53.07%)	497
Plastics	2(0.60%)	3(2.15%)	16(12.30%)	21
Nails	1(0.30%)	6(4.31%)	11(8.46%)	18
Needles	1(0.30%)	2(1.44%)	6(4.612%)	9
Wires	2(0.60%)	3(2.15%)	10(7.69%)	15
Clothes	5(5.51%)	7(5.03%)	12(9.23%)	24
Ropes	2(0.60%)	8(5.76%)	6(4.61%)	16
Total	331	139	130	600

X^2=137.340, p=0.00

From 331, 139 and 69 animals examined with fat, medium and thin body condition, 13(3.92%), 29 (20.86%) and 61 (46.90%) were positive for foreign body respectively. There was significant difference (p= 0.00) between different body condition scores and foreign body distribution in rumen and reticulum (Table 4).

Table 5: Origin of animals was found determining the frequency of occurrance of rumen and reticulum foreign body in cattle slaughtered at Wolaita Sodo Municipal Abattoir.

FBs	Origin					Total
	Bale	Sodo	Areka	Humbo	Gasuba	
No FBs	74(83.14%)	94(92.15%)	101(50.50%)	156(78%)	72(84.71%)	497
Plastic	2(2.24%)	2(1.96%)	3(2.40%)	11(5.50%)	3(3.57%)	21
Nails	2(2.24%)	1(0.98%)	7(5.60%)	8(4%)	1(1.19%)	19
Needles	1(1.12%)	1(0.98%)	3(2.40%)	2(1%)	1(1.19%)	8
Wires	1(1.12%)	1(0.98%)	3(2.40%)	7(3.50%)	2(2.38%)	14
Clothes	7(7.86%)	2(1.96%)	5(4%)	8(4%)	3(3.57%)	25
Ropes	2(2.24%)	1(0.98%)	3(2.40%)	8(4%)	2(2.38%)	16
Total	89	102	125	200	84	600

X^2=30.49, p=0.169

Slaughtered cattle at Wolaita Sodo Municipal Abattoir were come from five different origins like Bale, Sodo, Areka, Humbo and Gasuba. The highest frequencies of rumen and reticulum foreign bodies observed in cattle originated from Humbo (22%) while the lowest from Sodo (7.84%). There was not statistically significant differences (p= 0.169) among the origin of animals (Table 5).

Table 6: Frequency of occurrence of rumen and reticulum foreign body in cattle slaughtered at Wolaita Sodo Municipal Abattoir.

Foreign bodies	Number	Sites of Foreign Body		Total
		Rumen	Reticulum	
No foreign bodies	498	0(0%)	0(0%)	498
Plastics	-	23(35.38%)	-	22
Nail	-	1(0.02%)	18(47.64%)	19
Needles	-	1(0.02%)	8(21.05%)	9
Wires	-	2(3.07%)	10(26.32%)	12
Clothes	-	22(33.84%)	2(5.40%)	24
Ropes	-	16(24.62%)	-	16
Total	498	65	38	600

X^2=119.12, p=0.00

From 103 positive cases of foreign body, 65 (10.83%) were occurred in rumen while 38 (6.33%). Occurrence of foreign body was strongly significant difference (p= 0.00) in rumen and reticulum (Table 6).

4. Discussion

Ingestion of indigestible foreign materials by ruminants is a common worldwide problem previously reported by (Ghurashi *et al*., 2009). The present study revealed an overall prevalence of 103(17.16% of rumen and reticulum foreign body in cattle slaughtered at Wolaita Sodo Municipal abattoir. The present study indicate prevalence of foreign bodies is almost similar with Rahel (2011) 17.07% of prevalence of fore stomach foreign bodies in Hawasa Municipal Abattoir, Ethiopia and slightly higher than the report of Desiye and Mersha (2012) 13.22% of rumen and reticulum foreign body in cattle slaughtered at Jimma Municipal Abattoir and significantly lower than the prevalence (77.41%) which was reported by Ismail *et al.* 2007 in adult dairy cattle having indigestible foreign bodies in their fore-stomach, as the result they are suffering from recurrent rumen tympani in Jordan.

In present study, the higher prevalence (17.22%) of foreign bodies was detected in female cattle than male (17.15%). The differences in prevalence rates observed in female (20.0%) and male (15.7%) cattle have also been reported by Tiruneh and Yesuwork (2010), who concluded that the higher prevalence rates of foreign bodies in female cattle were a result of the effect of drought on the production stages of the females that occurred in the year of their study. Ingestion of foreign bodies is associated with a shortage of forage (Hailat *et al*., 1996) as well as increased pollution of grazing lands with indigestible materials (Tesfaye *et al*., 2012). In present study, the higher prevalence in female cattle may be explained by the fact that females are more commonly affected than beef cattle since they are more likely to be fed a chopped feed such as silage or hay (Hailat *et al*., 1996).

In this study, highest prevalence 73(22.95%) of foreign bodies was detected in cattle greater than old cattle (>10 year age) followed by adult cattle (5-10 years) 29(10.29%). There is no foreign body in young cattle (≤5 year's age) because young animal was not slaughtered in Wolaita Sodo Municipal Abattoir. This finding is agree with the work of Abebe and Nuru (2011) who recovered plastics, leather, clothes and ropes at higher prevalence from the rumen and reticulum of old sheep and goats and Desiye and Mersha (2012) who found (81.25%) of foreign bodies in cattle greater than 10 year age. Rahel (2011) also reported (17.85%) of the animals had higher frequency of foreign bodies in rumen and reticulum in the old age. This is because of more foreign bodies in older animals may be a result of the gradual accumulation of indigestible materials ingested over a prolonged period of time

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In this finding, the prevalence was higher in the cross breed cattle (22.78%) compare to local breeds (16.30%). This findings are agree with the work of Desiye and Mersha (2012) who found 70% in cross breed and 10.77% in local breed and Rahel (2011) who reported forestomach foreign bodies with the high prevalence of (58.82%) in crossbreeds. This might be due to associated with the level of body size, production and drought power which requires high demand of energy and nutrition, hence increase exposure for foreign bodies.

The prevalence of foreign bodies in present study of cattle with thin body condition is 61 (46.90%), medium 29(20.86%) and fat body condition 13(3.92%). This finding is in agreement with the reports of Abebe and Nuru (2011) and (Hailat *et al*., 1996). Poor body condition by itself might be due to the contribution of the foreign body that is the animal loss weight after it has been exposed or it might be due to the interference of foreign body with the absorption of volatile fatty acid (VFA) and thus causes reduced weight gain reported by (Rahel, 2011; ismael *et al*., 2007; Remi-Adewunmi *et al*., 2004).

In the present study, the lowest prevalence of foreign body was observed in animals originated from Sodo (7.84%) and the highest in those originated from Humbo (22%). However, this result is disagree to Rahel (2011) reported a prevalence (30.5%)of foreign body in Hawassa which is urban area. The difference in the prevalence rate might be due to difference in the origin of animals presented for slaughter and types of waste management system between the sites (Urban and rural). Animals from urban areas have more chance of acquiring foreign bodies than rural, but people who live in urban area have great awareness about adverse effect of foreign bodies on animal health, production and productivity. So they manage waste and reduce environmental pollution than those people who live rural area.

The highest frequency of occurrence of rumen and reticulum foreign bodies was detected at rumen (10.83%). This may be due to the fact that many ingested feed goes to the rumen. This study also indicated that Metallic foreign bodies were most frequently recovered from reticulum, while non metallic foreign bodies were detected from rumen. Metallic foreign bodies were most frequently recovered from reticulum due to retention of foreign bodies by the honey comb structure of the reticular mucosa and their heavy weight result in gravitational attraction force of these heavy foreign bodies to the ventral part of the forestomach.

The types of foreign bodies in this study were plastic, nails, wires, needle, clothes and ropes. From this result, plastics 23 (22.3%), nail 19 (18.4%), wire 12 (11.65%), needle 9 (8.74), cloth 24 (23.3%) and rope 16 (15.5%) were encountered of the positive cases in fore-stomach. This finding is in general agreement with previous reports from different areas of Ethiopia and Nigeria like (Abebe and Nuru 2011; Roman and Hiwot, 2010; Tesfaye *et al*. 2012).

5. Conclusion and Recommendations

This study revealed that rumen and reticulum foreign bodies have great economic significance associated with not only death but also reduce production and productivity of animals suffering from foreign bodies. It is common in developing countries like Ethiopia where the standard of animal management is unsatisfactory. This study revealed an overall prevalence of 17.16% of foreign bodies in the fore stomach of cattle slaughtered at Wolaita Sodo Municipal Abattoir. Ingested foreign bodies by 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. The types of foreign bodies that found in rumen and reticulum of cattle were plastics, clothes, ropes, needles, nails, and wires. More foreign bodies were found in the rumen (10.83%) than the reticulum (6.33%). Animals with thin body condition and female cattle are the most affected groups compared to that of good body condition and male cattle respectively and also cattle have ≥10 years were more affected than adult cattle. Hence, body condition score, sex and age of animals are considered risk factors for the occurrence of foreign bodies. Therefore, degree of association is highly statistically significant ($p<0.05$) for the occurrence of foreign body.

Based on the above conclusion the following recommendations are forwarded:

- Environmental pollution should be reduced by proper management of waste which reduces the chance of ingesting foreign bodies.
- The owner of cattle should develop awareness toward the effect of foreign bodies in the health, production and productivity of animals.
- The cattle should be supplied with sufficient diet even if the season is dry in order to mitigate the problem of ingestion of foreign bodies.
- The grazing land should be clear and free from any type of foreign bodies.
- The cattle should be kept away from polluted environment.

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Quick Response Code	Website: www.ijarm.com
	Subject: Veterinary Medicine
DOI:10.22192/ijamr.2017.04.01.002	

How to cite this article:
Kassahu Bassa and Wale Tesfaye. (2017). Study on rumen and reticulium foreign bodies in cattle slauthered at Wolaita Sodo municipal Abattoir, Ethoipia. Int. J. Adv. Multidiscip. Res. 4(1): 11-19.
DOI: http://dx.doi.org/10.22192/ijamr.2017.04.01.002