European Journal of Biological Sciences 10 (1): 01-05, 2018
ISSN 2079-2085

DOI: 10.5829/idosi.ejbs.2018.01.05

Parasite Worm Burden and Hematological Profile in Menz Lambs, Ethiopia

Mintesnot Tsegaye

National Institute for Control and Eradication of Tsetse Fly and Trypanosomosis,
Kaliti Tsetse fly Mass Rearing and Irradiation Center, P.O. Box: 19917, Addis Ababa, Ethiopia

Abstract: A study was conducted on Menz lambs at Ethiopian Health and Nutrition Research Institutes (EHNRI) from February to March 2008 to determine the effect of the parasitic worm burden on hematological profile and to estimate the normal blood parameters of Menz lambs. A total of 135 lambs were randomly selected from lambs used by the institutes for the rabies vaccine production purpose. There was no statistically significant association between counts of adult parasites of any species with hematological parameters considered (P>0.05).The mean hematological parameters found were within the normal range for sheep. The overall estimation of blood parameters for Red blood cell(RBC), packed cell volume(PVC), hemoglobin(Hgb), Mean corpuscular volume (MCH), Mean corpuscular hemoglobin concentration (MCHC), Red cell distribution width (RDW), WBC, Lymphocytes, Monocytes, Neutrophils, Basophils and Eosinophils were 10.255±0.151 x 10^6/µl, 27.992±3.9772%, 12.8750±0.755 g/dl, 27.5740±2.31 fl, 12.0600±0.262 pg, 43.6111±0.006 g/dl, 29.5010±0.38%, 5.4010±0.2049 k/µl, 4.4397±0.1708 k/µl, 0.931±0.1773 k/µl, 0.07±0.02 k/µl, 0.11656±0.02773 k/µl and 0.27707±0.06198 k/µl, respectively. All erythrocytes values were not significantly influenced by sex except MCHC values. MCHC values were greatly influenced by sex (P<0.01). In contrast all leucocytes values were significantly influenced by sex (P<0.05). Ten parasitic species belonging to eight genera were identified. Worm count for GIT nematodes and *Fasciola* was light. *Trichuris ovis*, *Trichostrongylus colubriformis*, *Cooperia curtecie*, *Oesophagostomum colombianum*, *Trichostrongylus axie*, *Haemonchus contortus*, *Bunostomum trignocephalem, Fasciola hepatica*, *Monezia expansa* and *Dictyocaulus filaria* were identified. The light intensity of infection with parasitic worms, in the study animals, apparently resulted in the absence of a significant relationship between worm burden and hematological profile (P>0.05). The hematological parameters of lambs obtained during the study could be used as a normal reference value for the sheep of this age, lambs between 3 and 6 months old.

Key words: Cell-Dyn · Hematology · Lambs · Parasites · Sheep

INTRODUCTION

Ethiopia has an estimated 25 million heads of sheep [1]. Nonetheless, the productivity of sheep is lower than the values for sub-Saharan Africa, due to several constraints among which disease is the most important. Helminthosis has considerable significance in a wide range of agro climatic zones in Ethiopia and constitutes one of the most important disease constraints to small ruminant production [2].

Several types of helminthes parasites are commonly found together with other factors, such as poor nutrition and course ill thriftiness. Helminth parasites are the major causes of loss in productivity and poor growth performance. These worms could be classified as liver flukes, stomach and intestinal worms, lungworms and tapeworms [3]. A Wide range of ovine gastrointestinal nematode genera, liver flukes and lungworms are known to exist in the various parts of the country. The most common parasitic worm reported to be found in the country include *Haemonchus, Trichostrongylus, Ostertagia, Bunostomums, Strongyluss, Chabertias, Oesophagostumums, Trichuriss* and *Skirjabinema* species [4, 5].

Corresponding Author: Mintesnot Tsegaye, National Institute for Control and Eradication of Tsetse Fly and Trypanosomosis, Kaliti Tsetse fly Mass Rearing and Irradiation Center, P.O. Box: 19917, Addis Ababa, Ethiopia.
Tel: +251-913234449.

Worms may cause poor growth, weight loss, decreased feed conversion, decreased milk production, diarrhea, anemia, meat and fiber production loss and sometimes death [6]. The most common and significant abnormality of haemograms is anemia. In sheep, anemia occurs most commonly after blood loss, hemolysis and chronic diarrhea [7].

Anemia in animals has been much frequently due to heavy infection with blood sucking parasites such as hookworms and the stomach worm, *Haemonchus contortus*. The pathogenesis of *Haemonchus* infection are a result of anemia and hypoprotienimia caused by the blood sucking activity of the parasite. Its blood sucking activity characterizes Osteratagia. Mild anemia, hypoalbuminaemia and dehydration are the most commonly observed features in ostertagiosis in sheep. Animals with large number of *Trichostrongylus axie* show a decrease of blood albumin, Hemo-concentration and a rise in serum pepsinogen [8].

Modern veterinary medicine provides an expanding battery of clinical diagnostic aids, by which organ function may be assessed. Hematological tests have been widely used for the diagnosis of various animal diseases. The information gained from the blood parameters would substantiates the physical examination and coupled with medical history provide excellent basis for medical judgment. However, there are only limited works on hematological profiles of indigenous animals in Ethiopia in general and the effect of endoparasites on the hematological parameters in particular, even if they exist, they have been done on experimental infection with a single or few parasites species which may not show the actual field condition [9]. Therefore, this study aimed at determining the effect of parasitic worm burden on hematological profiles in Menz lambs.

MATERIALS AND METHODS

Study Area: The study was carried out at Ethiopian Health and Nutrition Research Institutes (EHNRI) in Addis Ababa on Menz sheep. The study animals were brought from DebreBerhan area in the central high lands of Ethiopia with altitude range of 2500-3000m.a.s.l. DebreBerhan is located at 130 km northeast of Addis Ababa. The area has bimodal rainfall pattern with long rains from June to September and short rains from March to May. The farming system in the area is mainly mixed crop-livestock farming.

Study Animals: The study was conducted on 135 Menz lambs between 3 to 6 months old. The Menz sheep breed is estimated to be over 1.5 million and is one of the major Ethiopian sheep breeds. All study lambs were raised under traditional management with minimum health intervention.

Sampling and Sample Size: The study was conducted from February to March 2008 on 135 lambs randomly selected from sheep that were presented for vaccine production. The selected lambs were examined for their hematological profile and 135 lambs were later examined for adult worm burden count of the GIT, liver and lungworms when they were purposively killed for harvesting brain tissues for rabies vaccine production.

Parasitological Examination: Parasitological examination was made using standard procedures. During postmortem findings lungs, liver, abomasums and small intestine of each lambs was examined separately. Abomasum, small, large intestines were opened, scraped and washed thoroughly. The contents of each organ were left to settle for up to 15 minutes. In order to obtain relatively clear sediment, the process was repeated 3 to 4 times. The sediment was preserved in 10% formalin until worms were counted and identified. Worms were collected with aid of dissecting needle and stereomicroscope after pouring the sediment in to Petri dishes and keeping them against a black ground. The worms were identified using identification keys as described by Hansen and Perry [10].

RESULTS

Hematological Results: The overall estimates for RBC, packed cell volume PVC, Hgb, MCV, MCHC, RDW, were 10.255±0.151 x 10^6/µl, 27.992±3.9772%, 12.8750±0.755 g/dl, 27.5740±0.231 fl, 12.0600±0.262 pg, 43.6111±0.006 g/dl and 29.5010±0.380%, respectively. The least squares means (and standard errors) of erythrocytes series are presented in Table 1a.

There was no statistically significant association between worm burden of any species of parasite and erythrocytes values. The least squares means of leukocyte values (absolute and differential count) are presented in Table 2a.

The overall estimates for WBC, Lymphocytes, Monocytes, Neutrophils, Basophils and eosinophils were 5.4010±0.2049 k/µl, 4.4397±0.1708 k/µl, 0.9313 k/µl, 0.070±0.02 k/µl, 0.11656±0.02773 k/µl and 0.27707±0.06198 k/µl, respectively. Like the erythrocytes values, there was also no statistically significant association between worm burden of any species of parasite and leucocytes values.

Table 1a: Least square means of erythrocytes values in Menz lambs (n=135)

Erythrocyte values	TotalRBC K/µl	Hemoglobin g/dl	MCH pg	MCHC	MVC fl	RDW %	HCT(PVC)%
Mean±SE	10.255±0.15	12.875±0.75	12.060±0.26	43.611±1.00	27.574±0.23	29.501±0.3	27.992±3.9

Table 1b: Least square means of erythrocytes values in Menz lambs as influenced by sex.

	Erythrocyte values						
Sex	RBC* K/µl	HGB g/dl	HCT%	MCVfl	MCHpg	MCHC g/dl	RDW%
Male	10.3±1.3	12.1±1.9	27.9±3.3	27.4±1.7	11.7±0.5	39.6±5.4	30.7±1.9
Female	10.02±1.5	11.923±1.8	27.433±3.2	27.743±2.2	11.693±0.5	48.803±12.8	29.423±2.3

K*=Kilo, thousands

Table 2a: Least square means of leucocytes series in Men lambs (n=135)

Leucocytes values	WBC K*/µL	Neu k/µl	lympho K/µl	MonoK/µl	Eos K/µL	Baso K/µl
Absolute count	5.7401±0.209	0.9313±0.1773	4.4397±0.1708	0.070±0.02	0.11656±0.0277	0.27707±0.06198

K*=Kilo, thousands

Table 2b: Least square means of leucocytes values in Menz lambs as influenced by sex

Sex	Leucocytes values					
Absolute count	WBC K*/µL	NEU k/µl	LYM K/µl	MONOK/µl	EOS K/µL	BASO K/µl
Male	6.897±2.736	0.017±0.009	5.865±1.98	0.092±0.067	0.00033±0.0006	0.974±1.395
Female	5.838±1.844	0.981±1.373	4.327±1.491	0.0848±0.073	0.11±0.163	0.336±0.464

K*=Kilo, thousands

Table 4: Mean adult worm count in Menz lambs (n=90)

Species of parasites								
Mean count of adult worms	T.ct*	T.axie	T.ci*	C.curtecie	B.trig*	O.c*	T.ovie	F.hepatica
	8	38	160	98	14	15	21	2

T.ct- *T. conturtus*, T.ci- *T. colubriformis*, B.trig- *B. trignocephalum*, O.c- *O. columbianum*

All erythrocytes values were not influenced by sex except MCHC values. In contrast all leucocytes values were significantly influenced by sex .The least squares means of leucocytes values (absolute and differential count) and erythrocyte values of both sex are presented in Table 1b and 2b.

Parasitological Results: Mean postmortem differential adult worm counts in this study were generally very low. The common adult worms found during worm counting were *T. coulobriforms*, *H. conturtus*, *T. axie*, *O. columbianum*, *C. curtucie*, *T. ovies* and *F. hepatica* with mean counts of 160, 8, 38, 15, 98, 21 and 2, respectively.

DISCUSSION

The hematological values for Menz lambs aged between three and six months were within normal ranges described by Schalms *et al*. [11]. They reported similar values to this results: RBC (9-15 M/µl), Hgb(9-15g/dl), PCV (27.0-45.0%), MCV (28-40fl), MCHC (8-12g/dl), total leukocytes (4-12 K/µl), Neutrophils (0.7-0.6 K/µl), lymphocytes (2-9 K/µl) and Monocytes (0-0.750 K/µl). However, slight differences were observed on hematological parameters compared with previous works on hematological parameters in Menz sheep [12]. However the values for RBC, Hgb and PCV of this study were favorably comparable to the report of this report, even though there was a slight difference on parameters of MCV, MCH and total WBC count. The difference could be due to the techniques employed in diagnosis [13-15]. All erythrocytes values were not influenced by sex except MCHC values. In contrast all leucocytes values were significantly influenced by sex. Similar finding was reported by Egbe-nwiyi *et al*. [16].

Mean parasitic adult counts were very low. Adult worm counts of 1 to 500 *Haemonchus*, 1 to 1000 *Trichostrongylus*, 1 to 50 *Oesophagostomum* and 1 to 19 *Fasciola hepatica* are in general considered as light degree of infection. Our result of worm burden also agreed with mean monthly mature count in Ethiopian high land sheep at DebreBerhan; where low to moderate abomasal and intestinal worm burden was reported [17].

Based on the differential adult worm count during necropsy, *Trichuris ovis* was the most prevalent followed by *Trichostrongylus colubriformis*. Other species of higher pathogenicity ;*Haemonchus*, *Bunostomum* and *Fasciola* were found less frequently and with low burden [18, 19].

There was no significance association between parasitic worm burden (Total and differential) and blood values in the present study. However, significant association between worm burden and blood values in sheep have been described previously, where hematocrit level was inversely associated with nematode worm egg counts [20]. *Haemonchus* was found to depress hemoglobin level [21]. The disagreement of the result of this study with these results could be due to low adult parasite load in the study animals. The study animals were most likely borne at the end of the last rainy season. Therefore they were possibly not exposed to large numbers of infective larvae when they started grazing. The mean blood parameters determined using modern automated cell blood counter (Cell-Dyn 3700) was within the normal range compared to values in the literature. In addition the value obtained with the machine compared favorably with a report of hematological values on Menz sheep done manually, except for a slight difference in the total leukocytes count. Therefore automated hematological analyzer can be used as a diagnostic aid in sheep where they are available.

CONCLUSION

The study indicated that hematological parameters do not significantly change with worm count in lambs. Economically important species of parasites were found infecting the lambs, though in small numbers. Considering the age of the lambs (3-6 months) and the time of the study (February to March) it is possible to conclude that the study animals started grazing in the dry season. Therefore, lambs which start their first season grazing in the dry season continue to carry light worm burden throughout dry season. The hematological result obtained from this study could serve as a normal reference value for Menz and other breeds of sheep in Ethiopia. Moreover, the value obtained in the study was not significantly affected by worm count and can be representative of animals managed under traditional management.

REFERENCES

1. Central Statistical Authority, 2012. Spatial Analysis of Livestock Production Patterns in Ethiopia.
2. Haile, A., S. Tembely, D.O. Anindo, E. Mukasa-Mugerwa, J.E.O. Rege, A. Yami and R.L. Baker, 2002. Effects of breed and dietary protein supplementation on the responses to gastrointestinal nematode infections in Ethiopian sheep. Small Ruminant Research, 44(3): 247-261.
3. Tesfaye, H., 1998. Ovine and bovine helminthiasis in Kelala (S. Wollo).In Ethiopian Veterinary Association Proceedings of the 12th Conference Addis Ababa, Ethiopia, pp: 30-34.
4. Ayalew, T., 1994. Preliminary survey of sheep helminthiasis in Kimbibit district, North Shoa. In 8th Conference of the Ethiopian Veterinary Association, Addis Ababa, Ethiopia, pp: 86-94.
5. Christopher, G. and F. Margaret, 2002. Sheep and Goat Medicine, Cambridge University press, USA, pp: 39-82.
6. Jones, T.C., R.D. Hunt and N.M. King, 1997. Veterinary Pathology (6thedn) Williams and Wilkins.
7. Radostitis, O. M., D.C. andCC. Gay, 1994. Acute carbohydrate engorgement of ruminants (Rumen overload). Veterinary Medicine. A textbook of the Diseases of Cattle, Sheep, Pigs, Goats and Horses, 8th ed. BaillièreTindall, London, 262-269.
8. Robinson, F.W.and R.R.C. Huxtable, 1998. The relationship between pathology and medicine in clinical pathologic principle for veterinary medicine, Cambridge university press, New York, USA pp: 39-82.
9. Jain, N.C., 1993. Essential of veterinary hematology copyrights by Lea and Febiger Philadelphia. USA.
10. Hansen, J. and B. Perry, 1994. The epidemiology, diagnosis and control of helminthes parasites of ruminants. A handbook. 2nd edition .ILRAD, Nairobi, Kenya, pp: 171.
11. Schalms, O.W., N.C. Jain and E.I. Carol, 1975. Veterinary hematology. 3rd edn. Lea and Febiger Philadelphia. USA.
12. Tibbo, M., K. F. Aragaw, M. Abunna, A. Woldemeskel, M. Deressa, L. Dechassa and J.E.O. 2005. Factors affecting hematological profiles in three indigenous Ethiopian sheep breeds. Comparative Clinical Pathology, 13(3): 119-127.

13. Butler, E., M. Lichman and B. Coller, 2001. Williams Hematology, 6th edition. Published by Hemacylix, London, pp: 35-36.
14. Sjaastad, O.V., K. Hove and O. Sand, 2010. Physiology of domestic animals. Scan. Vet. Press.
15. Willard, M.D. and H. Tvedten, 2011. Small Animal Clinical Diagnosis by Laboratory Methods-E-Book. Elsevier Health Sciences.
16. Egbe-Nwiyi, T.N., S.C. Nwaosu and H.A. Salami, 2000. Hematological values of appararently healthy sheep and goats as influenced by age and sex in arid zone of Nigeria. African Journal of Biomedical Research, 3(2): 109-115.
17. Bekele, T. and O.B. Kasali, 2004. The effect of endoparasites on the productivity of Ethiopian high land sheep, International Livestock Center for Africa (ILIKA), Addis Ababa, Ethiopia.
18. Menkir, S., 2007. Helminthes parasites of sheep and goats in Eastern Ethiopia. Doctoral thesis, Swedish university of Agricultural Science, Sweden, Uppsala, pp: 13-16.
19. Odikamnoro, O.O., G.A. Ibiam, O.V. Umah and O.T. Ariom, 2015. A survey of common gut helminthes of goats slaughtered at Ankpa abattoir, Kogi State, Nigeria. Journal of Parasitology and Vector Biology, 7(5): 89-93.
20. Soulsby, E.J.L., 1982. Helminths, arthropods and protozoa of domesticated animals (No. Ed. 7). Bailliere Tindall, pp: 40-50.
21. Roberts, J.L. and R.A. Swan, 1982. Quantitative studies of ovine haemonchosis. The interpretation and diagnostic significance of the changes in serial egg counts of Haemonchus contortus in a sheep flock. Veterinary parasitology, 9(3-4): 223-231.