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Haemato-biochemical changes before and after therapy with ivermectin and levamisole in Gastrointestinal Nematodes infected goats

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Abstract
368 goats were presented to the Campus Veterinary Hospital and Ambulatory Clinical Services, Mylardevpally, College of Veterinary Science, Hyderabad, from December-2017 to June-2018. Out of which 140 goats (38.04%) were found positive for gastrointestinal nematodal infestation. 10 apparently healthy goats, which were negative for gastrointestinal nematodal infestation were selected, subjected to haematological and biochemical investigations and they served as healthy control (group I). Goats positive for gastrointestinal nematodal infestation were randomly divided into two groups (II and III) with each group having 10 positive cases and studied haematological and biochemical changes on day 0 of before therapy and day 7 of after therapy in ivermectin and levamisole treated groups of II and III respectively, There was significant (P<0.05) changes noticed in the mean Haemoglobin (9.73 ± 0.01 and 9.67 ± 0.01), Packed cell volume (26.59 ± 0.58 and 26.21 ± 0.33), Total erythrocyte counts (11.34 ± 0.01 and 11.23 ± 0.007), lymphocytes (49.14 ± 0.95 and 49.42 ± 0.34), Total serum proteins (5.14 ± 0.03 and 5.31 ± 0.03), Albumin levels (1.92 ± 0.04 and 2.02 ± 0.04) whereas, significant (P<0.05) increase in Total leucocyte counts (10.68±0.01 and 10.98 ± 0.02), eosinophils (7.12 ± 0.17 and 6.97 ± 0.10), monocytes (3.01 ± 0.03 and 2.96 ± 0.01), Globulin (3.22 ± 0.03 and 3.29 ± 0.05) and Alanine aminotransferase levels (26.09 ± 0.33 and 24.19 ± 0.52) on before therapy in group II and III respectively, and found normal levels after therapy.

Keywords: Goat, nematodes, haemato-biochemical, ivermectin, levamisole

Introduction
Goats are one of the earliest domesticated small ruminants. Over 94% of the goat population of the world is distributed in two continents Asia and Africa (Acharya, 1992) [1]. South Asian countries including India and Pakistan are the major producers of goat milk, whereas, in Europe the most developed dairy goat industry is in France and Italy. Indian breeds such as Jamunapari, Beetal, Surti produce fairly good amount of milk (Pal *et al.*, 2010) [2]. Goat is the means of livelihood for many marginal farmers, it contributes about 47.3 million rupees to national economy, particularly through milk, meat and by-products apart from providing the best quality manure, hair, skin, hides etc. (Rekib and Vihan, 1997) [3]. They are kept primarily for milk and meat so they contribute substantially to household income and food security in the rural areas. They provide a dependable source of income to about 40% of the rural population below poverty line in India and to many who do not possess any land (Viswanath, 2002) [4]. Goat population in Telangana is 135.2 million (According to Animal Husbandry Annual Report 2016-2017, 19th Livestock Census, 2012).

Helminths are common parasites of animals. Infections by gastrointestinal helminth parasites of animals are among the most common and economically important diseases of grazing animals (Perry, 2002) [5]. They are characterised by lower outputs of animal products (meat, milk, hides and skins) and manure. Nematode infestation of gastrointestinal tract is one of the major problems in goats which are characterized clinically by enteritis, dehydration, emaciation and death. These changes are responsible to affect the growth, yield and reproductive performance of animals leading to economic loss of the farmer (Sharma *et al.*, 2014) [6]. In sub-clinical form worm sucks blood continuously (Maiti *et al.*, 1999) [7] resulting in anemia and hypoproteinemia. Serum biochemistry and haematological analysis have been found to be important and reliable indicators for assessing an animal's health status and might give an assessment of the degree of damage to host tissue as well as severity of infestation (Otesile *et al.*, 1991) [8]. Therefore, the present investigation was undertaken to study the effect

of gastrointestinal nematodiasis on haematological and biochemical changes with therapeutic drugs.

2. Materials and Methods

The present investigation was carried out from December-2017 to June-2018 in the Department of Veterinary Medicine and collaboration with the Department of Veterinary Parasitology, College of Veterinary Science, Hyderabad.

2.1 Collection and analysis of faecal samples

Five grams faecal sample was collected directly from the rectum of each goat with faecal scoop in a zip lock cover and the collected faecal samples were analyzed by Direct Smear Method and Sedimentation /Salt Flotation Technique for the presence of nematodal eggs as described by Eysker and Ploeger (2000) [9]. Ten apparently healthy goats which were free from gastrointestinal nematodal infestation, served as healthy control (group I). Goats with faecal samples positive for gastrointestinal nematodal eggs were selected and were randomly divided into two groups viz., II and III and consisting of 10 animals each group and these groups of goats were subjected to haematological and biochemical changes before and after therapy on day 0 and day 7, respectively. Two different drugs were administered as a single dose in animals of group II and III with ivermectin (Neomec) at 200 µg/kg bw subcutaneously and levamisole (Nilverm) at 7.5 mg/kg bw orally, respectively.

2.2 Collection and analysis of haematological parameters

Blood samples were collected on day 0 (before treatment) and day 7 (after treatment) from goats that were positive for nematodal eggs in 4 ml EDTA vacutainers from jugular vein under aseptic conditions for estimating Haemoglobin (g %), Packed cell volume (%), Total erythrocyte counts (x 10^6 µL), Total leucocyte counts (x 10^3 µL) and Differential leucocyte counts (%).

2.3 Collection and analysis of biochemical parameters

Blood was collected in 4 ml serum vacutainers with clot activators under aseptic conditions and after collection, blood was allowed to clot at room temperature and centrifuged for serum separation. Serum samples were then transferred into Eppendorf tubes and were maintained at 4 ^oC till they reached the laboratory for estimation of Total serum protein (g/dl), albumin, globulin (g/dl) and Alanine aminotransferase levels (µL). Data collected was analyzed statistically as per the methods described by Snedecor and Cochran (1967) [10].

3. Results

The mean haematological findings before and after therapy of group II and III are summarized in Table 1 and 2 respectively, Goats found positive for gastrointestinal nematodal infestation were selected and divided as group II and III and Haematological analysis revealed the mean haemoglobin (g %) in group II on day 0 and 7 were 9.73 ± 0.01 and 11.10 ± 0.01, respectively whereas in group III on day 0 and 7 were 9.67 ± 0.01 and 10.84 ± 0.01, respectively. The mean PCV (%) in group II on day 0 and 7 were 26.59 ± 0.58 and 35.47 ± 0.14, respectively whereas in group III on day 0 and 7 were 26.21 ± 0.33 and 33.5 ± 0.45, respectively. The mean TEC (x 10^6 µL) in group II on day 0 and 7 were 11.34 ± 0.01 and 13.51 ± 0.01, respectively whereas in group III on day 0 and 7 were 11.23 ± 0.007 and 12.93 ± 0.01, respectively. The mean TLC (x 10^3 µL) in group II on day 0 and 7 were 11.09 ± 0.02 and 10.79± 0.004, respectively whereas in group III on day 0 and 7 were 10.98 ± 0.02 and 10.87 ± 0.003, respectively. The mean neutrophils (%) in group II on day 0 and 7 were 40.22 ± 0.26 and 39.48 ± 0.75, respectively whereas in group III on day 0 and 7 were 40.16 ± 0.25 and 39.47 ± 0.70, respectively. The mean lymphocytes (%) in group II on day 0 and 7 were 49.14 ± 0.95 and 53.45 ± 0.67, respectively whereas in group III on day 0 and 7 were 49.42± 0.34 and 53.46 ± 0.28, respectively. The mean eosinophils (%) in group II on day 0 and 7 were 7.12 ± 0.17 and 3.95 ± 0.15, respectively whereas in group III on day 0 and 7 were 6.97 ± 0.10 and 3.98 ± 0.13, respectively. The mean monocytes (%) in group II on day 0 and 7 were 3.01 ± 0.03 and 2.68 ± 0.01, respectively whereas in group III on day 0 and 7 were 2.96 ± 0.01 and 2.65 ± 0.01, respectively. The mean basophils (%) in group II on day 0 and 7 were 0.51 ± 0.04 and 0.44 ± 0.05, respectively whereas in group III on day 0 and 7 were 0.49 ± 0.04 and 0.44 ± 0.03, respectively.

The biochemical parameters in goats before and after therapy of group II and III are presented in Table 3 and 4 respectively, The mean serum total protein concentration (g/dl) in group II on day 0 and 7 were 5.14 ± 0.03 and 6.45 ± 0.07, respectively whereas in group III on day 0 and 7 were 5.31 ± 0.03 and 6.42 ± 0.06, respectively. The mean concentration (g/dl) of serum albumin in group II on day 0 and 7 were 1.92 ± 0.04 and 3.81 ± 0.01, respectively whereas in group III on day 0 and 7 were 2.02 ± 0.04 and 3.84 ± 0.03, respectively. The mean concentration (g/dl) of serum globulin in group II on day 0 and 7 were 3.22 ± 0.03 and 2.64 ± 0.07, respectively whereas in group III on day 0 and 7 were 3.29 ± 0.05 and 2.58 ± 0.04, respectively. The mean alanine aminotransferase levels (U/L) in group II on day 0 and 7 were 26.09 ± 0.33 and 17.08 ± 0.12, respectively whereas in group III on day 0 and 7 were 24.19 ± 0.52 and 18.07 ± 0.28, respectively.

Table 1: Mean Haematological changes in goats of Group II before and after therapy

S. No.	Haematological parameters	Healthy control (Group I)	Group II (n=10)	
			Before therapy (Day '0')	After therapy (Day '7')
1	Hb (g %)	11.58±0.02	9.73 ± 0.01[a]	11.10 ± 0.01[b]
2	PCV (%)	36.75±0.88	26.59 ± 0.58[a]	35.47 ± 0.14[b]
3	TEC (x 10^6 µL)	14.02±0.07	11.34 ± 0.01[a]	13.51 ± 0.01[b]
4	TLC (x 10^3 µL)	10.68±0.01	11.09 ± 0.02[a]	10.79 ± 0.004[b]
5	Neutrophils (%)	39.45±0.15	40.22 ± 0.26	39.48 ± 0.75
6	Lymphocytes (%)	53.51±0.42	49.14 ± 0.95[a]	53.45 ± 0.67[b]
7	Eosinophils (%)	3.89±0.15	7.12 ± 0.17[a]	3.95 ± 0.15[b]
8	Monocytes (%)	2.72±0.14	3.01 ± 0.03[a]	2.68 ± 0.01[b]
9	Basophils (%)	0.43±0.02	0.51 ± 0.04	0.44 ± 0.05

[a, b] Significant at $P<0.05$

Table 2: Mean Haematological changes in goats of Group III before and after therapy

S. No.	Haematological parameters	Healthy control (Group I)	Group III (n=10)	
			Before therapy (Day '0')	After therapy (Day '7')
1	Hb (g %)	11.58±0.02	9.67 ± 0.01[a]	10.84 ± 0.01[b]
2	PCV (%)	36.75±0.88	26.21 ± 0.33[a]	33.5 ± 0.45[b]
3	TEC (x 10^6 µL)	14.02±0.07	11.23 ± 0.007[a]	12.93 ± 0.01[b]
4	TLC (x 10^3 µL)	10.68±0.01	10.98 ± 0.02[a]	10.87 ± 0.003[b]
5	Neutrophils (%)	39.45±0.15	40.16 ± 0.25	39.47 ± 0.70
6	Lymphocytes (%)	53.51±0.42	49.42 ± 0.34[a]	53.46 ± 0.28[b]
7	Eosinophils (%)	3.89±0.15	6.97 ± 0.10[a]	3.98 ± 0.13[b]
8	Monocytes (%)	2.72±0.14	2.96 ± 0.01[a]	2.65 ± 0.01[b]
9	Basophils (%)	0.43±0.02	0.49 ± 0.04	0.44 ± 0.03

[a, b] Significant at $P<0.05$

Table 3: Mean biochemical changes in goats of Group II before and after therapy

S. No.	Biochemical parameters	Healthy control (Group I)	Group II (n=10)	
			Before therapy (Day '0')	After therapy (Day '7')
1	Total protein (TP)	6.73±0.08	5.14 ± 0.03 [a]	6.45 ± 0.07 [b]
2	Albumin	3.97±0.06	1.92 ± 0.04[a]	3.81 ± 0.01[b]
3	Globulin	2.76±0.06	3.22 ± 0.03[a]	2.64 ± 0.07[b]
4	Alanine aminotransferase (ALT)	16.19±0.36	26.09 ± 0.33[a]	17.08 ± 0.12[b]

[a, b] Significant at $P<0.05$

Table 4: Mean biochemical changes in goats of group III before and after therapy

S. No.	Biochemical parameters	Healthy control (Group I)	Group III (n=10)	
			Before therapy (Day '0')	After therapy (Day '7')
1	Total protein (TP)	6.73±0.08	5.31 ± 0.03 [a]	6.42 ± 0.06 [b]
2	Albumin	3.97±0.06	2.02 ± 0.04[a]	3.84 ± 0.03[b]
3	Globulin	2.76±0.06	3.29 ± 0.05[a]	2.58 ± 0.04[b]
4	Alanine aminotransferase (ALT)	16.19±0.36	24.19 ± 0.52[a]	18.07 ± 0.28[b]

[a, b] Significant at $P<0.05$

4. Discussion

In the present study, blood samples from 20 goats which were positive for gastrointestinal nematodal infestation and 10 apparently healthy goats were analysed for Hemoglobin (g %), Packed Cell Volume (%), Total erythrocyte counts (x 10^6 µL), Total leucocyte counts (x 10^3 µL), Differential leucocyte counts (%), Total serum protein (g/dl), albumin (g/dl), globulin (g/dl) and Alanine aminotransferase levels (µL).

In the present study, the reduction in Haemoglobin (Hb), Packed Cell Volume (PCV) and Total Erythrocyte Counts (TEC) in the goats that were infestated with nematodes, was due to their blood sucking ability and losses due to leakage on severe damage to gastrointestinal mucosa caused by the parasites (Soulsby, 1976 and Urquhart *et al.*, 1996). In the present study the total leucocyte counts and eosinophils in goats infestated with gastrointestinal nematodal parasites were found higher when compared with healthy control goats and the increase in the levels of total leucocyte counts during the study might be due to increased local immune responses by eosinophils and monocytes (Ahmed *et al.*, 2015) [3]. Eosinophils were considered to be important elements that respond against nematodes infestations (Balic *et al.*, 2000) [14]. The animals infestated with nematodes showed considerable degree of blood eosinophilia, when compared to the non-infestated animals. The eosinophils mobilized against specific parasites were frequently found to cause immobility and death of larvae of homologous or heterologous parasites often in association with antibodies and/or other factors (Rainbird *et al.*, 1998) [15]. In the present study the increase in monocytes was due to phagocytic activity of the cell digesting the particulate matter and debris of parasites as observed in cell mediated immune responses (Ahmed *et al.*, 2015) [3].

In the present study, biochemical analysis of serum from the goats infestated with gastrointestinal nematodal parasites revealed significant decrease ($P<0.05$) in the levels of total serum protein, albumin and significant increase ($P<0.05$) in the levels of globulin and alanine aminotransferase (ALT) before therapy and found normal levels after therapy. Similar observations were reported by Moudgil *et al.* (2017) [16] and Tarazona *et al.* (1982) [17]. The hypoproteinemia and hypoalbuminemia in the affected animals could be attributed to protein losing gastroenteropathy in nematodiasis (Soulsby, 1982) and malabsorption of proteins from damaged intestinal mucosa in concurrent gastrointestinal infections (Ahmed *et al.*, 2015) [3]. The affected animal loose large amount of serum protein into the gut lumen and about 210-340 ml of serum protein may be excreted through faeces per day in the affected animals (Bordoloi *et al.*, 2012 and Dargie *et al.*, 1975) [19, 20]. In the infestated goats the globulin levels was significantly ($P<0.05$) higher than the healthy control goats. Similar increase in the values of globulins were reported by Diogenes *et al.* (2010) [21] and Jas *et al.* (2010) [22]. The parasitic infestation was found to stimulate the host's immune system resulting in increased synthesis of gamma globulins (Tarazona *et al.*, 1982) [17]. The increased levels of alanine aminotransferase (ALT) was observed in infestated goats due to traumatic damage of abomasal and intestinal lining mucosa by the parasites and the nematodes larva were found to cause damage to deep abomasal muscular layers, which were in agreement with the findings of Sharma *et al.*, 2001 [23],

Moudgil *et al.*, 2017 [16], Ratnesh *et al.*, 2013 [24] and Hassan *et al.*, 2012 [25].

5. Conclusion

It was concluded that the haemato-biochemical parameters were altered in goats with gastrointestinal nematodes and found normal levels after anthelmintic therapy. Therefore, the haemato-biochemical findings plays an important diagnostic role to assess health and disease in goats suffering from gastrointestinal nematodes.

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7. References

1. Acharya RM. Goat production. Proceedings of 5th international conference on goats. New Delhi, India, 1992, 49.
2. Pal UK, Mandal PK, Rao VK, Das CD. Quality and Utility of Goat Milk with Special Reference to India: An Overview. Asian J. Anim. Sci., 2010; 5(1):56-63.
3. Rekib A, Vihan VS. Economic losses in goat production due to diseases. 3rd proceedings, National seminar on small ruminant diseases, CIRG, Makhdoom, Mathura, 1997, 10.
4. Viswanath CS. Handbook of Animal Husbandry. 3rd Edn. ICAR, New Delhi, 2002, 2.
5. Perry BD. investing in animal health research top alleviate poverty. ILRI (International Livestock Research Institute), Nairobi, Kenya, 2002, 148.
6. Sharma P, Sharma D, Dogra PK, Mandial RK. Comparative efficacy of fenbendazole and oxyclozanide-tetramisole combination against gastrointestinal nematodes in naturally infected Gaddi goats. Vet. Resea. International. 2014; 2(1):15-17.
7. Maiti SK, Rao VN, Ali SL. Clinico-haematological and therapeutic studies in parasitic gastroinenteritis in sheep. Ind. Vet. Journal. 1999; 76(5):435-437.
8. Otesile EB, Fagbemi BO, Adeyemo O. Vet. Parasitol. 1991; 40(3, 4):207-216.
9. Eysker M, Ploeger HW. Value of present diagnostic methods for gastrointestinal nematode infections in ruminants. Vet. Parasitol. 2000; 120:S109-S119.
10. Snedecor GW, Cochran WG. Statistical methods. Iowa State. University Press. 1967; 327:12.
11. Soulsby EJL. Pathophysiology of parasitic infection. Academic Press, New York, 1976.
12. Urquhart GM, Armour J, Duncan JL, Dunn AM, Jennings FW. Vet. Parasitol. 1996; 2:122-125.
13. Ahmed A, Dar MA, Bhat AA, Jena B, Mishra GK, Tiwari RP. Study on haemato-biochemical profile in goats suffering from gastrointestinal parasitism in Jaipur district of Rajasthan. J Livest. Sci. 2015; 6:52-55.
14. Balic A, Bowles VM, Meeusen EN. The immunology of gastrointestinal nematodes in ruminants. Adv. Parasitol. 2000; 45:181-241.
15. Rainbird MA, Macmillan D, Meeusen ET. Eosinophil-mediated killing of *Haemonchus contortus* larva: effect of eosinophil activation and role of antibody, complement and interleukin-5. Parasite Immunology, 1998; 20(2):93-103.
16. Moudgil AD, Sharma A, Verma MS, Kumar R, Dogra PK, Moudgil P. Gastrointestinal parasitic infections in Indian Gaddi (goat) breed bucks: clinical, hemato-biochemical, parasitological and chemotherapeutic studies. J. Parasitic Diseases. 2017; 41(4):1059-1065.
17. Tarazona JM, Sanz-Pastor A, Babin-M-Del M, Dominguez T, Parra I, Pasto-A-Sanz *et al*. Caprine Trichostrongyloidis II clinical studies of field infections. Anales-del-Institutocational-de-Investigaciones Agrarias; Ganadera-Spain, 1982; 14:111-124.
18. Soulsby EJL. Helminths, arthropods and protozoa of domesticated animals, (No. Ed. 7). Bailliere Tindall, 1982.
19. Bordoloi G, Jas R, Ghosh JD. Changes in the haemato-biochemical pattern due to experimentally induced haemonchosis in Sahabadi sheep. J Parasitic Diseases, 2012; 36(1):101-105.
20. Dargie JD, Allonby EW. Pathophysiology of single and challenge infections of *Haemonchus contortus* in Merino sheep: Studies on red cell kinetics and the "self-cure" phenomenon. International J. for Parasitol. 1975; 5(2):147-157.
21. Diogenes PVA, Suassuna ACD, Ahid SMM, Soto-Blanco B. Serum Protein Electrophoretie Profile of Goats Infected with *Haemonchus contortus*. J Anim. and Vet. Advances. 2010; 9(11):1603-1606.
22. Jas R, Ghosh JD, Pandit S, Das K. Haemato-biochemical impact of primary infection of *Oesophagostomum columbianum* in goats. J. Vet. Parasitol. 2010; 24(2):117-120.
23. Sharma DK, Chauhan PPS, Agrawal RD. Changes in the levels of serum enzymes and total protein during experimental haemonchosis in Barbari goats. Small Ruminant Resea. 2001; 42(2):119-123.
24. Ratnesh K, Sanjeev R, Vishnu PG, Mamta N, Senapati PK. Haematological and biochemical changes in black Bengal goats infected with *Haemonchus contortus*. Ind. J. Small Ruminants. 2013; 19(2):172-174.
25. Hassan MM, Hoque MA, Islam SA, Khan SA, Hossain MB, Banu Q. Efficacy of anthelmintics against parasitic infections and their treatment effect on the production and blood indices in Black Bengal goats in Bangladesh. Turkish J. Vet. and Anim. Sci. 2012; 36(4):400-40.