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Impact of Naturally Occurring Gastrointestinal Nematodosis on Serum Protein Concentration in Garole Sheep

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Abstract

The major pathogenic effect of gastrointestinal (GI) nematodosis is caused due to the protein loosing gastroenteropathy and blood sucking habit of some nematodes. The impact of gastrointestinal nematodosis on serum protein concentration was determined in Garole sheep under field condition. Thirty sheep having natural infection of *Haemonchus, Oesophagostomum, Trichostrongylus, Strongyloides, hookworm* and *Trichuris* were randomly divided into two equal groups—one group was kept nematode free by tactical treatment with Ivermectin at 0.2 mg/kg body weight subcutaneously and the other group was kept untreated for allowing them to harbor the naturally acquired infections. Serum biochemical parameters i.e. total serum protein (TSP), serum albumin (SA), serum globulin (SG) and albumin—globulin (SA : SG) level in both the groups were estimated once prior to the first anthelmintic treatment and there after on day 10, 40 and 70 of post-treatment (DPT). The nematode infected sheep had significantly lower values of total serum protein, serum albumin and globulin level as compared to the nematode freed group of sheep.

Key words : Gastrointestinal nematodosis, Serum protein concentration, Garole sheep.

West Bengal, especially the Sunderban Delta of South 24 Parganas district, is the home tract of a popular sheep breed, the Garole sheep (Sharma et al. 1999). Garole sheep rearing has gained an importance due to its short generation interval, higher prolificacy and the ease with which it can be reared, marketed and used as a resource to supplement the income of small and marginal farmers. But profitable sheep rearing suffer from a variety of constraints of which disease problem is the major hindrance. Although sheep suffer from a variety of diseases but their habits and habitat make them highly prone to parasitic diseases especially due to gastrointestinal parasitic infection. Gastrointestinal parasites cause severe damage to the gastrointestinal mucosa causing digestive disturbances and reduced absorption of food materials resulting morbidity losses (Soulsby 1965). Absorption of serum protein hampered due to damaged mucosa and losses of serum protein occurs through feces causing protein loosing enteropathy and hypoproteinaemia (Jas et al. 2008) and ultimately results in severe economic losses due to reduced weight gain and reproductive efficiency (Lloyed and Soulsby 1978).

Methods

Selection of Study Area and Duration

For the study on impact of naturally occurring gastrointestinal nematodosis on serum proteins in Garole sheep the village Manmathapur under the block Kakdwip, Gram Panchayat Rabindra (sheep population 2,185 : 17th All India Livestock Census, Govt. of West Bengal 2004) in South 24 Parganas district was selected. Sheep rearing population in this village constituted the small, marginal farmers and landless laborers. The sheep were maintained under semi-intensive system. Routine deworming was not practiced in sheep of both the places. The study was conducted for a continuous period of six months, i.e. from February to July, 2007.

Selection of Animal

A total of 100 Garole sheep, above four months old, were selected and screened for the presence of gastrointestinal nematode eggs by qualitative fecal examination using standard salt flotation technique

Table 1. Mean (±SE) of total serum protein, serum albumin, serum globulin and serum albumin globulin ratio in treated and untreated groups of sheep. Values bearing different superscripts viz., a, b, c in a column and x, y in a row differ significantly. N=Number of replicates. *P*=Significant value at 1 and 5% level. Gr-I=Treated group of sheep, Gr-II=Untreated control group of sheep.

Day post-treatment	TSP (g/dl) Gr-I	Gr-II	*P* value	SA (g/dl) Gr-I	Gr-II	*P* value
0	7.22 ± 0.32^{xb}	7.50 ± 0.23^{xa}	> 0.05	3.5 ± 0.23^{xc}	3.49 ± 0.18^{xa}	> 0.05
10	7.63 ± 0.22^{xab}	7.03 ± 0.27^{xa}	> 0.05	3.73 ± 0.18^{xbc}	3.04 ± 0.13^{yb}	< 0.05
40	7.97 ± 0.53^{xab}	5.93 ± 0.16^{yb}	< 0.01	4.12 ± 0.07^{xab}	2.65 ± 0.08^{yc}	< 0.01
70	8.01 ± 0.17^{xa}	5.65 ± 0.20^{yb}	< 0.01	4.44 ± 0.04^{xa}	2.42 ± 0.07^{yc}	< 0.01
P value	< 0.05	< 0.01	N = 5	< 0.01	< 0.01	N = 5
		SG (g/dl)			SA : SG	
0	3.72 ± 0.25^{xa}	4.01 ± 0.13^{xa}	> 0.05	0.94 ± 0.06^{xb}	0.87 ± 0.05^{xa}	> 0.05
10	3.90 ± 0.18^{xa}	3.99 ± 0.13^{xa}	> 0.05	0.96 ± 0.06^{xb}	0.76 ± 0.04^{yb}	< 0.05
40	3.85 ± 0.18^{xa}	3.28 ± 0.12^{yb}	< 0.05	1.07 ± 0.07^{xa}	0.81 ± 0.03^{ya}	< 0.05
70	3.57 ± 0.21^{xa}	3.23 ± 0.21^{yb}	> 0.05	1.43 ± 0.07^{xa}	0.75 ± 0.06^{yb}	< 0.01
P value	0.05	< 0.01	N = 5	< 0.05	< 0.01	N = 5

(Soulsby 1982). The sheep that were found positive for nematode eggs were subjected to quantitative fecal examination and those having fecal egg count i.e. EPG ≥ 150 were identified. Thirty such sheep were selected in Manmathapur for evaluation of serum protein impacts.

Grouping of the Selected Animals

The selected sheep (N=30) at Manmathapur were randomly divided into two groups. Group (Gr) I : Treatment with Ivermectin (nematode freed), Group (Gr) II : Untreated control (Harboring natura-lly occurring nematode). The sheep of both the groups were separately identified by individual neck-tag and were maintained as per the farmers'/farm's own practices, i.e. semi-intensive rearing system.

Anthelmintic Treatment of the Selected Animals

The sheep under the Gr-I were kept nematode free by given tactical treatment with Ivermectin (Bilivin, Brilliant Industries Ltd., Andhra Pradesh) at 200 µg/kg b.wt. subcutaneously (S/C) during the entire study period. Thus, whenever an animal in Gr-I became quantitatively positive (EPG ≥ 150) on any day of fecal examination, all the sheep of this group were treated with Ivermectin. The sheep of Gr-II were not given any anthelmintic treatment so as to allow them harboring the naturally occurring nematode infections.

Parameters Studied

Total Serum Protein. Total serum protein (TSP) was estimated spectrophotometrically (JASCO-V-530), by Biuret method (Reinhold 1953) and the value was expressed in gram/deciliter. Serum albumin (SA) was determined by UV-spectrophotometer and the value was expressed in gram/deciliter. The value of serum globulin (SG) was estimated by subtracting the value of SA from that of TSP. The value of SG was expressed in gram per deciliter.

The serum albumin (SA) and serum globulin (SG) ratio were determined by dividing the value of SA with SG..

Results and Discussion

Total Serum Protein (TSP, g/dl)

The value of TSP gradually increased following elimination of the infection by Ivermectin treatment (Gr-I) and the final value on day 70 (8.01) was significantly ($P < 0.05$) higher than pre-treatment

value (7.22). Contrary to this there was a declining trend in the values on TSP in the infected group (Gr-II) and this decline was significant ($P < 0.01$) from day 40 onward compared to the pre-treatment value. A comparison of the final TSP values between the nematode free and the infected groups revealed a significantly ($P < 0.01$) higher value (8.01) in the former than the later (5.65) group of sheep (Table 1).

Serum Albumin (SA, g/dl)

Table 1 shows that the changes in SA level of the nematode free and the infected groups of sheep had a similar pattern as seen in TSP. Thus, in the nematode free sheep (Gr-I) the SA level recorded a significant ($P < 0.01$) increase from day 40 post-treatment onwards and the final value on day 70 post-treatment became 4.44 compared to the initial value (3.50). However, the sheep harboring nematode infection (Gr-II) recorded a gradual decrease in SA level, which (3.04) became significant ($P < 0.01$) on day 10 post-treatment compared to the initial level (3.49) and the final value (2.42) was much lower ($P < 0.01$) than the initial value. When the SA level was compared between the nematode freed and the infected groups it was evident that the infected group (Gr-II) had significantly ($P < 0.05$) lower value from day 10 onwards and the final value (2.42) was much lower ($P < 0.01$) than that in the nematode free group (4.44).

Serum Globulin (SG, g/dl)

Serum globulin level on different post-treatment days did not differ significantly ($P > 0.05$) in the treated group (Gr-I). However, in the infected group (Gr-II) it was significantly ($P < 0.01$) lower from day 40 onwards and the final level (3.23) was significantly lower than the initial level (4.01). When the SG values between the two groups were compared it was obvious that these values did not differ significantly except on day 40 when the values in the nematode free and the infected groups were 3.85 and 3.28, respectively (Table 1).

Serum Albumin and Globulin Ratio (SA : SG)

The values for SA : SG in the treated group (Gr-I) became significantly ($P < 0.05$) higher on day 40 (1.07) following treatment and thereafter, compared to the initial value (0.94). However, in Gr-II the changes in this value during the course of observations were inconsistent, although the final value (0.75) was significantly ($P < 0.01$) lower compared to the initial value (0.87). When the values were compared between the nematode free (Gr-I) and the infected group (Gr-II) it was revealed that these values in the Gr-II were significantly ($P < 0.05$) lower from day 40 onwards, the final values being 0.75 and 1.43 in the infected and the nematode free group, respectively (Table 1).

Hypoproteinaemia with decreased levels of TSP and serum albumin and globulin is an important consequent of gastrointestinal nematodosis, which is responsible for protein loosing enteropathy. In the present study serum protein level had significantly declined in the infected sheep. This finding substantiated with the previous observations (Altaif and Dargie 1978, Borah et al. 1982, Badrie and Kamenov 1982).

The protein loss in gastrointestinal nematodosis is predominantly due to selective loss of serum albumin having smaller size and osmotic sensitivity to fluid movement (Tanwar and Mishra 2001). Hypoalbuminaemia in the present study obviously has been aggravated by increased catabolism of albumin and protein malabsorbation through the damaged intestinal mucosa.

References

Altaif K. I. and J. D. Dargie. 1978. Genetic resistant to helminthes. The influence of breed and hemoglobin type on the response of sheep to re-infection with *Haemonchus contortus*. *Parasitology* 77 : 161—175.

Badrie F. and I. Kamenov. 1982. Changes in serum proteins and their functions in lambs with experimental *Oesophagostomum venulosum* infection. *Vet.* Medi. Nauki. 19 : 52—59.

Borah D. J., P. K. Baruah, A. R. Gogoi and G. K. Roychoudhury. 1982. Studies on some of the hematological and biochemical changes in goats infected with *Strongyloides papillosus*. *J. Res. Assam Agri. Uni.* 3 : 24—27.

Jas R., S. Datta and J. D. Ghosh. 2008. Hemato-biochemical impact of gastrointestinal nematodosis in goat. *J. Vet. Para.* 22 : 21—26.

Lloyed S. and E. J. L. Soulsby. 1978. Survey of parasites

in dairy goats. *Am. J. Vet. Res.* 39 : 1057—1059.
Reinhold J. G. 1953. *Standard methods of clinical chemistry.* M. Reiner (ed.). Academic Press, New York, USA.
Sharma R. C., A. L. Arora, H. K. Narula and R. N. Singh. 1999. Characteristics of Garole sheep in India. *AGRI* 26 : 56—64.
Soulsby E. J. L. 1965. *Text book of veterinary clinical parasitology.* Volume. 1. Helmins. Blackwell Sci. Publ. Oxford, UK.
Soulsby E. J. L. 1982. *Helminths, arthropods and Protozoa of domesticated animals.* 7th edition. The English Language Book Soc., London, UK.
Tanwar R. K. and S. Mishra. 2001. Clinico-hemato-biochemical studies on intestinal helminthiasis in poultry. *Vet. Pract.* 2 : 137—140.