Journal of Animal and Veterinary Advances 5 (9): 782-785, 2006
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The Haemogram of Dogs with Gastrointestinal Parasites in Zaria, Nigeria

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Abstract: A study was conducted at the Ahmadu Bello University Veterinary Teaching Hospital (ABUVTH), Zaria, Nigeria to determine the effect of specific gastrointestinal (GI) parasites of dogs on the haemogram of such infected dogs. A total of 4214 (62.7 %) indigenous Nigerian dogs were presented to ABUVTH, Zaria, Nigeria between January, 1978 to December, 2000 with GI parasitism. The sick dogs were presented with the following clinical signs: Anorexia, post pandrial emesis, pale mucous membrane, dog bite, diarrhoea, bloody faeces, recumbency, straining during defaecation, emaciation, ascites, foaming in the mouth, worms in faeces, abortion, fever (39.8-41°C), inflamed eyes, lethargy, bloody discharge from the nose, abdominal pain and dullness. About 5469 (81.4%) of the dogs presented were males, while 1252 (18.6%) were females. The GI parasites encountered in this study include: hookworms (n=4107 or 61.1%), tapeworms (*Dipylidium caninum*) (n = 1042 or 15.5%), Ascarids (*Toxocara canis* and *Toxacara leoninae*) (n = 605 or 9%) and 289 (4.7%) were unidentified. The multiple infections observed in the study include: hook worm and tapeworms (n = 2352 or 35%), hookworm and coccidia oocysts (*Isospora* spp.) (n = 1385 or 20.6%), hookworm and *Toxocara spp* (n = 1028 or 15.3%). There was leucocytosis and eosinophilia in infected dogs and the contribution of each parasite to the blood picture is discussed. Also, the public health significance of the parasites encountered is discussed.

Key words: Haemogram, dogs, gastrointestinal parasites

INTRODUCTION

Gastrointestinal helminthosis is a widely recognized disease of dogs. The clinical manifestations of common helminths in dogs have been summarized[1]. In a recent study, it was reported that blood and Gastrointestinal (GI) parasites are responsible for anaemia in dogs[2]. Vincent *et al*.[3] had earlier documented the deleterious effects of anaemia in patients.

A proportion of dogs infected with haemoparasites, ectoparasites and helminthes do not show obvious clinical signs of disease[4]. Such dogs are usually presented by their owners with vague complaints such as 'not eating well', 'not doing well' and 'loosing weight' or for routine examination. Clinical laboratory evaluation of blood and faeces from such dogs may provide a useful means of diagnosis. This study was conducted to investigate the blood picture of dogs with gastrointestinal parasites in Zaria, Nigeria and the contribution of individual parasites to the blood picture.

MATERIALS AND METHODS

Faecal samples from 4214 indigenous Nigerian dogs presented to the Ahmadu Bello University Veterinary Teaching Hospital (ABUVTH), Zaria, Nigeria between January 1978 and December, 2000 Table 1 were examined for the presence of GI parasites using egg floatation method[5]. Blood samples were also collected from these dogs to determine the haemogram of indigenous Nigerian dogs with GI parasitism[6,7]. Student t-test was used to compute the statistical difference in the mean values of the haemogram of the sick dogs[8] and the results obtained were expressed as mean±standard error of the mean (SEM).

RESULTS

The result of the 4214 dogs with GI parasites, 4107 of the dogs had hook worms, 1042 had tapeworms (*Dipylidium caninum*), 652 had *Coccidia* infection

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Table 1: Annual distribution of dogs presented to the Ahmadu Bello University Veterinary Teaching Hospital (ABUVTH), Zaria, Nigeria (1978-2000)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1978	20	22	30	40	85	60	70	80	90	95	80	60	732
1979	10	15	22	35	68	20	10	11	15	18	20	10	254
1980	60	10	5	6	28	14	12	10	8	15	20	10	198
1981	22	10	5	21	18	12	16	17	12	13	10	12	168
1982	10	5	8	58	14	20	60	17	8	8	18	19	245
1983	22	5	10	22	10	14	12	10	6	7	4	8	130
1984	16	18	22	86	27	13	14	18	22	16	17	9	278
1985	20	6	8	26	16	17	8	9	12	18	19	22	181
1986	12	9	8	85	22	40	41	18	20	16	18	20	309
1987	17	22	18	98	44	22	16	17	8	9	18	10	299
1988	22	16	8	16	61	20	16	22	18	19	28	11	257
1989	-	-	93	56	43	33	59	53	58	76	45	44	560
1990	81	64	55	34	119	32	29	16	11	47	41	31	560
1991	51	8	8	16	22	18	60	22	11	20	16	9	261
1992	10	15	12	10	18	20	5	6	18	20	11	18	163
1993	50	-	29	47	41	34	46	31	55	18	47	28	426
1994	51	40	45	45	38	61	52	31	50	40	54	64	571
1995	11	-	22	21	17	7	20	22	21	17	6	9	173
1996	27	-	13	4	8	1	8	4	6	5	6	11	93
1997	4	11	23	35	30	18	12	8	13	13	9	10	186
1998	8	16	20	21	19	20	19	16	25	15	11	11	201
1999	12	36	26	25	25	34	14	24	17	26	4	5	248
2000	12	16	37	18	22	31	32	24	16	13	-	7	228
Total	536	344	527	825	795	561	633	486	520	544	512	438	6721
%	7.97	5.12	7.84	12.28	11.83	8.35	9.42	7.23	7.74	8.09	7.62	6.52	100

Table 2: Multiple infections encountered in dogs during the study period (January 1978-December, 2000)

Hookworm + Ascarid(s)	1196	(17.8%)
Hookworm + Tapeworm	2352	(35%)
Coccidia + Ascarids(s)	101	(1.5%)
Hookworm + Cocidia	1385	(20.6%)
Hookworm + Coccidia + Ascarid(s)	101	(1.5%)
Hookworm +Coccidia + Tapeworm	155	(2.3%)
Hookworm + Spirocerca + Tapeworm	255	(3.8%)
Coccidia + Spiorocerca	54	(0.8%)
Hookworm + Spirocerca	356	(5.3%)
Coccidia + Tapeworm	54	(0.8%)
Ascarid(s) + Tapeworm	101	(1.5%)
Tapeworm + Trichuris	101	(1.5%)
Hookworm + Spirocerca + Trichuris	23	(0.35%)
Ascarid (s) + Trichuris	54	(0.8%)
Hookworm + Ascarid (s) + Tapeworm	208	(3.1%)
Spirocerca + Ascarid (s)	54	(0.8%)
Hookworm + Tapeworm + Ascarid(s)	54	(0.8%)
Tapeworm + Ascarid(s) + Trichuris	54	(0.8%)
Hookworm Coccidia + Triochuris	54	(0.8%)
	6721	100%

Table 3: Haemogram of dogs in which hookworm eggs were detected

	Normal dogs Mean±SEM	Infected dogs Mean±SEM
PCV (%)	37.2±0.38	36.8±0.47
HB (g/dl)	12.79±0.13	12.72±0.16
WBC μL^{-1}	11491.9±226.2	11434.6±308.6
Band μL^{-1}	89.09±14.0	53.31±10.5
Neutrophil μL^{-1}	7159.9±204.2	6930.1±214.4
Lymphocyte μL^{-1}	3170.0±80.6	3271.2±116.2
Eosinophil μL^{-1}	855.3±48.9	997.3±67.7
Monocyte μL^{-1}	213.5±11.6	181.6±14.7
Basophil μL^{-1}	3.5±0.6	0.6±0.6
Total Protein (g dL^{-1})	7.1±0.05	7.3±0.06

(*Isospora spp*), 605 had *Ascarids* (*Toxocara canis* and *Toxocara leoninae*) and 289 were not identified. The multiple infections observed were hookworms and tapeworms (n = 2352 or 35%), hookworms and coccidia (*Isospora sp.*) (n = 1385 or 20.6%), hookworms and *Toxocara sp.* (n = 1028 or 15.3%) Table 2. The hamograms of dogs infected with different GI parasites are presented in Tables 3-8. For dogs infected with hookworms, there was no statistically significant difference ($p>0.01$) in Packed Cell Volume (PCV) and haemoglobin concentration of the clinically sick and healthy dogs Table 3. Dogs with coccidial infection (*Isospora spp*) had significant increase in their total leucocyte counts compared to healthy dogs Table 4. Dogs infected with ascarids had a statistically significant

Table 4: Haemogram of dogs in which *Coccidia* oocysts were detected

	Normal dogs Mean±SEM	Infected dogs mean±SEM
PCV (%)	37.1±0.3	36.1±1.08
HB (g/dl)	12.8±0.1	12.1±0.4
WBC μL^{-1}	11553.6±210.2	10133.0±696.0
Band μL^{-1}	76.4±9.9	52.1±25.5
Neutrophil μL^{-1}	7088.8±155.8	6790.2±554.3
Lymphocyte μL^{-1}	3254.1±69.9	2507.4±178.7
Eosinophil μL^{-1}	930.4±41.7	586.6±100.2
Monocyte μL^{-1}	201.3±9.5	196.7±28.9
Basophil μL^{-1}	2.6±1.1	0.0±0.0
Total Protein (g dL^{-1})	7.3±0.04	7.1±0.13

Table 5: Haemogram of dogs in which Ascarid eggs were detected

	Normal dogs Mean±SEM	Infected dogs Mean±SEM
PCV (%)	37.2±0.8	33.7±1.1
HB (g/dl)	12.8±0.5	11.6±0.4
WBC μL^{-1}	11473.8±210.0	11374.9±695.1
Band μL^{-1}	74.3±9.8	85.3±29.9
Neutrophil μL^{-1}	7072.1±155.3	7050.2±573.7
Lymphocyte μL^{-1}	3198.9±69.0	3395.9±265.9
Eosinophil μL^{-1}	926.0±41.5	624.6±104.2
Monocyte μL^{-1}	200.0±9.2	218.9±50.1
Basophil μL^{-1}	2.5±1.1	0.0±0.0
Total Protein (g dL^{-1})	7.29±1.3	6.8±1.3

Table 6: Haemogram of dogs in which *Spirocerca* eggs were detected

	Normal dogs Mean±SEM	Infected dogs Mean±SEM
PCV (%)	37.0±0.3	37.5±1.4
HB (g/dl)	12.4±0.1	13.8±0.5
WBC μL^{-1}	11437.5±204.6	13048.4±1244.9
Band μL^{-1}	75.0±9.6	31.7±21.9
Neutrophil μL^{-1}	7042.3±152.0	8472.8±898.7
Lymphocyte μL^{-1}	3200.5±67.8	3248.0±359.3
Eosinophil μL^{-1}	906.3±40.3	1152.4±269.6
Monocyte μL^{-1}	202.2±9.2	143.5±41.0
Basophil μL^{-1}	2.5±1.0	00±0.0
Total Protein (g dL^{-1})	7.2±0.04	7.9±0.25

Table 7: Haemogram of dogs in which tapeworms were detected

	Normal dogs Mean±SEM	Infected dogs Mean±SEM
PCV (%)	37.0±0.3	37.2±0.9
HB (g/dl)	12.8±0.1	12.7±0.3
WBC μL^{-1}	11415.0±217.9	11924.8±507.69
Band μL^{-1}	76.7±10.3	58.5±16.9
Neutrophil μL^{-1}	7060.7±162.6	7156.5±355.4
Lymphocyte μL^{-1}	3165.7±70.3	3575.9±212.2
Eosinophil μL^{-1}	906.6±42.7	946.8±106.6
Monocyte μL^{-1}	202.9±9.7	184.7±27.3
Basophil μL^{-1}	2.4±1.1	2.4±2.4
Total Protein (g dL^{-1})	7.3±0.04	7.2±0.013

Table 8: Haemogram of dogs in which *Trichuris* eggs were detected

	Normal dogs Mean±SEM	Infected dogs Mean±SEM
PCV (%)	37.1±0.3	39.0±2.4
HB (g/dl)	12.7±0.1	12.7±0.7
WBC μL^{-1}	11436.3±204.3	11049.8±2410.3
Band μL^{-1}	73.3±9.5	0.0±0.0
Neutrophil μL^{-1}	7044.5±151.5	6277.1±1136.8
Lymphocyte μL^{-1}	3208.9±67.6	4012.3±1216.1
Eosinophil μL^{-1}	909.8±40.6	544.6±88.8
Monocyte μL^{-1}	197.6±9.1	215.8±51.6
Basophil μL^{-1}	2.5±1.0	0.0±0.0
Total Protein (g dL^{-1})	7.3±0.04	7.0±0.4

decrease ($p<0.01$) in their PCV values and statistically significant increase ($p<0.01$) in eosinophil counts compared with normal dogs Table 5. There was an increase in the total leucocyte counts of dogs infected with tapeworms compared to normal dogs Table 7. Table 6 and 8 shows the variation in the haemogramm of dogs infected with *Spirocerca* spp and *Trichuris* sp. respectively in which there was an increase in total leucocyte counts in both cases. Eosinophilia was found in all the dogs with GI parasitism.

DISCUSSION

The significance of leucocytosis and eosinophilia in dogs with GI parasitism has been documented earlier[9]. However, the contribution of the different GI parasites of dogs to the leucocytosis and eosinophilia has not being determined. In this study, eosinophilia was demonstrated in dogs with Ascarids (*Toxocara canis* and *Toxocara leonine*) and coccidial parasites (*Isospora spp.*) and there was a statistically significant difference ($p<0.01$) in the eosinophil counts of dogs infected with these parasites, compared to the healthy animals presented to ABUVTH.

Eosinophilia is rarely associated with coccidial infections[9], but in the present study, we found a statistically significant difference ($p<0.01$) in the eosinophil counts of infected dogs compared to the healthy ones. The significance of this finding still remains a course of research. There was a statistically significant difference ($p<0.01$) in the band cells and lymphocytes of dogs parasitized with hookworms and coccidial organisms when compared to the healthy dogs. Neutrophilia was observed in all the parasitic infections. It therefore means that the leucocytosis observed in dogs with GI parasitism may be as a result of increase in the number of all leucocytes in the peripheral circulation (neutrophilia, lymphocytosis, monocytosis and eosinophilia).

The zoonotic significance of hookworm infection and toxocariosis has been reported[9,10]. In the present study, 61.1% (4107) of the dogs examined had hookworm infection. This is suggestive of a very high prevalence rate. It is possible that the human population that came in contact with these dogs during the study period may have been exposed to hookworm infestation and toxocariosis, since most indigenous dogs roam around freely. It is concluded that the human and veterinary public health officials in this area should educate the community in Zaria on the zoonotic/hazardous significance of hookworm disease and toxocariasis. The study also suggests that dogs in Zaria, Nigeria are

vulnerable to GI parasites and these have effect on their haemogram. Hence dog owners in this area are advised to carry out routine deworming to control the ectoparasitic infestations.

ACKNOWLEDGEMENT

The authors of this manuscript are grateful to the Ahmadu Bello University Veterinary Teaching Hospital (ABUVTH), Zaria, Nigeria; Clinical Pathology and Protozoology Laboratories, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria for granting us access to the data used in this retrospective study.

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