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THE EFFECT OF GASTRO-INTESTINAL PARASITES ON
BLOOD PICTURE
IN SHEEP AND GOATS AT AL-GASSIM
(With 6 Tables)

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تأثير الطفيليات المعوية والمعدية على صورة الدم
في الماعز والأغنام بالقصيم

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أجري هذا البحث خلال الفترة من نوفمبر ١٩٩٠ وحتى مايو ١٩٩٢ ، اشتملت الدراسة على التعرف على أنواع الطفيليات الداخلية التي تصيب الأمعاء والمعدة في الماعز والأغنام بقطاعان اماراة القصيم بالمملكة العربية السعودية . وأوضحت النتائج العملية اصابة الحيوانات وينسب متفاوتة بالعديد من الديدان الداخلية . من هذه الطفيليات الترياكواسترونجلس (*Trichostrongylus spp.*) ، الهيمونكس (*Haemonchus spp.*) ، الأوسترتاجيا (*Ostertagia spp.*) ، والأوسفجستوم كولمبيانم (*Oesophagostomum columbianum*) والترياكورس أوفس (*Trichuris ovis*) ، والاييميريا (*Eimeria spp.*) . تميزت الأعراض الاكلينيكية التي ظهرت على الحيوانات المريضة بفقر الدم ، الهزال ، فقد وزن الجسم والاسهال . لوحظ انخفاض شديد في العدد الكلي لكرات الدم الحمراء والهيموجلوبين ونسبة الخلايا المضغوطة . سجلت زيادة ملحوظة في العدد الكلي لكرات الدم البيضاء وكذلك العدد المطلق للخلايا المتعادلة ، والحمضيه والقاعدية . وصاحب ذلك نقص في عدد الخلايا الليمفاوية .

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SUMMARY

The presnet work was carried out on sheep and goats at some animal farms at Al-Gassim Emarrah, Saudi Arabia. The work was done during the period between November 1990 and May 1992. The total number of the examined animals were 2150 adult sheep and 760 adult goats. The clinical and laboratory examinations revealed that 21.4% of sheep and 15.8% of goats were infested with internal parasites. The reported parasites were *Eimeria* spp., *Trichostrongylus* spp., *Haemonchus* spp., *Ostertagia* spp., *Oesophagostomum* *Columbianum* and *Trichuris ovis*. The clinical symptoms appeared were characterized by anaemia, emaciation, loss of weight and diarrhoea. Prominent decrease was observed in the values of red cells count, haemoglobin content and packed cells volume. Leucocytosis, increase in the absolute numbers of neutrophils, eosinophils and basophils were obvious in all diseased animals.

INTRODUCTION

Sheep and goats are considered the main source of animal protein for Saudi Arabian. Every year the Kingdom of Saudi Arabia imports thousands of these species from various countries.

By time animals face very stressfull factors including shipping, fatigue, change of ration beside unsuitable hygienic measurements. Under these arid conditions it is noticed that animals become susceptible to various parasitic infestations.

The resulting parasitic diseases were sometimes so serious that sheep and goat production was infleunced with great economic losses, mainly, due to gastrointestinal parasitism and mortalities which may reach 30-40% (KUIL,1972 and SOULSBY, 1965). Five helminths commonly infest the small intestine of sheep and goats; among them *Trichostrongylus* spp. which is commonly associated with diarrhoea (BLACKWELL, 1983). Heavy mortalities in these animals were recorded also by AKEREJOLA, *et al.* (1979) in Nigeria. Severe diarrhoea in ewes due to *Ostertagia* spp. was reported by REID (1976).

The aim of this study is to survey some points which may be of further knowledge to the clinicians in these arid area of Saudi Arabia. This will include:

- 1- Types of gastro intestinal parasites and degree of parasitism in these species.
- 2 - Description of the clinical signs appeared on the diseased cases.
- 3 - Degree of tolerance under these conditions and the reflection of the deliterious effects of the ensued disease through measuring value of some blood parameters.

MATERIAL and METHODS

The present work was carried out during the period between November 1990 and May 1992. Faecal samples of 2150 sheep and 760 goats were examined for the gastrointestinal parasites. Animals belong to bedwins scattered around Kasseem in places (primitive pens). Animals graze on the day and spend the night under the shelters or in these pens. The clinical and the results of faecal examinations revealed that the diseased cases selected for this work were 460 adult Nagdi sheep (3-4 years old) and 120 adult Syrian breed goats (2.5-4 years old).

In most instances, sheep and goats were living side by side under the same environmental conditions. Each species of animals was subdivided into another three groups (mild, moderate and heavy infested). These classifications were done on basis of the degree of parasitic infestation (Table 2). The clinical signs were observed and recorded.

The qualitative and quantitative determinations of the parasitic eggs were done according to COLES (1980). Also, *Eimeria* oocysts infection was determined according to COLES (1980).

Sixty adult sheep and 40 adult goats of the same breeds and ages and proved to be clinically and laboratory healthy, were used as control. Blood samples were collected from the jugular vein of the diseased and control animals using ethylene diamine tetra-acetic acid (E.D.T.A) as anticoagulant. The blood was used for the estimation of the total red cells count, haemoglobin content, packed cells volume, total leucocytic count and absolute differential leucocytic count (COLES, 1980).

The obtained data were subjected to statistical analysis according to STEEL and TORRIE (1980).

RESULTS

Faecal examination of the diseased animals revealed the presence of stomach worm eggs. The eggs were belonged to *Trichostrongylus* spp., *Haemonchus* spp., *Ostertagia* spp., *Oesophagostomum columbianum* and *Trichuris ovis*. Coccidiosis among diseased cases was demonstrated by the presence of *Eimeria* spp. oocysts in their faeces.

The percentages of parasitism among sheep and goats were shown in table 1. The degree of parasitic infestation among the animal groups of both species was recorded in table 2.

The main clinical signs noticed among most diseased cases were anorexia, diarrhoea, loss of weight and general weakness. Animals with severe coccidiosis showed copious diarrhoea with straining and discharge dark liquid bloody faeces, loss of weight, inappetence and dull appearance. In animals with Haemonchosis, there may be little or no diarrhoea, but possibly intermittent periods of constipation. All the haemonchosis infested cases showed severe anaemia and anasarca.

Most cases with *Trichostrongylus* spp. and *Ostertagia* spp. infection showed profuse watery diarrhoea that was usually persistent.

The blood picture of the studied animals were recorded in tables 3, 4, 5 and 6.

DISCUSSION

It was clear that 21.4% of the examined sheep and 15.8% of goats were infested with gastro-intestinal parasites.

In adult sheep and goats, the most important causes of parasitic gastro-enteritis were *Trichostrongylus* spp., *Haemonchus* spp., *Ostertagia* spp., *Oesophagostomum columbianum* and *Trichuris ovis*. *Eimeria* spp. constituted a marked percent of infection. Variations in infestation percentages with each type of parasite was observed between sheep and goats. The observed variations might be due to species and breed difference on one hand, and the previous environmental factors of the imported country on the other. Our findings were strongly supported by the previous work of BLACKWELL (1983) and AKEREJOLA, *et al.* (1979).

It was clear from tables 3 and 4 that the values of erythrocytes and haemoglobin in both animal species were lowered than the normal values. The decrease was significant in heavy infested groups as compared with the

mild and moderate ones. These results coincide with those obtained by LEATHERS, *et al.* (1982); BOWDEN (1969); DOBSON (1967); GALLAGHER (1963) and SINCLAIR (1962). They reported anaemia with prominent decrease in both haemoglobin and erythrocytes in sheep and goats naturally infested with internal parasites. The occurrence of anaemia with suppression of bone marrow function was recognized as phenomenon in several chronic diseases. Possibly the toxic substances produced by the parasites might act directly on the bone marrow lead to suppression of the erythropoiesis or indirectly by an injurious action on another important organ such as the liver. The anaemia in such cases might be also due to chronic blood loss as a result of parasitism. The impairment in absorption, utilization and assimilation of some elements essential for erythropoiesis such as iron and copper due to intestinal and hepatic injuries must be considered.

Marked decrease in packed cells volume percent was observed in both diseased sheep and goats. The highly significant drop ($P < 0.01$) in packed cells volume was seen in heavy infested goats. This drop was due to chronic blood loss caused by the parasites (COLES, 1980). In sheep and goats suffering from parasitic infestation, the drop in packed cell volume coincides with oligocythemia.

Varying degrees of inflammatory leucocytosis was observed among all diseased cases (tables 5 & 6). The highest levels were observed in the diarrhoeic animals with heavy parasitic infestation.

Elevations in the absolute values of neutrophils and eosinophils were recorded in all diseased animal groups (Tables 5 & 6). Very highly significant increase ($P < 0.001$) in their values was recorded in heavy infested animals. Our results were equivalent to those obtained by LEATHRE, *et al.* (1982) DANIEL and EDWARD (1967). The observed leucocytosis associated with neutrophilia in the diseased animals can be due to the toxins of the internal parasites and their effects on liver and intestine (JUBB and KENNEDY, 1985 and JONES and HUNT, 1983).

The reported increase in the total leucocytes count consisting mainly of neutrophils is indicative of a more severe condition with good bone marrow response. The reported eosinophilia can be due to antibody reaction produced by the keratin of the parasites (DOBSON, 1967). Also, the histamine released by antigen antibody reaction was thought to be an additional factor that cause eosinophilia. (BEST and TYLOR, 1955).

Marked elevation was observed in the absolute number of basophils among the infested animal groups (Tables 5 & 6). The reported basophilia

was most probably associated with eosinophilia (COLES, 1980).

The recorded drop in the absolute number of lymphocytes in diseased animals (Tables 5 & 6) might be attributed to the increased activity of the adrenal glands with the tissues invaded by the parasitic toxins.

REFERENCES

- Akerejola, O.O.; Schillhorn, T.W.; Van Veen and Njoku, C.O. (1979): Ovine and Caprine disease in Nigeria. A review of economic losses. *Bull. Anim. Health. Prod. Afri.*, 27: 65-70.
- Best, C.H. and Tylor, N.S. (1955): *The Physiological Basis of Medical practice.* Williams and Wilkins Co., Baltimore.
- Blackwell, T.E. (1983): Enteritis and Diarrhoea. Symposium on sheep and goats. *Medicine Veterinary Clinics of North America. Large animal practice.* Vol. 5, No. 3: 557-569.
- Bowden, R.J. (1969): Relationship between *Oesophagostomum columbianum* infection and the nutritional status of sheep. *Haematological changes.* *Aust. J. Agric. Res.*, 20: 601.
- Coles, E.M. (1980): *Veterinary Clinical Pathology*, 3rd Ed. W.B. Saunders Company, Philadelphia, London, Toronto.
- Daniel, J.M. and Edward, C.B. (1967): Peripheral blood eosinophilia in porcine ascariasis. *Cornell Vet.* 57, 96.
- Dobson, C. (1967): Pathological changes associated with *Oesophagostomum columbianum* infestation in sheep. *Haematological observations on control worm-free and experimentally infested sheep.* *Aust. Agric. Res.*, 18: 523.
- Gallagher, C.H. (1963): Studies on Trichostrongylosis of sheep. Plasma volume, haemoglobin concentration and blood cells count. *Aust. Agric. Res.*, 14: 349.
- Jones, T.C. and Hunt, R.D. (1983): *Veterinary Pathology*. 5th Ed. Lea and Fibiger. Philadelphia.
- Jubb, K.V.E. and Kennedy, P.C. (1985): *Pathology of Domestic Animals*. 3rd Ed. Academic press, New York.
- Kuil, H. (1972): Himeagraph. Dept. Parasitology and Entomology. Ahmadu Bello Univ. and Inst. Trop. Dis. Utrecht. 1-47.
- Leathers, C.W.; Foreyt, W.J.; Fetcher, A. and Forey, K.M. (1982): Clinical fascioliasis in domestic goats in montana. *J.A.V.M.A.*, 180: 1450-1454.

- Reid, J.F.S. (1976): The common diarrhoeas of sheep in Britain. *Vet. Rec.* 78: 496-499.
- Sinclair, K.B. (1962): Observations on clinical pathology of ovine fascioliasis. *Brit. Vet.*, 118: 37-51.
- Soulsby, E.J. (1965): *Textbook of Veterinary Clinical Parasitology. Vol. I, Helminths*, Oxford, Blackwell Scientific publication.
- Soulsby, E.J.L. (1982): *Helminths, Arthropods and Protozoa of Domesticated Animals. 6th Ed. Monings Vet. Helminthology, Helminthology Bailliere*. Tindall, Cassell. London.
- Steel, G. and Torrie, J.H. (1980): *Principle and Procedures of Statistics. Biometrical Approach*. Tosho printing Co. LTD. Tokyo. Japan.

Table (1)
Types, numbers and percentages of parasites infested the digestive tract of sheep and goats

	Sheep		Goats	
	No.	%	No.	%
<i>Eimeria</i> spp.	94	20.4	26	21.7
<i>Trichostrongylus</i> spp.	85	18.5	20	16.6
<i>Haemonchus</i> spp.	73	15.9	12	10.0
<i>Ostertagia</i> spp.	42	9.1	16	13.3
<i>Oesophagostomum columbianum</i>	26	5.7	7.	5.9
<i>Trichuris ovis</i>	60	13.0	14	11.7
Mixed infestation	80	17.4	25	20.8

Table (2)
The values in thousands of eggs and oocysts count/gram of faeces in infested sheep and goats

Degree of infestation	Sheep	goats
Mild	10 (7-15)	6 (4 - 11)
Moderate	22 (16-27)	15 (12-17)
Heavy	34 (28-42)	26 (18-30)

Table (3)
The Erythrogram of the control and infested sheep

Blood parameters	Control sheep n= 60	infested sheep		
		Mild n=	Moderate n=	heavy n=
RBCs x 10 ⁶ /c.mm	10.10 ± 1.10	8.3 ± 0.82	7.1 ± 0.61*	5.2 ± 0.51**
HB (gm %)	9.5 ± 0.72	7.4 ± 0.07	6.1 ± 0.94*	4.8 ± 0.02**
PCV (%)	30.2 ± 2.61	28.0 ± 0.21	25.1 ± 0.92	24.6 ± 0.45

(mean ± st. error)

+ significant (P < 0.05)

++ high significant (P < 0.01)

+++ very high significant (P < 0.001)

Table (4)
The Erythrogram of the control and infested goats

parameters	Control goats n= 40	Infested goats		
		Mild n=	Moderate n=	Heavy n=
RBCs x 10 ⁶ /c. mm	11.91 ± 0.37	10.02 ± 0.37	9.32 ± 0.38*	8.01 ± 0.41**
Hb (g %)	11.32 ± 0.37	10.57 ± 0.92	8.12 ± 0.85*	7.01 ± 0.35**
PCV (%)	24.51 ± 0.81	21.72 ± 1.42	18.07 ± 1.01*	14.12 ± 0.57**

(mean + st. error)

Table (5)
The leucogram of the control and infested sheep

Leucogram	Control sheep	Infested sheep		
		Mild	Moderate	heavy
WBCs x 10 ³	8.92 ±	10.12 ±	12.40 ±	13.40 ±
/C, mm	0.22	0.31	0.42*	0.91**
Neutrophils	2944 ± 125	3939 ± 317**	5828 ± 285***	6968 ± 421***
Eosinophils	446 ± 38	808 ± 44***	1240 ± 68***	1608 ± 79***
Basophils	89 ± 15	202 ± 35**	248 ± 76*	402 ± 38***
Lymphocytes	5174 ± 358	4959 ± 232	4712 ± 265	4154 ± 308*
Monocytes	268 ± 37	202 ± 41	372 ± 79	268 ± 61

Absolute differential leucocytic count = cells/ul.

Table (6)
The leucogram of the control and infested goats

Leucogram	Control goats	Infested goats		
		Mild	Moderate	heavy
WBCs x 10 ³	8.15 ±	10.38 ±	10.38 ±	11.01 ±
/c.mm	1.04	1.12	0.05*	0.07**
Neutrophils	2854 ± 285	4360 ± 276**	4520 ± 282**	5505 ± 364***
Eosinophils	163 ± 38	830 ± 46***	1130 ± 78**	1431 ± 67***
Basophils	0.0 ± 0.0	104 ± 35**	226 ± 47**	330 ± 56***
Lymphocytes	4972 ± 386	4982 ± 229	5198 ± 330	3523 ± 220***
Monocytes	163 ± 56	104 ± 25	226 ± 31	220 ± 43

Absolute differential leucocytic count = cells/ul.