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CLINICAL, HAEMATOLOGICAL AND BIOCHEMICAL
STUDIES ON PIROPLASMOSIS IN CALVES
AT AL-GASSIM
(With 4 Tables)

By

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**دراسات إكلينيكية ودموية وبيوكيميائية
عن الطفيليات الدموية في العجول بمنطقة القصيم
بالمملكة العربية السعودية**

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إشتمل هذا البحث على عدد ٢٥ من العجول الفريزيان المريضة (البيروپلازما) وأستخدم معها ١٠ حيوانات سليمة كضابط، وقد تراوحت أعمار العجول بين ٦-٨ شهور. هذا وقد تميزت الأعراض الاكلينيكية للعجول المريضة بضعف الشهية للأكل، الهزال، الضعف العام وفقر الدم، لوحظ ارتفاع درجة حرارة بعض العجول مع ظهور دم في البول. لوحظ تضخم بعض الغدد الليمفاوية الخارجية في بعض الحيوانات التي أوضحت الفحوص الدموية المعملية إصابتها بالطفيليات الدموية (البيروپلازما). إتضح من دراسة صورة دم الحيوانات المريضة أن هناك نقص شديد في العدد الكلي لكرات الدم الحمراء في المليمتر المكعب ومحتوى الهيموجلوبين بالإضافة الى نسبة الخلايا المصفوفة. كما لوحظ وجود نقص معنوي في العدد الكلي لكرات الدم البيضاء وكان مصحوبا بنقص في العدد المطلق للخلايا المتعادلة والحمضية والليمفاوية في العجول المريضة.

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كما لوحظ أيضا زياده في العدد المطلق للخلايا المتعادله الغير ناضجه، الخلايا القاعدية وخلايا المونوسيت. وقد اتضح من الدراسات البيوكيميائية لمصل الدم وجود زياده في نشاط أنزيمات الترانس أمينازيس (GOT, GPOT) وكذلك أنزيم لاكتك ديهيدروجيناز كما حدث أيضا زياده معنويه في نسبة البيليروبين الكلبي والجلوبيولين ونقص في البروتين الكلبي والالبومين في مصل دم العجول المريضة.

SUMMARY

The present work conducted on 25 clinically diseased friesian calves. Ten healthy calves wer used as control. The age of animals ranged between 6-8 months. Diseased animals manifested inappetence and emaciated and anaemic. Some cases showed high fever and haemoglobinuria, while others showed prominent enlargement of the external lymph nodes. Laboratory examination of the blood smears revealed that diseased animals were suffering from piroplasmosis. The haemogram of the diseased calves showed decrease in the total red cells count, per mm³, haemoglobin content and packed cells volume. In the diseased calves, there was significant leucopenia associated with a drop in the absolute values of neutrophils, eosinophils and lymphocytes. On the other hand, marked increase was reported in the basophils and monocytes. Increased activity of blood serum transaminases and lactic dehydrogenase was noticed in the diseased calves. Meanwhile, marked elevations in blood serum total bilirubin and globulin were noticed with a decrease in total protein and albumin.

INTRODUCTION

Piroplasmosis are among the most prevalent diseases in temperate zone. They occur commonly in chronic forms with little or ill-recognized clinical signs; yet lowering the physical and productive performance of the affected animals. With regard to stress factors such as vaccination, transportation, concurrent infections, weather changes and others, the acute faetal forms become more predominant with high economic losses (SOULSBY,1969).

Piroplassmosis are dangerous. diseases of cattle which incriminated for major economic losses. Such losses are resulted from deaths of the affected animals, unthriftness of the chronic cases, the cost of treatment and the prevention programs.

In recent years, it has been emphasized by many investigators about the diagnostic and prognostic values of some blood constituents in this disease (COLES, 1980 and MEDWAY et al., 1972).

REHMAN and ROYCHOUNDHURY (1981); SINA and GUNARY (1981); MULLER (1981) and SHARMA (1979) reported changes in the blood picture of piroplasma infected cattle. Also, the values of some blood serum biochemicals in animals with piroplasmosis have been studied (ELISSALDE, et al. 1983; MULEY, et al. 1980 and ZIN EL-ABDIN, et al. 1976).

The present work was planned to investigate the influence of naturally occurring piroplasmosis either single or mixed infection on the blood picture in calves. Also, the work might ascertain the effect of the disease on the vital functions of the liver.

MATERIAL and METHODS

Animals of the present work were belonged to one of the breeding cattle farms lies at the west district of Burriedah City, Al-Gassim Emarah, Kingdom of Saudi Arabia.

The owner of the farm was complaining from the great economic losses caused by high rate of mortality among the Friesian calves which reached about 50%. He mentioned that the animals were heavy infested by ticks. The faeces of the diseased calves was soft or hard and dark in colour and contained blood.

Our work includes the remaining living calves that were 25 animals. They were between 6-8 months old. The animals were clinically examined and the symptoms were observed and recorded. On the basis of the reported clinical symptoms, the diseased calves were divided into three groups. For comparison another group of healthy control animals (10 calves, 6-8 months old) were selected from piroplasmosis free herd.

Faecal samples, blood smears from the ear vein, whole blood samples with EDTA (anticoagulant) and whole blood samples for obtaining clear serum were collected.

The faecal samples were examined to exclude the positive cases of internal parasites. The fixed blood films were stained and examined for parasites and the differential leucocytic count was conducted (COLES, 1980Z). The whole blood samples with EDTA were used for the determination of total erythrocytes count per mm³, haemoglobin content in Gram% and packed cells volume in percent (SCHALM, 1975).

The obtained blood serum was used for the determination of transaminases (GOT and GPT) lactic dehydrogenase (LDH), total bilirubin, total proteins, albumin and globulins. The reagents used were in the form of test kits supplied by BioMerieu, France.

The obtained data were subjected to statistical analysis according to SNEDECOR (1965).

RESULTS

The first group of the diseased calves were 8 cases. The clinical symptoms appeared were characterized by fever (40.6–41.7 c), increase in pulse rate (110–160/minute) and hypoxia. Animals of this group showed haemoglobinuria, pale mucous membranes, inappetence and constipation. Only two cases of this group showed muscle tremors, incoordination, ataxia, grinding of the teeth and finally recumbent in coma.

Animals of the second group were 10 cases. They showed slight rise in body temperature (39.4–40.5 C). Some of the external lymph nodes were clearly enlarged. Animals were weak, emaciated and anaemic. Four cases showed salivation and lacrymation. Animals of this group evacuated soft or solid haemorrhagic faeces.

The third group included 7 cases. The noticed clinical signs were characterized by great enlargement of some external lymph nodes, emaciation, gneral weakness, decreased appetite and absence of fever.

Collected faeces from the diseased animal groups were negative for the internal parasites. Blood smears from the diseased calves revealed the presence of blood parasites within the red blood cells. Examined blood smears show single or mixed infection of *Babesia* spp., *Thieleria* spp. and *Anaplasma* spp. The data of the blood parameters were recorded in four tables.

DISCUSSION

It was clear that diseased calves of our work were suffering from piroplasmosis. The infection appeared to be single or mixed. The high mortality among calves was due to the deliterious effects of piroplasmosis. The reported clinical symptoms were similar to those described by MULLER (1981); REHMAN and ROYCHOUNDHURY (1981); OMUSE (1978) and SOULSBY (1969) in piroplasma infected cattle.

The obtained data of the erythrogram (Table 1) showed anaemia among diseased calves. The anaemia was laboratory supported by the decrease in the values of the erythrocytes count, haemoglobin content and packed cells volume. Irrespective of the diseased groups suggested, most of the values of the erythrogram showed significant decrease, however, calves of the first group were the most affected ones. LAIBLIN (1978) and WRIGHT (1973) attributed the presence of aplastic anaemia in steers experimentally infected with *Theileria annulata* to toxins mediated lesions of the bone marrow. The observed anaemia among calves of some groups especially group 1 was primarily due to the destructive effect of the parasites on erythrocytes (SOULSBY, 1969).

Animals of the infected group (Table 2) showed significant leucopenia which was associated with marked decrease in the absolute percents of neutrophils, eosinophils and lymphocytes. The reported leucopenia, neutropenia, eosinopenia and lymphopenia in the infected animals of our work agreed with those reported by OMUSE (1978) and LAIBLIN (1978) in steers experimentally infected with *Theileria annulata* infection.

Meanwhile, the leucogram of the infected calves (Table 2) showed unusual elevation in the percents of band cells, basophils and monocytes. The reported leucopenia associated with the unusual rise in the number of immature neutrophils might lead to degenerative shift to left with the progression of the disease.

The elevation in the absolute values of monocytes and basophils were in agreement with the findings of REHMAN and ROYCHOUNDHURY (1981) in calves experimentally infected with *Babesia bovis*. Monocytosis was a good reflection for chronic diseases (COLES, 1980).

Concerning the activity of blood serum transaminases (GOT and GPT), there was a significant ($P < 0.05$ – $P < 0.001$) increase in their levels in calves of the infected groups when compared with the control ones (Table 3). These findings were supported by MULLER (1981) and KOCH (1968). DWIVEDI and GAUTAMAN (1977) attributed the elevation in transaminases to liver necrosis and lysis of erythrocytes during babesia infection.

As far as blood serum lactic dehydrogenase enzyme was concerned, it was found that prioplasmosis was accompanied with a marked increase in its level when compared with normal animals (Table 3).

A significant elevation ($P < 0.05$ – $P < 0.01$) was noticed in total serum bilirubin in piroplasma infected group (Table 4). These findings were supported by MORGAN (1969) and ZIN EL-ABDIN *et al.* (1976). A prominent

drop was recorded in the level of total serum protein and albumin in calves of the diseased groups compared with the control one (Table 4). These findings were in agreement with those reported by ZIN EL-ABDIN *et al.* (1976) in Theileria annulata infected cattle. Hyperglobulinaemia occurred in the infected groups was similar to the findings of IVANOVA (1976).

It could be concluded from the present study that most of the used parameters of liver function tests showed significant elevation in their values in piroplasmosis infected calves. This showed without any doubt, that the recorded clinical symptoms were the result of liver dysfunction.

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Table 1
The erythrogram of the studied calves

Animal groups	RPCs X10 ⁶ /c.mm	Hb (g%)	PCV (%)
Control	8.7 ± 0.94	9.7 ± 1.10	31.2 ± 3.8
Group (1)	4.8 ± 0.56 ⁺⁺⁺	6.8 ± 0.42 ⁺	18.6 ± 2.4 ⁺
Group (2)	6.2 ± 0.68 ⁺	4.8 ± 0.37 ⁺⁺⁺	21.0 ± 3.1
Group (3)	5.6 ± 0.72	4.6 ± 0.41 ⁺⁺⁺	20.2 ± 2.8

± standard error;
 + significant (P < 0.05)
 +++ Very highly significant (P < 0.001)

Table 2
The leucogram of the studied calves

Animal groups	WBCs X10 ³ / c. mm	Absolute differential leuc. Count (cells/ul)					
		Band	N.	E.	B.	L.	M.
Control	8.3 ± 0.92	41 ± 5	2490 ± 412	415 ± 69	41 ± 6	4980 ± 378	332 ± 62
Group (1)	6.1 ± 0.81 ⁺	61 ± 7 ⁺	1220 ± 115 ⁺	183 ± 45 ⁺	244 ± 82 ⁺	311 ± 261 ⁺⁺⁺	732 ± 114 ⁺⁺⁺
Group (2)	4.5 ± 1.21 ⁺⁺	49 ± 10	945 ± 89 ⁺⁺⁺	135 ± 37 ⁺⁺	180 ± 45 ⁺⁺	2295 ± 313 ⁺	450 ± 48
Group (3)	6.0 ± 0.79 ⁺	84 ± 12 ⁺⁺	1200 ± 118 ⁺	240 ± 72	300 ± 93 ⁺	2640 ± 318 ⁺	780 ± 138 ⁺⁺

N = Neutrophils E = Eosinophils B = Basophils
 L = Lymphocytes M = Monocytes
 + significant (P < 0.05)
 ++ Highly significant (P < 0.01)
 +++ very highly significant (P < 0.001)

Table (3)
The mean values of some blood enzymes in
the studied calves

Animal groups	GOT (I.u/L)	GPT (I.u/L)	LDH (I.u/L)
Control	48.7 ± 6.72	9.2 ± 1.31	241.2 ± 65.4
Group (1)	130.6 ± 12.3+++	20.4 ± 4.25*	450.3 ± 65.6*
Group (2)	110.8 ± 15.1**	27.2 ± 3.81**	380.6 ± 57.4
Group (3)	92.5 ± 13.2*	24.0 ± 4.64*	347.2 ± 46.3

+ significant (P < 0.05)

* high significant (P < 0.01)

+++ very high significant (P < 0.001)

Table (4)
The mean values of some blood serum
biochemicals in the studied calves

Animal groups	T. bilirubin g/dl	T. proteins g/dl	Albumin g/dl	globulins g/dl
Control	0.40 ± 0.08	7.02 ± 0.52	3.25 ± 0.52	3.07 ± 0.67
Group (1)	1.58 ± 0.29**	6.03 ± 0.84**	1.82 ± 0.11*	4.21 ± 0.12
Group (2)	1.34 ± 1.45*	6.10 ± 0.88	2.10 ± 0.49	4.00 ± 0.13
Group (3)	1.42 ± 0.62	5.81 ± 0.46***	1.92 ± 0.19***	0.89 ± 0.42

± = standard error.

+ significant (P < 0.05)

** significant (P < 0.01)

+++ very significant (P < 0.001)