



Clinical and diagnostic study of trypanosomiasis of cattle in mosul, Iraq

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Abstract

This study reported the occurrence of *Trypanosoma vivax* in cattle in Mosul, Iraq and its effect on their haematology. The main clinical signs were anemia, lethargy, weakness, general weight loss and, loss of appetite. Blood samples from infected cattle were collected which showed decrease of hemoglobin concentration, packed cell volume and total erythrocytes count with leucopenia especially neutropenia and eosinopenia. Blood smears showed short form of trypanosome in acute cases and long forms in chronic cases. Morphological changes of erythrocytes showed the presence of anisocytosis, poikilocytosis, target cells, macrocytes, punctate basophile and sometimes monocytes. Anemia was basically normocytic normochromic. This study provides the baseline data for further studies on this parasite.

Keywords: Cattle, haematology, morphology, trypanosomiasis

Introduction

Trypanosomiasis is one of the world's most important human and livestock disease. The species *Trypanosoma vivax* is a blood parasite of ruminants, originating from Africa (Levine, 1973). The clinical signs of this disease are characterized by emaciation, anemia, abortion and death (Silva et al., 1996). Non-cyclical or mechanical transmission by blood sucking flies such as tabanid or stable flies (*Stomoxys* spp.) is usually cited as the principal method of transmission of this parasite (Raymond and Rousseau, 1987, Otte and Abuabara, 1991). Ticks have also been cited as potential vectors of *T. Vivax* (Lopez et al., 1979). Needles and instruments are important, but largely unrecognized contribution to local propagation during vaccination and mass treatment regimens (Wells et al., 1982; Raymond and Rousseau, 1987).

Silva et al. (1999) reported hematological changes in natural cases of bovine trypanosomiasis infected by *T. vivax* in beef and dairy cattle from Bolivian Wetland and Brazil. The main hematological changes produced by *T. vivax* infections were anemia and severe leucopenia.

The present study reported for the first time the presence of *T. vivax* in blood smears from naturally infected cattle in the Mosul city of Iraq.

Materials and Methods

In July 2011, seven Brazilian calves aged six months, reared for fattening in Gugjely region, two cows from Al-Hatra region and two bulls from Bawesa region were presented to the Veterinary Teaching Hospital, Veterinary Medicine College of Mosul University. The animals showed signs of anemia such as paleness of oral and conjunctiva, mucosal membranes, lethargy and weakness. Based on the history and clinical signs, haem parasite infection was suspected. Blood from each animal was taken in a sterile syringe and blood smears were prepared. Thin blood smears were prepared and stained with Giemsa and Leishmans. The slides were examined under light microscope (X200). The detailed identification and morphological study was conducted as described by Coles (1986).

For the biometrics characterization, 50 trypanosomes were measured using light microscope connected to a specific software (Image-prp Plus). The biometric data were compiled as described by Hoare (1972). Blood samples (five ml) of each case were collected from jugular vein with ethylene diamine tetra acetate (EDTA) as anticoagulant and examined for estimation of erythrocyte counts, total leukocyte counts, packed

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cell volume and hemoglobin concentration (Wiss and Jane, 2010). Blood cells, differential leukocyte counts, platelet counts were estimated according to the method of Coles (1986). Data were shown as range and mean of each parameter.

Results

The results of the present study showed the presence of *T. vivax* in blood smears from naturally infected cattle in the Mosul city, Iraq. The observed clinical signs in calves with trypanosomiasis (*T. vivax*) included rise in body temperature (40.5-41°C), anorexia, depression, emaciation, conjunctivitis, corneal opacity, paleness of mucous membrane and lymph node enlargement. The parasite was identified morphologically in all the blood smears as *T. vivax* (Plates 1 and 2).

The examination revealed trypomastigotes of parasite in the blood smears. The trypomastigotes forms were monomorphic with the posterior end typically

rounded. A free flagellum was present, the kinetoplast was large and terminal and an undulating membrane in conspicuous membrane (Plate 3). The mean, maximum and minimum values of different measurements of bovine *Trypanosoma vivax* are given in Table 1. Different haematological parameters of *T. vivax* are given in Tables 2 and 3. Hematological parameters showed severe anemia from significant decline of hemoglobin concentration, erythrocyte counts, and packed cell volume (PCV). Additionally, there was leucopenia due to lymphopenia and neutropenia in comparison with normal range for cattle with left shift, neutropenia and eosinopenia (Table 3). Many mature neutrophils of the infected animals were hyposegmented with two unequal segments or with two large equal segments. Morphological changes of erythrocytes showed the presence of anisocytosis, poikilocytosis, target cells, macrocytic, Burr cells, punctuate basophile as well as deficiency in hemoglobin of erythrocytes (Plate 4). The results of this study indicate that anemia was basically normocytic

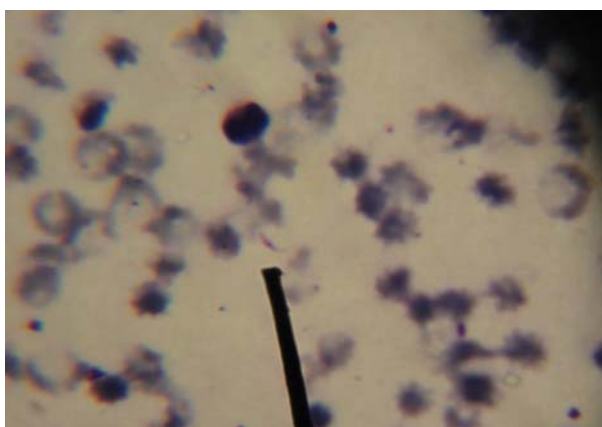


Plate 1: blood film of *Trypanosoma vivax*. Note the dark sub-terminal Kinetoplast, large purple nucleus, with long flagella. Leishman stain (100X)

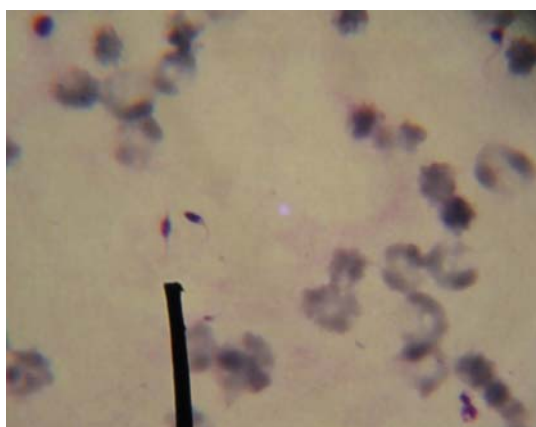


Plate 2: Thin blood film of *Trypanosoma vivax*. Note binary vision of trypanomastigote. Leishman stain (100X)

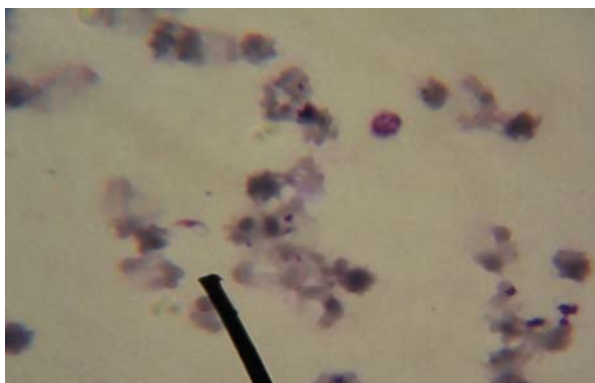


Plate3: *Trypanosoma vivax* in thick blood film showing developing trypanomastigote that has a free flagellum. Gemsa stain (100X)

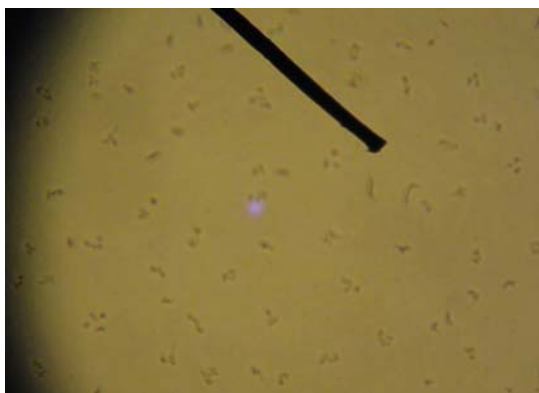


Plate4: Buffy coat smear of cow showed high parasitemia with *Trypanosoma vivax*

Table 1: Measurements ($\mu\text{m} \pm \text{SE}$) of bovine *Trypanosoma vivax* mean

	PK	KN	PN	NA	F	L	PN/KN	PN/NA
Minimum	0.56	2.88	1.92	4.80	2.88	12.48	0.66	0.40
Maximum	1.92	4.80	5.76	7.86	5.76	24.18	1.20	0.73
Mean	1.24	3.84	3.84	6.33	4.32	18.33	0.93	0.56
SE	0.05	0.10	0.16	0.13	0.20	0.21		

PK= Distance from posterior end to kinetoplast; KN= Distance from Kinetoplast to middle of nucleus; PN= Distance from posterior end to middle of nucleus; NA= Distance from nucleus to anterior extremity; F= Free flagellum length; L= Total length, including free flagellum

Table 2: Range and mean values of animals infected with *T. vivax*

Parameters	Range	Mean \pm SE
Hemoglobin (gm/dl)	3-8	(5.7 \pm 0.3)
Packed cell volumes (%)	16-21	(19 \pm 2.0)
Erythrocyte $\times 10^6$ μL	3.3-9.3	(6.3 \pm 0.4)
MCV(f/ml)	48-56	(50 \pm 3.0)
MCHC(g/dl)	25-37	(4.5 \pm 0.6)
Leukocyte count $\times 10^3$ μL	3-6	(4.5 \pm 0.6)
Platelets $\times 10^3/\mu\text{L}$	60-100	(80 \pm 15.0)

Table 3: Range and mean leukocytes number/ μL of cattle infected with *T. vivax*

Cell type $\times 10^3/\mu\text{L}$	Range	Mean \pm SE
Neutrophil	0.4-2.4	(1.35 \pm 0.20)
Lymphocyte	2.1- 6.1	(4.10 \pm 0.60)
Monocyte	0-0.3	(0.10 \pm 0.05)
Eosinophil	0.00	0.00
Basophile	0.00	0.00

normochromic with a tendency toward being macrocytic normochromic in some animals. The platelets count was lower than references range of normal animals, whereas clumping of platelets was common in blood smears of infected animals (Table 2).

Discussion

All observed trypanosomes in thin blood smears were identified as *T. vivax* which is the first report in Mosul city in Iraq. The result of this study suggested that the *T. vivax* is non-endemic for trypanosomiasis in this city. The disease might have occurred due to introduction of a suspected herd which came from Brazil. According to Hoare (1972), the range of lengths of *T. vivax* was from 18-21 μm (including free flagellum 3-6 μm long). The dimension of *T. vivax*, firstly, reported in Brazil was 22.77 μm (ranging from 19.2 to 25.0 μm) (Shaw and Lainson 1972). Similarly, Silva et al. (1996) found mean size of 18.73 μm (ranged 11.34-21.87 μm). Linhares et al. (2006) recorded mean size as 19.42 μm . In the present study, we found a dimension of 18.33 μm (ranging from 12.48 μm to 24.18 μm). The difference observed in biometrical data could be related to the phase of the disease (acute or chronic). Fairbairn (1953) showed that short forms were the characteristic of the strains causing acute disease in cattle in West Africa, while long form were associated

chiefly with strains causing chronic infection in East Africa. Furthermore, Davila et al. (1997) compared measurements of *T. vivax* in blood films from naturally infected bovine from Brazil and Bolivia and concluded that shorter forms could be related to the acute disease observed by them.

Anemia is a major feature of trypanosomiasis, which is largely due to extravascular hemolysis (Murry, 1982; Anosa, 1989). The role of extravascular hemolysis in *T. vivax* infection was confirmed by the presence of erythrophagocytosis in the spleen, liver and bone marrow (Anosa, et al., 1992). The anemia of bovine trypanosomiasis has been variously classified as macrocytic anemia in acute trypanosomiasis and microcytic anemia in chronic trypanosomiasis (Fiennes, 1954), macrocytic and normochromic anemia (Naylor, 1971) and normocytic normochromic anemia (Losos et al., 1973; Welled et al., 1983).

It has been suggested that in chronic stage of *T. vivax* infection in cattle, the erythrocytes were microcytic due to possibly of iron deficiency (Fiennes, 1954). Evaluation of mean corpuscular hemoglobin concentration in the infected cattle revealed absence of hypochromasia which indicated iron deficiency. The erythrocytes index reported in present study indicated that anemia was normocytic normochromic with a tendency to being macrocytic normochromic anemia.

In conclusion, to our knowledge, this is the first report on the occurrence of *Trypanosoma vivax* in Mosul, Iraq. This report could form a basis for further investigation of this parasite.

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