Ureamic Syndrome in *Theileria Equi*-Infected Argentine Polo Pony: A Case Report.

***Idoko S. I[1]., Abalaka S. E[1]., Mshelia P. W[2]., Edeh R. E[2]., Kolo H. N[3]., and Adeyanju K. Y[4]**

[1]Department of Veterinary Pathology, University of Abuja
[2]Department of Veterinary Medicine, Ahmadu Bello University, Zaria
[3]Department of Animal Production, Federal University of Technology, Minna
[4]Department of Veterinary Parasitology and Entomology, Ahmadu Bello University, Zaria

ABSTRACT

On June 26th, 2016, an 8-year old Argentine Polo Pony in the Fifth Chukker Polo and Country Resort, Maraban Jos, Igabi Local Government Area of Kaduna State, Nigeria was reported with the chief complaint of anorexia, depression, recurrent recumbency, colic and pyrexia. Physical examination revealed the following signs; pyrexia, tachypnoea and rapid pulse rates, bilateral epiphora as well as icteric ocular, gingival and vaginal mucous membranes, 5% dehydration, trembling, sweating, colic, body condition score of 3/5, reddish brown urine and tick infestation (identified as Rhipicephalus spp). Blood was collected via jugular venipuncture into vacutainer containing ethylenediamine tetraacetic acid (EDTA) for microscopic and haematological analyses while a second aliquot was transferred into plain vacutainer for biochemical analysis. Giemsa-stained thin blood smear revealed the presence of Theileria equi haemogram revealed normocytic hypochromic anaemia with thrombocytopaenia. The biochemical analysis showed decreased serum alanine aminotransferase (ALT), aspartate aminotransferase (AST) levels, hyperproteinaemia, hyperglobulinaemia, ureamia, hyperkalaemia, hyponatraemia, hypochloraemia and decreased bicarbonate concentration. Based on the presenting clinical signs, presence of ticks and laboratory findings, equine piroplasmosis accompanied by ureamic syndromewas diagnosed.

Keywords: *Theileria equi Equine Piroplasmosis, Horse, Rhipicephalus spp, Ureamic syndrome.*

***Corresponding email:** idoko.sunday@uniabuja.edu.ng
Tel: +234 (0)806 090 4664

This Paper was accepted on 20th November, 2017 and published 24th April, 2018

INTRODUCTION

The high prevalence of equine piroplasmosis (EP) and its associated systemic effects is a medical concern that needs urgent investigation, especially in Nigeria. The disease is caused by either of the two biologically different, but pathologically similar intraerythrocytic protozoans, *Babesia caballi* (*B. caballi*) and *Theileria equi* (*T. equi*)[1]. These protozoans are transmitted via the saliva of infected Ixodes ticks during bite; transplacental, intrauterine, blood transfusion and organ transplant. Infection with the tick-transmitted haemoprotozoan parasites can be clinical or subclinical, but can persist even with resolution of clinical signs [2; 3]. *Rhipicephalus spp* is the predominant tick species implicated in the disease transmission in Nigeria. Other ticks implicated include *Amblyomma spp*, *Boophilus spp*, *Hyalomma spp* and *Dermacentor spp* [4].

Nigeria, a tropical country in sub-Saharan Africa, is gradually becoming hotter owing to earth's rising temperature. The high temperature, which is associated with global warming, may be responsible for the climate-induced drifts in vector movements that ultimately results in emergence and re-emergence of vector borne diseases [5; 6; 7]. The unrestricted movement of horses during polo tournaments, racing and durbars in Nigeria and absence of routine screening tests before and after such events are some possible predisposing factors to the endemicity of EP in Nigeria.

Haemolytic anaemia is the principal clinical sequelae of concurrent *B. caballi* and *T. equi* infections [8] and this haematological abnormality is a worrisome trend in horses with clinical piroplasmosis [9]. The disease has caused untold economic losses due to impaired health, cost of treatment, decreased productivity and/or death of the equine population with its attendant emotional trauma to horse owners in Nigeria.

CASE REPORT

An eight year old Argentine Polo Pony belonging to Fifth Chukker Polo and Country Resort, Maraban Jos, Igabi Local Government Area of Kaduna State, Nigeria was presented with anorexia, depression, recurrent recumbency and pyrexia. These signs were observed four days prior to presentation. History further revealed that they had just concluded a polo tournament nine days prior to onset of clinical signs. The horse along with four others in the stables were fed with *Erragrostis tremula*hay, sometimes pasture at the paddock and wheat bran. On physical examination, the temperature was 38.6˚C, the respiratory and pulse rates were rapid. Other abnormalities observed were icteric ocular, gingival and vaginal mucous membranes, as well as bilateral epiphora, 5% dehydration, body condition score of 3/5, trembling, sweating, reddish brown urine and tick infestation. An episode of colic was reported.

Laboratory Investigations

Ten milliliters (10 mL) of blood was collected via the jugular vein using an 18 Gauge needle

and was divided into three aliquots for haemoparasitic, haematological and biochemical investigations using appropriate vacutainers. Ticks collected were sent to the Entomology Laboratory of the Department of Veterinary Parasitology, Ahmadu Bello University, Zaria for identification.

RESULTS

Protozoology:

Thin blood smear from the whole blood in vacutainer containing EDTA was air dried, fixed in 70% methanol for 5 minutes and stained with Giemsa solution for 30 minutes. The Giemsa-stained thin blood smear was examined by viewing Twenty Five (25) microscopic fields using 100x oil immersion magnification [10].Sample was positive for *Theileria equi* (+)as shown in **Figure 1** below;

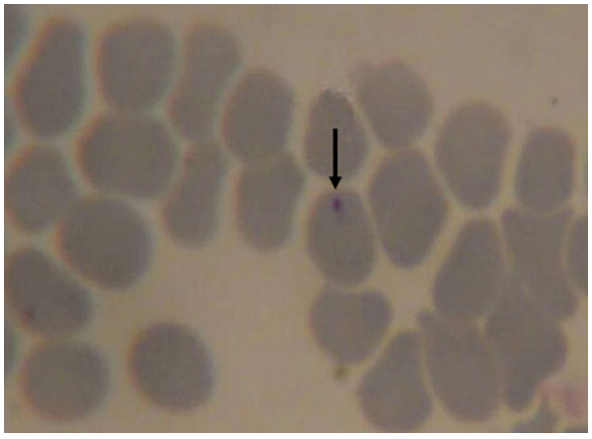

Figure 1: Merozoite stage of *Theileria equi* from a Giemsa-stained thin blood smear of the Argentine Polo Pony at 100× oil immersion magnification.
Key: Arrow pointing at the Intraerythrocytic parasites.

Haematology

Analyte (unit)	Result	Reference Range [II]
1. RBC (×10^6/µl)	6.18	6.0 – 10.4
2. HCT (%)	30.3	27.0 – 43.0
3. HGB (g/dl)	10.3	10.1 – 16.1
4. MCV (fl)	49.1	37.0 – 49.0
5. MCH (pg)	16.7	13.7 – 18.2
6. MCHC (g/dl)	33.9	35.3 – 39.3
7. RDW (%)	19.3	16.3 – 19.3
8. WBC (×10^3/µl)	10.6	5.6 – 12.1
9. LYMP (×10^3/µl)	4.7	1.2 – 5.1
10. PLT (×10^3/µl)	22.0	117 – 256
11. MPV (fl)	9.0	5.3 – 8.4
12. PCT (%)	20.0	7.0 – 21.0

Table I: Haemogram of the 8-year old Argentine Polo Pony

Keys: RBC (red blood cell count), HCT (haematocrit), HGB (haemoglobin), MCV (mean corpuscular volume), MCH (mean corpuscular haemoglobin), MCHC (mean corpuscular haemoglobin concentration), RDW (red blood cell redistribution width), WBC (white blood cell count), LYMP (lymphocyte), PLT (total platelet count), MPV (mean platelet volume), PDW (platelet volume distribution width) and PCT (plateletcrit)

Reference: Equine haematology Normal Values

Biochemical Analysis:

Analyte (unit)	Result	Reference Ranges [12]
1. AST (U/L)	13.0	205.0-555.0
2. ALT (U/L)	6.0	3.0-25.0
3. ALP (U/L)	109.0	109.0-315.0
4. Total bilirubin (mg/dl)	1.0	0.1-1.9
5. Albumin (g/dl)	3.8	2.5-4.2
6. Total protein (g/L)	8.3	4.6-6.9
7. Globulin (g/dl)	4.5	2.6-4.0
8. BUN (mg/dl)	56.0	8.0-27.0
9. Creatinine (mg/dl)	1.8	0.4-2.2
10. Total cholesterol (mg/dl)	108.1	51.0-109.0
11. Glucose (mg/dl)	81.9	72.0-114.0
12. Na^+ (mmol/l)	83.1	132.0-141.0
13. K^+ (mmol/l)	5.3	2.7-4.9
14. Cl^- (mmol/l)	81.0	94.0-102.0
15. HCO_3^- (mmol/l)	18.0	24.0-30.0

Table II: Serum biochemical result of an 8-year old Argentine Polo Pony

Keys: AST (aspartate amino transferase), ALT (alanine amino transferase), ALP (alkaline phosphatase), BUN (blood urea nitrogen), Na^+ (sodium), K^+ (potassium), Cl^- (chloride) and HCO_3^-(bicarbonate).

Reference: Equine Clinical Pathology Normal Values

DISCUSSION

The normocytic hypochromic anaemia observed in this case may be due to haemorrhage-induced iron deficiency anaemia secondary to ureamia-induced gastrointestinal ulceration or due to a chronic inflammatory process. The observed thrombocytopaenia was accompanied by an increase in MPV, which suggest that the juvenile platelets were becoming bigger and more active indicative of a regenerative response. During platelet activation, their shapes transform from biconcave discs to spherical with resultant pseudopod formation [13]. Similarly, the increased MPV could be suggesting a severe infection or systemic inflammatory process [14; 15] and/or other chronic disorders [16; 17; 18] or small fibrin clots or platelets clumping [12].Thrombocytopaenia is a common clinical sequalae in equine piroplasmosis. Similar result was reported by [9] in horses with equine piroplasmosis. Contrary to their finding, the anaemia in this case was normocytic hypochromic and the leukogram was unaltered unlike the macrocytic hypochromic anaemia and alterations in the leukogram reported by [9]. Many factors ranging from geographical area, strain(s) of the parasites and other predisposing factors could be responsible for the variations in the haemogram.

The biochemical results showed low serum ALT, AST and HCO_3^-, including hyponatraemia, hypochloraemia and elevated serum levels of BUN, hyperproteinaemia, hyperglobulinaemia and hyperkalaemia. The elevated BUN might be indicative of increased protein catabolism, dehydration or abnormal protein metabolism. The ureamia and electrolyte imbalance was consistent with changes in dehydrated animals evidenced by the pyrexia, sweating, trembling, dyspnea and 5% dehydration observed in this case. It could also be suggesting renal disease or high dietary protein. Dehydration is a common clinical finding in Babesiosis [19; 20; 21] as observed in this case. Toxicity associated with ureamia can cause ulceration of the gastrointestinal tract, inhibit bone marrow erythropoiesis, decrease platelet function and contribute to haemorrhage. The gastrointestinal bleeding can deplete the body's stores of iron, thus making it unavailable for erythrocytes and haemoglobin synthesis within the bone marrow. This possibly explains the observed reddish brown urine, normocytic hypochromic anaemia and electrolyte imbalance. The low serum HCO_3^- concentration was indicative of metabolic acidosis arising from anaerobic metabolism that possibly occurred secondary to the observed hypovolaemia and/or the ureamia.

The most probable cause of death in this case is ureamia-induced toxicity secondary to *Theileria equi* infection and ensuing dehydration. It is advisable to carry out prompt haemato-biochemical analysis on samples form horses with clinical piroplasmosis as a quick guide to arriving at accurate diagnosis and making the right choice of drugs and supportive therapy. Similarly, it is important to carry out further investigations that can specifically correlate changes in the haemogram and serum chemistry values with different phases of the disease.

ACKNOWLEDGEMENT

Authors are grateful to the staff of Protozoology and Entomology Laboratories of Department of Veterinary Parasitology and Entomology, Ahmadu Bello University, Zaria for their technical support.

REFERENCES

1. Office International des Epizooties (OIE) Terrestrial Manual, *(*2014). Equine Piroplasmosis. *Version adopted by the World Assembly of Delegates of the OIE in May 2014,* Chapters 2 .5 .8.

2. Ueti, M. W., Palmer, G. H., Kappmeyer, L. S., Statdfield, M., Scoles, G. A. and Knowles, D. P. (2005). Ability of the vector tick Boophilus microplus to acquire and transmit *Babesia equi* following feeding on chronically infected horses with low-level parasitaemia. *Journal of Clinical Microbiology,* 43 (8):3755–3759.

3. Ribeiro, I. B., Câmara, A. C. L., Bittencourt, M. V., Marçola, T. G., Paludo, G. R. and Soto-Blanco, B. (2013). Detection of *Theileria equi* in spleen and blood of asymptomatic piroplasm carrier horses. *Acta Parasitologica*, 58 (2): 218–222.

4. Ueti, M. W., Palmer, G. H., Scoles, G. A., Kappmeyer, L. S. and Knowles, D. P. (2008). Persistently infected horses are reservoirs for intrastadial tick-borne transmission of the apicomplexan parasite *Babesia equi*. *Infection and Immunity*, 76: 3525–3529.

5. Hickling, R., Roy, D. B., Hill, J. K., Fox, R. and Thomas, C. D. (2006). The distribution of a wide range of taxonomic groups are expanding polewards. *Global Change Biology*, 12: 450-455.

6. Chen, I. C., Hill, J. K., Ohlemuller, R., Roy, D. B. and Thomas, C. D. (2011). Rapid range shifts of species associated with high levels of climate warming. *Science*, 333: 1024-1026.

7. Balogun, E. O., Nok, A. J. and Kita, K. (2016). Global warming and the possible globalization of vector-borne diseases: a call for increased awareness and action. *Tropical Medicine and Health*, 44 (38).

8. Scoles, G. A. and Ueti, M. W. (2015). Vector ecology of equine piroplasmosis. *Annual Review of Entomology,* 60: 561-580.

9. Mahmoud, M. S., Abu El-Ezz, N. T., Abdel-Shafy, S., Nassar, S. A., El Namaky, A. H., Khalil, W. K. B., Knowles, D., Kappmeyer, L., Silva, M. G. and Suarez, C. E. (2016). Assessment of *Theileria equi* and *Babesia caballi* infections in equine populations in Egypt by molecular, serological and hematological approaches. *Parasites and Vectors*, 9 (260): 1-10.

10. Bose, R., Jorgensen, W. K., Dalgliesh, R. J., Friedhoff, K. T. and de Vos, A. J. (1997). Current state and future trends in the diagnosis of Babesiosis. *Veterinary Parasitology*, 57 (1-3): 61–74.

11. Fielder, S. E. (2018). *Haematological Reference Ranges: In Merck Veterinary Manual*. 11th ed. Merck & CO., INC. Whitehouse Station, New Jersey, USA. Available from: http://www.merckvetmanual.com/appendixes/reference-guides/hematologic-reference-range v3362734. accessed: 02-04-2018 #
#

12. Freeman, K. P. (2010). *Equine Clinical Pathology Notes*. 1-66.

13. Ustundag, B. Y., Murat, P. and Kagan, H. (2016). The use of platelet indices,

plateletcrit, mean platelet volume and platelet distribution width in emergency non-traumatic abdominal surgery: a systematic review. *Biochemia Medica*, 26 (2):178–193.

14. Margetic, S. (2012). Inflammation and haemostasis. *Biochemistry and Medicine (Zagreb),* 22:49–62.
15. Safak, S., Uslu, A. U., Serdal, K., Turker, T., Soner, S. andLutfi, A. (2014). Association between mean platelet volume levels and inflammation in SLE patients presented with arthritis. *African Health Science,* 14:919-924.
16. Beyazit, Y., Sayilir, A., Torun, S., Suvak, B., Yesil, Y. and Purnak, T. (2012). Mean platelet volume as an indicator of disease severity in patients with acute pancreatitis. *Clinical Research in Hepatology and Gastroenterology,* 36: 162-168.
17. Chu, S. G., Becker, R. C., Berger, P. B., Bhatt, D. L., Eikelboom, J. W. andKonkle, B. (2010). Mean platelet volume as a predictor of cardiovascular risk: a systematic review and meta-analysis. *Journal of Thrombosis and Haemostasis*, 8:148-156.
18. Güneş, A., Ece, A., Şen, V., Uluca, U., Aktar, F. and Tan, I. (2015). Correlation of mean platelet volume, neutrophil-to-lymphocyte ratio, and disease activity in children with juvenile idiopathic arthritis. *International Journal of Clinical and Experimental Medicine*, 15:11337-11341.
19. Coles, E. H. (1984). *Veterinary Clinical Pathology*. 4th ed. Philadelphia: W.B. Saunders Co; 25-29.
20. Sandhu, G., Grewal, A., Singh, A., Kondal, J., Singh, J. and Brar, R. (1998). Haematological and biochemical studies on experimental *Theileria annulata* infections. *Veterinary Research Communications*, 27: 15-25.
21. Camacho, A. T., Guitian, F. J., Pallas, E., Gestal, J. J., Olmeida, S., Goethert, H., Telford, S. and Spielman, A. (2005). Serum protein response and renal failure in canine *Babesia annae* infection. *Veterinary Research*, 36: 713-722.
22. Wright, I. G. (1981). Biochemical characteristics of Babesia and physio-chemical reactions in host. In: Babesiosis, ed. By: Ristic M, Kreier JP. *Academic press, New York*, 171-205.