**AHC -06**

# Blood Changes Observed in Laminitic Nigerian Horses

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## Abstract
Blood profiles of 60 Nigerian horses comprising of 22 apparently healthy (group A, as control), 27 lame non-laminitic (group B) and 11 radiographically confirmed lame laminitic horses was evaluated for possible changes in a 4 month study (March to June, 2017). Five milliliters of blood were collected from the jugular vein of each horse. Parameters evaluated include packed cell volume (PCV), red blood cell (RBC) count, haemoglobin (HB) concentration and white blood cell (WBC) count. In lame non-laminitic (group B) and lame laminitic (group C) horses, the mean values of PCV and RBC were significantly ($p < 0.05$) lower than those found in the apparently healthy horses (group A). The mean numbers of white blood cells were significantly ($p < 0.05$) lower in lame non-laminitic (group B) and lame laminitic (group C) than those found in the apparently healthy horses (group A). The mean values of haemoglobin concentration were slightly lower in lame laminitic (group C) horses than those found in the apparently healthy horses (group A), but lame non-laminitic (group B) horses had practically same HB value with apparently healthy horses (group A). A significant ($p < 0.05$) decrease in the mean values of neutrophil were found in the lame non-laminitic (group B) and lame laminitic (group C) horses than those found in the apparently healthy horses (group A). Lymphocytes, monocytes, basophils and eosinophils) remained statistically invariable.

**Keywords:** Nigerian horse, lameness, hoof, laminitis, hematology

## Introduction
Laminitis is a metabolic disease of great complexity resulting in diminution of blood perfusion in the capillary of the foot (Riber *et al*., 1995). It has been demonstrated as being a highly complex metabolic disease associated with disorders of the cardiovascular system, the endocrine system, the renal and gastrointestinal systems, and causing acid-basic and coagulation imbalance (Riber *et al*., 1995)**.** The preponderance of evidence supported roles for inflammation, metabolic derangement, endothelial and venous dysfunction, and matrix degradation as causes of laminitis (Hussein and Al-Derawie, 2012). Evaluation of the blood is commonly used for diagnosis of various diseases of animals, including horses (Schalm *et al*., 1975; Radostits *et al*., 1994). Equine laminitis has been reported to be associated with some haematological and serum biochemical changes, but details of these alterations have not been fully investigated (Hussein and Al-Derawie, 2012).

Due to the scarcity of data regarding blood biochemistry changes in Nigerian horses with laminitis, the objective of the study was to evaluate the hematological and some biochemical changes in Nigerian horses with natural clinical forms of lameness and laminitis in Nigerian horses.

## Materials and Methods
A total 0f 60 horses comprising of 22 apparently healthy horses (group A), radiographically diagnosed 27 lame non laminitis horses (group B) and lame laminitis horses (group C) were studied. Five mililitres (5ml) of blood was collected aseptically from the jugular vein of each of the 60 horses in the mornings with the assistance of attendants and dispensed into bottles with ethylene diaminetetracetate (EDTA) for the haematological evaluation. The packed cell volume (PCV) was determined by the micro-haematocrit method (Thrall and Weiser, 2002). The haemoglobin concentration (Hb) was determined by the cyanomethaemoglobin method (Higgins *et al*., 2008). The red blood cell (RBC) and total leukocyte counts (TLC) were done by the haemocytometer method, while thin blood smear made on clean grease-free glass slides for differential leukocyte count were stained following the Leishman technique and enumerated by the meander counting method (Thrall and Weiser, 2002).The SPSS statistical package was used to analyze data generated from the study.

The haematological and serum indices in the three groups were subjected to one way analysis of variance, and variant means were separated by the least significant difference method. Significance was accepted at $p< 0.05$.

**Results and Discussion**

The results of the hematological indices were summarized in table 1 and figure I. In lame non-laminitic (group B) and lame laminitic (group C) horses, the mean values of PCV and RBC were significantly ($p < 0.05$) lower than those found in the apparently healthy horses (group A). The mean numbers of white blood cells were significantly ($p< 0.05$) lower in lame non-laminitic (group B) and lame laminitic (group C) than those found in the apparently healthy horses (group A).The mean values of haemoglobin concentration were slightly lower in lame laminitic (group C) horses than those found in the apparently healthy horses (group A), but lame non-laminitic (group B) horses was practically same with apparently healthy horses (group A). With regards to differential leucocytes (WBC), a significant ($p< 0.05$) decrease in the mean values of neutrophil were found in the lame non-laminitic (group B) and lame laminitic (group C) horses than those found in the apparently healthy horses (group A). The other white blood cell types (lymphocytes, monocytes, basophils and eosinophils) remained statistically invariable (Figure D 1).

Table 1:Mean values of haematological profiles of apparently healthy horses (group A), lame non-laminitis (group B) and lame laminitic (group C) horses

| Parameters | Group 1 (Apparently healthy) | Group 2 (Lame non-laminitic) | Group 3 (Lame-laminitic) |
|---|---|---|---|
| PCV (%) | $38.86 \pm 1.39^a$ | $26.96 \pm 0.85^b$ | $27.36 \pm 0.86^b$ |
| RBC ( x $10^6$/µl) | $7.81 \pm 0.33^a$ | $4.30 \pm 0.24^b$ | $4.53 \pm 0.38^b$ |
| HB (g/dl) | $14.96 \pm 0.78$ | $14.74 \pm 0.58$ | $13.23 \pm 1.22$ |
| WBC ( x $10^3$/µl) | $6.02 \pm 0.28^a$ | $4.16 \pm 0.20^b$ | $3.90 \pm 0.29^b$ |

Results with different superscript indicate significant difference ($p< 0.05$

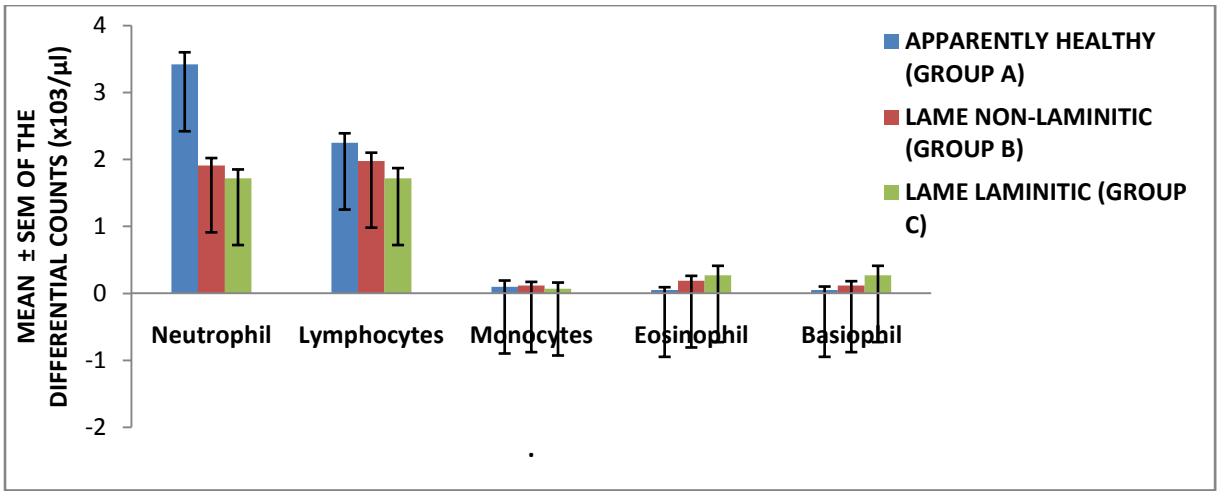


Fig. I:Mean values of the differential count profiles of apparently healthy horses (group A), lame non-laminitic (group B) and lame laminitic (group C) horses

In lame non-laminitic and lame laminitic Nigerian trade horses, a significant decrease in the PCV and RBC mean values were observed. This finding is in consonance with report of Sharma *et al.* (2015) who reported same in laminitic cattle. This decrease may be due to infection condition and or immune mediated diseases. This could be true because most of the lame non-laminitic and lame laminitic horses sampled showed signs of anaemia such as dullness, weakness, palor of the mucus menbrane and reduced exercise tolerance. The observed clinical signs of anaemia could have resulted from nutritional factors (nutritional anaemia), since lame horses may not be able to walk around and feed. These findings are not in agreement with those of Kameya (1973) and Riber *et al*. (1995), who reported non-significant differences in RBC values of healthy and acute laminitis affected horses. The difference of results in the present and previous studies could be due to complicating overwhelming bacterial infection and or viral infection and possibly because the previous study was carried out strictly in the acute laminitic horses compared to the current chronic laminitic horses. It could also be the variation of etiology of the laminitis however, it needs further investigations. On the other hand, HB values in the lame non-laminitic and lame laminitic horses was the same as the apparently healthy (group A) horses. The

cause of significant decrease in PCV and RBC with no parallel effects on HB may be due to deformation undergone be red blood cell (RBC) which might be caused by blood acidosis as reported by Riber *et al.* (1995). Sharma *et al.* (2015) also observed statistically insignificant decrease in HB values in affected laminitic cattle. Contrary to this observation, Hussain *et al*. (2004) in mules reported no statistical difference in the PCV values of laminitis and normal animals.

The observed significant ($p< 0.05$) decrease (leucopaenia) in WBC mean values in lame non-laminitic (group B) and lame laminitic (group C) compared to the apparently healthy (group C) horses does not support the findings of Hussein and Al-Derawie. (2012), Kameya (1973) and Eaton *et al*. (1995) who reported non significant ($p > 0.05$) effect of acute laminitis on leucocytes number. In this study, the results of the white blood cell (WBC) did not also coincide with the report of Riber*et al.* (1995) who documented a slight increase in white blood cells in laminitic than those in the non-laminitic (control) Andalusian horses. The work of Kameya (1973) and Eaton *et al.* (1995) reported significant leucocytosis in acute laminitic horses.

The differences in this and the other previous aforementioned findings may be associated with two important factors. Firstly, it could be that the lame non-laminitic and lame laminitic Nigerian horses had overwhelming bacterial infection. Secondly, previous studies were carried out strictly in the induced acute laminitic horses compared to the current chronic lame laminitic horses. In relation to different types of white blood cells, a significant ($p < 0.05$) decrease in the neutrophil counts (neutropaenia) were observed in the lame non-laminitic and lame laminitic Nigerian horses. This result is comparable to but slightly different from the findings of Riber *et al*. (1995) who documented lower number neutrophils in acute laminitic horses compared to the control. Severe inflammatory diseases, regardless of inciting agent, can lead to neutropenia if neutrophil margination and emigration into inflamed tissues exceeds the release of neutrophils from the bone marrow. With small storage pool of segmented neutrophils in the equine marrow, it is common for horses with overwhelming bacterial infection to have neutropenia (Steven, 2000).

**Conclusion**

In conclusion, the haematological values such as PCV, RBC, and neutrophil were significantly lower in lame non-laminitic (group B) and lame laminitic (group C) than those found in the apparently healthy Nigerian horses (group A). The mean lymphocytes, HB, basophils, monocytes and eosinophils did not differ significantly between the lame non-laminitic (group B), lame laminitic (group C) and apparently healthy (group A) Nigerian horses.

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