



Evaluation of Hematological Parameters in Goats as Guide to Disease Diagnosis

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ABSTRACT

This study aimed to monitor the hematological parameters of two major breeds of indigenous goats reared in Nigeria: the Red Sokoto (Maradi), and the West African Dwarf (common in the southern part of the country). The samples of blood were collected from the jugular vein under aseptic conditions and transferred into ethylene diamine tetra acetic acid (EDTA) sample bottles. The blood samples were analyzed for their hematological profiles. For the Red Sokoto Goat, the erythrocytic indices revealed packed cell volume.; $25.37 \pm 4.31\%$, red blood cell count; $10.15 \pm 3.88 \times 10^6$ cells/mm³ and haemoglobin concentration; 10.04 ± 3.29 g/dl. Leucocytic indices revealed; total leucocyte count $15.82 \pm 7.79 \times 10^3$ cells/mm³, neutrophils $40.93 \pm 13.67\%$, lymphocytes $53.56 \pm 14.12\%$, eosinophils $2.58 \pm 2.45\%$, monocytes $2.00 \pm 2.23\%$, basophils $0.16 \pm 0.78\%$, and band cells $1.02 \pm 2.08\%$. While that of West African dwarf packed cell volume.; $23.14 \pm 4.81\%$, red blood cell count; $7.93 \pm 2.73 \times 10^6$ cells/mm³ and haemoglobin concentration; 7.49 ± 1.91 g/dl. Leucocytes indices revealed; total leucocyte count $14.86 \pm 7.55 \times 10^3$ cells/mm³, neutrophils $51.29 \pm 19.58\%$, lymphocytes $47.57 \pm 19.72\%$, eosinophils $0.43 \pm 0.53\%$, monocytes $0.71 \pm 0.76\%$, basophils $0.00 \pm 0.00\%$, and band cells $0.00 \pm 0.00\%$. The data was used to provide early diagnosis of diseases and reduce the rise of antimicrobial resistance in both animals and humans.

Key words: Haematology, Red Sokoto, West African Dwarf, Erythrocytic indices and Leucocytic indices.

INTRODUCTION

Goats are one of the oldest domesticated species of animals and have been used for milk, meat, fur, and skin across the world (Coffey et al., 2004). Goats are the most populated domesticated animals in Africa and survive in tropical rainforests, semi-arid savannahs, and dry zones (Pamo et al., 2007). Although the majorities raise this breed through semi-intensive backyard farming, rising prophylactic or meta-

phylactic usage of antimicrobials (AMU) is causing the emergence and spread of antimicrobial resistance (AMR), which is possibly the most feared peril that humanity has ever faced. Food animals have the capacity to transfer AMR infections or the antibiotic resistance gene (ARG) through their milk and meat, acting not just as a mere reservoir but also as a possible vector (Koutsoumanis et al., 2021). One of the main risk factors for the acceleration of antimicrobial resistance (AMR) of bacteria

in both humans and animals has been highlighted in recent years as excessive use of antibiotics in livestock and production beyond what is necessary for therapeutic purposes (Haulisah et al., 2021). Hematological parameters in goats are crucial diagnostic tools because they enable effective disease management and therapy. The clinical professional can make an accurate diagnosis thanks to this parameter. This would make it possible to prevent AMR brought on by the indiscriminate use of antibiotics and guarantee that healthy meat and milk are available for human consumption. The hematological parameters evaluated in this study are the red blood cell (RBC) counts, packed cell volume (PCV), hemoglobin concentration (HbC), total leucocyte count, and differential leucocyte counts. These values can be elevated or reduced due to variations in breed, sex, age, and alteration in sample collection, transportation, preservation, and error in performing the techniques (Stockham and Scott, 2008).

MATERIALS AND METHODS

Study Area

The study was conducted in Sokoto State, which is located in the extreme northwest of Nigeria, near the confluence of the Sokoto River and the Rima River. The state is bounded by Zamfara State from the east, Kebbi State from the west, and the Niger Republic to the north. The state has a mass area of about 25,973 km² (10,028 square meters), with latitude 13° 01' N and longitude 05° 15' E. Sokoto state is in the dry Sahel, which is surrounded by sandy savannah and isolated hills. The state has an annual average temperature of 28.3 °C (82.9 °F). Sokoto is a very hot area with a maximum day temperature of 40 °C (104.0 °F) where the dryness makes the heat unbearable. The warmest months in the state are February to April, with daytime temperatures of 45 °C (113 °F) while the rainy season runs from June to October, and from late October to February is the cold season, which is mostly dominated by the harmattan, with the wind blowing the Sahara

dust over the land. Over 80% of the people living in the state practice agriculture (NPC, 2006).

Experimental Animals

A total of fifty (50) blood samples were collected from goats presented to the Large Animal Clinic of the Usmanu Danfodiyo University Veterinary Teaching Hospital and the Aliyu Jodi Veterinary Clinic, twenty five (25) samples each for Red Sokoto Goat and West African Dwarf Goat respectively.

Blood Sample Collection

In accordance with the aseptic procedure of collecting blood samples, hand gloves were used, and after proper restraint, a 5 mL syringe and a 21-gauge needle were used to collect the blood from the jugular vein of the goat. 3 ml of the blood was transferred into a bottle containing ethylene diamine tetraacetic acid (EDTA). The blood sample in the bottle was preserved in a flask with ice before transporting it to the Clinical Pathology Laboratory at Usmanu Danfodiyo University in Sokoto for haematological analysis.

Haematological Procedures

The haematological parameters were carried out on arrival to the laboratory. Haematological analysis were carried out following standard procedures. The PCV was determined by the micro haematocrit method (Thrall and Weiser, 2002), while the Hb concentration was determined by the cyamethaemoglobin method (Higgins et al., 2008). The RBC and total leucocyte count (TLC) were carried out by the haemocytometer method (Thrall and Weiser, 2002).

The differential leucocyte count was done by making a blood smear on a clean glass slide and staining it following the Leishman technique. The different cells of the Leucocytic series were enumerated by the battlement counting method (Thrall and Weiser, 2002).

Statistical analysis

All the results obtained from this study were expressed as mean standard deviation, to illustrate the importance of clinical diagnosis.

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RESULTS

Table 1: Mean and standard deviation of hematological parameters of Red Sokoto goats presented for clinical examination.

PARAMETERS	RED SOKOTO GOAT	REFERENCES (Tambuwal <i>et al</i> 2002)
PCV (%)		25.7 ± 3.1
Hb(g/dl)	10.04 ± 3.29	11.4 ± 1.6
RBC (×10 ⁶ cells/mm ³)	10.15 ± 3.88	10.9 ± 2.1
WBC (×10 ³ cells/mm ³)	15.82 ± 7.79	10.6 ± 2.8
NEUTROPHILS %	40.93 ± 13.67	36.4 ± 2.5
LYMPHOCYTES %	53.56 ± 14.12	51.6 ± 3.0
EOSINOPHILS %	2.58 ± 2.45	3.9 ± 1.5
MONOCYTES %	2.00 ± 2.23	7.4 ± 1.7
BASOPHILS %	0.16 ± 0.78	0.00 ± 0.00
BAND CELLS %	1.02 ± 2.08	0.00 ± 0.00

Table 2: Mean and standard deviation of hematological parameters of West African Dwarf goats presented for clinical examination.

PARAMETERS	WEST AFRICAN DWARF GOAT	REFERENCES (Daramola <i>et al</i> 2005)
PCV (%)	23.14 ± 4.81	29.4 ± 0.9
Hb(g/dl)	7.49 ± 1.91	9.8 ± 0.3
RBC (×10 ⁶ cells/mm ³)	7.93 ± 2.73	11.5 ± 0.4
WBC (×10 ³ cells/mm ³)	14.86 ± 7.55	13.5 ± 0.8
NEUTROPHILS %	51.29 ± 19.58	33.5 ± 1.7
LYMPHOCYTES %	47.57 ± 19.72	65.8 ± 1.1
EOSINOPHILS %	0.43 ± 0.53	0.8 ± 0.2
MONOCYTES %	0.71 ± 0.76	0.1 ± 0.0
BASOPHILS %	0.00 ± 0.00	0.00 ± 0.00
BAND CELLS %	0.00 ± 0.00	0.00 ± 0.00

Key: PCV – Packed Cell Volume, RBC – Red Blood Cell Count, Hb – Hemoglobin Concentration, WBC – White Blood Cell Count.

DISCUSSION

This article aids in comprehending the significance of performing hematological parameters on goats, allowing clinicians to assess the physiological and pathological status of these animals. The mean concentrations of erythrocyte indices indicated that packed cell volume, red blood cell count, and hemoglobin concentration were all within the normal range. However, Red Sokoto goats had slightly elevated erythrocyte parameters compared to West African dwarf goats. Therefore, an increase could be attributed to health, nutritional, physiological, and environmental factors (Analia et al., 2021), which may have a predisposition for red Sokoto goats in the environment where the research was conducted compared to the West African dwarf, which is more tolerant and common in southern Nigeria. The Leucocytic indices revealed that the total leucocyte count in Red Sokoto goats was above the normal range; neutrophils, lymphocytes, eosinophils, monocytes, and basophils were all within the normal range; however, band cells were elevated in Red Sokoto goats. Total leukocytes, monocyte, and neutrophils were above the normal range in the West African dwarf, while eosinophils were below the normal range. Lymphocytes and basophils were all within the normal range. Compared to the reference value, elevated neutrophils in West African dwarf goats suggest stress, transient systemic infection, trauma, inflammation, corticosteroid administration and suggestive of acute infections (Nayha and Farah, 2023). In the Red Sokoto goat, the presence of band cells above the normal range suggests a shift to the left, degeneration of the bone marrow, and chronic infection. Below-normal lymphocyte counts in a West African dwarf are indicative of stress, viral disease, and immunodeficiency. Eosinophils below the normal reference range in West African dwarfs are indicative of severe or acute inflammation and idiosyncratic drug reactions, whereas those above the normal

reference range are indicative of hypersensitivity reactions and parasitic infection (Newcomer et al., 2020). However, a thorough grasp of hematological indices permits accurate diagnosis and aids in preventing antibiotic resistance in humans and animals as well as mortality.

CONCLUSION

Conclusion: In both Red Sokoto goats and West African Dwarf goats, the erythrocytic indices were found to be within the normal range, however, the leucocytic indices showed a slightly raised value when compared to the reference value. Therefore, it's crucial to perform basic hematological tests on sick animals in order to assure accurate disease diagnosis, provide healthy food items like meat and milk, and guard against antibiotic resistance.

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