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Research Article

Determination of Hematological Parameters of Bunaji Cattle Slaughtered in Sokoto Modern Abattoir, Sokoto State, Nigeria

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Abstract

Cattle are a significant part of Nigeria's meat supply and livestock production, with beef being the most consumed meat, followed by sheep and goat meat. Currently, the population of cattle in Nigeria is estimated at 15.3 million, with over 90 percent owned by traditional producers in the northern regions. Indigenous breeds of cattle include the Red Bororo, White Fulani, and Sokoto Gudali. This study was aimed at establishing the normal reference hematological parameters of Bunaji cattle in Sokoto. The result obtained will be useful in determining the normal reference hematological value of Bunaji cattle in Sokoto, Nigeria, and will serve as an aid in the clinical diagnosis of various metabolic and pathological disorders, which can unfavorably affect the productive and reproductive performance of cattle, leading to heavy economic losses. An experimental study (random sampling) was conducted at the Sokoto modern abattoir for one month. Blood samples of 60 apparently healthy Bunaji cattle (male and female) ranging in age from 2 to 3 years, which were brought for slaughter, were collected using EDTA, and a complete hemogram was performed. The results obtained showed, mean of PCV (%), Hb (g/dl), RBC (x106/mm6), WBC (x103/mm3), Neutrophils (%), Lymphocytes (%), Monocytes (%), Eosinophils (%), Basophils (%), MCV (fl), MCH (pg), MCHC (g/dl) were 31.60±7.17, 10.93±2.54, 6.34±2.91, 6.62±1.70, 60.23±11.26, 37.25±11.75, 2.25±1.23, 0.07±0.25, 0±0.00, 54.04±65.49, 18.88±6.09, 34.95±4.73 respectively. It is concluded that all the hematological parameters obtained from this research were within the normal reference range with the exception of neutrophils, which had little variation.

Keywords

Bunaji Cattle, Hematology, Abattoir, Sokoto

1. Introduction

Livestock proved one-third of Nigeria's agricultural output, which also provides jobs, food, farm energy, manure, fuel, and transportation. Additionally, they are a significant source of government funding. Nigeria has a diverse and intricate traditional livestock production system. The most effective users of uncultivated land are livestock, particularly ruminants,

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which can significantly increase crop productivity [1]. In the meat and livestock production, cattle hold an important place, however, season variation, especially summer, might cause huge economic losses in cattle industry globally [2, 3], this has contributed to the alteration of antioxidant such as superoxidase dismutase due to environmental stress [4, 5]. With an estimated population of over 167 million and an annual population growth rate of three percent, Nigeria is the biggest market for animal products in sub-Saharan Africa [6]. According to estimates, beef makes up roughly 45 percent of all the meat consumed in Nigeria, with sheep and goat meat coming in second place with 35 percent. The northern regions of the country and traditional producers hold more than 90% of these [7]. The number of cattle in Nigeria is currently estimated at 15.3 million. The national herd is thought to grow at a speed of 1.5% every year. It's interesting to note that while industrialized countries produce roughly two-thirds (2/3) of the world's meat, the majority of the world's cattle are found in developing countries. Regardless of their level of productivity, livestock in developing nations improves nutrition, economic possibilities, family income, draught power, and a more balanced agricultural system for millions of families [7]. Nigerian cattle come in a variety of breeds. The most common breeds of cattle in Nigeria include Sokoto Gudali, Red Bororo, White Fulani, Keteku, Adamawa Gudali, Ndama, Wadara, Azawak, Kuri and Muturu [7].

Hematology is the study of the quantities and shapes of the blood's biological components, including the erythrocytes (red blood cells), leucocytes (white blood cells), and thrombocytes (platelets) [8], and how to utilize this information to diagnose and track disease [9]. Research on the extent of blood damage and disease diagnosis can benefit both from hematological investigations. Hematological investigations is important in selecting the animals that are genetically resistant to specific diseases and environmental conditions, by understanding the relationship between the environmental conditions and blood properties, which are of physiological and ecological importance [10]. Animal physiological status can be accurately predicted by hematological markers [11]. Hematological parameters are those that have to do with the blood and the organs that create blood. Blood serves as a pathological indicator of animals health status that have been exposed to toxins and other circumstances [12]. Blood analysis offers the chance to look into the existence of many metabolites and other components in an animal's body, and it is extremely important to the nutritional, physiological, and pathological status of an organism. The components of blood can be examined to obtain crucial knowledge for the diagnosis and prognosis of animal diseases. Blood changes in relation to physiological health conditions [10]. These alterations are helpful in determining how animals react to various physiological circumstances. In this study, the hematological parameters of farm animals were studied in relation to breed, age, sex, and management practices, among other factors.

2. Materials and Methods

2.1. Location of the Study

The study was conducted in the Department of Veterinary Physiology and Biochemistry, Faculty of Veterinary Medicine, Usmanu Danfodiyo University, Sokoto, Nigeria, and the abattoir in the Sokoto metropolitan region. Sokoto state has a total size of 28,232.37 square kilometers, situated in northwestern part of the country (Nigeria). The state lies between latitudes 4° to 6° north and longitudes 11° 30° to 13° 50° east. It shares borders with the Niger Republic in the north, Zamfara State in the east, and Kebbi State in the south and west [13].

2.2. Design of the Study

An experimental research (using the random sampling technique) was conducted. 60 (30 males and 30 females) apparently healthy cattle (physically examined, good body condition score, absence of visible lesions and parasitological infestation) ranging between 2 years – 3 years of age brought for slaughtering were used for this research. Between November 2022 and December 2022.

2.3. Sample Collection

Blood samples were collected from the jugular vein at the point of slaughter into a plastic tube containing ethylene diamine tetracetic acid (EDTA) and transported to the Physiology and Biochemistry Laboratory for hematological analysis.

2.4. Determination of Hematological Parameters

2.4.1. Pack Cell Volume

Heparinized blood was centrifuged in a capillary tube (micro-hematocrit tube) at 10,000 RPM for five minutes in order to calculate the packed cell volume (PCV) [14]. The capillary tubes were filled up to two-thirds of uncoagulated blood, and one end was sealed with plasticine. The PCV was read as a percentage using a microhematocrit reader.

2.4.2. Hemoglobin (Hb)

The Hb concentration was determined by the cyanohemoglobin method. Twenty microliters of uncoagulated blood were added to 5 mL of Drabkin's solution. It was then mixed and allowed to stand for 20 minutes to react. The absorbance of both the samples and the standard were measured against the Drabkin's reagent blank at a wavelength of 540nm using a digital colorimeter.

2.4.3. Erythrocyte (Red Blood Cell) Count

The erythrocyte count was done with a hemocytometer using diluting fluid. Twenty microliters of blood were added to 4 ml of diluting fluid (a combination of sodium citrate, formalin, and distilled water) to make 1:200 dilutions. It was then mixed, and a drop of the diluted blood was charged onto the Neubauer chamber and allowed to settle for 2-3 minutes. The Neubauer chamber was mounted on a light microscope, and the erythrocytes were enumerated at X 40. The number of all cells enumerated in the 5 central squares for each sample was multiplied by 10,000 to obtain the erythrocyte counts per microliter of blood.

2.4.4. Total Leukocyte (White Blood Cell) Count

The total leukocyte counts were also done with a hemocytometer, using a diluting fluid. Twenty microliters of blood were added to 380 microliters of diluting fluid (a combination of glacial acetic acid, gentian violet, and distilled water) to make a 1:20 dilution. This was mixed, and a drop of the diluted blood was charged onto the Neubauer chamber and allowed to settle for 2–3 minutes. The Neubauer chamber was then mounted on a light microscope, and the leukocyte count was enumerated at x10 magnification. Then the number of cells enumerated in the four big side squares for each sample was multiplied by 50 to obtain the leukocyte counts per microliter of blood.

2.4.5. Differential Leukocyte Count

The differential leukocyte counts were performed on a thin smear stain using Leishman's stain. Using a cover slip, a drop of blood was applied to a spotless, grease-free glass slide to create a tiny smear. The Leishman process was used to air dry and stain the smear. The different leukocyte types were enumerated using the battlement counting method at X100 (oil emersion). The percentage (%) values obtained were converted to absolute values by multiplying out the total WBC count.

3. Results

The study's hematological values for seemingly healthy Bunaji cattle slaughtered at the modern abattoir in Sokoto are displayed in Table 1. Pack cell volume, red blood cell count, total white blood count, differential leukocyte count (neutrophils, basophils, eosinophils, lymphocytes, and monocytes), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC) are among the hematological indices that were found. Microsoft Excel was used to compute the mean, standard deviation, and standard error of each index. Hb (%)/RBC x 10 for MCV (fl), Hb (g/dL)/RBC x 10 for MCH (pg), and Hb (g/Dl)/PCV (%) x 100 for MCHC were used.

Table 1. *Showing the mean and standard deviation (SD) of the hematological parameters.*

Blood parameters	Mean	Standard deviation
PCV (%)	31.60	7.17
Hb (g/dL)	10.93	2.54
RBC (×10⁶/µL)	6.34	2.91
WBC (×103/µL)	6.62	1.70
Neutrophils (%)	60.23	11.26
Lymphocytes (%)	37.25	11.75
Monocytes (%)	2.25	1.23
Eosinophils (%)	0.07	0.25
Basophils (%)	0	0.00
MCV (fl)	54.04	65.49
MCH (pg)	18.88	6.09
MCHC (g/dl)	34.95	4.73

Key: PCV (Pack Cell Volume), Hb (Hemoglobin), RBC (Red Blood Cell), WBC (White Blood Cell), MCV (Mean Corpuscular Volume), MCH (Mean Corpuscular Hemoglobin) and MCHC (Mean Corpuscular Hemoglobin concentration).

4. Discussion

The aim of this study was to determine the hematological parameters of Bunaji cattle slaughtered in a modern abattoir in Sokoto. The average PCV obtained is aligned with the study of [10, 15, 16]. The average hemoglobin concentration obtained is consistent with the study of [10, 15] but contrary to the study by [17]. The reason for the variation might be because the report of [17] was carried out to determine the hemoparasite (Theileria) found in the blood. The average RBC obtained agreed with the report in [18] but contrary to that obtained from healthy Muturu breed cattle reported by [18]. The reason for this might be due to genetic variation leading to higher erythrocyte values in the Muturu compared to the Bunaji. The average WBC obtained for this study agreed with the study of [10] but contrary to that obtained from healthy Muturu breed of cattle reported by [14], and this could predispose them to many infections.

The average neutrophils obtained for this study were not in agreement with what was reported by [18] from Muturu cattle examined to determine the hematological and biochemical parameters in the blood. This variation observed might be a result of stress. The average lymphocytes obtained for this study agreed with the findings of [10] but contrary to the study of [19]. The average monocyte obtained for this study agreed with the report of [10] but contrary to what was obtained by [19]. The average number of eosinophils obtained for this

study was not in agreement with the report of [10]. The average MCV, MCH, and MCHC obtained in this research agreed with the reports of [10, 15].

5. Conclusion

It is concluded that all the hematological parameters obtained from this study were within the normal range with the exception of neutrophils, which had little variation.

Abbreviations

PCV	Pack Cell Volume
Hb	Hemoglobin
RBC	Red Blood Cell
WBC	White Blood Cell
MCV	Mean Corpuscular Volume
MCH	Mean Corpuscular Hemoglobin
MCHC	Mean Corpuscular Hemoglobin Concentration

Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

Ashiru Dahiru: Conceptualization, Funding acquisition, Methodology, Writing – original draft

Musa Muhammad: Supervision, Visualization

References

[1] O. A. Lawal-Adebowale, "Factors influencing small ruminant management in selected urban communities of Abeokuta, Ogun State," Nigerian Journal of Animal Production, vol. 39, no. 1, 2021, https://doi.org/10.51791/njap.v39i1.2279

[2] Abdoon, A. S., Attia, M. Z., Soliman, S. S., Kandil, O. M., El-Toukhey, N. E., & Sabra, H. A. (2020). *Seasonal variation in number of ovarian follicles and hormonal levels in Egyptian buffalo and cattle. International Journal of Veterinary Science, 9*(1), 126–130.

[3] Abdoon, A. S. S., Attia, M. Z., El-Toukhey, N. E., Kandil, O. M., Sabra, H. A., & Soliman, S. S. (2020). *Effect of reproductive status and season on blood biochemical, hormonal and antioxidant changes in Egyptian buffaloes*. *International Journal of Veterinary Science, 9*(1), 131–135. Retrieved from https://www.ijvets.com/pdf-files/Volume-9-no-1-2020/131-135.pdf

[4] Soliman, S. S., Abdoon, A. S. S., El-Toukhey, N. E., Kandil, O. M., Sabra, H. A., & Attia, M. Z. (2020). *Transcript abundance of GAPDH, HSP70, SOD2, PGES, and PPAR γ mRNA gene expression during the different stages of reproduction in Egyptian buffaloes*. Journal of the Egyptian Veterinary Medical Association, 80(2), 93–208.

[5] Seham S. Soliman, Amro M. El-Sanea, Omaima M. Kandil, Amal M. Aboelmaaty and Ahmed Sabry S. Abdoon (2024). Impact of Reproductive Status, Body Condition Score, and Locality on Hormonal, and Some Blood Metabolites in Egyptian Buffaloes. Egypt. J. Vet. Sci. Vol. 55, No. 5, pp. 1387-1396.

[6] Yusuf, A. A. (2024). *The prospect of beef and dairy products in Nigeria*. *International Journal of Innovative Food, Nutrition & Sustainable Agriculture, 12*(2), 44–51. Retrieved from https://www.seahipublications.org/wp-content/uploads/2024/04/IJIFNSA-J-5-2024.pdf

[7] Kubkomawa, H. (2017). Indigenous breeds of cattle, their productivity, economic and cultural values in Sub-Saharan Africa: A review. *International Journal of Research Studies in Agricultural Sciences, 3*(1), 28–36. https://doi.org/10.20431/2454-6224.0301004

[8] A. Dahiru and A. Ishaq Ja'afaru, "Ameliorative Effect of < i> Moringa oleifera</i> Leave Extract on Kerosene Induced Hematological, Serum Biochemical and Histological Changes in Wistar Rats," American Journal of Applied Chemistry, vol. 9, no. 6, 2021, https://doi.org/10.11648/j.ajac.20210906.13

[9] Trevor J. Whitbread (2022). Clinical Hematology, Veterinary Manual. Merck & co., Inc Rah way Nj. USA. Page 54.

[10] Etim, N. N., Williams, M. E., Akpabio, U., & Offiong, E. E. A. (2014). Haematological parameters and factors affecting their values. *Agricultural Science, 2*(1), 37–47. https://doi.org/10.12735/as.v2i1p37

[11] Khan, T., & Farhat, Z. (2005). Haematological Study in Response to Varying Doses of Estrogen in Broiler Chicken. International Journal of Poultry Science, 4(10), 748-751. https://doi.org/10.3923/ijps.2005.748.751

[12] A. Dahiru and B. Saidu, "Ameliorative effects of Moringa oleifera on haematology, cardiac-troponin-I, electrolytes and histology of Wistar rats exposed to diesel fumes," Sokoto Journal of Veterinary Sciences, vol. 22, no. 4, 2025, https://doi.org/10.4314/sokjvs.v22i4.2

[13] ICT Directorate, Sokoto State Government (2023). https://sokotostate.gov.ng/history-of-sokoto/the-land/

[14] Etim, N. N., Enyenihi, G. E., Williams, M. E., Udo, M. D., & Offiong, E. E. A. (2013). *Haematological parameters: Indicators of the physiological status of farm animals*. British Journal of Science, 10(1), 33–45.

[15] MLA. The Merck Veterinary Manual (2012). White House Station. NJ: Merck & co., Inc. page 34-50.

[16] Ode, S., Adamu, M., & Saror, D. (2016). Haematology and some serum biochemistry of apparently healthy Muturu and Bunaji breeds of cattle in Benue State, Nigeria. *Comparative Clinical Pathology, 25*(6), 1219–1224. https://doi.org/10.1007/s00580-016-2375-1

[17] Singh, J., Yadav, K. K., & Mandal, A. B. (2001). Feeding plane of milch Murrah buffaloes in its native breeding tract. Buffalo J., 17(1): 1-12.

[18] Stuen, S. (2020). Haemoparasites—Challenging and wasting infections in small ruminants: A review. *Animals, 10*(11), Article 2179. https://doi.org/10.3390/ani10112179

[19] Bedenicki, M., Potočnjak, D., Bedrica, L., *et al.* (2014). Haematological and biochemical parameters in the blood of an indigenous Croatian breed – Istrian cattle. *Archives Animal Breeding, 57*(18), 1–12. https://doi.org/10.7482/0003-9438-57-018