

Haematological Parameters And Blood Chemistry Of Apparently Healthy West African Dwarf (Wad) Goats In Owerri, South Eastern Nigeria

Opara, M.N., Udevi, N. and Okoli, I.C.

Tropical Animal Health and Welfare Research Group

Department of Animal Science and Technology, Federal University of Technology

P.M.B. 1526, Owerri Nigeria. Email: oparamax@yahoo.com

ABSTRACT: The blood chemistry and other haematological parameters of 130 West African Dwarf (WAD) goats consisting of 60 adults (30 bucks and 30 does) and 70 young ones (56 buck-kids and 14 doe-kids) were determined. The mean PCV (%), WBC ($\times 10^9/l$), RBC ($\times 10^{12}/\mu l$) and Hb (g/dl) were 28.4 ± 0.9 , $17.3 \pm 0.9 \times 10^9 / L$, $2.7 \pm 0.1 \times 10^{12} / \mu l$, and $9.5 \pm 0.3 g / dl$ respectively. Male WAD goats had significantly ($p < 0.05$) higher lymphocytes, neutrophil and WBC than the females, while other parameters were similar. The values obtained for serum sodium, total protein and urea levels were $126.1 \pm 2.2 mmol / l$, $5.2 \pm 0.1 g / dl$ and $37.9 \pm 1.7 mg / dl$ respectively, while the values obtained for serum enzymes such as Aspartate Amino Transferase (AST), Alanine Amino Transferase (ALT) and Alkaline Phosphatase (ALP) were $6.7 \pm 1.01 IU / l$, $5.3 \pm 0.7 IU / l$ and $63.2 \pm 6.9 IU / l$ respectively. There was significantly ($p < 0.05$) higher percentage of PCV, Hb and RBC in female WAD goats than the males. The WBC, MCV and MCH were significantly higher in the male WAD goats. The percentage of lymphocytes was higher in male goats, while that for neutrophil was higher in the female goats. Age did not significantly influence the haematological parameters of the WAD, except for the significantly higher Neutrophils in the does than other groups. Eosinophil values were significantly higher ($p < 0.05$) in the WAD doe – kids than other age groups examined. Serum sodium was higher ($p < 0.05$) in younger WAD goats, than the older ones. This study has reported haematological and serum biochemical values which could serve as baseline information for comparison in conditions of nutrient deficiency, physiological and health status of West African Dwarf goats in Southeastern Nigeria. [New York Science Journal 2010;3(8):68-72]. (ISSN: 1554-0200).

Key Words: Blood chemistry, apparently healthy, West African Dwarf (WAD) goats, Owerri, Nigeria

INTRODUCTION

To meet the high demand for meat as a source of animal protein in the future, much of the increase in meat production would have to come from short-cycle animals which will require a little management practice to rear them. Examples are the domestic goat, sheep and other mini-livestock such as the grasscutter.

The significance of determining haematological and biochemical indices of domestic animals has been well documented (Oduye and Adadevoh 1976, Oduye and Otesile 1977, and Opara et al, 2006). The changes in these parameters have been studied in cattle (Ghargariu et al, 1984), sheep (Kaushish and Arora, 1977) and Red Sokoto goats (Tambuwal et al, 2002). There is a great variation in the haematological and biochemical parameters as observed between breeds of goats (Azab and Abdel-Maksoud 1999, Tambuwal et al, 2002) and in this regard, it may be difficult to formulate a universal metabolic profile test for goats. These differences have further underlined the need to establish appropriate physiological baseline values for various breeds of livestock in Nigeria, which could help in the realistic evaluation of the management practice, nutrition and diagnosis of their health condition.

Goat production in Nigeria makes a major contribution to the agrarian economy (Adeloye, 1998). The West African Dwarf goats are found in the region, south of latitude $14^{\circ}N$ across West Africa in the coastal area which is humid and favours high prevalence of diseases (Adeloye, 1998). This eco-zone is infested with tsetse flies. However, the West African dwarf goats thrive well here and reproduce with twins and triplet births (Adeloye, 1998), thereby satisfying a part of the meat requirement in this region.

The Food and Agricultural Organization (FAO 1990) reported that sub-Saharan Africa, Latin America and the near east are the areas mostly affected by low animal protein supply per capital. This could mostly be seen as a result of high dependence on cattle, sheep and goats. The high cost of these animals or their products (meat and milk) makes it practically impossible for the average citizens to afford the right quantity and quality of meat which will increase or measure up the recommended animal protein requirement of 35g for human being (FAO).

In Nigeria and West Africa, goats are reared traditionally at subsistence level. They are usually left to scavenge and cater for their own nourishment (Adeloye, 1985). Domestic left-over, which

composition depends on the family menu may constitute parts of the goats' diet. Nutrition, age, sex, genetics, stress and transportation are all known to affect haematological and biochemical parameters observed between tropical and temperate animals (Ogunrinde et al, 1981; Bush 1991 and Ogunsanmi et al, 1994).

There is dearth of literature on the haematological and plasma biochemical values of the West African Dwarf goats in south eastern region of Nigeria. This study will therefore examine the WAD goats in Owerri and document their haematological and plasma biochemical values.

MATERIALS AND METHODS

Blood samples were collected from the jugular vein of 130 West African Dwarf (WAD) goats consisting of 60 adults (30 bucks and 30 does) and 70 young ones (56 buck-kids and 14 doe-kids). Three millimeter (3ml) of blood collected from each of these goats was stored in plastic sample bottles containing EDTA for haematological studies, while another 7ml was deposited into anticoagulant free plastic tube and allowed to clot at room temperature within 3 hours of

collection. The serum samples were later stored at a temperature of -20°C for biochemical studies. The haematological studies were carried out according to procedures by Jain, (1986), while biochemical analyses were done using the method described by Ogunsanmi et al, (2002).

Data generated were analysed, using descriptive statistics and where significant differences were observed between means, they were separated by the Duncan's new multiple range test (Obi, 1990).

RESULTS

The result of the haematological values obtained from 130 West African Dwarf (WAD) goats is shown on table 1.

All the haematological parameters were similar ($p > 0.05$), except the significantly higher ($p < 0.05$) mean WBC counts in the bucks than the does, which was $18.7 \pm 1.2 \times 10^9/l$ and again a significantly lower ($p < 0.05$) neutrophil values in the bucks, which was 28.1 ± 1.4 , while the values in the does was 40.3 ± 2.2 . Lymphocyte values were also significantly higher ($p < 0.05$) in the bucks than in the does. These values were 70.3 ± 1.3 and 56.5 ± 2.2 respectively.

Table 1: Haematological values of West African Dwarf (WAD) goats.

Parameters	WAD goats	Males	Females
PCV, %	28.4 ± 0.9	27.4 ± 1.2	29.9 ± 1.4
Hb, g/dl	9.5 ± 0.3	9.2 ± 0.4	9.9 ± 0.5
RBCs $\times 10^{12}/\mu\text{l}$	2.7 ± 0.1	2.5 ± 0.2	2.9 ± 0.2
MCHC, g/l	332.3 ± 2.5	333.2 ± 3.3	331.0 ± 4.1
MCV, fl	114.5 ± 7.4	119.9 ± 11.9	106.3 ± 4.6
MCH, Pg	37.8 ± 2.2	39.6 ± 3.6	35.2 ± 1.3
WBC, $\times 10^9/l$	17.3 ± 0.9	18.7 ± 1.2^a	15.1 ± 0.9^b
Lymphocytes	64.8 ± 1.7	70.3 ± 1.3^a	56.5 ± 2.2^b
Neutrophils	32.9 ± 1.6	28.1 ± 1.4^b	40.3 ± 2.2^a
Eosinophils	0.3 ± 0.1	0.2 ± 0.1	0.4 ± 0.2
Monocytes	2.4 ± 0.3	2.2 ± 0.4	2.8 ± 0.6
Basophils	0.2 ± 0.1	0.2 ± 0.1	0.1 ± 0.1

Table 2 shows the serum biochemical values of West African Dwarf (WAD) goats in Owerri, south eastern Nigeria. There was no sexual dimorphism ($p > 0.05$) between the male and female WAD goats examined here. All the serum biochemical values compared favourably between both sexes.

Table 2: Serum biochemical values of West African Dwarf (WAD) goats.

Parameters	WAD goats	Males	Females
Sodium, mmol/l	126.1 ± 2.2	126.4 ± 3.2	125.6 ± 2.8
Potassium, mmol/l	7.1 ± 0.5	7.1 ± 0.6	6.9 ± 0.8
Chloride, mmol/l	145.7 ± 4.4	144.9 ± 6.5	146.9 ± 5.6
Urea, mg/dl	37.9 ± 1.7	36.8 ± 1.9	39.7 ± 3.1
Creatinine, mg/dl	0.7 ± 0.04	0.7 ± 0.05	0.8 ± 0.07
Cholesterol, mg/dl	47.4 ± 4.5	51.2 ± 6.6	41.5 ± 5.3

Glucose, mg/dl	32.9 ± 3.8	38.2 ± 5.3	25.1 ± 4.6
Total protein, g/dl	5.2 ± 0.1	5.2 ± 0.1	5.2 ± 0.1
Albumin, g/dl	2.8 ± 0.1	2.9 ± 0.1	2.8 ± 0.1
Globulin, g/dl	2.4 ± 0.1	2.3 ± 0.1	2.4 ± 0.1
AST, IU/l	6.7 ± 1.0	5.7 ± 0.3	8.2 ± 2.5
ALT, IU/l	5.3 ± 0.7	4.9 ± 0.5	5.8 ± 1.6
ALP, IU/l	63.2 ± 6.9	61.1 ± 8.9	66.4 ± 11.3

Table 3 shows the haematological values of West African Dwarf (WAD) goats according to age groups of the animals. There were no significant differences ($p > 0.05$) in the haematological parameters measured among the different age groups of WAD goats, except for the significantly higher Neutrophils in the does than other groups. Eosinophil values were significantly higher ($p < 0.05$) in the WAD doe – kids than other age groups examined.

Table 3:Haematological values of West African Dwarf (WAD) goats according to age groups

Parameters	Buck	Doe	Buck – kid	Doe – kid
PCV, %	28.9 ± 2.1	30.0 ± 1.8	25.6 ± 0.5	29.5 ± 0.5
Hb, g/dl	9.5 ± 0.7	9.9 ± 0.6	8.6 ± 0.2	9.9 ± 0.1
RBC, X 10 ¹² /μl	2.7 ± 0.3	2.8 ± 0.2	2.3 ± 0.2	3.1 ± 0.1
MCHC, g/l	331.5 ± 4.1	330.1 ± 4.8	335.3 ± 5.5	335.5 ± 2.5
MCV, fl	115.9 ± 13.5	108.8 ± 5.2	125.0 ± 21.8	94.0 ± 0.0
MCH, Pg	38.3 ± 4.6	35.9 ± 1.5	41.3 ± 6.0	31.5 ± 0.5
WBC, X 10 ⁹ /L	18.2 ± 1.8	15.2 ± 1.0	19.4 ± 1.7	14.7 ± 1.5
Percentage distribution of leukocytes				
Lymphocytes,%	67.8 ± 1.4	55.4 ± 2.5	73.4 ± 1.9	62.0 ± 3.0
Neutrophils,%	30.4 ± 1.9 ^b	41.9 ± 2.4 ^a	25.3 ± 1.7 ^b	32.0 ± 1.0 ^b
Eosinophils,%	0.2 ± 0.1 ^b	0.3 ± 0.2 ^b	0.3 ± 0.2 ^b	1.0 ± 1.0 ^a
Monocytes,%	2.2 ± 0.6	2.4 ± 0.6	2.1 ± 0.4	4.5 ± 0.5
Basophils,%	0.2 ± 0.1	0.0 ± 0.0	0.3 ± 0.2	0.5 ± 0.5

The result of the biochemical values of West African Dwarf (WAD) goats according to their age is presented in table 4. The mean serum Sodium values were significantly higher ($p < 0.05$) among doe – kids, which was 141.5 ± 5.5mmol / L than in the other age groups which were 137.7 ± 1.7, 122.4 ± 1.9 and 117.4 ± 3.5mmol / L for buck – kid, doe and buck respectively.

Table 4: Serum biochemical values of West African Dwarf (WAD) goats according to age groups

	Buck	Doe	Buck-kid	Doe-kid
Sodium mmol/l	117.4 ± 3.5 ^b	122.4 ± 1.9 ^b	137.7 ± 1.7 ^a	141.5 ± 5.5 ^a
Potassium mmol/l	7.8 ± 0.9	6.8 ± 0.7	6.1 ± 0.9	7.9 ± 3.7
Chloride mmol/l	142.3 ± 8.8	142.6 ± 4.7	148.3 ± 10.2	168.5 ± 21.5
Urea mg/dl	34.5 ± 1.7	40.1 ± 3.6	39.6 ± 3.5	37.5 ± 7.5
Creatinine mg/dl	0.65 ± 0.04	0.8 ± 0.1	0.8 ± 0.1	0.9 ± 0.1
Cholesterol mg/dl	48.0 ± 8.0	41.3 ± 6.0	55.3 ± 11.4	43.0 ± 14.0
Glucose mg/dl	33.1 ± 7.2	24.4 ± 5.1	44.6 ± 7.7	28.5 ± 13.5
Total protein g/dl	5.1 ± 0.1	5.1 ± 0.1	5.4 ± 0.2	5.5 ± 0.1
Albumin g/dl	2.9 ± 0.2	2.8 ± 0.1	2.8 ± 0.1	2.8 ± 0.2
Globulin g/dl	2.1 ± 0.1	2.3 ± 0.1	2.6 ± 0.1	2.7 ± 0.2
AST IU/ l	6.4 ± 0.4	9.0 ± 2.9	4.8 ± 0.5	4.0 ± 2.0
ALT IU/ l	4.9 ± 0.6	6.1 ± 1.9	4.8 ± 0.8	4.5 ± 0.5
ALP IU/ l	59.4 ± 11.9	69.9 ± 13.4	63.3 ± 14.4	49.0 ± 7.0

DISCUSSION

Packed cell volume (PCV) in this study was higher than $25.7 \pm 3.1\%$ obtained for Red Sokoto goats (Tambuwal et al 2002). Earlier reports in Baladi goats (Azab and Abdel-Maksoud, 1999) and Red Sokoto goats (Tambuwal et al 2002) showed PCV values of 27.25 ± 0.59 and 25.7 ± 3.1 respectively. The findings of this study support that PCV varies among breeds of goats. In contrast, Patterson et al (1960) attributed increase in PCV values in cattle to increase in environmental temperature. This finding suggested that WAD goats have tendency for compensatory accelerated production (CAP) of PCV in case of infection and stress. Compensatory accelerated production has been shown to return PCV to normal following an infection (Dargie and Allonby, 1975). Similarly, serum total protein was higher than $4.4 \pm 1.5\text{g/dl}$ obtained for Red Sokoto goats (Tambuwal et al, 2002). Comparison of the results in this study with the earlier report suggests that PCV varies proportionately with serum protein. This suggested that PCV is beneficial in assessing the protein status and possibly forecasting the degree of protein supplementation in goats at different physiological states.

The PCV values obtained for the female WAD goats were comparable to those obtained for the males. This observation is in contrast with values obtained for Red Sokoto goats in Nigeria (Tambuwal et al, 2002) in which male animals have higher values than females.

Haemoglobin (Hb) concentration in this study fell within the range of high values obtained for Red Sokoto goats (Tambuwal et al, 2002). Hb was higher in adult WAD goats when compared to the values obtained for young WAD goats. West African Dwarf goats seem to possess relatively high Hb values, and this is an advantage in terms of the oxygen carrying capacity of the blood. The observed difference in adult and young WAD goats suggested that the oxygen carrying capacity of the blood was high in adult goats.

The total White Blood Cell (WBC) count was higher in this study than values obtained for Red Sokoto goats (Tambuwal et al, 2002), cattle in Nigeria (Oduye and Fasanmi 1971) and Nigerian buffaloes (Olusanya et al, 1976). WAD goats seem to possess protective system, providing a rapid and potent defense against any infectious agent and this is probably the physiological basis for the adaptation of this species to this ecological zone characterized by high prevalence of diseases. Total WBC counts differentials in adult WAD goats compared well with values obtained for young WAD goats in this study.

In goats, like other ruminants there are more lymphocytes than Neutrophils in circulation (Olusanya et al, 1976). However, the values obtained in this study fell within the broad range recorded for Red Sokoto goats (Tambuwal et al, 2002), thus suggestive of a well

developed immune system in the WAD goats with such number of immune cells to offer good health.

Sex was observed to have a significant effect on the lymphocyte and Neutrophil values of WAD goats. The male WAD goats had increased lymphocyte values compared to the female animals, where as the females had increased Neutrophil values compared to the male animals. This finding is similar to observation reported for Red Sokoto goats by Tambuwal et al, (2002).

Perhaps the most outstanding feature was the low Sodium (Na) level obtained in this study compared with other breeds kept in Nigeria such as the Red Sokoto, $138.0 \pm 0.6\text{mmol/l}$ (Tambuwal et al,2002) and sheep, $138.8 \pm 5.2\text{mmol/l}$ (Oduye and Adadevoh,1976). In this respect, WAD goat is probably similar to man (Macfarlane et al, 1970) and cattle (Oduye and Fasamni, 1971) which have been shown to have lower Na levels in tropical environment. This close association between tropical environment and lower Na level in man has been attributed to the variable dietary intake of salt and loss of Na and chloride ions in urine under tropical environmental condition (Macfarlane et al, 1970). Serum sodium (Na) levels were however higher in young WAD goats compared to adult goats.

Potassium (K) level was slightly higher in the WAD goats but did not differ from the values reported for Red Sokoto goats (Tambuwal et al, 2002) and WAD sheep (Oduye and Adadevoh, 1976). Potassium level was comparable in the age groups.

Creatinine, chloride and cholesterol levels were comparable among the age groups. Total protein was however slightly higher in young WAD goats compared to adult WAD goats. Albumin levels were also comparable in both age groups, but not globulins which were higher in young than adult WAD goats.

A high level of serum urea has been attributed to excessive tissues protein catabolism associated with protein deficiency (Oduye and Adadevoh, 1976).

This study showed a wide variation in the concentrations of both Aspartate Amino Transferase and the Alanine Amino Transferase (AST and ALT). The comparative value of alkaline phosphate (ALP) in both male and female is in contrast to the findings of Tambuwal et al (2002) for Red Sokoto goats. Although ALP level can be influenced by pregnancy, blood pH and disease (Kelly, 1974), the animals in this study were apparently healthy, non-pregnant, and these parameters could not have been influenced by these factors. Age was also observed to have a significant effect on ALP in this study similar to Red Sokoto goats (Tambuwal et al, 2002).

CONCLUSION

The components of the haematological and serum biochemical parameters in West African Dwarf

(WAD) goats in this study seem to point out some differences from those obtained for other ruminant species. The observed differences further support the fact that the physiological parameters reported for other ruminant animals may not be applied on West African Dwarf (WAD) goats kept in this ecological zone.

Age was observed to have a significant effect on parameters like Hb, RBC and MCHC values. Sex was also observed to have effect on the lymphocytes and Neutrophils, where the male WAD goats had increased lymphocyte values compared to the female animals, whereas the females had increased Neutrophil values compared to the male animals.

The findings of this study may serve as references in which alterations due to nutrient deficiency, physiological and health status can be compared both for diagnostic and therapeutic purposes in WAD goats in this ecological zone which is laddened with high prevalence of diseases.

Correspondence to:

Maxwell N. Opara
Tropical Animal Health and Welfare Research Group
Department of Animal Science and Technology
Federal University of Technology
P.M.B. 1526, Owerri Nigeria.
Telephone: +234 (0) 803 537 3748
Email: oparamax@yahoo.com

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