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STUDIES ON BLOOD AND PLASMA BIOCHEMICAL CHARACTERISTICS OF THE AFRICAN GIANT RAT *(Cricetomis gambianus)*

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ABSTRACT

A study to determine the blood parameters and plasma biochemical values of captive reared African giant rats *(Cricetomis gambianus)* were carried out. Twelve young giant rats within the age range of 6-7 weeks were intensively reared for 12 months. The rats were fed on commercial grower mash and water provided *ad libitum.* Two separate blood samples were collected from the jugular veins of eight rats at 4th, 8th and 12th month stages of the experiment. One group of the samples was used for haematological studies and the other for biochemical tests. Data collected were analyzed in a Completely Randomized Design with growth stages as the treatments and the eight animals as replications. Where significant differences were observed, means were separated using Duncan's Multiple Range test. Significant ($P<0.05$) treatment effect on haemoglobin and RBC contents were observed with content increasing with age of animal. Values for these parameters at the 8th (B_2) and 12th (B_3) months stages however, were statistically similar ($P>0.05$). Values of 2.00, 3.06 and 4.89 x 10w recorded as WBC content at the B_1, B_2 and B_3 stages respectively were significantly different ($P<0.05$). The 3.06 x 10/w obtained at 8th month stage was statistically intermediate. Similar trend was observed for percent lymphocytes content of the blood. There were no significant differences ($P>0.05$) in the PCV, FSR and CT of the blood samples at the three stages of growth. Protein content was highest in animals at the 4th month state (9.75g/dl) and lowest at the 12th month (2.23g/dl). Significant treatment differences ($P<0.05$) were also observed in cholesterol, alkaline phosphate and urea contents of the blood samples. Conversely, values recorded for creatinine, bilirubin and albumin contents were not significantly different ($P>0.05$). Since the data collected from this study is indicative of satisfactory physiological, nutritional and pathological conditions of the study animals, full-scale domestication and integration into the micro-livestock farming system is recommended.

KEY WORDS: Giant rat, blood parameters, serum chemistry, domestication

INTRODUCTION

Proteins are the main constituent of the human body, being the constituent of every living cell (Frandson, 1975). Since the composition of the human body generally is similar to that of animals, animal products therefore are good sources of high quality proteins among other vital nutrients needed by man for good health and growth. Unfortunately, low animal protein intake has been one of the problems plaguing the Nigerian society. According to FAO (1992) an average Nigerian as at 1975 could only afford 7.5g of animal protein per day as against the recommended 28g/day. Today, the level of intake is abysmally low due to low per capita income and hyper inflation among other factors as religious and social taboos that forbid consumption of certain animal species. There is therefore an urgent need to increase meat production in order to meet the demands of the teeming population. In view of the high cost of producing the larger animals coupled with the fact that larger animals have long production cycle, a shorter and faster production – cycled animals should be integrated into the farming system particularly the rural farming system (Okwori et and Tewe (1978), giant rats are very nutritious, have wide acceptability as meat sauce and adapt very quickly to captive conditions within two months of capture. The potentials of wild giant rat in supplying animal protein to the populace notwithstanding information on haematological and serum biochemistry are quite vital to enhance domestication and full integration into micro-livestock farming system. According to Mmereole (1996) and Onyeyili *et al.* (1991) haematological studies help to evaluate blood characteristics with a view to detecting various blood diseases and the effect of the non-blood diseases on the blood. In addition, haemotological indices are necessary in evaluation of the animal responses to therapy (Woerpel and Rosskopf 1984). Deaton *et al.,* 1970), Anosa and Isoun (1978) and Mmereole (1996) added that information on blood parameters of livestock will assist in associating certain inherent resistance to infections with certain blood characteristics. Unfortunately, information on blood characteristics of the African giant rat is non-existent in the sub-region.

The objective of this work was to study the

MATERIALS AND METHODS

Twelve (12) young African giant rats of mixed sexes whose parents were caught from the wild were intensively reared in individual metabolic crates for a period of twelve months was used for the study. They were fed *ad libitum* on commercial grower mash containing 2,750Kcal/kg metabolizable energy; 16.50% crude protein; 0.88% methionine; 0.95% lysine; 4.0% fat; and 1.5% premixes. Fresh water was supplied *ad libitum.*

At 4^{th}, 8^{th} and 12^{th} months of age, eight (8) animals (4 mature males and 4 non-pregnant females) were randomly selected and blood samples obtained from them (between 8.00 – 9.15am) via the jugular veins using enthylene diamine tetracetic acid (EDTA) as the anticoagulant, in accordance with the methods of Brown (1976). The samples were immediately taken to the diagnostic laboratory for determination of haematological and plasma biochemical parameters. Using the method of Brown (1976), the following hematological parameters were analyzed: haemoglobin content (Hb), red blood cell (RBC), white blood cell (WBC) and lymphocytes content. Using the standard procedure adopted by Schalm *et al.* (1975) and Mmereole (1996), sedimentation and fragility tests were carried out and then calculated in percentage osmotic equivalent. For the coagulation time determination, the various blood samples were put in test tubes and allowed to clot. Records of clotting time for each sample were kept. For the plasma biochemical analysis, the following determinations were carried out: protein, albumin, cholesterol, urea, creatinine and biliribin contents.

Data collected were analyzed in a completely randomized design with growth stages as the treatments and the eight animals as replications. Where significant differences were observed, means were separated using Duncan's multiple range test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Results of haematological indices are presented in Table 1. The results showed significant differences ($P<0.05$) in haemoglobin content at the 3 stages of growth, with content increasing with age of animal. Although the mean Hb content of 13.53g/dl (71%) is slightly lower than the mean value of 14.36g/dl reported for African giant rats in Oyewole *et al.* (1998), the mean value obtained in this study is higher than the 11.64g/dl value reported for captive-reared grasscutters in Idiong and Uko (2008) and the 65-75% range reported for chicken in Oyewole and Ogwegbu (1986). The haemoglobin content estimation is necessary for the establishment of the oxygen-carrying capacity of the animals circulatory system. According to Mmereole (1996), haemoglobin content below 60% indicates low oxygen-carrying capacity and this is an indication that such animal or bird can easily succumb to any form of respiratory disease while those with haemoglobin concentrations exceeding 60% can be regarded as having high oxygen carrying capacity. Such animals are likely to withstand some levels of respiratory stress (Salisbury, 1983; Winrobe, 1983; Woerpel and Rosskopf, 1984).

Table 1 shows results on red blood cell counts. Values obtained for the 3 growth stages were significantly different ($P<0.05$). The mean RBC counts in this study was 6.08×10^6/µl which is higher than 4.25×10^6/µl reported for grasscutters in Idiong and Uko (2008) and 2.00×10^6/µl recorded for chicken in Winrobe (1983). The red blood cells carry the respiratory pigments (i.e. haemoglobin). Therefore, any reductions in RBC counts imply a reduction in the quantity of haemoglobin and thus a reduction in the oxgygen-carrying capacity of the animals. Obviously, such animal will easily succumb to any condition that will generate a serious respiratory disease. The white blood cell counts ranged from 2.00×10^6/µl to 4.89×10^6/µl with a mean of 3.31×10^6/µl. The values were significantly different ($P<0.05$) and increases with age. The white blood cells play prominent role in disease resistance especially in the generation of antibodies and the process of phagocytosis. Fragility and sedimentation rates values ranged from 0.42 to 0.45 with a mean of 0.44 percent osmotic equivalent. These values were statistically similar ($P>0.05$) and fall within the range of 0.39-0.55% established as normal range for chickens in (Gilbert, 1962; Vanley, 1969). Information on fragility rates are higher in animals with certain infections as traumatic pericarditis, pleuritis and peritonitis (Woerpel and Rosskopf, 1984). Coagulation or clotting time values did not significantly ($P>0.05$) vary. The mean value of 4.60 minutes obtained in this study fall within the 3.82-10.00 minutes established by Mmereole (1996) and Gilbert (1969) for chickens and 4.42-5.50 minutes recorded for grasscutters in Idiong and Uko (2008). The variations observed in clotting time are due to certain factors such as absence of clotting as in the case of hemophilia to delayed clotting as in the case of certain infections. Delayed or reduced clotting are usually associated with certain disease conditions and this could aid in diagnostic processes (Apata and Adeleye, 1983; Oyewole and Ogwuegbu, 1986; Isegbe and Ubosi, 1993). The mean PCV of the animals was 40.39% and this value is lower than 48.43% reported in Oyewole *et al.* (1998) mainly due to genetic differences and seasonal effects. Mean MCV of giant rat (66.32fl) was lower than 71.97fl and 86.85fl reported for grasscutters by Idiong and Uko (2008) and Oyewole *et al.* (1998) respectively. This variation could also be attributed to genetic and study area differences.

Table 1: Values of blood parameters of African giant rats in captivity

Parameters	Sample Periods				
	B_1	B_2	B_3	Mean	SEM
Hb (g/dl)	9.49[b]	14.60[a]	16.51[a]	13.53	0.17
RBC (x10/µl	3.85[b]	6.54[a]	7.85[a]	6.08	0.04
WBC (x10/µl)	2.00[b]	3.06[ab]	4.89[a]	3.31	0.08
Lymphocytes (%)	41.52[b]	48.97[ab]	54.32[a]	48.27	0.90
PCV (%)	40.54	40.40	40.21	40.39	0.21
MCV (fl)	49.63[b]	71.51[a]	77.82[a]	66.32	0.83
FSR	0.44	0.42	0.45	0.44	0.06
CT (minutes)	4.65	4.55	4.59	4.60	0.10

[ab]Means within rows with different superscripts are significantly different (P<0.05)
*B_1 = 4 months of age
B_2 = 8 months of age
B_3 = 12 months of age

Table 2 shows the plasma biochemical values of giant rats. The values of protein, cholesterol and alkaline contents were significantly different among treatments (P<0.05). Creatinine levels were statistically similar (P>0.05). The mean creatinine level of 0.58 mg/dl was quite low compared to 1.2mg/dl reported in Opara *et al.* (2006). The mean cholesterol level of 153.04 mg/dl was comparatively lower than the mean value recommended for wild African cane rats by the authors. The urea concentrations of 33.31mg/dl was higher than 11.71mg/dl reported in Oyewole *et al.* (1998) probably due to genetic and seasonal differences. Protein and albumin contents of giant rats were slightly higher than values recorded for grasscutters in Idiong and Uko (2008), and could be attributed to differences between species.

Table 2: Serum chemistry values of African giant rats

Parameters	Sample Periods				
	B_1	B_2	B_3	Mean	SEM
Protein (g/dl)	9.75[a]	4.96[b]	2.23[c]	5.69	0.13
Cholesterol (mg/dl)	137.41[b]	153.65[ab]	168.33[a]	153.13	1.40
Creatinine (mg/dl)	0.57	0.58	0.60	0.58	0.05
Bilirubin (g/dl)	0.68	0.68	0.67	0.68	0.22
Albumin (mg/dl)	3.29	3.24	3.17	3.23	0.18
Alkaline phosphate (iu)	57.97[b]	62.15[b]	71.73[a]	64.01	1.04
Urea (mg/dl)	39.60[a]	32.04[b]	28.33[b]	33.31	0.66

[ab]Means within rows with different superscripts are significantly different (P<0.05)
*B_1 = 4 months of age
B_2 = 8 months of age
B_3 = 12 months of age

CONCLUSION

The study has shown that the African giant rat has high level of protein in the blood and therefore capable of alleviating the acute malnutrition problem of less privileged rural dwellers especially. The low cholesterol content is recommendable to coronary heart-diseased patients. Above all, the pathological conditions of the African giant rat is satisfactory and devoid of possible transfer of enzootic disease parasites to consumers and farmers. Mass domestication and integration of the animals into the micro-livestock

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