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Full Length Research Paper

Haematological and plasma biochemical parameters of the young grasscutter (*Thyronomys swinderianus*) reared in northern Nigeria

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To determine the haematological and serum biochemical parameters of young grasscutters, ten young reared African grassscutters (*Thyronomys swinderianus*-a wild rodent) were used. Results obtained indicates that the mean values of packed cell volume (PCV), haemoglobin concentration (HB) and total white blood cell count (WBC) were 38.5 ± 5.1%, 12.8 ± 1.7g/dL and 10.4 ± 2.8 x 10^9/L, respectively. Differential leukocyte count revealed values to be 59.5 ± 5.9, 38.8 ± 1.9, 1.4 ± 0.8, 1.2 ± 0.6, 0 and 0.1 ± 0.3% for neutrophil (NEU), lymphocyte (LYM), monocyte (MON), eosinophil (EOS), basophil (BAS) and band neutrophil (BAN), respectively. The study also revealed the values for serum biochemical parameters to be 2.53 ± 0.5mmol/L, 4.2 ± 0.8mmol/L, 21.4 ± 2.9 mg/dl, 1.3 ± 0.3 mg/dl, 134.1 ± 7.13 mmol/L, 4.1 ± 0.5 mmol/L and 97.4 ± 8.2 mmol/L for triglyceride, cholesterol, blood urea nitrogen (BUN), creatinine, sodium, potassium and chloride, respectively. These results indicated that both haematological and serum biochemical parameters in young reared grasscutter are comparable with those of reared captive and wild animals of this species, thus suggesting that age is not a factor in consideration and interpretation of haematological and many serum biochemical values in grasscutters found, at least, in northern Nigeria

Key words: Grasscutter, haematological, plasma biochemical, young reared

INTRODUCTION

The animal protein intake of the average Nigerian remains quite below the recommended daily ratio of the FAO (1992). This has necessitated the rural populace in particular, to explore alternative sources of the animal protein to complement the conventional livestock. Efforts being made to improve livestock production have continued to be constrained by diseases and high feeding costs. The search for alternative animal protein sources has, therefore, popularized attempts to domesticate and breed wild animals, especially rodents (Ajayi, 1971; Fonweban and Njwe, 1990; N.R.C, 1991).

African grasscutter (*Thryonomis swinderianus)*, is one of the most aggressively hunted of such wild rodents (Yeboah and Adamu, 1995; Opara et al., 2006). The natural habitat of this species of animal is the guinea savannah. In West Africa where grasses provide the main habitat, this wild rodent is called 'grasscutter', while in South Africa where it is mostly associated with cane fields, it is called 'cane rat'. Not only does grasscutter form a good delicacy in West African countries like Nigeria, Togo, Benin republic, Ghana and Cote d' voire (Baptist and Mensah, 1986; Asibey and Addo, 2000), but it also contribute to local and export earnings in the coun-

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Table 1. Hematological values of the young reared (Mean ± SD, n=10).

Parameter	Min-Max	Mean (n=10)	(Mean ± SD)
PCV (%)	29 – 44	38.4	38.4 ± 5.08
HB (g / dl)	9.7 – 14.7	12.8	12.8 ± 1.7
WBC (x 10^3/L)	8.600 – 12.700	10.44	10.44 ± 12.76
NEU (%)	52 – 71	59.5	59.5 ± 5.86
LYM (%)	27 – 46	38.8	38.8 ± 1.9
MON (%)	0 – 3	1.2	1.4 ± 0.84
EOS (%)	0 – 2	1.4	1.2 ± 0.63
BAS (%)	0	0.1	0
BAN (%)	0 – 1	**Mean (n=10)**	0.1 ± 0.32

Min, minimum; Max, maximum; SD, standard deviation; n,=sample size.

tries of this sub region. Grasscutter is found widely distributed in Africa where it is being exploited as source of animal protein (Asibey, 1974).

Although attempts to domesticate this rodent have continued (Eben, 2004), such efforts in the recent past have not been successful (Opara et al., 2006). The apparent lack of progress in such attempts may be attributable to poor understanding of its biology, lack of veterinary care and other management factors. Blood parameters such as haematological and biochemical values have been known to be good indices in assessing the physiological, nutritional and pathological status of animals (Bush, 1991; Sirois, 1995; Awah and Nottidge, 1998). Conversely, data on these for the grasscutter have been insufficient. It is only of recent that Opara et al. (2006) established the normal values of haematology and serum biochemistry for the adult wild grasscutter.

Till the time of writing this paper, no data on the parameters in young reared grasscutter was available, while those for adults' wild and captive grasscutters were scanty. In this paper, attempts were made to complement their efforts by establishing the normal haematological and some serum biochemical values for the young reared African grasscutter in the northern Nigeria.

The hematological values obtained in the present study for the young reared grasscutter were compared to the physiological values of the parameters in domestic animals; namely dog, cat, cattle, pig, sheep and goat and wild animals, grasscutter, African giant rat and African pangolin. Similarly, we compared the values for the mean plasma biochemical parameters obtained in the present study with those for the reared and wild adult grasscutter, African giant rat and African pangolin.

MATERIALS AND METHODS

Animal source and sample collection

Ten young reared African grasscutters of mixed sexes were purchased from farmers in Makurdi and Otukpo towns of Benue State in the northern Nigeria and transported using Laboratory rat cages to the Department of Veterinary Anatomy, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria, Nigeria, where they were acclimatized for three days prior to the experiment. They were fed with elephant that constituted their natural food and feed supplement and water was given *ad libitum*. The research was conducted during the harsh harmattan season (November) in northern Nigeria. After three days of acclimatization, the animals were sedated using gaseous chloroform in a confined container before severing the jugular veins to collect sufficient blood samples.

About 1.5 ml of blood sample was collected from each animal and transferred immediately into sterile sample bottles containing ethylene-diamine-tetra-acetic acid (EDTA). This blood was used for the haematological analyses. Another 4 ml of blood was collected into a screw-capped test tube and allowed to clot and serum expressed. The serum was harvested for biochemical analyses.

Haematology and plasma biochemistry

Haematological analyses such as determination of PCV, total WBC and differential leukocyte count were carried out according to the methods described by Coles (1974). The BUN and creatinine were determined according to the methods described by Sirois (1995); that is, photometric and Jaffe spectrophotometric procedures, respectively. Sodium and potassium values were measured using flame photometer method as described by Tiez (1986). Triglyceride was determined using standard commercial test kit (RANDOX Laboratories Ltd., Ardmore, Diamond Road, Crumlin Co. Auturm, UK) following strictly to the instructions provided by the manufacturer. Serum levels of cholesterol were carried out by Colometric enzymatic-end-point method (RANDOX laboratories Ltd., Ardmore, Diamond Road, Crumlin Co., Auturm, UK).

RESULTS

Results of haematological and biochemical analyses obtained in this study and comparison with others species are presented in Tables 1 and 4.

DISCUSSION

The statistical analysis of the data shows that both the haematological and plasma biochemical values in the reared young grasscutter can be compared with those of the adult captive (Ogunsami et al., 2002), wild adult (Opara et al., 2006) grasscutter and other wild animals,

Table 2. Plasma biochemical values (Mean ± SD) in reared young grasscutter

Parameter	Min-Max	Mean (n = 10)	(Mean ± SD)
Triglyceride (mmol/l)	1.8-3.2	2.53	2.53 ± 0.52
Cholesterol (mmol/l)	2.8-5.3	4.16	4.16 ± o.76
BUN (mg/dL)	17.2-26.3	21.4	21.4 ± 2.90
Creatinine (mg/dl)	0.8-1.8	1.26	1.26 ± 0.31
Na^+ (mmol/l)	120.4-144.1	134.1	134.1 ± 7.31
K^+ (mmol/l)	3.8-4.9	4.13	4.13 ± 0.51
Cl- (mmol/l)	84.1-108.8	94.4	97.4 ± 8.2

Min, minimum; Max, maximum; SD, standard deviation; n, sample size.

Table 3. Comparison of Hematological values (Mean ± SD) in the young reared grasscutter, dog, cat, cattle, sheep, goat and pig (*Maxine, 1978; Dellmann and Brown, 1987)

	Grasscutter (Present study)	Dog	Cat	Cattle	Sheep	Goat	Pig
*PCV (%)	38.4 (29-44)	45 (37-55)	37 (24-45)	40.6(36-49)	30.5(22-39)	35(24-48)	42(32-50)
*HB (g /dL)	12.80(9.72-14.70)	14.9(12-18)	12 (8-14)	12(10.38-14)	12.4(8.6-15.8)	11(8-14)	13(10-16)
WBC (x 10^3/L)	10.44(8.600-12.700)	12.6(6.0-17.0)	16.0(5.5-19.5)	7.9(4.0-12.0)	7.4(4.0-12.0)	8.9(4.0-13.0)	17.1(11.0-22.0)
NEU (%)	59.5 (52-710)	70 (60-77)	59 (35-75)	28 (15-45)	30 (10-50)	36 (30-48)	37 (28-47)
LYM (%)	38.8 (27-46)	20 (12-30)	32 (20-55)	58 (45-75)	62 (40-75)	56 (50-70)	53 (39-62)
MON (%)	1.4 (0-3)	5.2 (3-10)	3.0 (1-4)	4.0 (2-7)	2.5 (0-6)	2.5 (0-4)	5.0 (2-10)
EOS (%)	1.2 (0-2)	4 (2-100)	5.5 (2-120)	9.0 (2-20)	5.0 (0-10)	5.0 (1-8)	3.5 (0.5-1)
BAS (%)	0	0	0	0.5 (0-2)	0.5 (0-3)	0.5 (0-1)	0.5 (0-2)
BAN (%)	0.1 (0-1)	ND	ND	ND	ND	ND	ND

ND, not determined; (0 - 10), range.

Table 4. Comparison of some plasma biochemical values (Mean ± SD) in reared young and reared adult captive grasscutter, wild adult grasscutter, wild adult African giant rat and wild adult African pangolin.

	Reared young grasscutter* (n=10)	Reared adult grasscutter (Ogunsami et al. 1994) (n=10)	Wild grasscutter (opara et al., 2006) (n=100)	Wild adult African giant rat (oyewale, 1997) (n=15)	Wild adult pangolin (oyewale, 1997) (n=10)
Triglyceride (mgl/l)	46 ± 9.27	ND	ND	70.93 ± 25.05	ND
Cholesterol (mg/dl)	79.6 ± 13.82	126.4 ± 16.05	194 ± 4.99	ND	ND
Urea (mg/dl)	21.4 ± 2.9	21.87 ± 2.84	19.7 ± 2.78	16.41 ± 3.8	16.40 ± 3.8
Creatinine (mg/dL)	1.26 ± 0.31	1.26 ± 0.31	1.2 0± 0.14	0.59 ± 0.10	0.75 ± 0.11
Na^+ (mmol/l)	134.1± 7.31	138.55 ± 2.90	138.55 ± 2.90	96.85 ± 10.29	142.60 ± 6.45
K^+ (mmol/l)	4.13 ± 0.51	4.13 ± 0.51	4.25 ± 0.19	5.47 ± 0.52	5.60 ± 0.95
Cl- (mmol/l)	97.4 ± 8.2	97.4 ± 8.2	98.0 ± 3.19	81.14 ± 4.91	105.10 ± 3.38

*present study; ND, not determined; n= sample size.

like African giant rat and pangolin. Compared to physiological values of the dog and cat, our results showed that the mean values for total WBC (10.44 ± 12.76) was lower, but slightly above those of cattle and goat. This could be due to mere species difference and also the harsh harmattan weather in the northern part of Nigeria at this particular period of the year, which could be a factor. Higher total WBC count has been reported in Nigerian fowls (Oyewale, 1987). The total number of WBC in the donkeys' blood is the highest among domestic animals (Reece, 1997). However, like other species, the total and differential leukocytes counts may be altered by factors such as age, nutritional status, pregnancy and lactation (Reece, 1997).

Leukocyte counts have been reported to increase from any form of stress, exercise, feeding, age, breed and wide variety of other conditions (Dellmann and Brown, 1987). Other conditions include, infection, stress and of stress of capture (Goto et al., 1987; Dinh, 2002) and unfavorable condition in the animal habitat, such as shortage of food and water (Goto et al., 1987).

Basophils and eosinophils play a role in regulating allergic and inflammatory processes and host defense responses against parasitic infections, like helminthiasis and ectoparasitic infestation (Dellmann and Brown, 1987; Butterworth, 1999). In this study, the basophilic cells were not observed. The basophilic cells have been reported to be rare in the blood (Dellmann and Brown, 1987). The mean value of 1.2 ± 0.63 for eosinophil cells was the lowest among the animals compared. The reason for lowest eosinophil counts in grasscutter when compared with other animals is not known.

In the present study, the lymphocytes counts of the reared young grasscutter are less than the neutrophil counts. This observation agreed with findings of Hansen and Todd (1951) for horse and (Schalm et al., 1975) for cat and dog. However, it differ in human humans (Ezeilo and Obi, 1983), donkey (Nayer, 1978), goat, sheep, cattle and pig (Schalm et al., 1975) where lymphocyte counts are much higher than the neutroplils. In the Japanese quails, young birds showed greater percentage of neutrophils and monocytes and a lower percentage of lymphocytes than adult birds (Nirmalan and Robenson, 1971).

The mean BUN value in our study is in agreement with that documented for the reared captive adult, 21.87 ± 2.84 (Ogunsanmi et al., 1994). These values were higher than those reported for adult pangolin (Oyewale et al., 1997). We observed higher total protein values but lower potassium level than those documented for adult reared grasscutter, wild adult African giant rat and pangolin. The differences in nutritional composition might be responsible for this disparity. It appears that the commercial feed given to the reared young grasscutter had higher protein but lower potassium content than the grasses fed by these animals in the wild. These findings agree with those reported by Olayemi et al. (2006) for Nigerian laughing dove and duck. These researchers observed that the Nigerian ducks have higher levels of total protein, but lower serum potassium concentration than in the Nigerian laughing doves. The explanation for these differrences was that the commercial feed given to ducks had higher protein value, but lower in potassium than the guinea corn administered to the Nigerian laughing doves. The value for serum potassium in the present study is comparable to that reported for Hassawi donkey (Al-Basadah and Homeida, 2005).

The mean value for plasma sodium concentration observed in this study was higher than that of African giant rat, but lower than the values for pangolin and adult reared and wild grasscutter. The values in our study are, however, lower than those reported for guinea fowl and Nigerian domestic fowl (Oyewale, 1988).

In the present work, the values for plasma electrolytes like K^+ and Cl^- are similar to those obtained for adult wild and captive grasscutters (Ogunsanmi et al., 1994; Opara et al., 2006). The values also agree with the findings of Oduye and Fasanmi (1971) for white Fulani cattle. Similarly, the mean values obtained for Na^+ and Cl^- in the reared young grasscutter are lower than the values obtained for the African giant rat and pangolin.

Conclusion

A baseline data of haematological and plasma bio-chemical values of the young reared grasscutter has been presented here. These data will help in assessing the physiological, nutritional and pathological status of the young grasscutters, which have direct influence in their production.

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