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# Biometrical observations on the testes and epididymis of the domesticated adult African great cane rat *(Thryonomys swinderianus)*

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SUMMARY

Biometrical investigations were carried out on 23 biometrical parameters of the testes and epididymis of the domesticated adult African great cane rat (*Thryonomys swinderianus),* also known as the grasscutter. The average weight and age of the cane rats used in the study were 1.93 ± 0.42 kg and 18.80 ± 1.39 months respectively, with an average testicular size of 18.75 x 11.33mm. The average weights of the right and left testes were 1.18 ± 0.17g and 1.13 0.16g respectively, with a significant difference ($p< 0.05$). The average weights of the right and left epididymis were 0.32 g ad 0.30 g respectively, with no significant difference ($p<0.05$). There was a strong positive correlation ($r = 0.8214$) between the age of the rats and the weight of the testes and epididymis. The average percentage body weights for the testes and epididymis were 0.12% and 0.03% respectively. Unlike testicular parameters, there was no significant difference ($p<0.05$) between the right and left epididymal parameters. The results showed that the testes and epididymis of the cane rat are relatively smaller than those of comparable rodents. This work provides baseline data on the biometry of the testes and epididymis of the African great cane rats, thereby making available data useful in comparative regional anatomy and reproductive biology.

**Key words:** Cane rats – Biometry – Testis – Epididymis

## INTRODUCTION

Much attention is given to morphology and morphometry in relation to practice as well as theoretical science (Kolodzieyski and Danko, 1995). The grasscutter (*Thryonomys swinderianus*), also known as the African great cane rat (AGCR), is a wild hystricomorphic rodent widely distributed in the African subregion and exploited in most areas as a source of animal protein (Asibey, 1974; Vos, 1978; N.R.C., 1991).

Among the wild rodents found in the African subregion, the grasscutter or cane rat is the most preferred (Asibey and Eyeson, 1997; Clottey, 1981). Being the most preferred bush meat in West Africa, including

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Nigeria, Togo, Benin, Ghana and Cote' d'Voire (Baptist and Mensah, 1986; Asibey and Addo, 2000), it contributes to both local and export earnings of most West African countries (Asibey, 1974; N.R.C., 1991; GEPC, 1995; Ntiamoa, 1998) and is therefore hunted aggressively. Thus, the excessive and uncontrolled decimation of this animal for consumption poses a threat to the ultimate survival of the species (Opara et al., 2006). Moreover, the domestication of the grasscutter has not been all that successful so far, and this has highlighted the paucity of information on its reproductive biology, Veterinary care, nutrition and the management aspects of this rodent under farming conditions (Opara et al., 2006). Few livestock farmers trade or breed wild rodents (Fonweban and Njwe, 1990; N.R.C., 1991), but research studies addressing their domestication are producing conflicting results (Baptist and Mensah, 1986).

Recent studies on the African great cane rat have focused on its physiology, management, breeding, and nutrition. The physiological, nutritional and pathological conditions of grasscutters are usually assessed using haematological and biochemical analyses of their blood (Awah and Nottidge, 1988; Baptist and Mensah, 1986; Clottey, 1981; Fonweban and Njwe, 1990). Nutrition, age, sex, genetics, reproduction, housing, starvation, environmental factors, stress and transport are all known to affect haematological and biochemical parameters observed between tropical and temperate animals (Ogunrinade et al., 1981; Ogunsanmi et al., 1994). Also, the haematology, plasma biochemistry and whole blood minerals of the AGCR have been documented by Oyewale et al. (1997, 1998); Ogunsanmi et al. (2002) and Opara et al. (2006). Previous studies on the reproductive biology of rodents of the West African subregion had been reported by Oke et al. (1988, 1989, 1996) in the African giant rat.

However, there is a dearth of information on the biometrical analysis of the male reproductive organs of the domesticated adult African great cane rat (*Thryonomys swinderianus*). This study was therefore designed to investigate the biometry of the testes and epididymis of the domesticated adult grasscutter with a view to providing basic data that could be relevant in the improved breeding of the animal.

## Materials and Methods

Twenty domesticated adult male cane rats were used for the study. They were acquired from a commercial farm in Igbesa, Ogun State, Nigeria. Records on the age and feeding patterns of the animals were also obtained from the farm. The cane rats were kept at the Cane Rat Unit of the Animal House, Faculty of Veterinary Medicine, University of Ibadan. They were kept on a daily ration of Guinea corn offal of about 0.5 kg per animal supplemented with raw cassava (*Manihot species*) for 72 hours. They were examined and found to be clinically healthy, weighed using a Microvar® weighing machine before being stunned, and then slaughtered by cervical decapitation. Following this, each rat was placed on a dissection board on dorsal recumbency while a shallow medioventral incision was made from the linea alba to a point cranial to the anus in order to expose the abdominal and pelvic cavities. The right and left testes and epididymides were then dissected out quickly and placed in Petri dishes containing normal saline prior to morphometric investigations. The epididymides were carefully dissected out and separated into the caput, corpus and cauda regions on the basis of morphology. The weight of the testes and epididymides were determined using the Digital Microvar® weighing machine, while metric investigations were made using a venier caliper. The following investigations, involving a total of 23 biometrical parameters of the testes and epididymis, were carried out and results are presented in Tables 1 and 2:

*Testes*

**Length** (right and left): Length was measured from the anterior to the posterior borders.

**Breadth** (right and left): Distance between the lateral and medial borders at the mid-portion.

**Circumference** (left and right): Measured by encircling each testis at the mid-portion with a graduated nylon tape.

**Epididymis**

**Caput** (right and left): Length: The caput epididymides was first dissected and straightened out, the length was measured from the anterior to the posterior ends along the longitudinal portion.

**Corpus** (right and left): The corpus epididymides was dissected and then straightened out, the length was measured from the anterior end towards the posterior ends.

**Table 1.** Mean and S.D. values of testicular parameters of the domesticated adult African Great Cane Rat (*Thryonomys swinderianus*) (n=20).

| AOA (months) | WOA (Kg) | WORT (g) | WOLT (g) | LORT (mm) | LOLT (mm) | BORT (mm) | BOLT (mm) | CORT (mm) | COLT (mm) |
|---|---|---|---|---|---|---|---|---|---|
| 18.80±1.39 | 1.93±0.42 | 1.18±0.17 | 1.13±0.16 | 19.45±1.64 | 18.05±1.56 | 11.70±1.40 | 10.95±1.34 | 23.30±2.21 | 22.00±2.92 |

AOA- Age of animal WOA- Weight of animal WORT- Weight of right testis WOLT- Weight of left testis
LORT- Length of right testis LOLT- Length of left testis BORT- Breadth of right testis BOLT- Breadth of left testis
CORT- Circumference of right testis COLT- Circumference of left testis

**Table 2.-** Mean and S.D. values of the of the left and right epididymal parameters of the domesticated adult African Great Cane Rat (*Thryonomys swinderianus*) (n=20).

| | AOA (mths) | WOA (kg) | WOE (g) | LOE (mm) | CAW (g) | CPW (g) | CTW (g) | CAL (mm) | CPL (mm) | CTL (mm) | CTB (mm) | CAB (mm) | CPB (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L | 18.80±1.40 | 1.93±0.42 | 0.30±0.07 | 26.10±2.42 | 0.07±0.03 | 0.10±0.02 | 0.10±0.02 | 7.40±0.70 | 9.20±1.23 | 7.60±0.52 | 5.00±0.82 | 4.60±0.52 | 6.10±0.74 |
| R | 18.80±1.39 | 1.93±0.42 | 0.32±0.07 | 26.13±2.42 | 0.08±0.03 | 0.10±0.02 | 0.11±0.02 | 7.42±0.70 | 9.21±1.22 | 7.63±0.52 | 5.00±0.82 | 4.60±0.52 | 6.10±0.74 |

L-Left R-Right AOA – Age of Animal
WOA – Weight of Animal WOE – Weight of Epididymis LOE – Length of Epididymis
CTW – Weight of Caput Epididymis CPW – Weight of Corpus Epididymis CAW – Weight of Cauda Epididymis
CTL – Length of Caput Epididymis CPL – Length of Corpus Epididymis CAL – Length of Cauda Epididymis
CTB – Breadth of Caput Epididymis CPB – Breadth of Corpus Epididymis
CAB – Breadth of Cauda Epididymis

**Cauda** (right and left): The cauda epididymides was dissected and then straightened out and kept in normal position and length was measured from the anterior to the posterior extremity.

**Breadth** (right and left): Distance between the lateral and medial borders of the epididymis.

*Statistical Analysis*

All data were subjected to analysis of variance (ANOVA) according to the standard procedure described by Steel and Torrie (1980). Duncan multiple range test was used to compare means found to be statistically significant ($p< 0.05$), as described by Obi (1990).

## Results

The average weight of the cane rats used for the study was 1.93 ± 0.42 kg with an average age of 18.80 ± 1.39 months (Table 1). The average size of the testes of the cane rats was 18.75 x 11.33 mm. A mean relative testicular weight of 0.12% was obtained in the study.

The average weights of the right and left testes were 1.18 ± 0.17 g and 1.13 ± 0.16 g respectively, with a significant difference ($p<0.05$). There was a strong positive correlation ($r = 0.8214$) between the age of the rats and the weight of the testes and epididymis. Nevertheless, there was no correlation between the age of the rats and the weight of either the right or left testis. The average lengths of the right and left testes were 19.45 ± 1.64 mm and 18.05 ± 1.56 mm respectively, being significantly different ($p<0.05$). The average breadths of right and left testes were 11.70 ± 1.40 mm and 10.95 ± 1.34 mm respectively, while the average circumference of the right and left testes were 23.30 ± 2.21 mm and 22.00 ± 2.92 mm respectively. Both the right and left testicular parameters differed significantly ($p<0.05$).

A mean relative epididymal weight of 0.03% was obtained in the cane rats used in this study. The average weights of the right and left epididymis were 0.32 g and 0.30 g respectively, with no significant difference ($p<0.05$). Unlike the right and left testicular parameters, which differed significantly, there was no significant difference between the right and left epididymal parameters (Table 2). However, the right epididymal parameters showed a slight increase compared to those of the left as regards the weight and length. The mean weight, breadth and length of the cauda epididymidis were lower than those of the corpus and cuada epididymidis (Table 2). There was no significant difference ($p<0.05$) between the weights of the corpus and cauda epididymis. In all the rats studied, the breadth of the corpus epididymidis was greater than those of the cauda and caput. However, there was no significant difference ($p<0.05$) between the cauda and caput epididymidis in terms of their breadth.

## Discussion

The testes of the domesticated adult African great cane rat used in this study were typically ovoid in shape, creamy to milky-white in colour and were covered with stroma

(tunica albuginea), which consisted of collagenous tissue. The ovoid shape and creamy to milky-white coloration of the testes of the cane rat is typical of rodents and therefore conforms to the report of Massanyi et al. (2003) on testes of the rodent *Apodemus sylvaticus*. However, the relative testicular weight of 0.12% obtained in this study shows that the African Great Cane Rat has a smaller testis when compared to similar rodents. This is very evident from the dimensions of the testes obtained in this study. The rodent *A. sylvaticus,* with an average weight of 28.2 g, has testicular size of 13 x 8 mm (Massanyi et al., 2003) while the rats used in this study with an average weight of 1.93 kg had a mean testicular size of 18.75 x 11.33 mm. Nevertheless, the 0.11% relative testicular weight for the rats in this study is higher than that of the wild boar (*Sus scrofa scrofa*), with a mean relative testicular weight of 0.08% (Costa and Silva, 2006), but lower than that of the African giant rat (*Cricetomys gambianus*, Waterhouse), a comparable but smaller rodent, being 0.99% (Oke, 1982). The percentage body weight of the testes has been reported in the bull (Oyeyemi and Babalola, 2006), dog (Frandson, 1974), rat (Cavazos et al., 1954), the Nigerian cock and Leghorn Cock (Aire, 2000) to be 0.04%, 0.05-0.75%, 0.83%, 0.8% and 0.6% respectively.

The surface of the testes of the rats studied showed the presence of *tunica vaginalis propria* with radial septa (*septuli testes*) dividing the testes into lobules (*lobuli testes*), with a pyramidal shape. These are in agreement with earlier reports on the anatomy of the testes of mammals (Dyce et al., 2002). The testes and epididymis were completely descended in the scrotum which was usually intra-abdominal in position in all the animals studied. This does not conform to the typical position of the scrotum in rats and other mammals where the scrotum is usually extra- abdominal in position. This could be part of an adaptation for survival in the wild and calls for further studies. The significant difference ($p < 0.05$) observed between the right and left testes is typical of most paired organs of the animal body and is in agreement with the reports of Oyeyemi et al. (2006). The non-correlation between the age of the rats and the weight of the testes as observed in the study is in consonance with the report of Berndtson et al. (1987) that it is common to find differences of up to 50% in testicular weight in individuals of a species of similar ages.

The absence of significant differences in the right and left epididymal parameters of the cane rats in this study is consistent with the findings of Rind et al. (2006) concerning the bovine epididymis. The relative epididymal weight observed for the animals in this study shows that the epididymis accounts for about one ninth of the testis and is similar for most domestic animals (Dyce et al., 2002). Also, the attachment of the epididymis to the testis is not as firm as that found in typical rodents and mammals. Moreover, the corpus epididymis in rodents as well as mammals is usually narrower than the other two regions of the epididymis, unlike the rats studied here, where the breadth of the corpus epididymis was consistently wider than the other two parts. The 0.32 g mean weight of the epididymis observed for the cane rats in this study is also very small compared to that of the laboratory rat, reported to vary between 0.76 and 0.98 g with a length of about 400 cm (Cavazos et al., 1954). The 0.03% percentage body weight of the epididymis of the cane rats studied is lower than that of the African giant rat reported to be 0.21% (Oke, 1982). This shows that the epididymides as well as the testes of the cane rat are relatively smaller in size than that of the African giant rat and the laboratory rat.

The study provides baseline data on the dimensions of the testes and epididymis in the African great cane rat, thereby making available useful research data in comparative regional anatomy and reproductive biology of the cane rat.

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