The Morphostructure Of The Ovary Of African Tree Pangolin Manis tricuspis

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Citation

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Abstract

Little is known about the reproductive biology of pangolin, most especially the female sex organ. Hence, the need to study its ovary. Ovaries from ten female pangolins were used for this study. The animals were decapitated and a lower mid-line abdominal incision performed to have access to the ovarian tissues. The microanatomy of the left and right ovaries was compared. Similarly some morphometric parameters were also analyzed. The result present a morphostructural difference between the left and right ovaries; with the left conforming to the basic structure unlike the right. This preponderance feature of the left ovary over the right is also reflected in the morphometric analysis which present a significant difference ($p<.05$) when the data were compared. Hence the left ovary could be the principal sex organ of reproduction in African tree pangolin M. tricuspis.

INTRODUCTION

African tree pangolin M. tricuspis is an insectivorous mammal found in the southwest region of Nigeria (Ofusori et al., 2007a). The scientific classification is shown in table 1. It feeds primarily on ants and termites, using their front claws to open insect nests and long sticky tongues to capture their prey (Redford, 1983 & Redford and Dorea, 1984). They are largely terrestrial, spend most of the day in underground burrows, and curl into a ball when attacked, protected by thick scales that cover most of their bodies (Fig. 1). They walk mainly on their hind legs, although they keep their body horizontal to the ground, dragging their tail behind them. They are also proficient climbers and can swim. They use their claws to break open ant or termite nests and capture the occupants with their long sticky tongue (Griffiths 1990). They can take up to 200,000 ants each night. Its natural predators are leopards, hyenas, and pythons, but it is also hunted by humans. Humans use the meat, which is considered a delicacy. The meat of the Cape pangolin is especially popular with local people (Schlitter, 2005). Pangolin hide is used for boots and other leathery goods. The scales are thought to have medicinal value as an antiseptic, fever combatant, skin disease defense, and aphrodisiac. The scales are used as is or ground into powder for potions. These uses have led to reduced pangolin population even though there are bans on commercial trade of all pangolin species. The seven species of pangolin are now all becoming extremely rare as a result of this (Pangolin Specialist Group, 1996).

Few researches have been conducted on some aspect of this animal. Ofusori et al. (2007a) in their work on the morphometric study of the stomach of African pangolin reported that the corpus of pangolin's stomach is metabolically more active than the other parts of the stomach. Also, Adenowo and Caxton-Martins (2000) found from their investigation that the pineal gland of pangolin is markedly different from the human bovine pineal glands histologically.

In M. tricuspis, two birth records indicate that a litter was found in September and another in October. In other pangolins single young are born in a burrow and after several weeks are carried on their mother's tail, gradually learning to forage for themselves after several months (Schlitter, 2005).

One ovary or the other produces one egg per month during reproductive life in human. The ovary's spongy medulla is a mass of vessels in a loose connective tissue stroma. It fades into the cortex, where the eggs are. Cortical fibroblasts are arranged in dense cellular whorls, and are called "ovarian stroma". After ovulation, the granulosa cells and the theca interna become the corpus luteum, a new endocrine organ which makes estrogen and progesterone last until the end of the cycle, and even longer if pregnancy takes place. The wall of the follicle collapses into folds which are mirrored into

the structure. Blood and lymph vessels invade at once. The granulosa cells expand greatly ("luteinize") and become steroid-secreters. At the center is the blood from ovulation, which organizes into scar just like in wound healing. The scar will remain as a wiggly corpus albicans . The corpus luteum is maintained by LH from the pituitary and (if pregnancy occurs) chorionic gonadotropin (hCG) from the trophoblast.

A thorough search into the literatures revealed that only little is known about the reproductive biology of this species. Hence, the need to comparatively investigate the morphostructural differences in the left and right ovaries of M. tricuspis. This will add to the known biology of this mammal.

Figure 1

Table 1: Scientific classification of African tree pangolin (Rafinesque, 1821)

Scientific classification	
Kingdom:	Animalia
Phylum:	Chordata
Class:	Mammalia
Order:	Pholidota
Family:	Manidae
Genus:	Manis
Species:	*M.tricuspis*

Figure 2

Figure 1: Photograph of African tree pangolin (Ofusori and Caxton-Martins, 2005)

MATERIALS AND METHODS

CARE OF THE ANIMALS

Ten female African pangolin average weights (1.35kg) were procured from Asejire, a local town in the northwest region of Osun state. The animals were examined and confirmed to be presumably free from any pathological assaults. They were kept in the animal holdings of the department of Anatomy, Igbinedion University Okada, Nigeria, and fed with termites and water ad libitum. The animals were divided into two groups- A and B. All experimental procedures followed the recommendations provided in the "Guide for the Care and Use of Laboratory Animals" (National Academy Press, 1996)

EXCISION OF THE OVARY

The animals were decapitated and the left and the right ovaries of each of the pangolin excised following a lower mid-line abdominal incision. The ovaries were rinsed in physiological saline and blotted dry on a filter paper.

HISTOLOGICAL ANALYSIS

The ovaries of the animals in group A were fixed in 10% formol saline for a period of 48 hours. They were then processed accordingly for routine paraffin embedding. This included the dehydration in graded alcohol, clearing in xylene, infiltration in paraffin wax and finally embedded in paraffin wax for 24hours. The embedded tissues was sectioned at 5µm thickness and subjected to Heamatoxylin and eosin (H&E) staining procedure. The right and left ovaries were then studied for any microstructural differences.

MORPHOMETRIC ANALYSIS

The left and right ovaries of the animals in group B were subjected to morphometric assessments which included taking the wet weights using a Metler (P153) balance. The length, diameter and thickness were determined using digital Vernier Calipers and the volume by adopting water displacement method earlier described by Ofusori et al. 2007b.

STATISTICAL ANALYSIS

Data were express as mean ± S.E.M. The data were analysed by student t-test using the statistical soft ware STATISTICA VERSION 5. $p<0.05$ is considered significant.

RESULTS

The left and right ovaries were observed to be spherical in shape and encapsulated by tunica albuginea. Further macroscopic examination of the two ovaries revealed that the average weight of the left is somewhat higher than the right. This was evident when the relative weights were compared (Table 2). A significant difference was again recorded when the diameters were compared (Table 2). The length of the left ovary 1.45±0.05 was observed to be significantly different ($p<0.05$) from the right ovary 0.89 ± 0.08. The volume of the two ovaries differ significantly ($p<0.05$) when compared (Table 2). The mean value of the thicknesses of the right and left ovaries also present a significant difference as shown in Table 2.

The results of the microstructural investigation of the right and left ovaries revealed some microanatomical differences in the two ovaries. The left ovary which is the larger of the two was observed to conform to the basic microstructural organization having both the cortex and medulla (Fig 3a). Few capillaries, fibroblast and smooth muscle cells were observed in its cortical region with follicles in various sizes and states of development (Fig 2a & 3a). This is however different from the right which has its entire stroma dominated by connective tissue fibers as well as smooth muscle cells without any clear demarcation into cortical and medullary regions (Fig 2b and 3b).

Figure 3

Table 2: Showing various measured parameters in the ovary of African pangolin (M ± SEM)

Parameters	Left ovary	Right ovary
Relative Weight (g)	0.00059 ± 0.00006	0.00029 ± 0.000037*
Diameter (cm)	2.86 ± 0.09	2.27 ± 0.11*
Length (cm)	1.45 ± 0.05	0.89 ± 0.08*
Volume (ml)	1.00 ± 0.08	0.48 ± 0.07*
Thickness (cm)	0.33 ± 0.03	0.16 ± 0.02*

*Significantly different ($p<0.05$) left ovary vs. right ovary; n=5

Figure 4

Figure 2: Photomicrograph of the ovaries of (a) left. Note the corpora albicantes (CA) and developing follicle (arrow) in the cortical region (b) right (H&E Mag. x40)

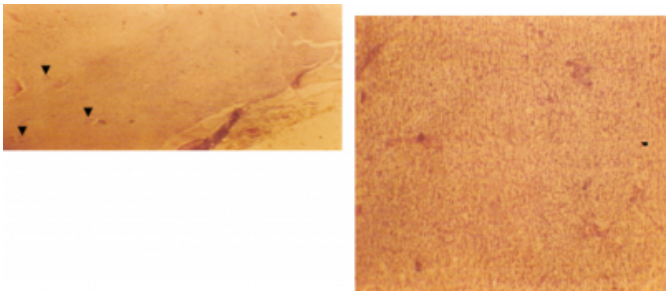
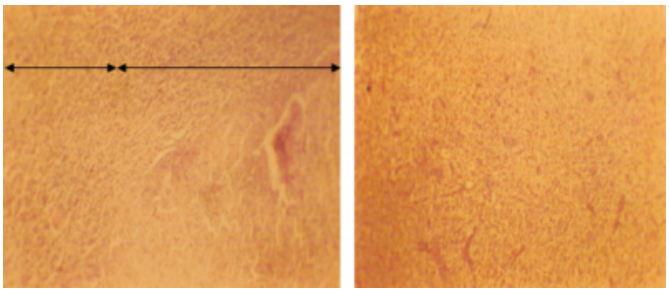


Figure 5

Figure 3: Photomicrograph of the ovaries of (a) left. Note the corpora albicantes (CA) (b) right (H&E Mag. X100)



DISCUSSION

Our morphostructural study in this investigation demonstrates morphometric and microanatomical differences between the left and right ovaries of the African tree pangolin M. tricuspis. The results from the morphometric assessment of the left and right ovaries (Table 2) suggest a bilateral variation and a preponderance of the left ovary over the right. All the parameters of the two ovary showed significant ($p<0.05$) variation, indicative of better

sequence of growth phase, development and differentiation in the left ovary as compared to the right. Although little is known about the reproductive biology of M. tricuspis, evidence from the histological analysis in this investigation suggests that the left ovary might be the principal organ of reproduction. A super-tough fibrous capsule- tunica albuginea was seen around the cortex in the two ovaries. Also, peritoneal membrane was attached and folded over most of the surface of the ovary. Histologically, two layers: theca interna and theca externa are recognized externally. The function of these layers may not be too different from that in human due to similar way of organization. For instance, theca interna consist of rounded cells which are believed to secrets estrogen, progesterone and androstenedione while theca externa are predominated by flattened stroma cells. The medullary part of the left ovary was observed to be highly vascularized and dominated by loose connective tissue (Fig 2a) while the cortical part was dominated by fibroblasts developing follicles corpora albicantes and few smooth muscle cells. This smooth muscle cells may be the termination of sympathetic fibers thus, playing some part in follicular maturation and ovulation (Heat et al., 1999). Developing follicles and the presence of corpora albicantes (Fig. 2a & 3a), makes it synonymous to what is obtainable in human as researched by Heath et al. (1999). This however placed the M. tricuspis ahead of some other mammals' vis-à-vis the development and differentiation of the reproductive organ. In a similar work, Ofusori and Caxton-Martins (2005) revealed that the gastrointestinal tract in M. tricuspis was well developed and organized than what is obtainable in Rattus norvegicus and Eidolon helvum. This presupposes that the pangolin has some advanced (mammalian) features when compared with some other mammals.

The right ovary on the contrary has a uniform stroma without any clear demarcation in to cortical and medullary parts (Fig 2b & 3b). The entire stroma which is dominated by connective tissue fibers as well as smooth muscle cells makes it more or less rudimentary in contrast to the left.

In conclusion, the comparative morphometric and histological study reveals some differences between the left and right ovaries of M. tricuspis, suggesting the left to be the principal sex organ. Additional studies are needed to clarify if there are other bilateral differences in the remaining parts of the reproductive system of African tree pangolin M. tricuspis.

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References

1. Adenowo TK and Caxton-Martins EA (2000). The microanatomy of the pineal gland in the pangolin Manis ticuspis: preliminary findings. Bk of abstract Anatomical society of West Africa 9th scientific conference, Pg 12.
2. Griffiths M, Greenslade PJM, Miller L and Kerle JA (1990). The diet of the spring-ant eater Tachyglossus Aculeatus Acanthion in tropical habitats in the northern territory. The Beagle 7:79-80.
3. Heath JW, Young B and Burkitt HG (1999). Gastrointestinal tract. Wheater's functional histology 3rd ed pg 335-365.
4. Ofusori DA and Caxton-Martins EA (2005). A comparative histological investigation of the gastrointestinal tract in pangolin, bat and rat (preliminary study): Bk of abstract 3rd Anatomical society of Nigeria annual conference. Pg 35.
5. Ofusori DA, Caxton-Martins EA, Adenowo TK, Ojo GB, Falana BA, Komolafe AO, Ayoka AO, Adeeyo AO and Oluyemi KA (2007a). Morphometric Study of the Stomach of African Pangolin (Manis tricuspis). Sci. Res. Essays Vol. 2 (10), pp. 465-467.
6. Ofusori, DA., Oluwayinka, OP., Adelakun, AE., Keji ST., Oluyemi, KA., Adesanya OA, Ajeigbe KO and Ayoka, AO. (2007b). Evaluation of the effect of ethanolic extract of Croton zambesicus on the testes of Swiss albino mice. Afri. J. Biotechnol Vol. 6 (21), pp. 2434-2438.
7. Pangolin Specialist Group (1996). M. tricuspis 2006 IUCN Red list of threatened species. IUCN 2006. Retrieved on 12 May 2006.
8. Redford KH and Dorea JG (1984). The nutritional value of invertebrates with emphasis on ants and termites as food for mammals. J. Zool., 203: 385-395
9. Redford KH (1983): Curious creatures to whom the ant is la haute cuisine. Smithsonian, 14:74.
10. Schlitter, DA. (2005). in Wilson, D. E., and Reeder, D. M. (eds): Mammal Species of the World, 3rd edition, Johns Hopkins University Press, 531.

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