Histological Study of the Adrenal Gland of the Adult Female Rabbit (*Orycotolagus Cuniculus*)

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Abstract

The aim of this study was to investigate the structure of the female rabbit adrenal gland by light microscopic observations. For this purpose, ten adrenals were collected from five adult female rabbits. The tissues were processed for light microscopy. The weight of rabbit gave mean values of 2.04k g and the mean values of long axis of left adrenal gland 15.46mm and the diameter of right gave mean values 11.30mm. The adrenal glands sit at the top of the kidneys,one on each side of the body, and have an inner core (known as the medulla) surrounded by an outer shell (known as the cortex). The adrenal cortex consists of three anatomic zones: the outer zona glomerulosa,; the intermediate zona fasciculata, which secretes cortisol; and the inner zona reticularis. The adrenal medulla, lying in the center of the adrenal gland, is functionally related to the sympathetic nervous system and secretes the catecholamines epinephrine and norepinephrine in response to stress.

Key word: *Adrenal gland, Rabbit, Orycotolagus Cuniculus*

Introduction

Rodents (Rodentia), the largest order of placental mammals, comprise more than half of the mammals known at present. The rabbit that is the subject of this study is from the Hystricidae family, which constitutes a small group of the order Rodentia [1,2,3]. The adrenal gland is composed of two distinct portions: an outer cortex (mesodermal origin) and an inner medulla (neuroectodermal origin) [4,5,6,7]. The adrenal cortex is subdivided into three [5, 6,7] or four [8] distinct zones of epithelial cells. The outermost zone is called zona glomerulosa in ruminants, in human [5,9] and in a few rodents [6,10,11] and is formed of irregular clusters .

Materials and Method

In this study, ten adrenal glands were collected from five adult female rabbits(.the average of wight 4.2kg and the average age five months &ten days). Animals were anaesthetized with Pentothal (6 mg/kg) and adrenal specimens were taken. For light microscopy, 10% formaldehyde solutions were used to fix the tissue. After fixation, the specimens were rinsed with buffer; treated with ethyl alcohol and xylol and embedded in paraffin blocks. Sections (5-7 μm thick) were made by microtome (Leitz) and then stained with hematoxylin-eosin. Photomicrographs were taken with a camera (Nikon) attached to a microscope. Micrometric measurements and volume were carried out with ocular micrometer.

Results

Data obtained from micrometric measurement of adrenal glands of adult rabbit are shown in table 1 . The weight of rabbit gave mean values of 2.04k g and the weight of right and left adrenal gland gave mean values of 0.14 and 0.15 g respectively .the mean values of long axis of left adrenal gland 15.46mm and the diameter of right gave mean values 11.30mm. The paired adrenal glands were located to the cranio-medial of the kidneys and both right and left adrenals were flat(fig.1). Morphological data obtained from this study showed that the adrenal cortex can be divided into three zones according to differences in the arrangement of its cells;an outer zone ,the glomerulosa ;a middle zone ,the fasciculate;and an inner zone,the raticularis. The zona fasciculate is the broadest of the three.The zona glomeruloza is a relatively narrow zone in which the arrangement of the cord is such that the cells are in arcuate groups(fig 2). Fig.3showed The cells tend to be columnar and they have spherical nuclei .A few lipid

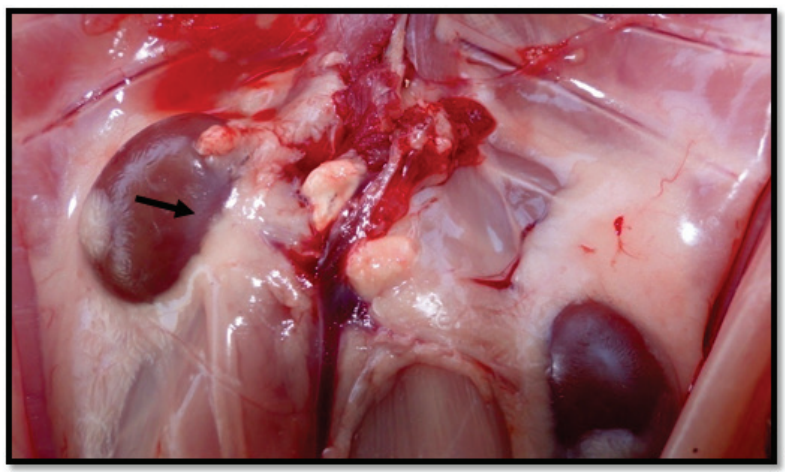
droplets may be found in the cytoplasm ,but they are they are sparse in comparison with the droplets in the zona fasciculate.The zona fasciculate ,the broadest zone ,is composed of cell cords coursing parallel in one another in a radial direction toward the medulla(fig.4). The cords are usually only one or two cells in width .The secretory cells are generally cuboidal or polyhedral in shape and they are sometimes binucleate .The nuclei appear more vesicular than those of the glomerulosa ,with less dens chromatin.The cells are relatively large.Since the lipids are dissolved by the usually technical procedures ,the cytoplasm has a spongy appearance(fig.5) .

The zona reticularis is composed of network of cell cords(fig.6&7).The cells are generally smaller than those of the fasciculata and they relatively few lipid droplets in comparison with the fasciculata and the droplets vary greatly in size.

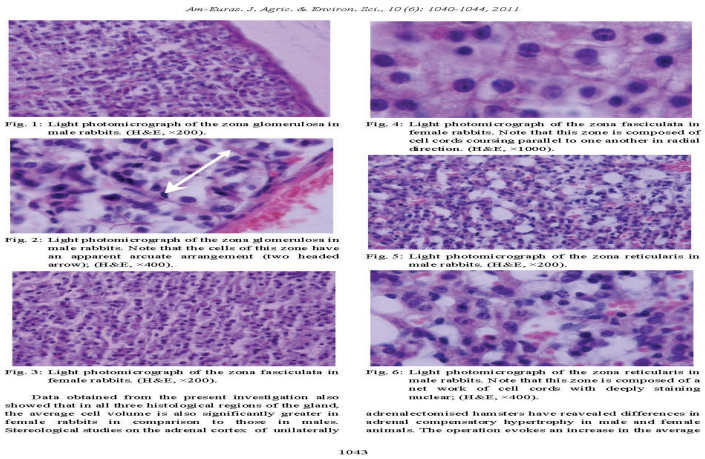
Medulla. The adrenal medulla was about one quarter of the area of the gland. The chromaffin cells in irregular clusters, and at the cortico-medullary boundary cortical cells were observed. Epinephrine-storing cells (E-cells) were more numerous and smaller than norepinephrine-storing cells (NE-cells). The majority were moderately electron-dense E granules, but some were highly electron-dense NE granules. Ganglion cells were rarely observed. Numerous central sinusoidal vessels were noticed in place of a large central venule.

Table 1 : Showing weight of rabbit in gm, weight in gm and volume in cm³ of right (Rt) and left (L) adrenal gland of five adult Rabbit . Mean ± standard deviation

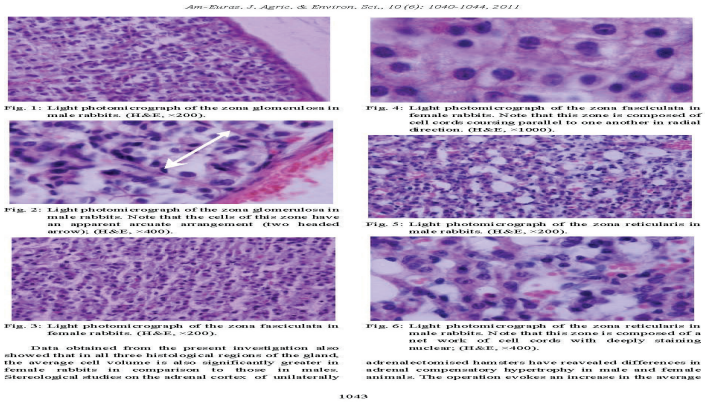
Rabbit number	Weight of Rabbit (kg)	Weight of adrenal gland (g) R	Weight of adrenal gland (g) L	Diameter/ mm R	Diameter/ mm L	Long axis/ mm R	Long axis/ mm L
1	2	0.15	0.15	-------	9.68	7.25	-------
2	2.2	0.14	0.15	-------	6.77	9	-------
3	1.9	0.13	0.14	-------	7.61	9.33	-------
4	2.3	0.15	0.16	-------	6.2	8.8	-------
5	1.8	0.13	0.14	-------	6.9	9.5	-------
Mean±SD	2.o4±0.089	0.14±0.01	0.15±0.017		7.43±0.59	8.77±0.32	



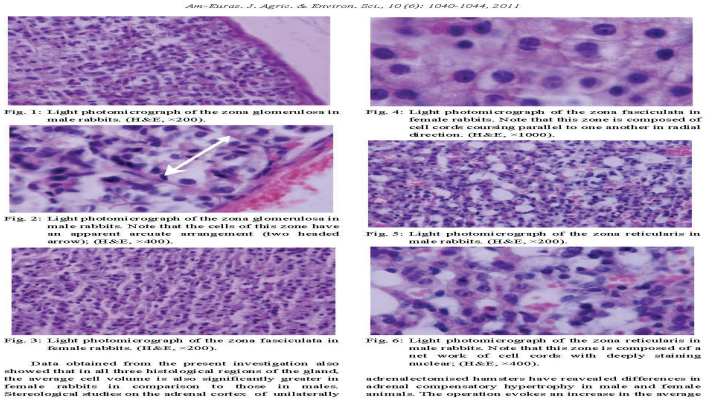
Fig(1) site of adrenal glands of female rabbit



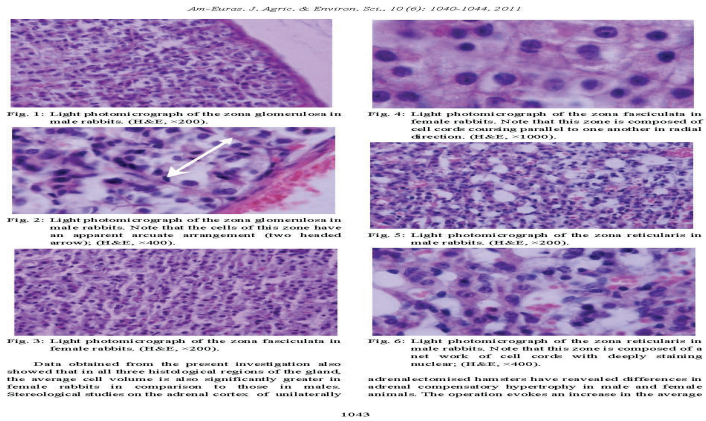
Fig(2)Light photograph of the zona glomerulosa of adrenal gland in the female rabbits(H&E200x)



Fig(3) Light photograph of the zona glomerulosa of adrenal gland in the female rabbits note that the cells of this zona have an apparent arcuate arrangement (two haeded arrow) (H&E400x)



Fig(4) Light photograph of the zona fasciculate of adrenal gland in the female rabbits(H&E200x)



Fig(5) Light photograph of the zona fasciculate of adrenal gland in the femadle rabbits note that is composed cell cords (H&E1000x)

Discussion

The adrenal cortex is composed of two[12] ,three [13] ,or four [14] distinct area of epithelial cells.The outer most is called zonae glomerulosa in ruminants and primates [15] ,and in a few rodents[(12,11)] .In most other domestic species including dogs,cats,horses and pigs the parenchyma forms archades just beanth the capsule.

Some investigators [(8,4,7 ,15, 16)] have reported that the zona fasciculata is the widest zone of the cortex and has a foamy appearance caused by the presence of numerous lipid vacuoles [(8, 5, 6,7).] The zona fasciculata forms 60% of the cortex **16** or 70.9% of the cortex in the rabbit **15** . According to **7** the zona fasciculate in human is 65% of the gland. Results of this study indicate that the zona fasciculata appears foamy and forms 66.3% of the cortex and 48.5% of the gland.

9 identified that the adrenal medulla in goat is about a quarter of the gland. According to 7 the adrenal medulla is 13% of the human gland. Our results are similar to those reported in goat by **9** .

Previous reports described that the adrenal medulla contains both types of chromaffin cells [(19, 18).] Furthermore, at the cortico-medullary boundary, cortical cells were together with chromaffin cells [(18,19).] Epinephrine cells were more numerous, smaller and contained less electron-dense granules than norepinephrine cells [(17,18,19,5,20).]

21 identified that the adrenal medulla in goat is about a quarter of the gland. According to 22 the adrenal medulla is 13% of the human gland. Our results are similar to those reported in goat by 23.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the College of biotechnology/ Al-Qasim Green University, Iraq and all experiments were carried out in accordance with approved guidelines.

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