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Description of Cellular Structures of Adenohypophysis in Pituitary Gland of Gray Mongoose (*Herpestes edwardsii*)

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***Abstract*—** To distinguish different species variations, overall morpho-histochemical traits are compared to those associated with other small carnivores or animal species. for an evaluation of the distribution and ratios of various pituitary cells. Ten healthy adult gray mongooses from the Middle Euphrates region were used in this study. After being collected, the animals were dissected, and the pituitary glands, which weighed between 550 and 600 g, were carefully removed to avoid damaging the tissues. Intramuscular injections of a combination of xylazine and ketamine (0.9 mg/kg and 26 mg/kg, respectively) were administered to the experiment animals. According to histochemical analyses, the pituitary gland of gray mongooses is shaped like a M and is separated into three regions: pars disalis, pars intermedia, and pars nervosa. Based on their affinity for chromophils (acidophil and basophil) and chromophobes, the two cell types in the adenohypophysis were classified. Acidophils were bigger than chromophobes and basophils. The periphery of the pars distalis contained two types of cells that varied in size and shape, accounting for about 35% of the pars distalis. Basophils were distributed in clusters and were larger and more numerous than acidophils and chromophobes. It comprises 60% of the pars distalis cells, while chromophobes only account for 5% of the total. In accordance to the current study, the pars distalis contained five different types of basophils, which were dispersed in different regions based on hormone secretion. The shape of the gray mongoose's pituitary gland varied, indicating that different wild animals—especially carnivorous ones—have different functional specializations. These discoveries offer basic knowledge about wildlife.

***Keywords* —** Histology investigation, cellular descriptive Mongoose.

INTRODUCTION

Nanotechnology deals with the small nanoparticles (NPs) or m The pituitary gland consider a main endocrine gland is related with hypothalamus through infundibular stalk and plays critical roles in other endocrine glands activities via several hormones secretion (1). This small gland is located in sella turcica of the basisphenoid bone body and composed of adenohypophysis and neurohypophysis (2).

In vertebrates, the hypothalamus is the main neural structure that controls homeostasis. It monitors and preserves the body's internal balance by coordinating intricate signals from other parts of the brain and the outermost regions. Its main neuroendocrine output comes from neural terminal arborizations in the median eminence, which release elements that regulate the pituitary endocrine cells' hormone release. Although these factors are far less understood, it is also likely to provide an equally important trophic stimulus to the gland's maintenance and plasticity (3).

In order to control essential functions like growth, puberty, metabolic processes, stress reactions, reproduction, turn sends signals to peripheral organs. The gland is located at the base of the brain in the "sella turcica", a recess located in the (sphenoid bone). The fully mature pituitary gland is made up of the neurohypophysis and the adenohypophysis , two morphologically and functionally unique structures whose close association raises interesting developmental and operational implications that have not yet been thoroughly investigated (4).

Histological evaluation of cells from pars distalis showed five distinct kinds of cells, which were categorized as chromophils and chromophobes based on the hormones called trophic hormones they secrete. In addition, the chromophil population was additionally separated into beta basophils, delta basophils (gonadotrophs), red acidophils (lactotrophs), and yellow acidophils (somatotrophs). throughout every category analyzed, delta basophils were consistently more prevalent than beta basophils among these. The majority of yellow acidophils (somatotrophs) were found in male Philippine carabaos and Philippine-Murrah buffaloes, while the majority of red acidophils (lactotrophs) were found in pregnant Philippine carabaos (5). Histological evaluation of cells from pars distalis showed five distinct kinds of cells, which were categorized as chromophils and chromophobes based on the hormones called trophic hormones they secrete. In addition, the chromophil population was additionally separated into beta basophils, delta basophils (gonadotrophs), red acidophils (lactotrophs), and

yellow acidophils (somatotrophs). throughout every category analyzed, delta basophils were consistently more prevalent than beta basophils among these.

MATERIALS AND MTHODS

Samples collection

For the current study, ten pituitary gland specimens were collected from gray mongooses (Herpestes edwardsii) in the Middle Euphrates region. After the animals were collected, they were dissected, and the pituitary glands were carefully removed to avoid damaging the tissues. Each gland was immediately immersed in 10% buffered neutral formalin to ensure correct fixation and survival of morphological features. This procedure was finished as soon as possible following removal to maintain structural integrity and prevent autolysis. After that, the fixed tissue samples were ready for histological preparation and microscopic examination, providing a strong basis for evaluating the pituitary framework of the species (6).

Histological examinations:-

Histological investigations were previously conducted on ten pituitary glands. Both the anterior and posterior lobes were the two parts of the glands. The specimen was cleaned with normal saline before being subjected to a standard operation collecting multiple sections from the cranial, middle, and caudal regions of the anterior lobe (7).

Staining for histological study:

The sections were stained with following stains:

1- Hematoxylin and Eosin to demonstrate the general component of tissue.

2- Periodic-acid shiff (PAS) reagents to demonstrate the glycoprotein, basophils cells and neurohypophysis.

3- Orange G stain

Morphometric measurement:

The following instances were utilized in this work to examine the measurement of pituitary gland cell types using various histological parameters:

Number of the cells/mm2

The oculometer was used for measurement the dimensions of the cells. Analysis of data was the done according to (8).

Measuring the number of the cells/mm2

This measurement was done by using the mean of 5 microscopic fields for each histological section which represent (1.13) mm2 under 40X, select 10 histological section, for each samples and repeat that for 5 animals to reach total number of 50. then take the arithmetic mean in all field then arithmetically into converted the 1mm2 (9).

RESULT AND DISCUSSION

The pituitary gland of the gray mongoose was shaped like a M and had no visible capsule. Dense connective tissue septa filled with blood vessels divided the gland's parenchyma into two separate regions, the neurohypophysis and the adenohypophysis.

Adenohypophysis:-

The adenohypophysis consists of three pars each pars different in compositions and location, had variance in relationship with other strictures of pituitary gland

The pars distalis:-

Pars distalis : Because it contains most of the cellular compositions that are responsible for stimulating hormones, this pars has a very important gland and is believed to be the largest part. This structure is highly vascularized and geographically concentrated rather than dispersed uniformly (Fig. 1). Based on stain affinity, the pars distalis contained three different cell types: chromophil (acidophil, basophil), chromophobe. According to (10), certain cell types were distributed in specific areas of the pars distalis, which may or may not be sectioned in different animals. These cell types vary in ratio and are distributed in the pars distalis.

I- Acidophil cells:-

It had been larger than basophils and chromophobes. It was located in the pars distalis' periphery. Acidophils were found to be cords. The cytoplasm of acidophils becomes pink when hematoxylin and eosin stain is applied. Acidophils, which come in two varieties and differ in size, shape, and location, made up about 35% of the pars distalis cells. The first type seemed to be somatotrops, whereas the second type had a rounded, irregular form. Their establishments were situated in the heart of the Pars Distalis and had a dark pink appearance. These cells may represent lactotrophs (Fig. 2, 3). According to Steele et al., (11), there are two types of cells found in paras ditalis that are responsible for stimulating growth and prolactin hormone. This finding is consistent with the current variance of acidophil in pars ditalis.

Chromophobes

The chromophobes were smaller than acidophils and larger than basophils. These cells had a rounded shape and a regular outline. Granules were absent from the cytoplasm. Its boundaries are easily discernible. These cells, which make up around 5% of the pituitary gland in gray mongooses, have dark nuclei with clear centers (Fig. 4). Different animals have different chromophobe distributions and ratios. This is due to the gland's hormonal state, since an increase in chromophobes relative to chromophils may suggest that cells are at rest and vice versa (12).

Basophil

According to the current study, there were five different types of basophiles in pars distalis that differ in size and location. Compared to acidophils and chromophobes, these types were bigger and more prevalent. Clusters of basophilic cells are visible. They were confined to the posterior and middle regions. These cells varied in size and shape and had a magenta-blue hue. It makes up 60% of the pars distalis cells. Their sizes and shapes varied (Fig. 4). These findings contradict those of Qi et al., (13), who discovered that the majority of basophils were dispersed throughout the entire gland, particularly in the posterior region.

Types of basophilic cells:

Basophils (type I):-

The most tiny cells in the pars distalis were of this type of cell. They had a rectangular form. The nuclei of these cells have oval-shaped chromatin and the cytoplasm contains granules that are distantly located. As one approaches the pars intermedia. The cell had a diameter of 10.2 µm. Adrenocorticotropic hormone may be secreted by these cells. (Fig. 6, Table 1).

Basophils (type II).

Compared to other basophil types, these cells were more pronounced. These cells varied in size and had an uneven shape. They had dense secretory granules alongside dark nuclei in their purple cytoplasm. They were found close to the sinusoidal capillaries, this types cells had a diameter of 12.5 µm. It might be a gonadotrope cell type (Fig. 7, Table 1).

Basophils (type III).

Despite being smaller in size, these cells were comparable to type (I). They had an oval form. The nuclei were dark, and the cytoplasm was purple. Follicle-stimulating hormone may be secreted by these cells, which had a diameter of 10.2 µm. (Fig. 8 Tables 1).

Basophils (type V).

Among basophilic cells, these seemed the biggest. They had an average shape and were elongated. The cytoplasm was brightly colored and contained homogenous fine chromatin-containing granules with prominent nuclei. As one moves upwards the posterior portion of the pars distalis. The cell measured (13.4) µm in diameter. These cells may secret thyrotropic stimulating hormone. (Fig.9.Table 1).

Pars intermediate

The current study indicates that the gray mongoose has a well-developed pars intermedia. It was in close proximity to the neurohypophysis, which was not divided from the pars distalis by a cleft. The pars intermedia had inadequate vascularization. It is possible to observe a large number of cells moving from the pars intermedia into the pars nervosa. There were two types of cells in this area of the pars: the first type was basophilic stained and clustered, while the second type was light stained (Fig. 10). These findings are consistent with those of (14), who claimed that the pars intermedia In contrast to (15), which claimed that the pars intermedia in other mammals, such as humans, was highly vascularized and contained three cell types, including the secretory tall columnar cells, the human pars intermedia was poorly vascularized and rudimentary, with only one or two cell types.

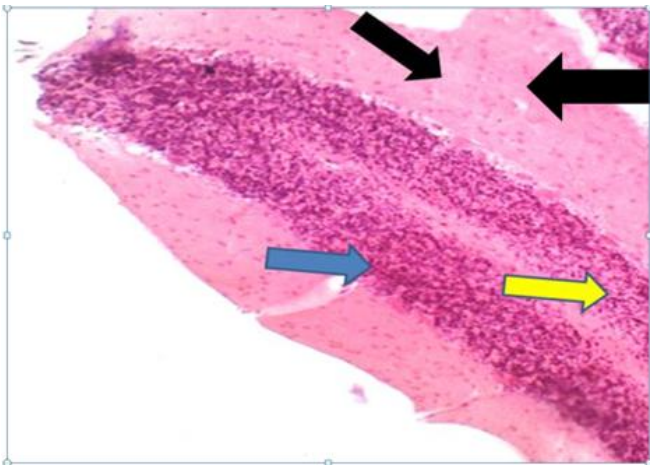

Figure 1. Histological section of pituitary gland show pars distalis (blue arrows), pars intermediate (yellow arrow) and pars nervosa (black arrow). 40X. H&E.

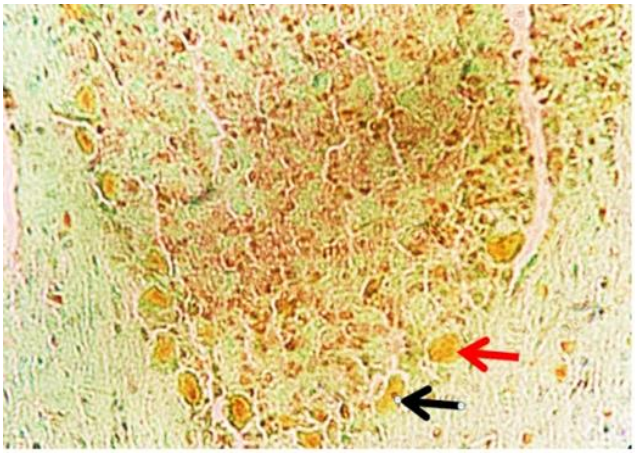

Figure 2 . Histological section of pituitary gland showing pars distalis finding the acidophils appeared in to two types: type I regular in shape and smaller, (red arrow) type II large and irregular shape (black arrow). While the basophile pale staining. Orange G stain. 1000X

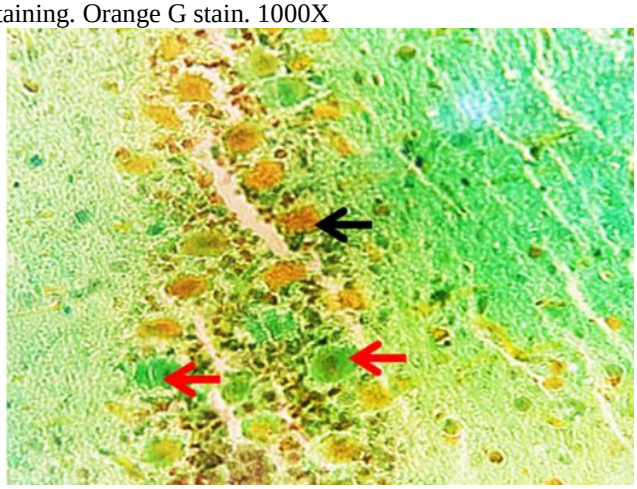

Figure 3 . Histological section of pituitary gland showing pars distalis finding the acidophils appeared in to two types: type I regular in shape and smaller, (type II large and irregular shape (black arrow). While the basophile pale – green staining (blue arrows). Orange G. 1000X

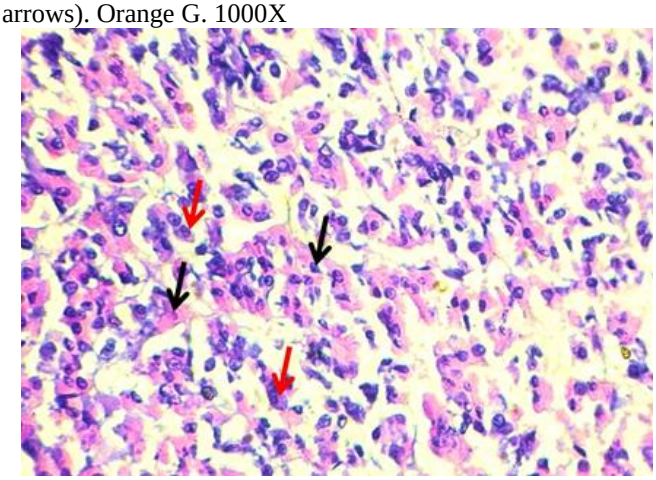

Figure 4. Histological section of pituitary gland show cellular distribution chromophils: acidophil as clusters (black arrows), basophil spread as a cord (red arrows) & (chromophobes) in pars distalis. 400X.

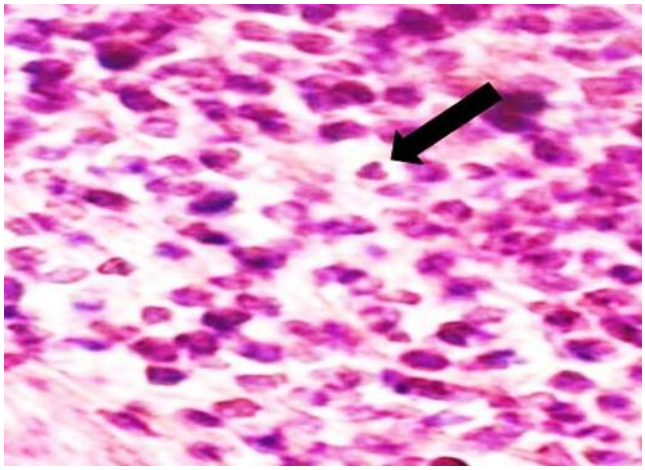

Figure 5. Pituitary gland in gray mongoose show chromophobes cells (black arrow). 1000X H&E

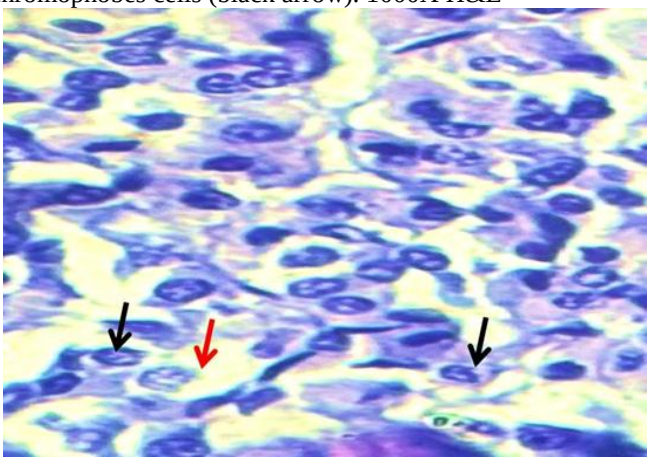

Figure 6 . Histological section of Pars distalis of pituitary gland show chromophobe had empty of cytoplasm with spherical nucleus (red arrow). The basophil type (I) a tiny cells, a rectangular form. The nuclei of these cells have oval-shaped (black arrow). 1000X. PAS stain.

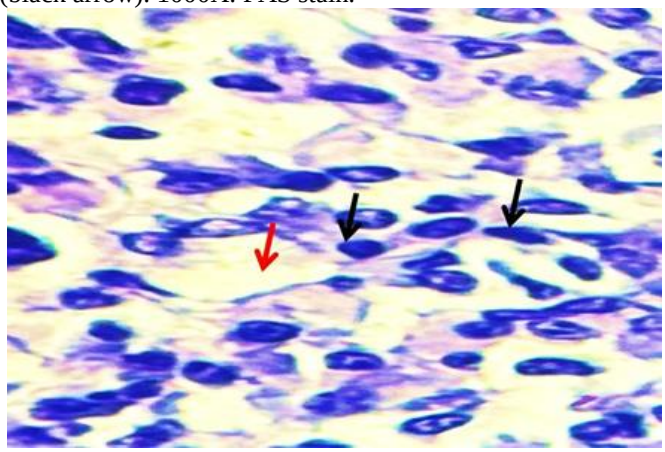

Figure 7 . Histological section of Pars distalis of pituitary gland show basophil type (II) varied in size and had an uneven shape. PAS stain.1000X.

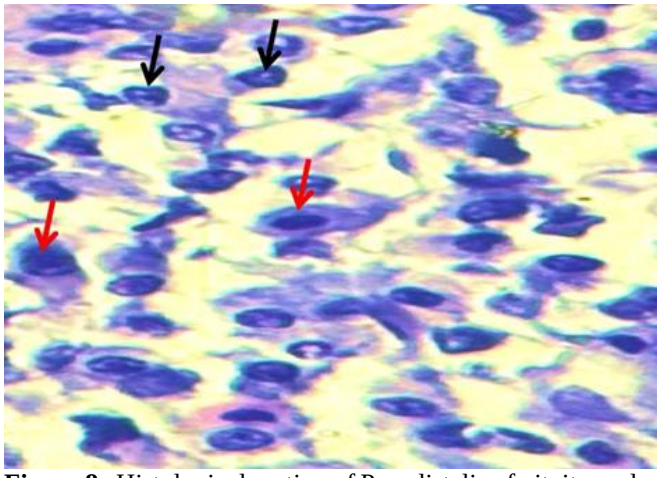

Figure 8 . Histological section of Pars distalis of pituitary gland show basophil type (III) smaller in size, these cells were comparable to type (I) had an oval form. The nuclei were dark, and the cytoplasm was purple (black arrow). The basophil type (V) seemed the biggest with elongated in shape. The cytoplasm was brightly colored and contained homogenous fine chromatin-containing granules with prominent nuclei 1000X. PAS stain

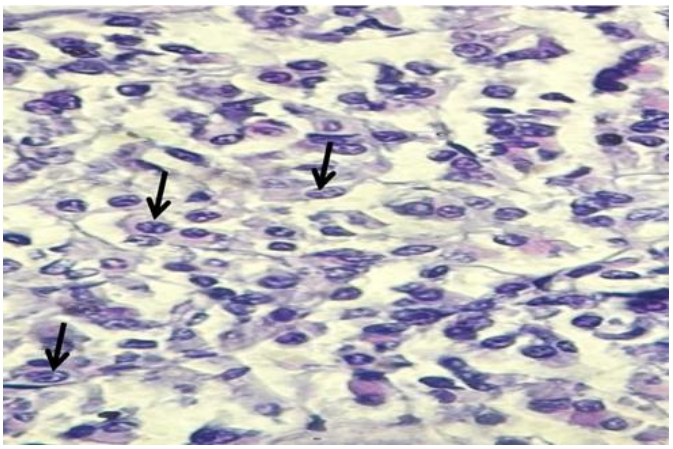

Figure 9. Histological section of Pars distalis of pituitary gland exhibit an irregular, oval shape and pale cytoplasm of basophil type (IV). One or two of the largest nucleolus's were located in the center of the nuclei that were most centrally located. 1000X. PAS stain.

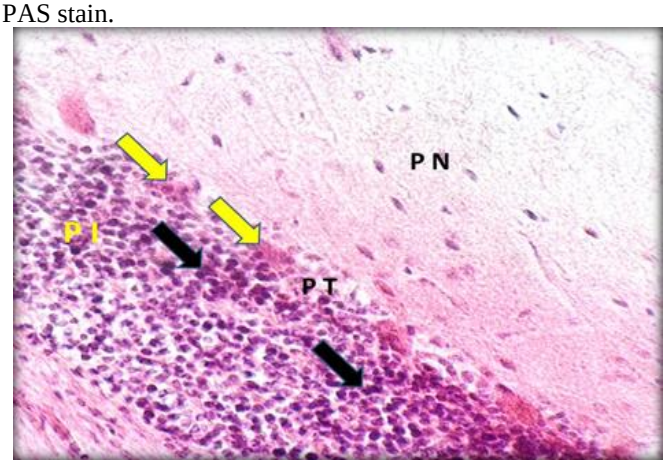

Figure 10. Pituitary gland show pars intermediate contain two types of cells, first types (yellow arrows) located near to pars

nervosa (PN) and second type located centrally (black arrows). 400X H&E.

Table 1. Shows the dimension type of cells & location of the cells in pars distalis . (n = 10 gland).

Type of cells	Diameter of cells/µ	Location of Cells
Acidophil/type I	13.32 ±0.3293	Posterior Part
Acidophil/type II	12.22 ±0.4678	Center
Basophils/type I	15.7 ±0.6853	Upper&Lower Part
Basophils/type II	12.43 ±0.3991	Upper&Lower Part
Basophils/type III	11.13 ±0.3111	Middle part
Basophils/type IV	15.95 ±0.517	Toward pars intermedia
Basophils/type V	14.8 ±0.5728	Toward pars intermedia
Chromophobe cell	11.36 ±0.4644	Different part in pars distalis

CONCLUSION

The current investigation highlighted the structural variety of morphological in pituitary gland in wild animals. The histological investigation include the forms of pituitary pars, distribution and ratio for types of cells. In addition, the nature of connection the pituitary gland in gray mongoose with hypothalamus.

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Conflict of Interest

According to the author, there is absolutely no clear disagreement.

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