ANATOMY AND HISTOLOGY OF THE ALBINO RAT'S OVIDUCT

Thesis

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By

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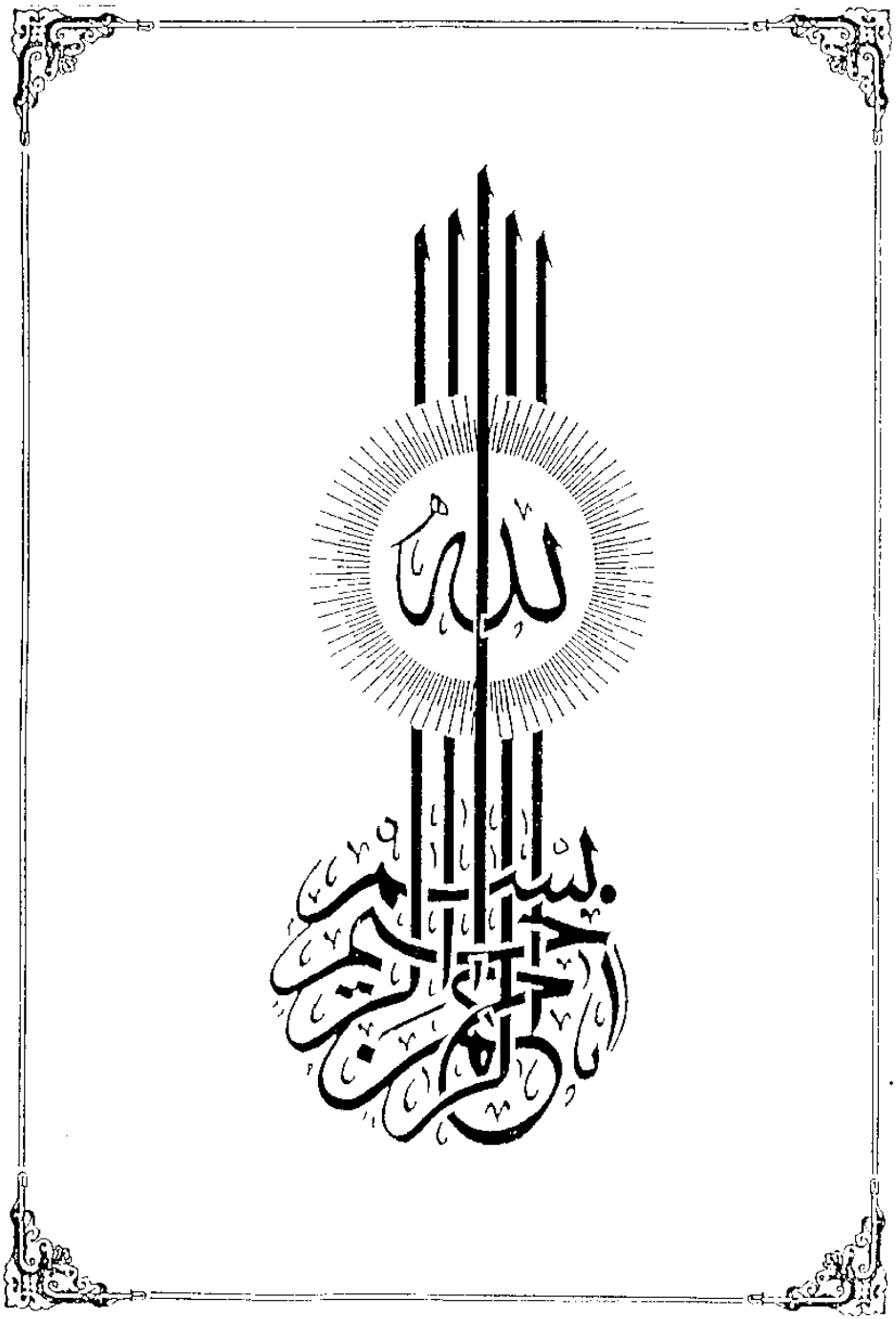

C O N T E N T S

Introduction and Aim of the Work

INTRODUCTION

Reviewing the literature, it was noted that many investigators studied the human female oviduct (Andrews, 1951; Fawcett and Wislocki, 1951; Lisa, Gioia, and Rubin, 1954; Fredricsson, 1959; Schultka, 1963; Clyman, 1966; Novak and Woodruff, 1967; Pauperstein and Woodruff, 1967; Zaghloul, 1978; Verhage, Bariether, Jaffe, and Akbar, 1979; Samberg, Degani, Zilberman, Eibschitz, Nir, and Scharf, 1983).

However, few worked on the rat's oviduct (Kellogg, 1945; Deane, 1952; Hafez, 1970; Filobbos, 1980; and Gaddum-Rosse, 1981).

The albino rat is one of the most commonly used experimental animals. Therefore, the study of the anatomy, histology, and histochemistry of its different tissues is a necessity. Thus, it became the aim of the present work to investigate the anatomy, histology, and some histochemical aspects of the albino rat's oviduct.

Review of Literature

REVIEW OF LITERATURE

GROSS ANATOMY

Huber (1915) measured the length of the oviduct in the albino rat and stated that it was approximately 2.5 - 3 cm.

Kellogg (1941) noted that the infundibulum of the rat's oviduct opened into a peritoneal capsule, the periovarial sac or bursa which surrounded the ovary and had usually no communication with the coelomic cavity. She also reported that the periovarial sac was formed chiefly from the mesosalpinx with contributions of tissues from the diaphragmatic ligament, mesovarium, and ligamentum ovarii proprium.

Kellogg (1945) stated that the oviduct of the adult rat was located close to the caudal pole of the ovary and the cephalic extremity of the uterine horn. It was compactly coiled into a number of coils which were enclosed between the two epithelial layers of the outer layer of the periovarial sac. She found that there was no regularity in the pattern of the coils. She also noted a ligament, the ligamentum ovarii proprium, which bound the ovary to the oviduct and uterine horn.

Deane (1952) reported that the fimbriated end of the

oviduct was enclosed within the ovarian bursa and apposed to the ovary.

Hafez (1970) stated that the oviduct of the rat could be divided into the infundibulum, with its fimbriae, the ampulla, the isthmus and the uterotubal junction. The oviduct was coiled into several loops. One side of the oviduct was bound to the mesosalpinx. The oviduct and the ovary were closely associated with each other anatomically. The end of the oviduct adjacent to the ovary was expanded into a funnel like structure called the infundibulum. The infundibulum occupied only a small area of the periovarial sac. Its fimbrae made very limited contact with the surface of the ovary. The ampulla which accounted for about half the length of the oviduct merged with a constricted segment of the oviduct called the isthmus.

HISTOLOGY

Allen (1922) stated that in the mouse oviduct scattered epithelial cells contained dark stained nuclei which represented degenerative changes associated with the estrus cycle.

Agduhr (1927) studied the oviduct of the mouse and considered the peg cells as degenerating secretory cells. He also reported that a thin basal process extended from the peg cell to the basement membrane. These processes were less numerous in the rat than in the mouse.

Kellogg (1945) stated that the wall of the rat's oviduct consisted of three layers : a folded mucous membrane composed of columnar epithelial cells and their tunica propria; a musculosa which was formed of an incomplete longitudinal layer and an outer circular layer; and a serosa which was derived from the wall of the periovarial sac. She also reported that the epithelium of the oviduct was simple, but appeared to be pseudostratified and the majority of cells were ciliated. However, non ciliated columnar cells increased towards the uterine end of the oviduct. Where the oviduct entered the wall of the periovarial sac, the columnar epithelium of the fimbria changed abruptly into simple squamous. She also found that scattered club or peg cells lay wedged between the distal ends of the columnar cells. Furthermore, she noted

that the circular and longitudinal muscle layers became more prominent towards the uterine end of the oviduct. She also found that the ligamentum ovarii proprium consisted of dense connective tissue and smooth muscle fibres which radiated in the wall of the periovarial sac to the various loops of the oviduct.

Andrews (1951) studied the epithelium in the human fallopian tube. He reported that it was formed of three types of cells; ciliated, non ciliated, and peg cells. Ciliated cells were characterized by having long cilia, ovoid pale staining nuclei which were usually situated near the ciliated luminal margin of the cell, and a pale staining cytoplasm. The non ciliated cells were narrower and contained less cytoplasm which stained darker. Their nuclei were elongated, oval shaped, and darkly stained. Peg cells were probably one mere stage in the cyclic alterations of the non ciliated cells resulting from extrusion of cytoplasm. They consisted of a compressed nucleus similar to that of a non ciliated cell, but with a very small amount of cytoplasm. In addition to the above mentioned types of cells, he described another type which was scattered along the course of the epithelium wedged between the epithelium of the submucosa. He called them wandering cells. They were small rounded cells, with round, small heavily stained nuclei, and with a cytoplasm that did not stain at all.

Fawcett and Wislocki (1951) studied the human fallopian tubes. They stated that the ciliated epithelial cells were either eosinophilic or weakly basophilic, while the non ciliated secretory cells exhibited marked cytoplasmic basophilia.

Deane (1952) stated that in the rat's oviduct, the epithelial cells were columnar and ciliated. They rested on a distinct basement membrane of reticular fibres. They were relatively eosinophilic and possessed rounded or elongated nuclei, so crowded that the sheet appeared pseudostratified. Lymphocytes occasionally occurred between the epithelial cells.

Lisa et al. (1954) investigated the interstitial portion of the human fallopian tubes. They found that it was formed of two components; a muscular coat, and a mucosa. The muscle was formed of two layers, an outer circular and an inner longitudinal layer. The outer circular was a continuation of the muscle of the extramural part of the tube. The inner longitudinal was a continuation of the subendometrial muscle at the funnel of the uterine cavity. The longitudinal muscle layer was very rich in vascular channels. The mucosa was formed of a single layered columnar epithelium and a villous pattern. The basement membrane rested upon the muscle and occasionally upon the vascular channels. Sometimes a thin layer of reticulum separated them. The villi had a moderate amount of reticular fibres which were slightly more abundant

near the internal ostium of the tube at the junction with the uterine cavity.

Fredricsson (1959) studied the epithelial cells of the human fallopian tubes. He reported that their height varied with the different stages of the menstrual cycle. The height increased during the follicular phase, reached maximum height in the late follicular and early luteal phases and then decreased. Ciliated and secretory cells were regularly found. The number of these cells were approximately equal. However, more secretory cells existed in the ampulla than in the infundibulum. Finally, no apparent changes in the cellular composition of the epithelium during the different phases of the reproductive life were found.

Schultka (1963) stated that cytologic and cytopochemical findings in the human oviduct epithelium revealed that the supposedly disparate cell types are in reality different functional phases only of one uniform epithelial cell type.

Clyman (1966) studied the human fallopian tube. He reported that the epithelium of the human fallopian tube was formed of three distinct types; ciliated cells, non ciliated or secretory cells, and peg cells. The non ciliated cells were present near the basement membrane. There was no apparent

change in the number of ciliated cells during the cycle. The peg cells were seen in the menstrual and the premenstrual phase. They appeared near the basement membrane between the other cells. He also reported that the number of secretory cells in the epithelium of the midportion of the fallopian tube was greater than that of the ciliated cell. There was again an increase in the number of the ciliated cells approaching the cornual portion of the tube. He also reported that the smooth muscle cells of the fallopian tube were similar in structure to those described for other human smooth muscle. He described loosely arranged sheets of elongated smooth muscle cells that had a well defined double membrane, an outer plasma type membrane, and an inner more electron dense membrane.

Novak and Woodruff (1967) studied the human fallopian tube. They described an incomplete longitudinal muscle layer at the uterine end of the tube.

Pauperstein and Woodruff (1967) observed an indifferent cell in the basal part of the human tubal epithelium. These had scanty, acidophilic cytoplasm and a nucleus with heavily clumped chromatin and a central dark nucleolus.

David and Czernobilsky (1968) studied the histology of the uterotubal junction in the rabbit, rhesus monkey and human female. They reported that in the rabbit, polyplike mucosal

projections at the uterotubal junction might block that area irrespective of muscle contraction. In the monkey, there appeared in the uterotubal junction a dense connective tissue zone between the lumen and the inner circular muscle layer. In the human female, an inner longitudinally arranged muscle layer appeared in the isthmus and intramural portion of the tube occupying the same location as the connective tissue zone in the monkey. A sphincter like action was therefore possible.

Blandau (1969) reported that fimbriae of the oviduct contained erectile tissue, a network of smooth muscle fibres and several large blood vessels. The fimbrial surfaces were covered by innumerable cilia.

Brenner (1969) reported that cilia in the rhesus monkey uterine tube infundibulum were completely lost during the luteal phase and were renewed during the follicular phase.

Nayak and Arthur (1969) studied the epithelium in the mammalian uterine tube. They described, in the infundibulum of the oviduct of guinea pigs, cattle, sheep and bovine, cilia and ciliary rootlets present in the ciliated cells during both the follicular and luteal phases of the estrous cycle. They also declared that cyclical changes in the ciliated cells of the infundibulum of large domestic animals had not been reported.