STUDY OF THE ALBINO RAT OVARY

THESIS

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IN

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BY

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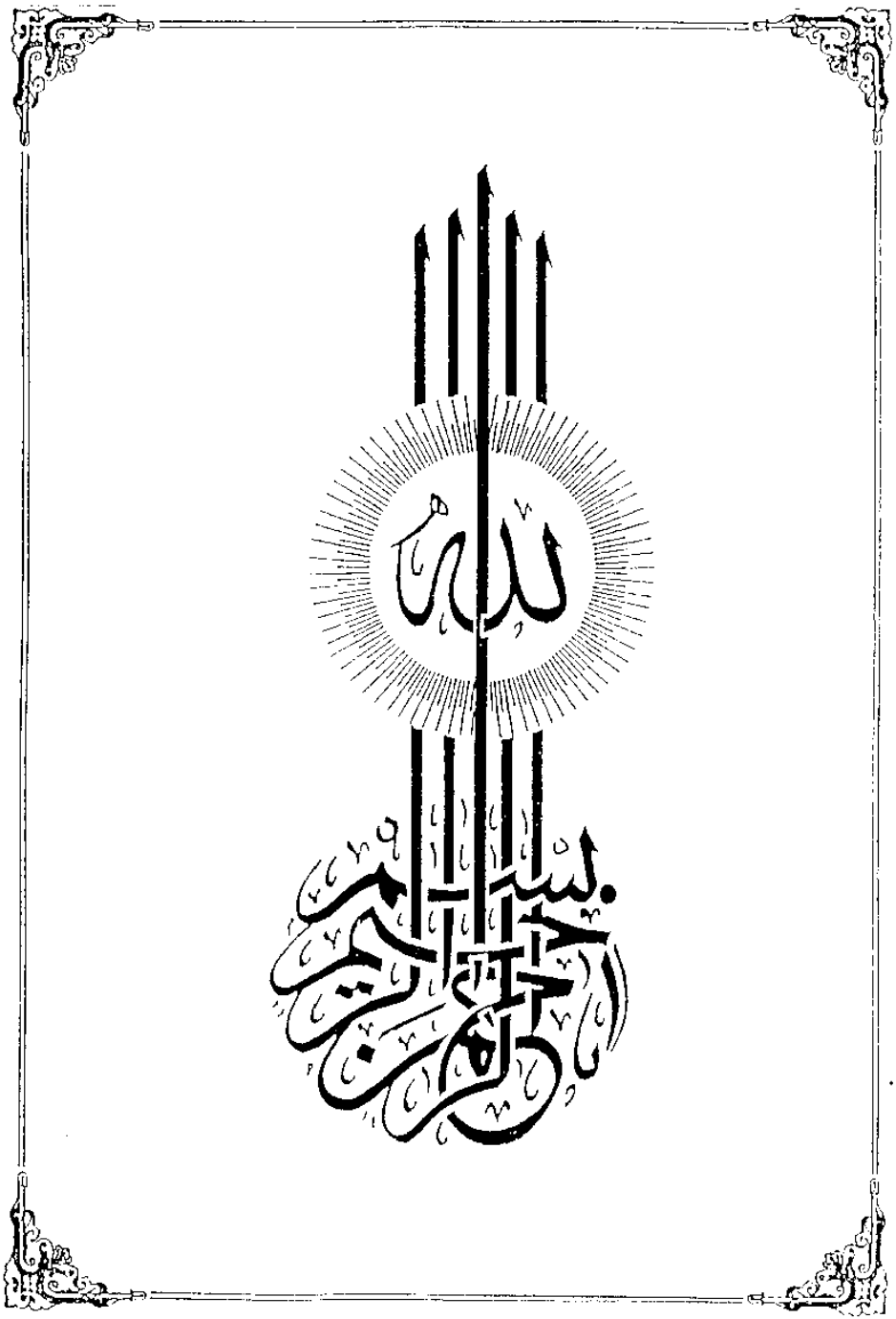
TO WHOM

I AM PROUD BEING THEIR DAUGHTER

TO

My FATHER and MOTHER

THANKS FOR EVERYTHING



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Introduction

INTRODUCTION

The ovary undergoes complex developmental changes during the pre and postnatal period before it becomes structurally and functionally mature. Reviewing the literature, it was noticed that many authors investigated the prenatal development of the ovary especially as regards the origin of the germ cells using light microscopy (Stegner and Onken, 1971 and Eddy, 1974).

Moreover, several investigators concentrated their study on the development of the ovary in the early neonatal period (Rasmussen, 1973 and Doss, 1986).

Few authors investigated the development of the ovary during the prepubertal period concentrated on the development of the oocytes and follicles (Peters, 1969; Alten and Groscurth, 1975 and Doss, 1986).

The lack of a comprehensive study on the development of the albino rat ovary during the postpubertal period stimulated the present study. The histology and histochemistry of the adult albino rat ovary would be studied.

Review of Literature

REVIEW OF LITERATURE

MACROSCOPIC ANATOMY OF THE OVARY OF THE RAT

Donaldson (1924), studied the anatomy of the female urogenital system of the adult albino rat. He described the ovaries as being a mass of follicles. He stated that variation of the weight of the ovaries during gestation and lactation depended largely upon the number and size of the corpora lutea present.

Kellogg (1941), studied the development of the periovarial sac of the white rat. He observed that the periovarial sac was formed chiefly from the mesosalpinx. The development of the sac was closely correlated with changes in the shape of the ovary. Concurrent with the change of the ovary from an elongate to a round body, the oviduct shifted across the free surface of the gland drawing with it the mesosalpinx. A small space on the caudo-ventral surface of the gland, not covered by the sac on the day of birth, was closed about the seventh day by caudal movement and coiling of the oviduct. During the process, the ostium became included within the periovarial sac.

Kellogg (1945), studied the postnatal development of the oviduct of the rat, macroscopically and microscopically. Her study included a hint on the macroscopic anatomy of the ovary.

She stated that the oviduct and ovary were situated close to the cephalic extremity of the horn of the uterus. The oviduct was compactly coiled and located adherent to the caudal pole of the ovary. The coils were enclosed between the two epithelial layers of the periovarial sac. Except for a small ventromedian opening, the peritoneal ostium, it completely surrounded the ovary. The hilus of the ovary was located in a depression on the median surface where the two layers of the peritoneal sac diverged.

THE SURFACE EPITHELIUM OF THE OVARY

Harrison and Matthews (1951), studied the cortex of the mammalian ovary which showed the presence of subsurface crypts lined by germinal epithelium, which penetrated into or passed through the tunica albuginea. Such crypts were suggested to be differentiated from intraovarian clefts which simply subdivided the ovary. The association of crypt formation with oogenesis led the authors to the suggestion that such crypts were possibly a vestige of the primitive pattern of ovarian structure.

Sauramo (1954), investigated the histology and function of the human ovary from the embryonic period to the fertile age. In the embryos and small foetuses, the cells of the surface epithelium were cuboidal or rounded 4 - 8 μ in diameter and in the foetus of 7 cm, these cells were quite distinct from ovarian tissue and were cuboidal. In the newborn, the cells already adjoined the tunica albuginea and the height of the cells varied at different points. This was the picture until the onset of puberty.

Epsey (1967), in his E/M study on the apex of the rabbit Graafian follicles, observed that the germinal epithelium was composed of a layer of cubical cells, loosely attached to an indistinct basement membrane. These cells contained large idented nuclei. Their cytoplasm appeared rich in mitochondria

and occasionally contained lipid inclusions. These cells were held together by obvious desmosomes on the lateral surfaces. The tunica albuginea was in the form of a layer of fibroblasts about six cells deep. The intercellular spaces of this layer were filled with massive bundles of collagenous fibres embedded in an amorphous matrix of ground substance. The theca externa fibroblasts were about 15 cells thick at the apex. They were flat branching cells, their nuclei were more elongated and regular and the collagen was less abundant. The theca interna was composed of two cell layers. These secreting cells had large oval nuclei with very prominent nucleoli. Their cytoplasm was dominated by lipid droplets, numerous mitochondria, Golgi networks and few small lysosomal-like bodies. At the inner edge of theca interna, there was an extensive network of large capillaries.

Weakly (1969), using E/M, described the details of the cytological changes occuring during differentiation of the surface epithelium of the developing hamster ovary. He stated that the epithelial cells covering the surface of the ovary varied from squamous to low columnar at all stages of ovarian development and maturation in the hamster. Microprojections originated from the surface of these cells.

Motta and Didio (1971), studied the surface of the ovary and the subcellular structure of the wall of preruptured and ruptured ovarian follicles of guinea pigs, mice, rats and rabbit as well as ovaries of human individuals by means of li-

ght, transmission and scanning electron microscopy in order to observe the modifications in the superficial epithelium and the subadjacent layers during the final stages of follicular maturation. The superficial epithelium appeared to be made up of regular hemispherical cells that normally surrounded only three fourths of the prominence of each rupturing follicle. The remaining one fourth presented a flat epithelium that became progressively thinner, the epithelial cells becoming elongated seeming to stretch and slide and finally disappeared possibly desquamating at the follicular apical area.

Condos (1975), studied the surface epithelium of the developing human ovary using light and electron microscopy. He stated that the surface epithelium of the developing ovary underwent diffuse proliferation during the fourth and fifth months of gestation, after which it reverted to a single layer separated from the developing cortex by a tunica albuginea. The proliferation was associated with marked nuclear irregularity and pleomorphism similar to that seen in surface epithelial cells neoplasms. The epithelial changes occured during the same time period that interstitial cells with ultrastructural and histochemical properties of steroid secreting tissue appeared in the ovarian stroma. The possible role of steroid hormones in stimulating surface epithelial cells proliferation was suggested.

Beck (1980), studied the postnatal development of the

ovarian surface epithelium of rat using light and electron microscopy and ultracytochemical methods. At birth, the epithelial covering of the ovary was stratified. This condition was associated with oocytes embedded in the surface epithelium. Superficial and deeper cells could be seen with the electron microscope. The superficial layer exhibited wide intercellular spaces which were apical and bounded by gap junction. With increasing age, these spaces became filled with homogenous electron dense material. The basal cells had numerous cytoplasmic protrusions and interdigitations. Moreover, from the surface epithelium, cortical cords containing clusters of oocytes, reached into the ovarian stroma. The basal cytoplasm of the deeper cells exhibited granules with an electron dense content. The greatest amount of granules was found in the second week of life. Then, they decreased in number with increasing age. During the second week of life, the surface epithelium became reduced to a simple epithelium as the oocytes migrated into the ovarian cortex. At the same time, the epithelium became separated from the oocyte bearing cords by a definite tunica albuginea. The epithelial cords disintegrated leaving primordial follicles. These observations suggested that the follicle epithelial cells were derived from the surface epithelium and the epithelial cords.

Ribeiro, Ferronha and David-Ferreira (1983), performed a freeze-fracture study of the hamster ovary surface epithelium intercellular junctions. Typical gap junctions, in the form of clusters of particles and complementary pits were observed

associated with tight junctional elements. Sometimes, the gap junctions were the outermost element of the junctional complexes.