General structure of the female reproductive tract

A. Two ovaries,

B. Two oviducts (also called the uterine tubes or fallopian tubes)

1. Infundibulum - funnel shaped opening of the fallopian tube next to the ovary. Note that the fallopian tube is not connected to the ovary.

2. Fimbria - finger-like projections extending from the edge of the infundibulum.

C. Uterus

1. Uterine horns - points where the fallopian tubes connect on the left and right sides.

2. Fundus or body of uterus

3. The uterine wall

4. Cervix - bulbous end of the uterus that projects into the vagina

5. passageway from the vaginal canal into the uterine cavity.

D. vagina

E. External genitalia, the labial lips, are not shown in this drawing.

II. The ovary

A. Covered by modified mesothelium called germinal epithelium.

1. This name is a misnomer since the germ cells (i.e. the oocytes) do not arise from it.

2. This mesothelium covering is a simple cuboidal epithelium in young woman, and becomes a simple squamous epithelium in older woman.

B. Just below germinal epithelium is a poorly defined region of dense connective tissue called the tunica albuginea of the ovary

1. Recall that the penis also is surrounded by a tunica albuginia.

2. These tunics have the same developmental derivation in males and females

C. The ovarian tissue within the tunica albuginia can be divided into medullary and cortical regions.

1. Cortex

a. Composed of ovarian follicles that are surrounded by a primitive connective tissue composed of spindle shaped fibroblasts.

* The follicles are sperical structures that are each composed of somatic cells (called follicle cells) that surround an oocyte.

* In addition to the spindle shaped fibroblasts, the stroma of the cortex also contains collagen and reticular fibers.

2. Medulla

a. Blood vessels (helical arteries and veins) and nerves in a dense stroma of supporting tissue.

b. The blood vessels and nerves enter/leave the ovary through a hilus of connective tissue.

D. There are four types of follicles.

1. Primordial follicles

a. One incomplete layer of flattened follicle cells surrounding a central oocyte (immature egg)

b. These follicles are located just beneath the tunica albuginia and form groups of primordial follicles called egg nests.

c. The oocyte is about 40 um in diameter.

2. Primary follicles

a. These are follicles that have begun to mature at the beginning of the most recent menstrual cycle.

b. Consist of 1 - 7 layers of cuboidal follicle cells that surround a central oocyte.

c. There are no fluid filled spaces between the follicle cells.

d. During the primary follicle stage the oocyte grows to about 110 um in diameter.

* It develops a thick acellular layer of glycoproteins, called the zona pellucida, that completely surrounds the oocyte.

* The plasmalemma of the oocyte and the adjacent plasmalemma of the the adjacent layer of follicle cells develop many microvilli that extend into the zona pellucida and interdigitate with one and other.

** This interdigitation of microvilli increases the surface area of contact between the oocyte and its adjacent follicle cell layer.

** Thus, the area over which nutrients can pass into and wastes out of the oocyte is increased.

** The layer of follicle cells that is directly adjacent to the zona pellucida is called the corona radiata.

e. Theca interna forms from stromal cells that surround the original follicle cell layers.

3. Secondary follicles (also called an antral or vesicular follicle)

a. Consist of 8 - 12 layers of follicle cells surrounding the central oocyte

b. Major characteristic is that fluid-filled spaces have formed between some of the layers of follicle cells.

* These spaces will enlarge and fuse with each other to form the antrum of the mature follicle.

c. Theca folliculi is identifiable

* Consists of two major stratified layers of cells that are derived from the stromal cells

* These layers are the theca interna and theca externa

4. Graafian follicle

a. Has a well developed antrum filled with a fluid called liquor folliculi (or follicular liquor).

b. Oocyte located within a hillock of multiple layers of follicle cells that projects into the antral cavity - called the cumulus oophorus.

c. The follicle cells directly adjacent to oocyte form the corona radiata that will remain associated with oocyte after ovulation.

Oocytogenesis:

The succeeding phase of ootidogenesis occurs when the primary oocyte develops into an oocyte. This is achieved by the process of meiosis. In fact, a primary oocyte is, by its biological definition, a cell whose primary function is to divide by the process of meiosis

However, although this process begins at prenatal age, it stops at prophase I. In late fetal life, all oocytes, still primary oocytes, have halted at this stage of development, called the dictyate. After menarche, these cells then continue to develop, although only a few do so every menstrual cycle.

Meiosis I[

Meiosis I of oocytogenesis begins during embryonic development, but halts in the diplotene stage of prophase I until puberty. The mouse oocyte in the dictyate (prolonged diplotene) stage actively repairs DNA damage, whereas DNA repair is not detectable in the pre-dictyate (leptotene, zygotene and pachytene) stages of meiosis.[11] For those primary oocytes that continue to develop in each menstrual cycle, however, synapsis occurs and tetrads form, enabling chromosomal crossoverto occur. As a result of meiosis I, the primary oocyte has now developed into the secondary oocyte and the first polar body.

Meiosis II

Immediately after meiosis I, the haploid secondary oocyte initiates meiosis II. However, this process is also halted at the metaphase II stage until fertilization, if such should ever occur. When meiosis II has completed, an ootid and another polar body have now been created.