Ovary

The ovaries, one on either side of the uterus, descend to the brim of the superior portion of the pelvic cavity during the third month of development. A series of ligaments holds them in position. The **broad ligament** of the uterus attaches to the ovaries by a double-layered fold of peritoneum called the **mesovarium.** The **ovarian ligament** anchors the ovaries to the uterus, and the **suspensory ligament** attaches them to the pelvic wall. Each ovary contains a **hilum,** the point of entrance and exit for blood vessels and nerves along which the mesovarium is attached. The ovary has two distinct functions: germ cell production and steroid hormone biosynthesis. Germ cell support occurs in microscopic structures known as ovarian follicles. Resting follicles each contain a primitive or **primordial oocyte** surrounded by a single layer of cells, the **granulosa cells**. Surrounding the granulosa cells are a collar of cells known as **theca cells**. Theca cells produce androgens that are then converted to estrogens by the granulosa cells. Steroid hormones produced by the ovary act within the follicle to support the developing oocyte and outside the ovary on target tissues. The human ovary contains about 2 million oocytes at birth but only 100 000 at puberty. The number of oocytes continues to decrease throughout a woman's reproductive lifespan. This decrease occurs because mitosis of the primitive oogonia stops midway through fetal life and does not resume. At the time mitosis stops, the newly formed oocytes enter into the prophase of the first meiotic division. They will remain in meiotic prophase until either they are stimulated to mature for ovulation or they degenerate in a process called **atresia**.

The primordial follicles are scattered just beneath the connective tissue capsule covering the ovary. This superficial position permits ovulation into the abdominal cavity. The earliest signs of follicular growth are: (i) an increase in size of the oocyte; (ii) a change in the shape of the surrounding granulosa cells from flat to cuboidal; (iii) an increase in granulosa cell number; and (iv) the appearance of a **zona pellucida** around the oocyte.

The zona pellucida is a sphere of gelatinous protein matrix immediately surrounding the oocyte. Once growth of the granulosa cells has produced three to four layers of cells, fluid begins to accumulate between the cells. This fluid resembles blood plasma and contains high concentrations of several protein and steroid hormones. When this follicular fluid accumulates around the oocyte, the follicle is known as a **Graafian follicle** and is approaching ovulation. Although as many as 20 follicles begin to mature in each wave of recruitment, typically only one successfully ovulates.

The **ovaries** (= egg receptacles), which are the female gonads, are paired glands that resemble unshelled almonds in size and shape; they are homologous to the testes. The ovaries produce

(1) Gametes, secondary oocytes that develop into mature ova (eggs) after fertilization, and
(2) Hormones, including progesterone and estrogens (the female sex hormones), inhibin, and relaxin.

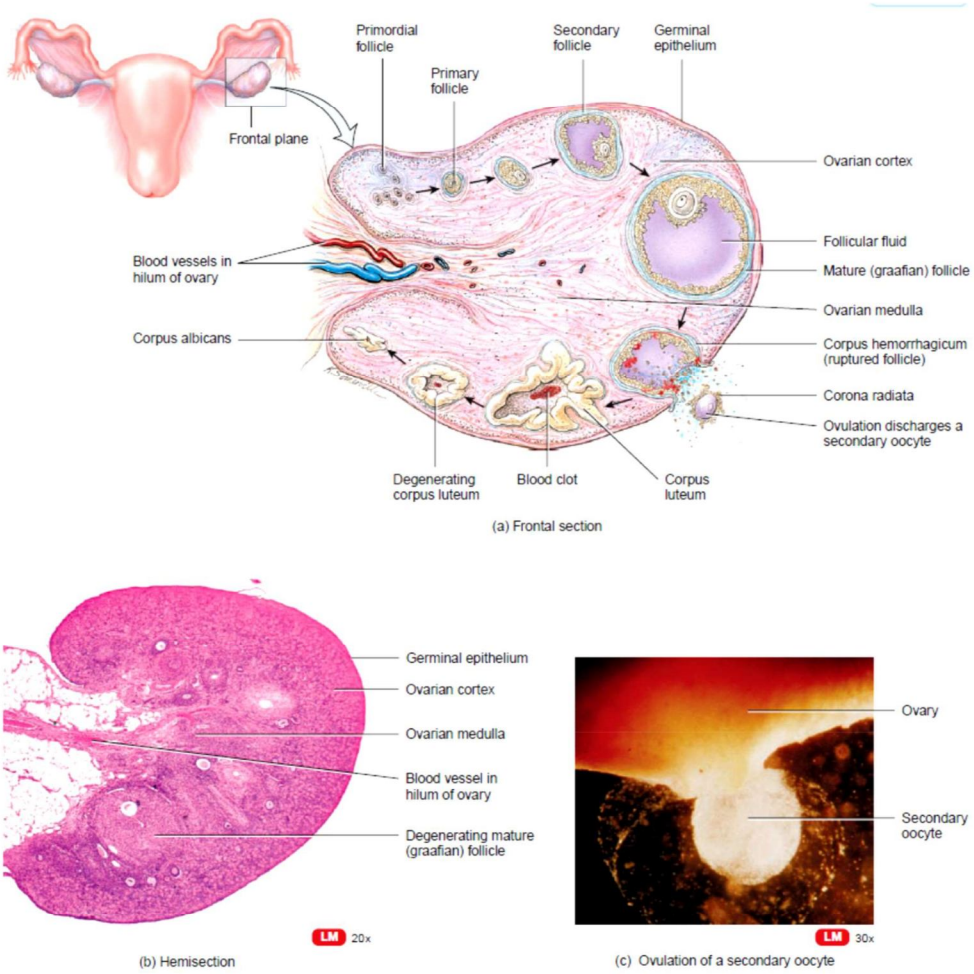
Histology of the Ovary

Each ovary consists of the following parts:

• The **germinal epithelium** (*germen* = sprout or bud) is a layer of simple epithelium (low cuboidal or squamous) that covers the surface of the ovary. that the cells that produce ova arise from the yolk sac and migrate to the ovaries during embryonic development.

• The **tunica albuginea** is a whitish capsule of dense irregular connective tissue located immediately deep to the germinal epithelium.

• The **ovarian cortex** is a region just deep to the tunica albuginea. It consists of ovarian follicles (described shortly) surrounded by dense irregular connective tissue that contains collagen fibers and fibroblast-like cells called *stromal cells.*



• The **ovarian medulla** is deep to the ovarian cortex. The border between the cortex and medulla is indistinct, but the medulla consists of more loosely arranged connective tissue and contains blood vessels, lymphatic vessels, and nerves.

• **Ovarian follicles** (*folliculus* _ little bag) are in the cortex and consist of **oocytes** in various stages of development, plus the cells surrounding them. When the surrounding cells form a single layer, they are called **follicular cells;** later in development, when they form several layers, they are referred to as **granulosa cells.** The surrounding cells nourish the developing oocyte and begin to secrete estrogens as the follicle grows larger.

• A **mature (graafian) follicle** is a large, fluid-filled follicle that is ready to rupture and expel its secondary oocyte, a process known as **ovulation.**

• A **corpus luteum** (yellow body) contains the remnants of a mature follicle after ovulation. The corpus luteum produces progesterone, estrogens, relaxin, and inhibin until it degenerates into fibrous scar tissue called the **corpus albicans** (white body).