

HISTOLOGY & PHYSIOLOGY OF OVARY

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The ovaries are the female gonads. Paired ovals, they are each about 2 to 3 cm in length, about the size of an almond. The ovaries are located within the pelvic cavity, and are supported by the mesovarium, an extension of the peritoneum that connects the ovaries to the broad ligament. Extending from the mesovarium itself is the suspensory ligament that contains the ovarian blood and lymph vessels. Finally, the ovary itself is attached to the uterus via the ovarian ligament.

The ovary comprises an outer covering of cuboidal epithelium called the ovarian surface epithelium that is superficial to a dense connective tissue covering called the tunica albuginea. Beneath the tunica albuginea is the cortex, or outer portion, of the organ. The cortex is composed of a tissue framework called the ovarian stroma that forms the bulk of the adult ovary. Oocytes develop within the outer layer of this stroma, each surrounded by supporting cells. This grouping of an oocyte and its supporting cells is called a follicle. The growth and development of ovarian follicles will be described shortly. Beneath the cortex lies the inner ovarian medulla, the site of blood vessels, lymph vessels, and the nerves of the ovary.

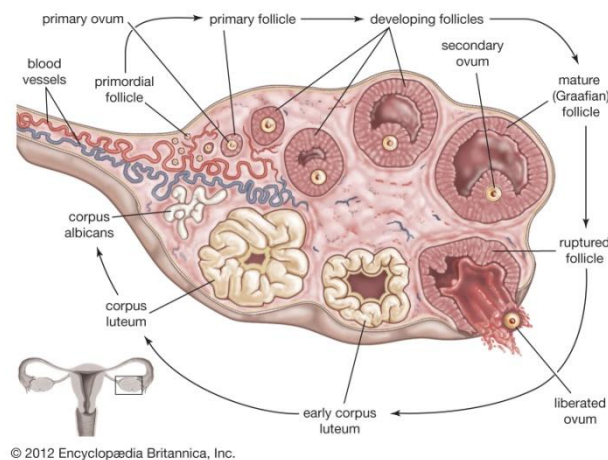


Fig : T.S OVARY OF MAMMAL

Structure

Outer Tunica Albuginea

- Connective tissue layer covering the ovarian cortex.
- Overlying this structure is a single layered Germinal epithelium.

Ovarian Cortex

- Contains:
 - Follicles in various stages of development
 - Corpus Luteum (includes Corpus Haemorrhagicum and Corpus Albicans)

Ovarian Medulla

- The Medulla is made up of dense connective tissue. This is where all of the lymphatics, nerves and vasculature of the Ovary are found.
- The structure of the ovary is reversed.
- The cortex is in the centre, follicles develop here.
- This layer is enclosed by a dense, richly vascularised connective tissue layer which is analagous to the medulla of other domestic mammals.
- The cortex reaches the surface of the ovary at the ovulation fossa, a deep indentation at the free margin. This is where mature follicles rupture in ovulation, as opposed to at various points on the surface in other domestic mammals.
- Follicles can be identified by transrectal palpation, but Corpora Lutea cannot. Identification of Corpora Lutea requires ultrasonography.

Histology

Stroma

- The body of the ovary (ovarian stroma) consists of:
 - spindle-shaped cells
 - fine collagen fibres
 - ground substance

- Stromal cells resemble fibroblasts, but some contain lipid droplets.
- Bundles of smooth muscle cells are scattered throughout the stroma.

Cortex

- Follicles containing oocytes in various stages of development.
- Atretic Follicles
- Corpora lutea
- Corpora albicans
- The superficial cortex is more fibrotic than the deep, and is called the tunica albuginea.
- On the surface of the ovary is the germinal epithelium. This is a continuation of the peritoneum.

Medulla

- Highly vascular
- Contains hilus cells, which are similar to the Leydig cells of the testes.

Physiology and Function

The ovaries are the site of egg cell production and also have specific endocrine function.

Oogenesis

Gametogenesis in females is called oogenesis. The process begins with the ovarian stem cells, or oogonia. Oogonia are formed during fetal development, and divide via mitosis, much like spermatogonia in the testis. The ovaries are the site of gamete (egg cell, oocyte) production. The developing egg cell (or oocyte) grows within the environment provided by ovarian follicles. Follicles are composed of different types and number of cells according to their maturation stage, which can be determined by their size. When oocyte maturation is completed, a luteinizing hormone (LH) surge secreted by the pituitary gland stimulates follicle rupture and oocyte release.

This oocyte development and release process is referred to as ovulation. The follicle remains functional and transforms into a corpus luteum, which secretes progesterone to prepare the uterus for possible embryo implantation. Usually each ovary takes turns releasing eggs each month. However, this alternating egg release is random. When one ovary is absent or dysfunctional, the other ovary will continue to release eggs each month.

Folliculogenesis

Again, ovarian follicles are oocytes and their supporting cells. They grow and develop in a process called folliculogenesis, which typically leads to ovulation of one follicle approximately every 28 days, along with death to multiple other follicles. The death of ovarian follicles is called atresia, and can occur at any point during follicular development. Recall that, a female infant at birth will have one to two million oocytes within her ovarian follicles, and that this number declines throughout life until menopause, when no follicles remain. As you'll see next, follicles progress from primordial, to primary, to secondary and tertiary stages prior to ovulation—with the oocyte inside the follicle remaining as a primary oocyte until right before ovulation.

Folliculogenesis begins with follicles in a resting state. These small primordial follicles are present in newborn females and are the prevailing follicle type in the adult ovary. Primordial follicles have only a single flat layer of support cells, called granulosa cells, that surround the oocyte, and they can stay in this resting state for years—some until right before menopause.

After puberty, a few primordial follicles will respond to a recruitment signal each day, and will join a pool of immature growing follicles called primary follicles. Primary follicles start with a single layer of granulosa cells, but the granulosa cells then become active and transition from a flat or squamous shape to a rounded, cuboidal shape as they increase in size and proliferate. As the granulosa cells divide, the follicles—now called secondary follicles—increase in diameter, adding a new outer layer of connective tissue, blood vessels, and theca cells—cells that work with the granulosa cells to produce estrogens.

Endocrine Function

Ovaries secrete estrogen, progesterone, and testosterone. Estrogen is responsible for the secondary sex characteristics of females at puberty. It is also crucial for the maturation and maintenance of the mature and functional reproductive organs. Progesterone prepares the uterus for pregnancy and the mammary glands for lactation. The co-actions of progesterone and estrogen promote menstrual cycle changes in the endometrium. In women, testosterone is important for the development of muscle mass, muscle and bone strength, and for optimal energy level. It also has a role in libido in women.