

The Ovaries

- The ovaries have two functions - "production" and ovulation of oocytes and the production and secretion of hormones.
- The ovary is attached to the broad ligament by a short fold of peritoneum, called the mesovarium (or ligament of the ovary), through which vessels and nerves pass to the ovary and enter it at the hilus of the ovary.
- The surface of the ovary is covered by a single layer of cuboidal epithelium germinal epithelium. It is continuous with the peritoneal mesothelium.
- Fibrous connective tissue forms a thin capsule, the tunica albuginea, immediately beneath the epithelium.
- The ovary is divided into an outer cortex and an inner medulla.
- The cortex consists of a very cellular connective tissue stroma in which the ovarian follicles are embedded.
- The medulla is composed of loose connective tissue, which contains blood vessels and nerves.

Ovarian Follicles- Ovarian follicles consist of one oocyte and surrounding follicular cells. Follicular development can be divided into a number of stages.

Primordial follicles: these are located in the cortex just beneath tunica albuginea. One layer of flattened follicular cells surround the oocyte (about 30 μm in diameter). The nucleus of the oocyte is positioned eccentric in the cell. It contains a prominent nucleolus. Most organelles of the oocyte aggregate in the centre of the cell, where they form the vitelline body .

Primary follicle: It is the first morphological stage that marks the onset of follicular maturation . The previously flattened cell surrounding the oocyte now form a cuboidal or columnar epithelium surrounding the oocyte. Their cytoplasm may have a granular appearance, and they are for this reason also called granulosa cells. The continued proliferation of these cells will result in the formation of a stratified epithelium surrounding the oocyte.

Secondary follicle: Small fluid-filled spaces become visible between the granulosa cells as the follicle reaches a diameter of about 400 μm . These spaces enlarge and fuse to form the follicular antrum, which is the defining feature of the secondary follicle. The oocyte is now located eccentric in the follicle in the cumulus oophorus, where it is surrounded by granulosa cells. The theca folliculi differentiates with the continued growth of the follicle into a theca interna and a theca externa. Vascularization of the theca interna improves, and the spindle-shaped or polyhedral cells in this layer start to produce oestrogens. The theca externa retains the characteristics of a highly cellular connective tissue with smooth muscle cells. The oocyte of the secondary follicle reaches a diameter of about 125 μm . The follicle itself reaches a diameter of about 10-15 mm.

Graafian follicle: increases further in size (in particular in the last 12h before ovulation). The Graafian follicle forms a small "bump" on the surface of the ovary, the stigma (or macula pellucida). The stigma is characterised by a thinning of the capsule and a progressive restriction of the blood flow to it. Prior to ovulation the cumulus oophorus separates from the follicular wall. The oocyte is now floating freely in the follicular antrum. It is still surrounded by granulosa cells which form the corona radiata. The follicle finally ruptures at the stigma and the oocyte is released from the ovary.

Atresia: Atresia is the name for the degenerative process by which oocytes (and follicles) perish without having been expelled by ovulation. Only about 400 oocytes ovulate - about 99.9 % of the oocytes that were present at the time of puberty undergo atresia. Atresia may affect oocytes at all stages of their "life" - both prenatally and postnatally. By the sixth month of gestation about 7 million oocytes and oogonia are present in the ovaries. By the time of birth this number is reduced to about 2 million. Of these only about 400,000 survive until puberty.

Atresia is also the mode of destruction of follicles whose maturation is initiated during the cycle (10-15) but which do not ovulate. Atresia is operating before puberty to remove follicles which begin to mature during this period (none of which are ovulated). Given that atresia affects follicles at various stages of their development it is obvious that the process may take on quite a variety of histological appearances.

The Corpus luteum: The corpus luteum is formed by both granulosa cells and thecal cells after ovulation has occurred. The wall of the follicle collapses into a folded structure, which is characteristic for the corpus luteum. Vascularization increases and a connective tissue network is formed. Theca interna cells and granulosa cells triple in size and start accumulating lutein within a few hours after ovulation. They are now called granulosa lutein cells and theca lutein cells and produce progesterone and oestrogens.

Hormone secretion in the corpus luteum ceases within 14 days after ovulation if the oocyte is not fertilised. In this case, the corpus luteum degenerates into a corpus albicans - whitish scar tissue within the ovaries. Hormone secretion continues for 2-3 months after ovulation if fertilisation occurs.

