OOGENESIS

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Formation of mature ovum from oogonia is called oogenesis.

PRE-NATAL DEVELOPMENT

Oogenesis begins in fetal life.

PRIMORDIAL GERM CELLS

Primordial germ cells (2n) appear in yolksac in 4th week of fetal life. These primordial germ cells proliferate by mitosis and migrate towards gonads.

OOGONIA

Primordial germ cells produce oogonia by mitosis. Oogonia (2n) are surrounded by flat epithelial cells. Mitosis takes place in oogonia and their number increases. The oogonia enlarge and become surrounded by flat epithelial cells (follicular cells) and are converted into primary oocyte (2n). The primary oocyte will then begin the process of meiosis. DNA replication takes place in primary oocyte.

DIPLOTENE STAGE

During the prophase of meiosis 1 there is a special stage called Diplotene stage. When primary oocyte enters into this stage they arrest their further progression in prophase 1.

DEGENERATION OF PRIMARY OOCYTES

Before birth a lot of oogonia and primary oocytes degenerate. At about 5th month of fetal life, their number is about 7 million which is reduced to 2 million after birth and around 40,000 at puberty.

PRIMORDIAL FOLLICLES

Primordial follicles then surround primary oocyte. (not to confuse primordial follicle with primordial germ cells)

POST NATAL DEVELOPMENT

Upto puberty primary oocyte remains arrested in prophase and most of them degenerate. At puberty, female has about 40,000 primordial follicles along with oocyte.

PRIMARY FOLLICLE

Every month about 5-15 primordial follicles start growing. The follicle cell around the primary ovum become cuboidal and multi-layered. This stage is called primary follicle.

ZONA PELLUCIDA

When primary follicle is being developed, oocyte secrete some glycoproteins outside and the follicular cells secrete some glycoprotein inward so between the oocyte and follicular cells a special glycoprotein layer forms called zona pellucida.

ANTRUM

With further development, follicular cells will proliferate and enlarge, fluid-filled spaces will appear in between follicular cells and they will fuse with each other to form a fluid-filled cavity called antrum.

CUMULUS OOPHORUS

Some follicular cells remain around ovum and zona pellucida called cumulus oophorus.

THECA FOLLICULI

The connective tissue, derived from ovarian stroma start thickening and make a special covering around the growing follicle called theca folliculi. Theca interna is found towards the interior while theca externa towards the exterior.

SECONDARY FOLLICLE

The grown follicle, which has developed a central cavity is now called secondary follicle. Inside the secondary follicle, the primary oocyte is still arrested in diplotene stage.

SECONDARY OOCYTE

The primary oocyte will now complete its first meiotic division and form two daughter cells. One daughter cell will form secondary oocyte (n) while the other will become the first polar body.

GRAAFIAN FOLLICLE

The fully mature secondary follicle is now called graafian follicle. 14 days before next menstrual period, this graafian follicle is ready for ovulation.

OVULATION

Before ovulation, LH concentration increase. Just 3 hours before ovulation, secondary oocyte arrests itself at metaphase 2. Later, the ovum along with some surrounding cumulus oophorus cells ovulate out and are taken up by fallopian tube.

CORONA RADIATA

The cells of cumulus oophorus re-arrange themselves around secondary oocyte and are called corona radiate.

CORPUS LUTEUM

The remaining ruptured follicle converts into yellow colored mass called corpus luteum which produce progesterone.

POST OVULATION PROCESSES

The ovum stays in fallopian tube for 24 to 48 hours. If sperm doesnot come, the ovum will die.

When sperm reaches fallopian tube, the mere touch of the sperm with secondary oocyte cause the oocyte to become active and rapidly complete its second meiotic division and produce a definitive or mature ovum along with a polar body. The first polar body also produce two other polar bodies.

From the sperm, male pro-nucleus enter into the ovum and fuses with the female pro-nucleus to form a zygote.

At the time of fertilization 3 events take place:

1. Second meiotic division completes and secondary ovum is converted into mature ovum
2. Sex of zygote is determined by the sperm and hence genetic sex is determined at zygote stage
3. Sperm activates the metabolic machinery of ovum so that it can form a fully functional zygote.