

# Embryology

## Foundation block

### Objectives:

- ☑ Describe female cycles
- ☑ Define Gametogenesis (male& female)
- ☑ Describe spermeogenesis
- ☑ Describe the processes of oogenesis and spermatogenesis.



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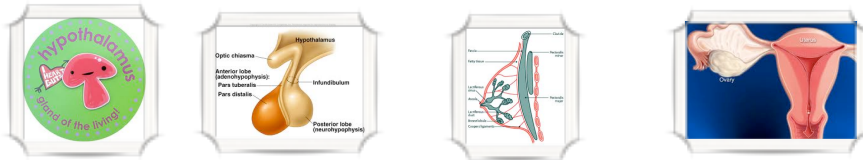
first lecture(September 8th)  
Gametogenesis and Female Cycle

# Female reproductive cycle:

\***Uterine** > in the **uterus**. **Ovarian** > in the **ovaries**. They occur **simultaneously!**

\*Depends on -in order for it to be normal- activity and coordination of:

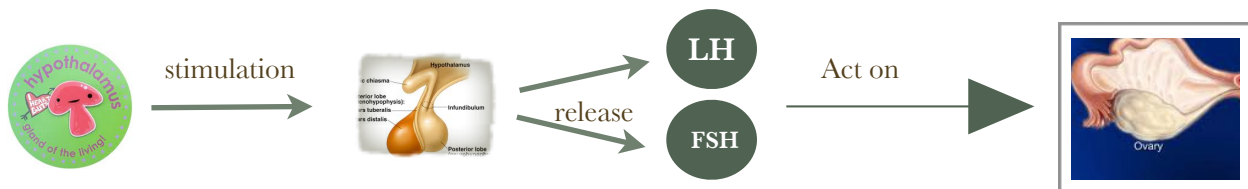
(hypothalamus, pituitary gland, mammary gland, ovaries, uterus and vagina)



\*Average days in cycle: ~28 days. Ranges from 23 to 35 days.

\*Order of business: **Gonadotropin-releasing hormone** (synthesized by **hypothalamus**)

» Stimulates **pituitary** to release (FSH&LH) » The two hormones act on ovaries.



## Ovarian cycle:

\*Under control of pituitary gland.

\*Ovaries are made of two parts. Outer cortex and inner medulla.

\*Ovarian cortex contains hundreds of thousands of primary follicles.

\*FSH starts working at puberty. The primary follicle grows throughout the follicular phase under the effect of FSH and the flat cells become cuboidal, columnar and then forming many layers around the oocyte.

\***Primary follicle**: A nucleus encircled with one layer of flat cells called follicular cells.

\*Functions of FSH: a) Stimulate follicles to mature. b) *indirectly*: Estrogen production by follicles.

\*Final maturation of follicle requires LH.

\***LH**: a) Ovulation trigger (rupture of ovum from follicle).

b) Stimulates follicular cells to produce progesterone.

\* Ovulation happens midcycle. Although FSH promotes growth of more than one primary follicle, **only one** primary follicle develops into a mature follicle and ruptures through the surface of the ovary. Expelling an oocyte.

### Phases:

1-Follicular (**Growth of follicles**, nucleus surrounded by membrane). Under control of (**FSH**). Full maturation requires (**LH**).

2-Ovulatory ( Release of **Ovum**).

3-Luteal (Corpus luteum forms from ruptured follicle).

**Corpus luteum:** The remaining of the ruptured follicle is called corpus luteum.

- It secretes **Progesterone** and *some* **Estrogen**.
- These 2 hormones stimulate endometrial glands to secrete and prepare endometrium for implantation of fertilized Ovum.

### 2 different scenarios:

- \* **If oocyte is fertilized** → the Corpus Luteum enlarges and remains till the 4th month of pregnancy.
- \* **If oocyte is not fertilized** → the corpus luteum involutes and degenerates in 10-12 days.

## Menstrual cycle:

\* Cyclic changes in the endometrium -lining of uterus-caused by **estrogen** and **progesterone**.

\*Day one is when menstrual flow begins.

**Phases:**

1-**Menstrual phase**(4-5days): Starts with day one. Functional layer of endometrium is sloughed off and discarded with flow.

2-**Proliferative phase**(9 days): Coincides with growth of primary follicle (follicular phase in *ovarian* cycle). Controlled by **estrogen**. Endometrium thickness is increased. Glands increase in number and spiral arteries elongate.

3-**Luteal phase**(13 days): Coincides with formation and growth of corpus luteum. Secretory or **progesterone** phase. Endometrium thickens under **progesterone** and **estrogen**. Spiral arteries grow into superficial layer and coil. Venous network develops.

**Direct arteriovenous network anastomoses.**

2-**Ischemic phase**(1 day): Degeneration of corpus luteum -in case ovum is not fertilized- causes drop in estrogen and progesterone levels. Endometrium shrinks. Rupture of damaged cell wall. Loss of 20-80 ml of blood. Entire compact layer and most of the spongy layer is discarded.

**Gametogenesis:**

\*Gametogenesis: formation of gametes (Haploid).

\*Importance of meiosis: a)Reduction to haploid b) Genetic variation.

\*Spermeogenesis: Metamorphosis (change in shape) of immature spermatids into mature sperms.

Gametogenesis	
Female	Male
Oogenesis	Spermatogenesis
Oogonia → primary oocyte → secondary oocyte → Ovum	Spermatogonium → Primary spermatocyte → Secondary spermatocyte → Spermatid → Sperm
One oogonium → One Ovum.	One spermatogonium → 4 sperms.

+ 2 polar bodies!!!

# Gametogenesis

## Female

\* Starts before birth.

\* In ovaries

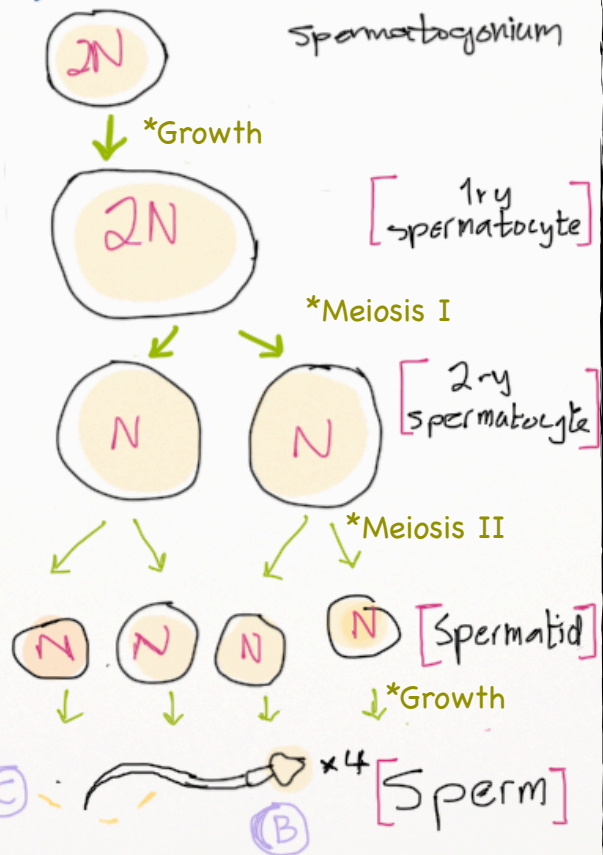


## Male

\* Puberty  $\rightarrow$  Old age.

\* Takes 2 mons.

\* In the seminiferous tubules in the testis:



(A) Polar bodies (1&2) degenerate. (B) Growth takes place in epididymis (C) Meiosis II degenerates if 2ry oocyte is not fertilized.

\* Spermeogenesis: 1) Nucleus  $\rightarrow$  Condenses.

2) Golgi apparatus  $\rightarrow$  Acrosome

3) Mitochondrion  $\rightarrow$  sheath

4) Centriole  $\rightarrow$  axial filament

