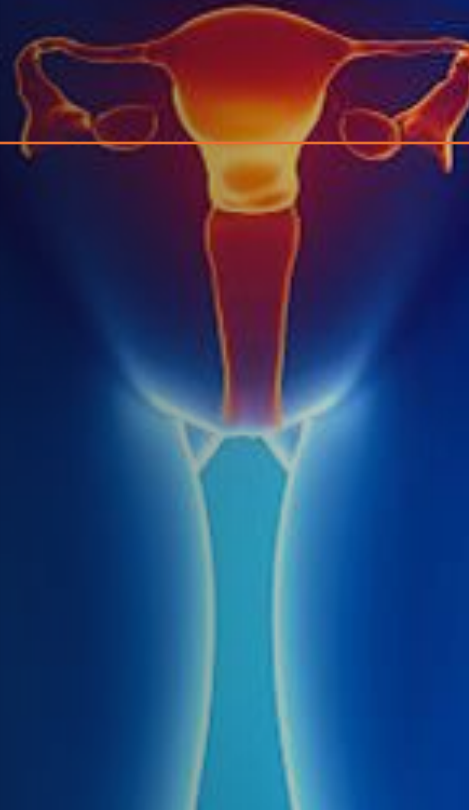


ANATOMY & PHYSIOLOGY II

**GHC 2013 / NMS 2012 /
OHC 3013 / PTAP 1123**

CHAPTER 5

REPRODUCTIVE SYSTEM - FEMALE



Topic Outlines

- 5.1 Introduction to Female Reproductive System
- 5.2 Female Reproductive Organs
 - 5.2.1 Ovary
 - 5.2.2 Fallopian Tube
 - 5.2.3 Uterus
 - 5.2.4 Vagina
 - 5.2.5 Vulva
 - 5.2.6 Mammary Glands
- 5.3 Oogenesis
- 5.4 Menstrual Cycle
- 5.5 Menopause
- 5.6 Secondary Sex Characteristics - Female

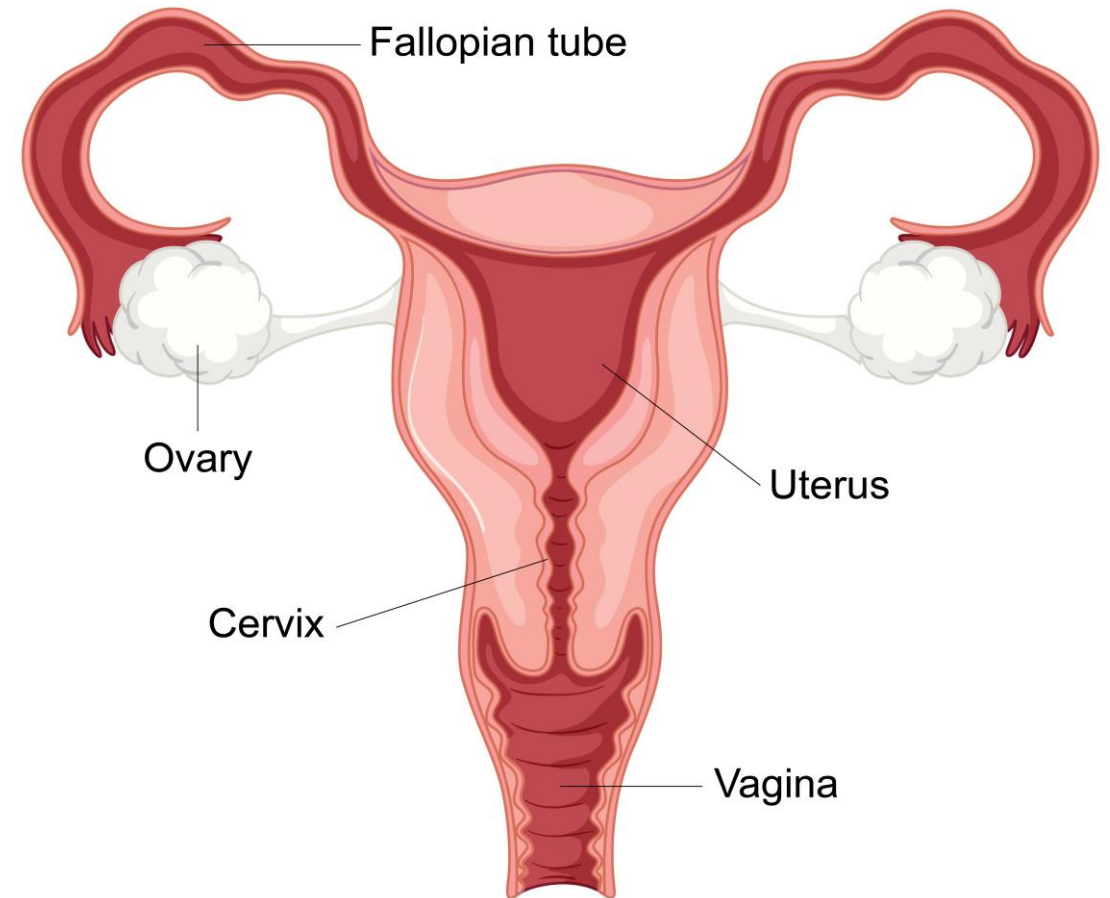
Learning Outcomes

At the end of this chapter, students should be able to:

- Identify the female reproductive organs
- Describe the functions for each of the organs
- Describe the oogenesis process and menstrual cycle

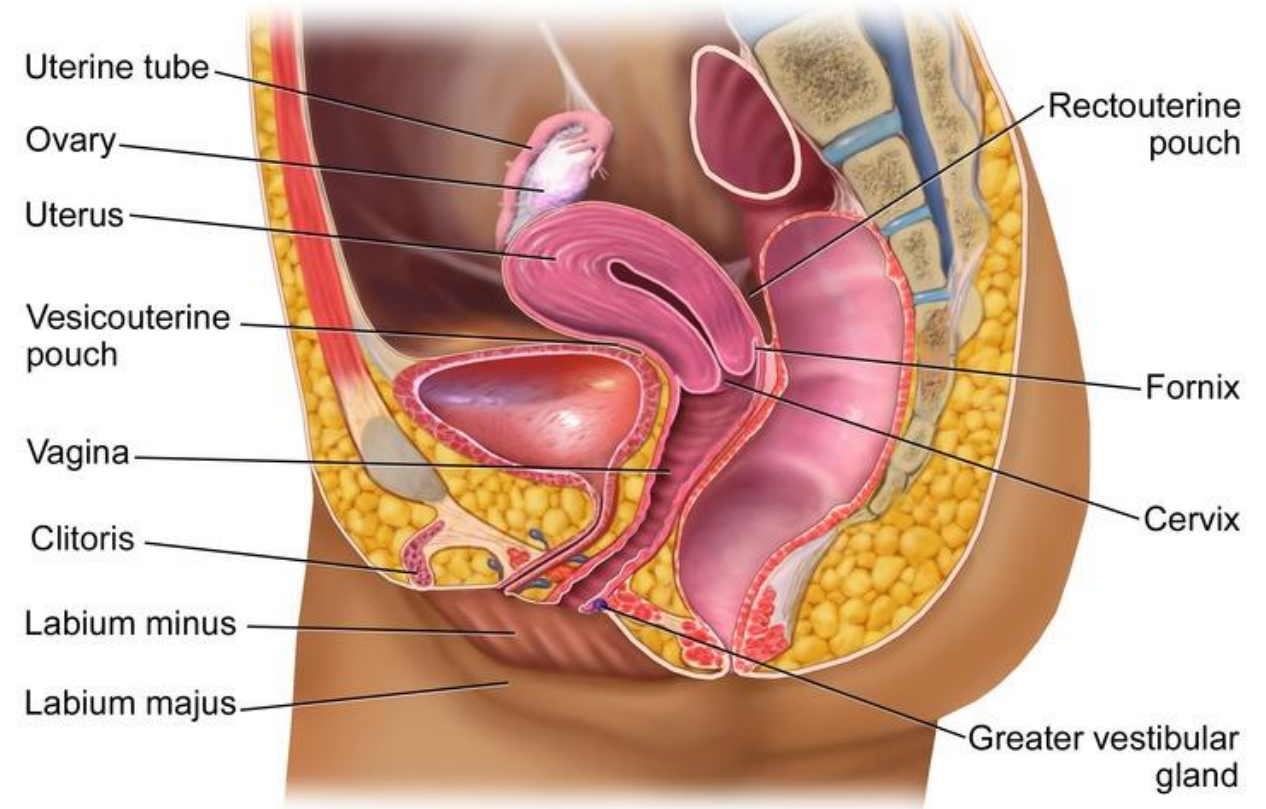
5.1 Introduction to Female Reproductive Organ

- Ovaries
 - primary female reproductive organs
 - make female gametes (ovum)
 - secrete female sex hormones (estrogen and progesterone)
- Accessory ducts
 - uterine tubes (fallopian tubes), uterus, vagina
- Internal genitalia
 - ovaries and internal ducts
- External genitalia
 - external sex organs



5.2 Female Reproductive Organs

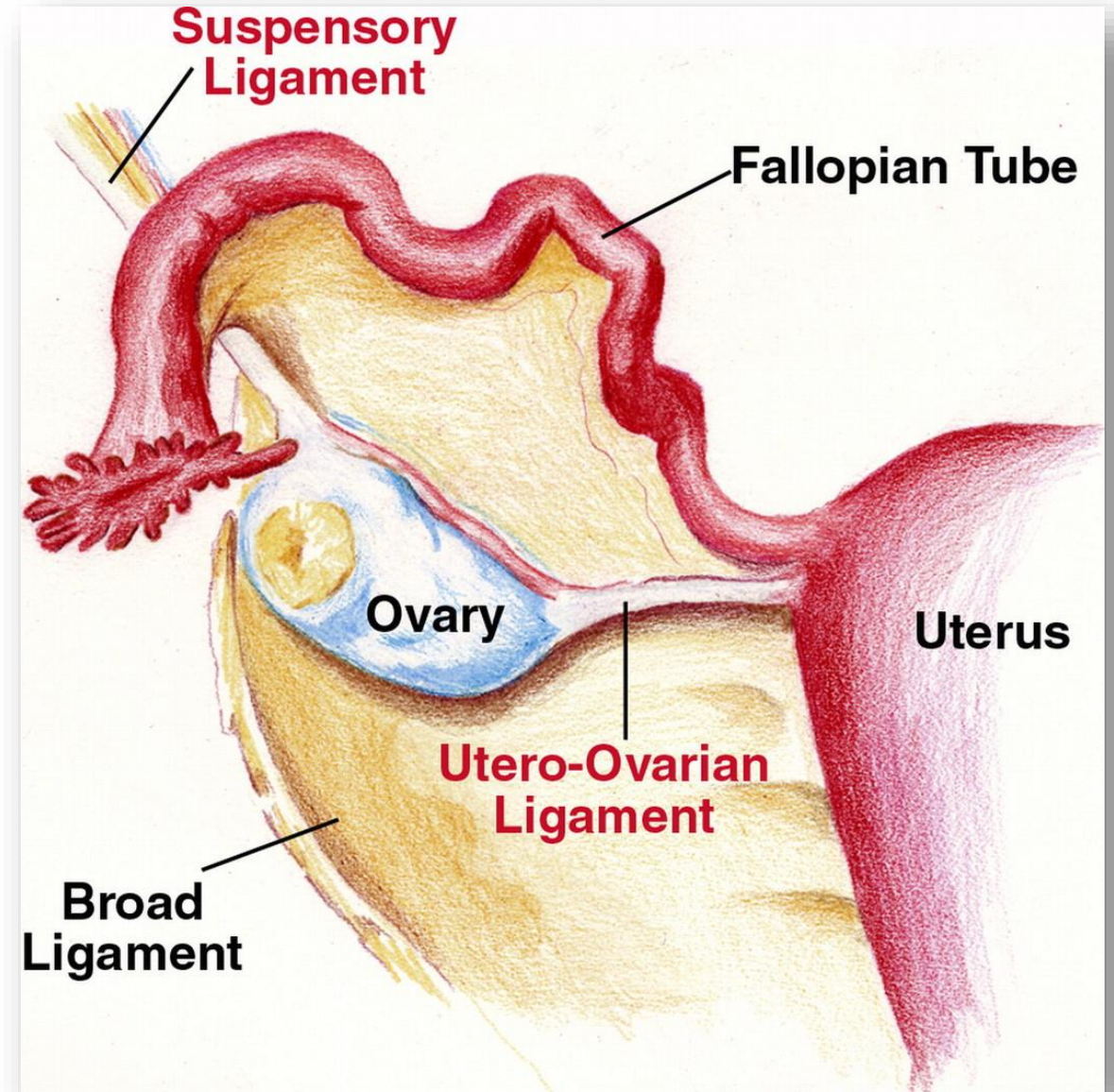
- Consist of:-
 - Ovary
 - Fallopian tubes (*uterine tubes*)
 - Uterus
 - Cervix
 - Vagina
 - Vulva
 - Mammary glands



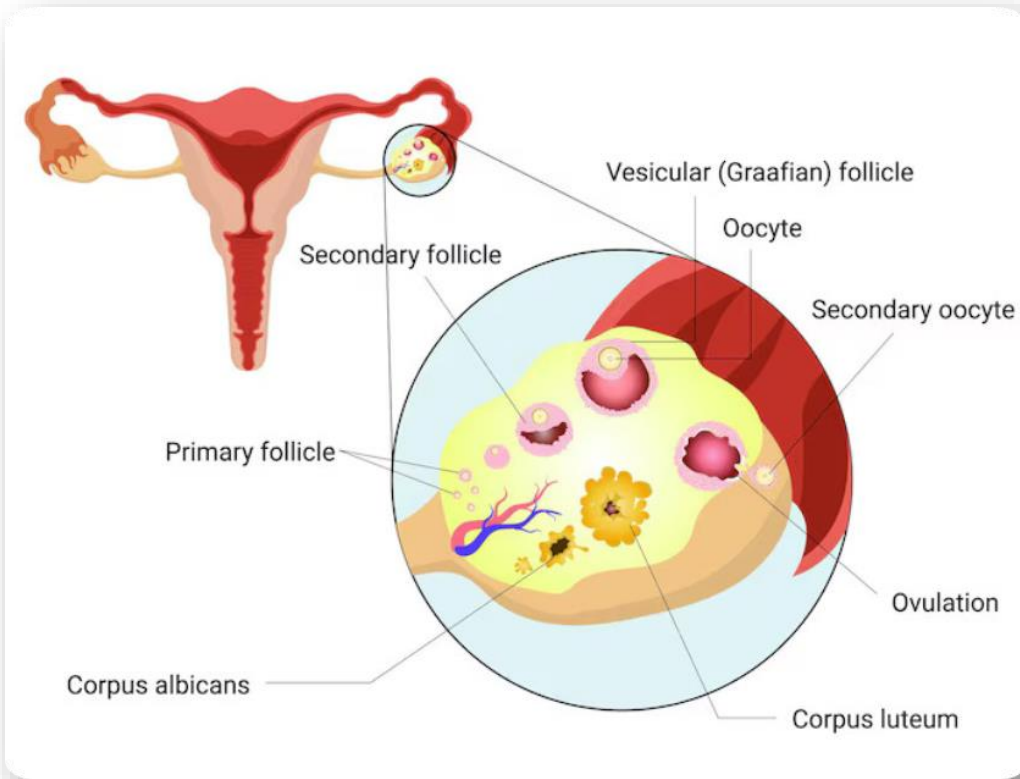
The Female Reproductive System

5.2.1 Ovary

- Paired
- Shape & size = almonds nut
- Three (3) ligaments that attach the ovaries :
 - [1] broad ligament
 - [2] ovarian ligament
 - [3] suspensory ligament
- Ovary functions :
 - produce female gamete (ovum)
 - produce hormones (progesterone & estrogens)

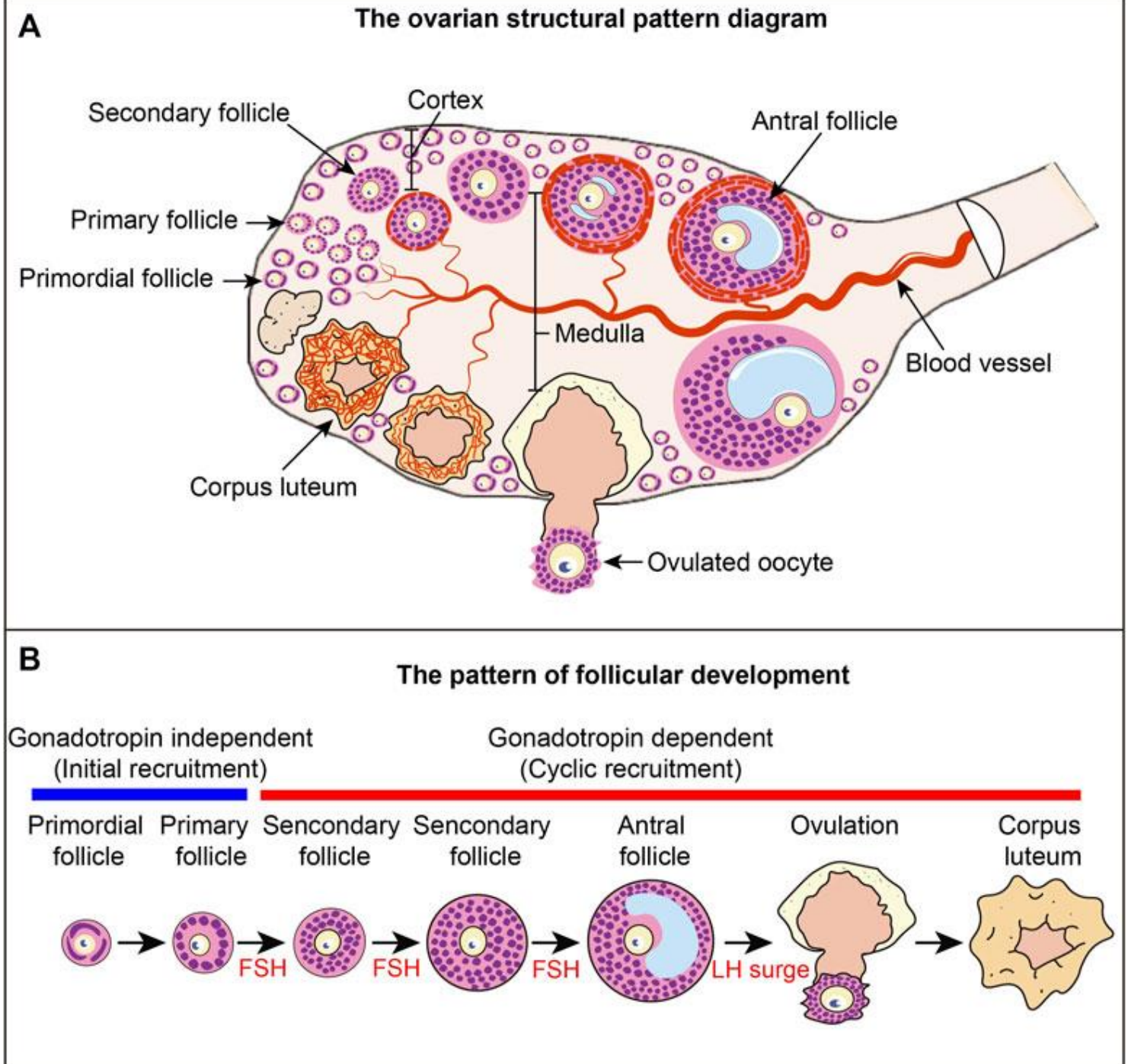


5.2.1 Ovary



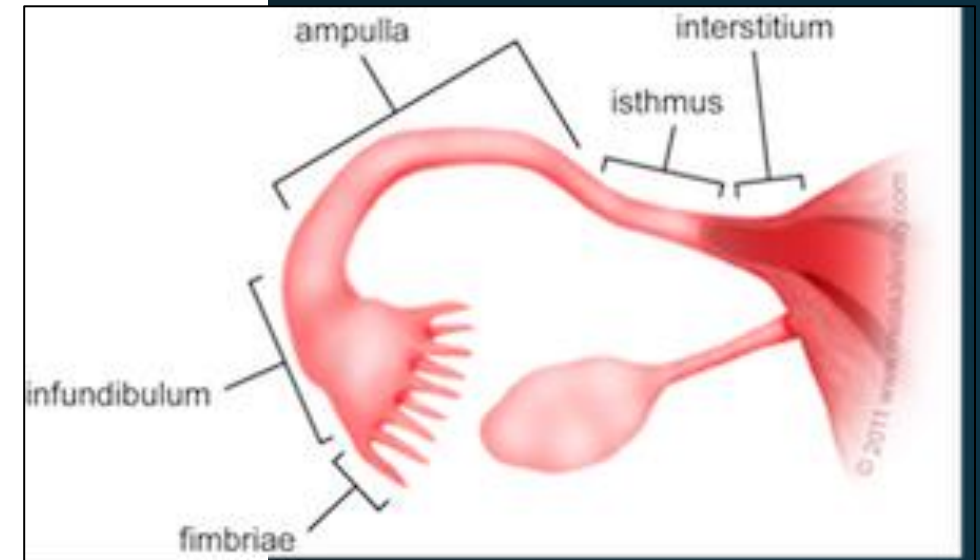
- Inside the ovary :
 - a) Blood vessel → ovarian arteries
→ ovarian branch of uterine artery
 - b) Embedded in ovary cortex = ovarian follicles
 - c) Each follicle = consists of an immature egg called an oocyte
 - d) Graafian follicle = secondary follicle at its most mature stage
= bulges from the surface of ovary
 - e) Ovulation = ejection of oocyte from ripening follicle
 - f) Corpus luteum = ruptured follicle after ovulation

5.2.1 Ovary

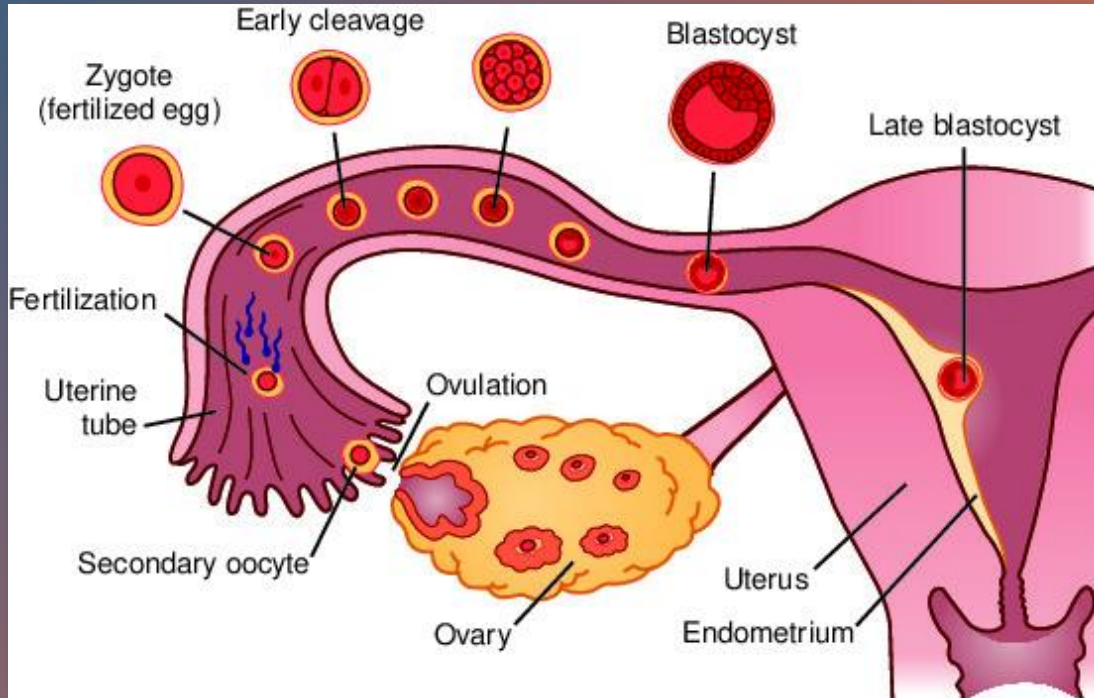


5.2.2 Fallopian Tube

- other name = Uterine tube
- 2 tubes extend laterally from the uterus
- Components :
 - *isthmus*
 - *ampulla*
 - *infundibulum*
 - *fimbriae* (end of tube, fingerlike)
- Functions :
 - = transport a secondary oocyte (ovum) to uterus
 - = sites where fertilization occurs



5.2.2.1 Fertilization



- Definition of fertilization :

→ **Sperm (n) & ovum (n) merge and forming a single diploid (2n) zygote**

- How fertilization occur?

→ **sperm + ovum**

- Fertilization occur in **fallopian tube**

- Fertilization commonly occur in about **12 – 24 hour after ovulation**

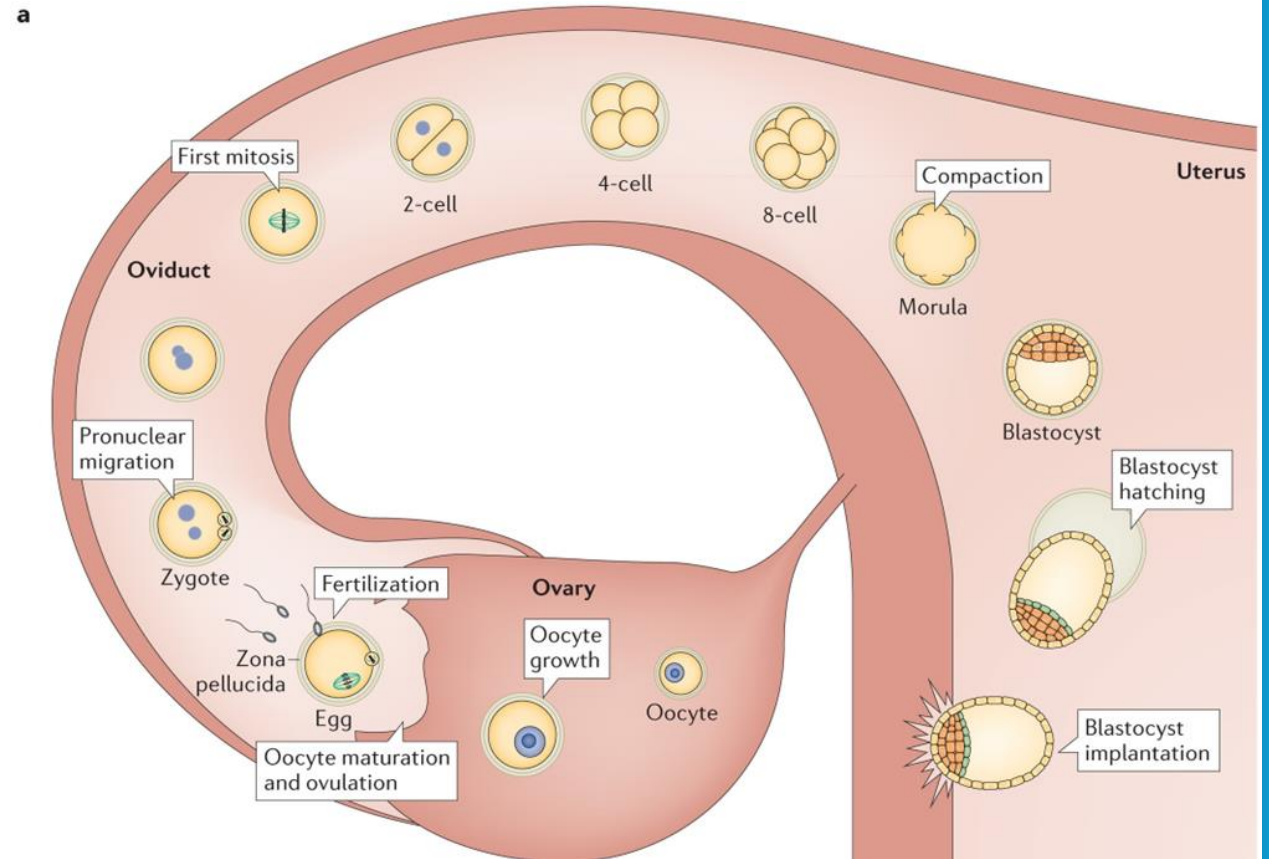
- Why that specific time?

→ **Sperms can stay inside vagina for 48 hour**

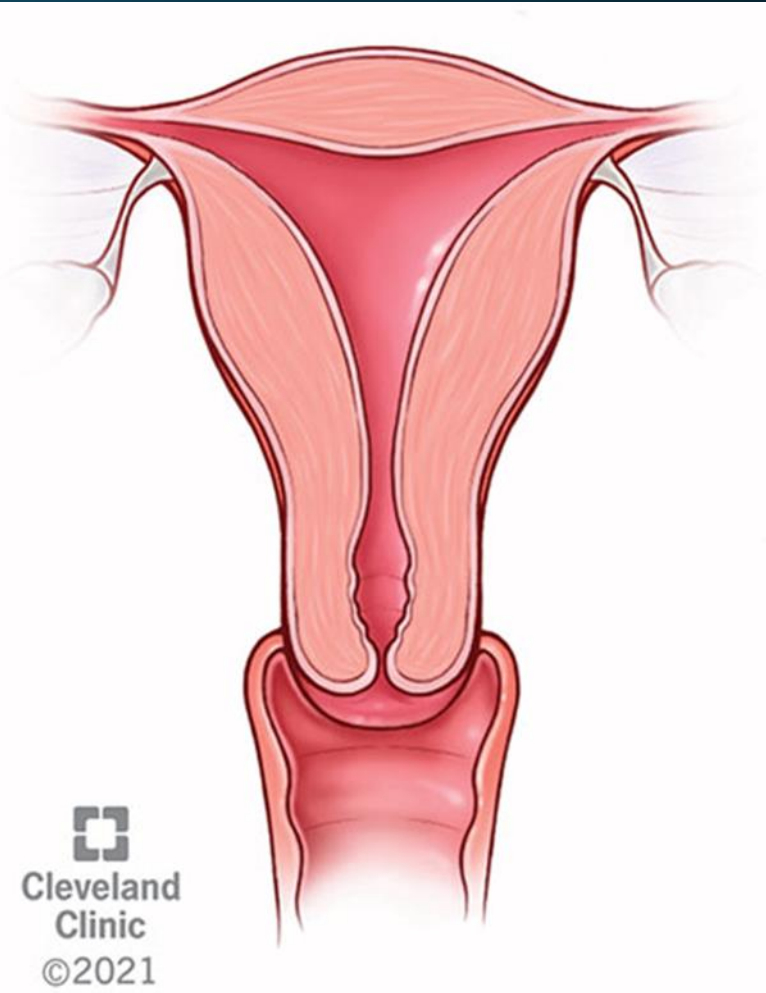
→ **Ovum is viable for 24 hour after ovulation**

5.2.2.2 Pathway of Fertilized Zygote

- **36 hours** after fertilized
 - zygote become 2 cells (mitosis)
 - name = **Cleavage**
- **48 hours** after fertilized
 - Cleavage become 4 cells
 - name = **2nd Cleavage**
- **96 hours** after fertilized
 - 16 cells
 - name = **Morula**
- **Day 5** after fertilized
 - number of cell increase
 - name = **Blastocyst**



5.2.3 Uterus

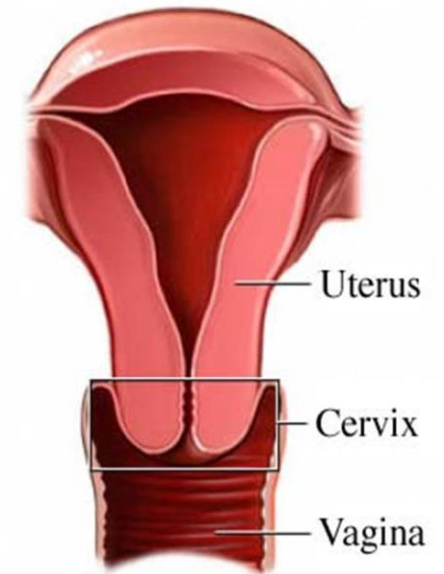
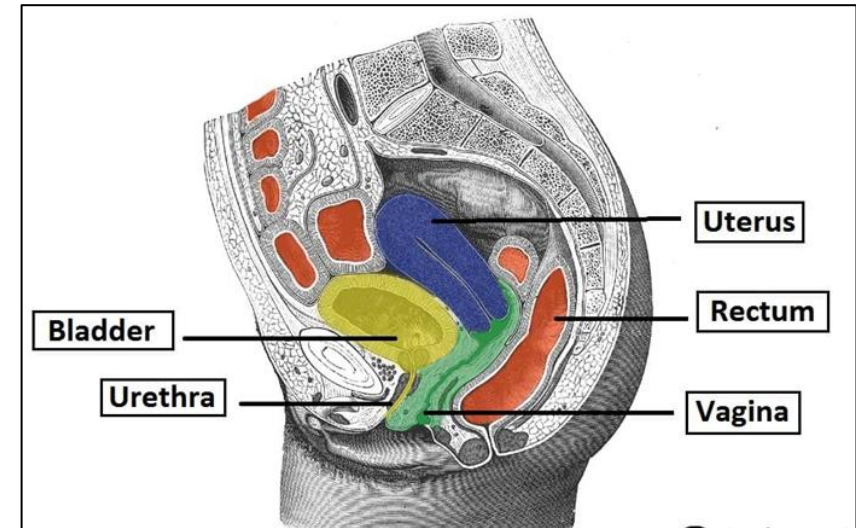
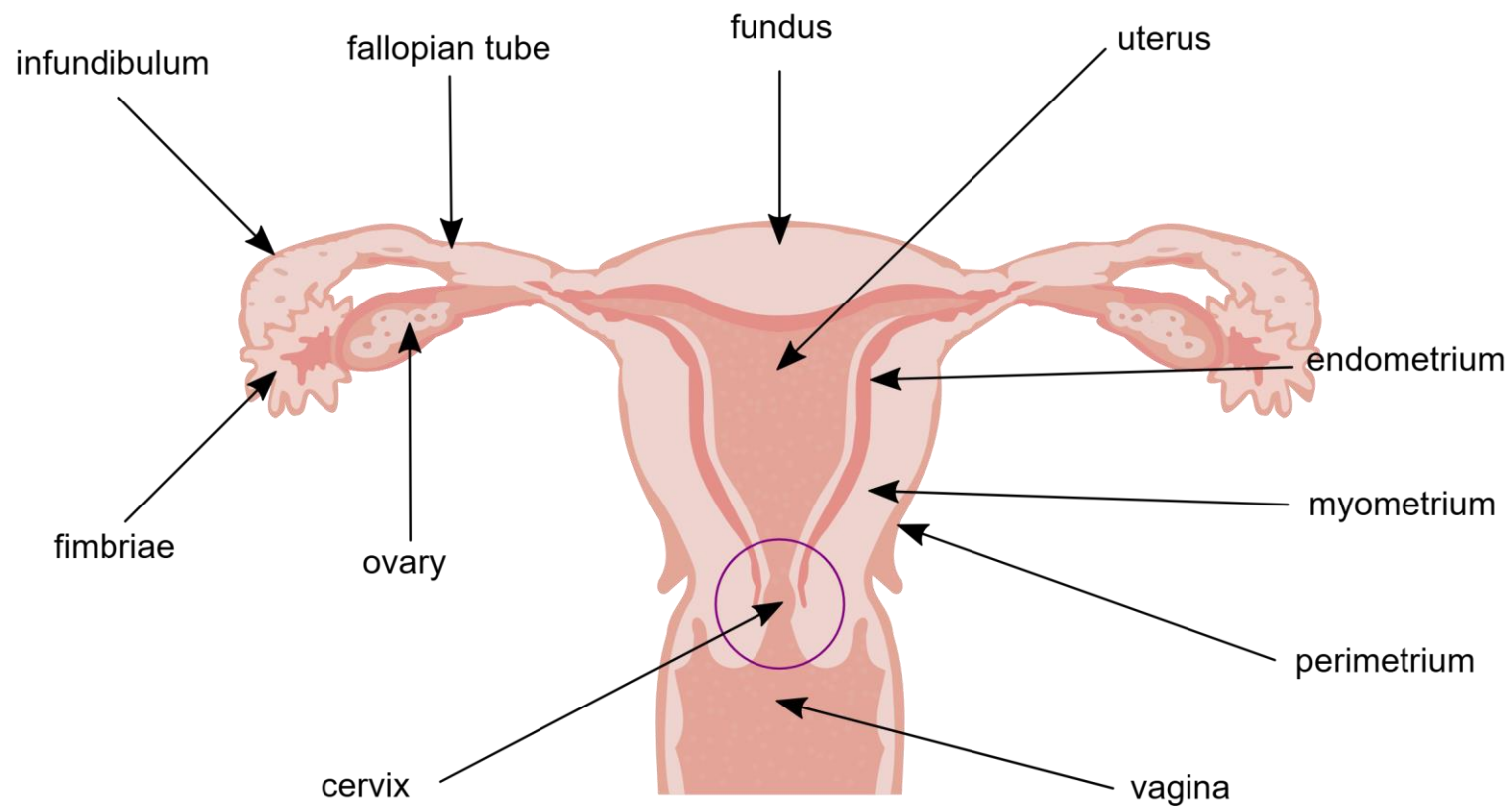


- Also known as womb
- A hollow, thick – walled organ
- Location = **located in pelvis; anterior to rectum & posterosuperior to bladder**
- Size & shape = Pear (inverted)
- Components :
 - a) **Fundus** ----- rounded superior portion to the entrance of fallopian tube
 - b) **Body** ----- major portion of uterus
 - c) **Cervix** ----- inferior portion that project into vagina inferiorly

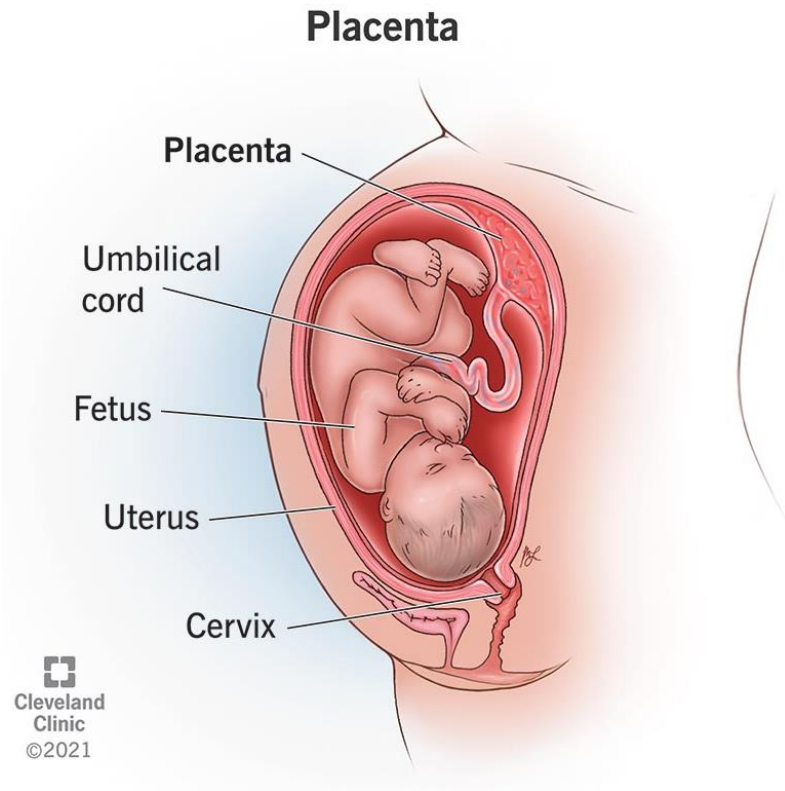
Three layers of uterus wall are :

- Perimetrium (outer layer)
- Myometrium (middle layer / muscle)
- **Endometrium** (inner layer)

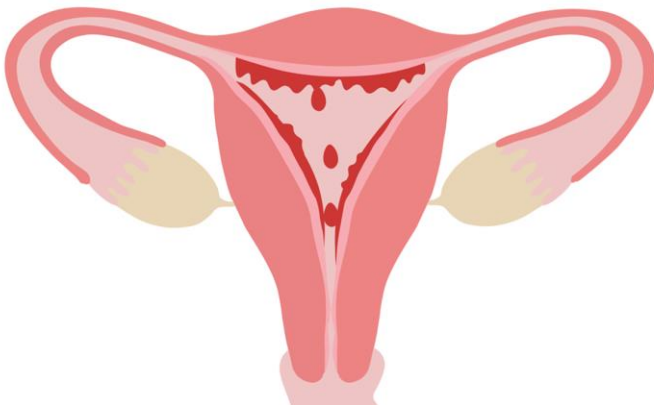
5.2.3 Uterus



5.2.3.1 Functions of Uterus

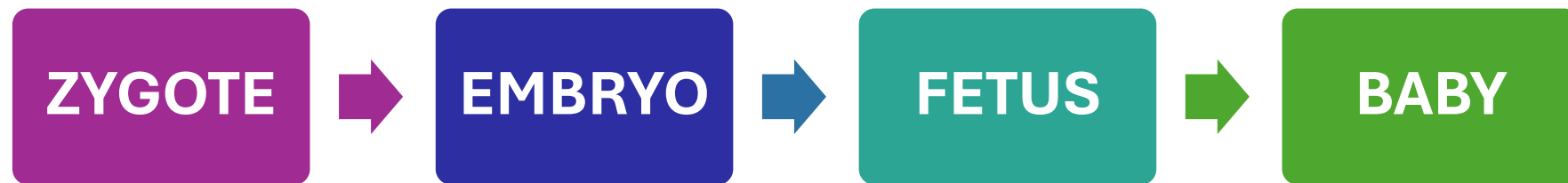


- 1) Site of regulation of **menstrual cycle**
- 2) Site of **implantation** for fertilized egg
- 3) **Development** of the fetus during pregnancy
- 4) Houses and **nourishes** fetus until sufficiently mature to function outside the mother's body

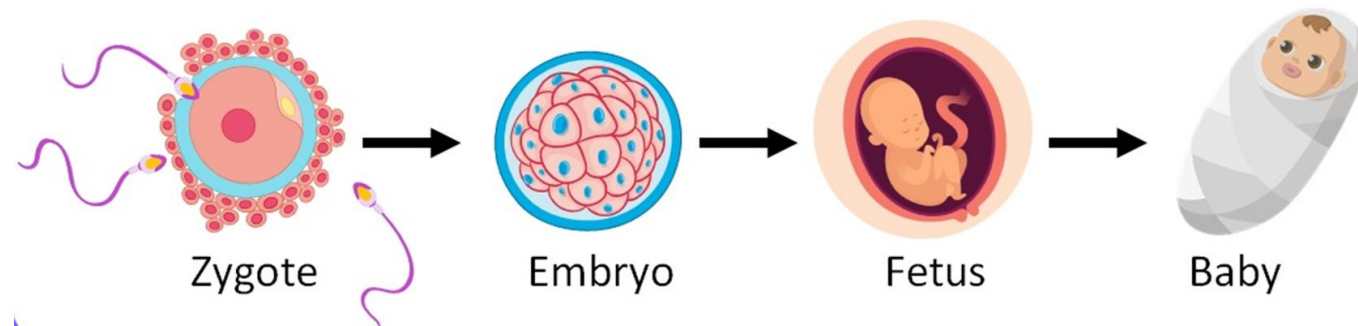


5.2.3.2 Implantation

- Definition:
 - **Attachment of Blastocyst on the endometrium in about 6 days after fertilized**
- The Blastocyst that attached on the endometrium will develop:-



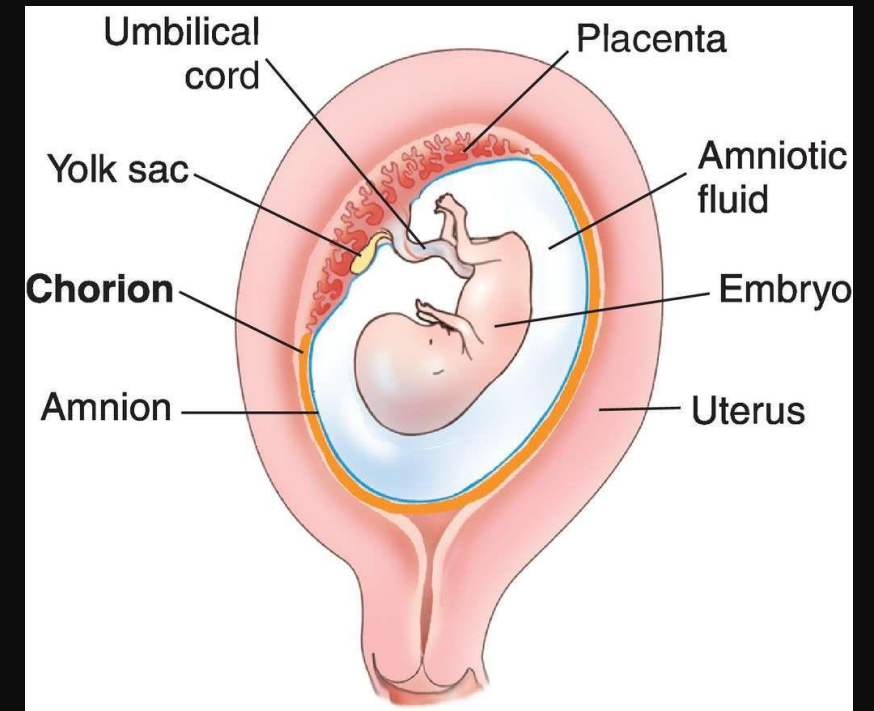
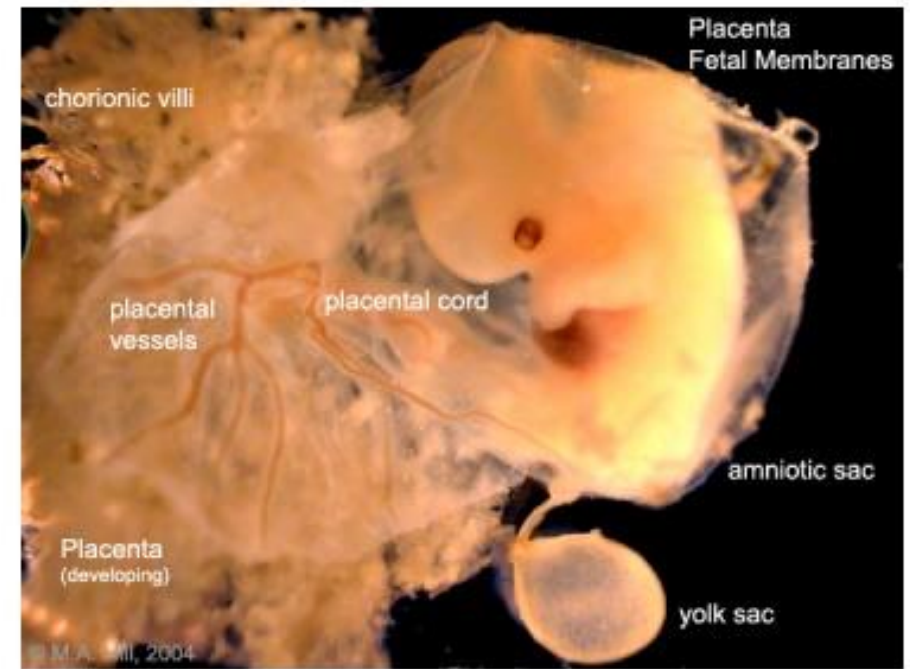
ZYGOTE DEVELOPMENT



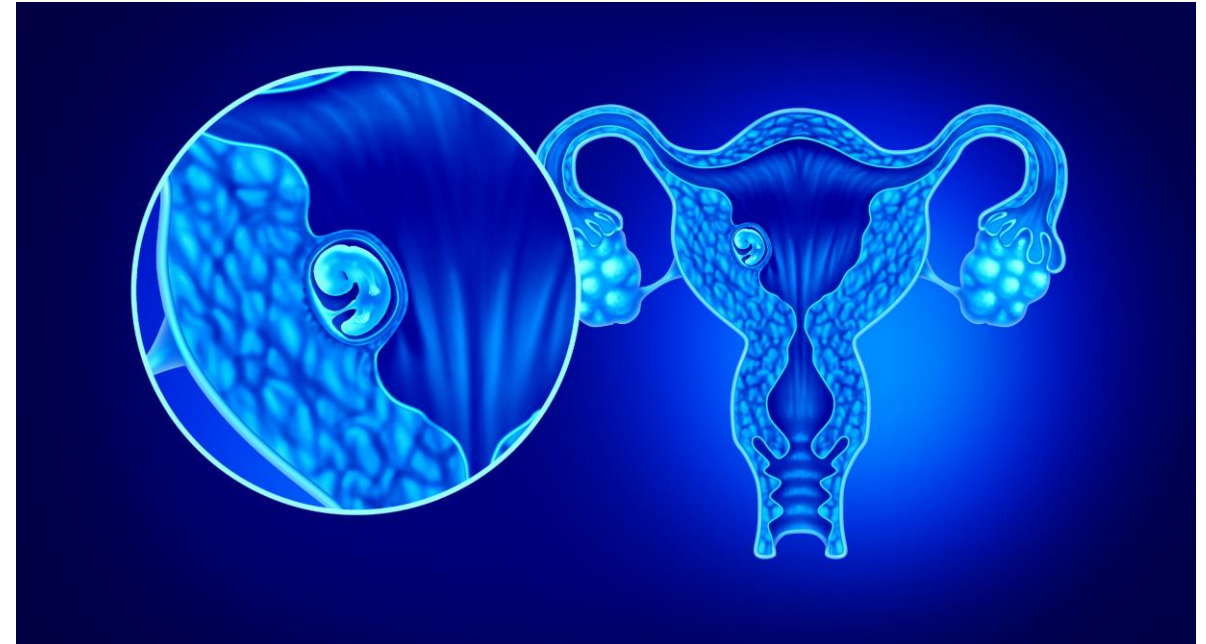
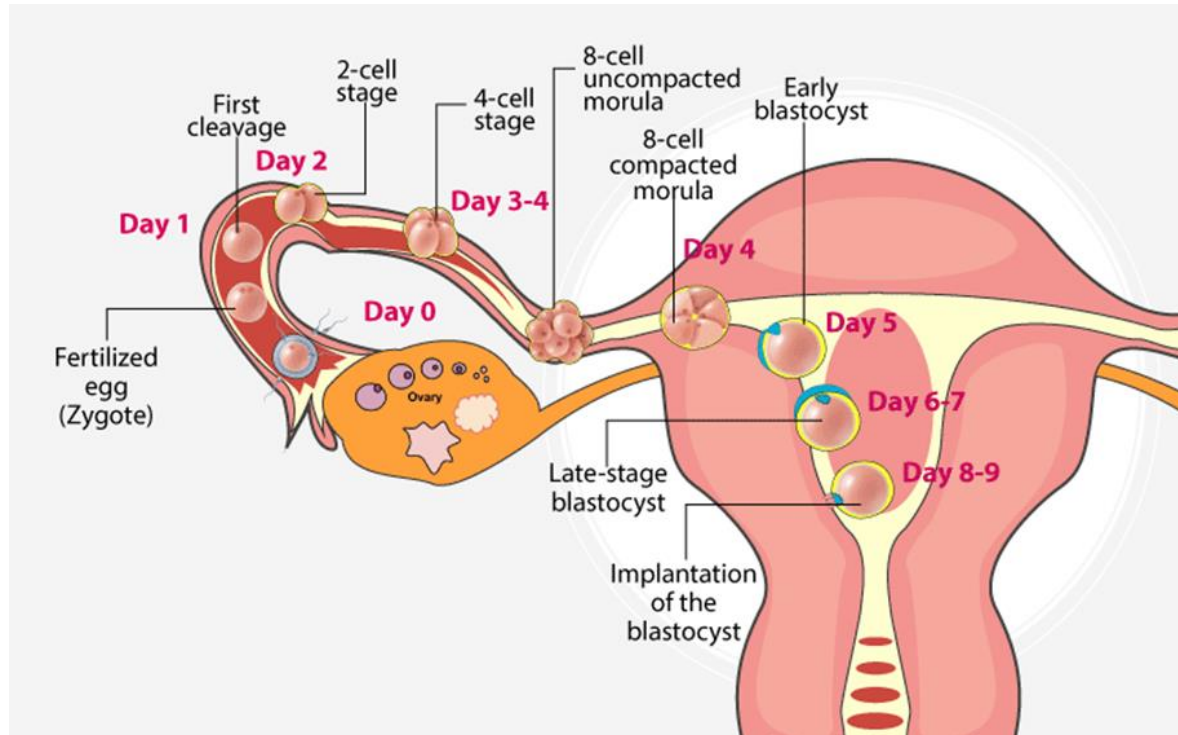
5.2.3.2 Implantation

What structures develop during implantation?

- Yolk sac
- Amnion
- Amniotic fluid
- Chorion
- Allantois
- Placenta
- Umbilical cord

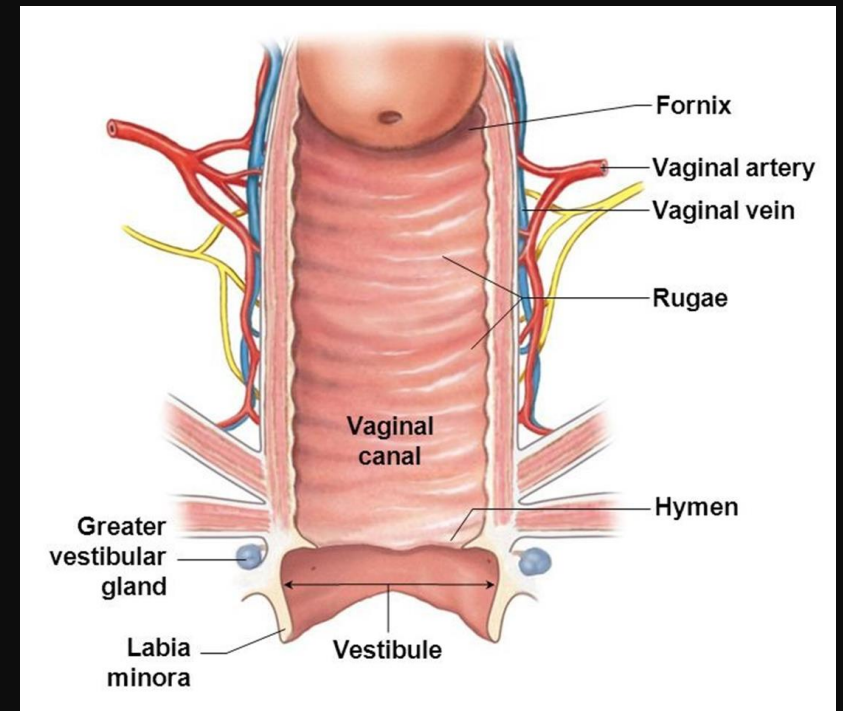
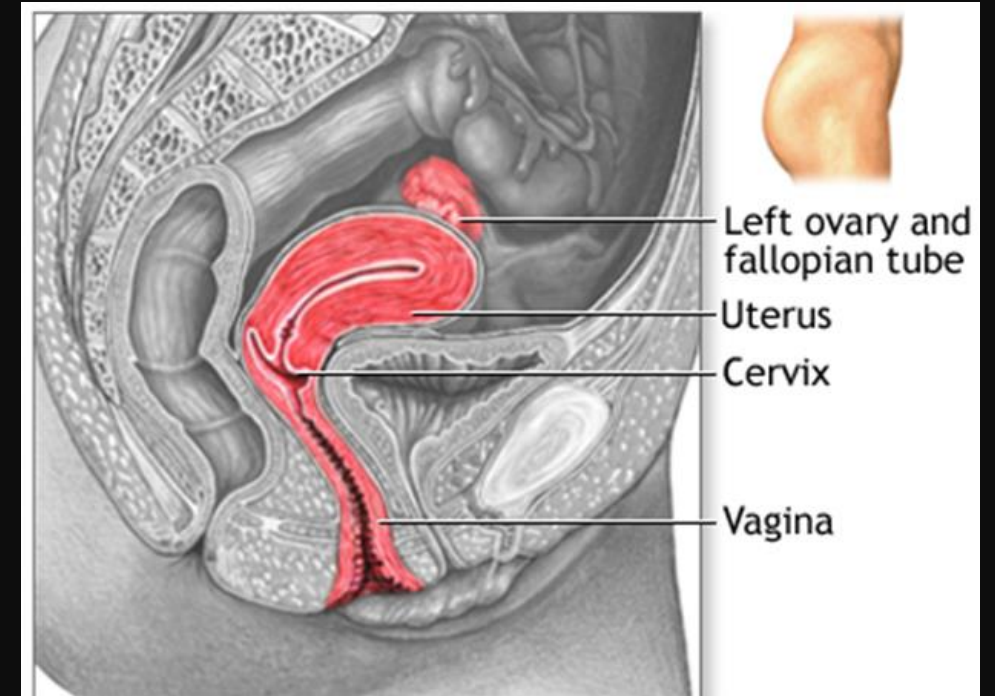


5.2.3.2 Implantation



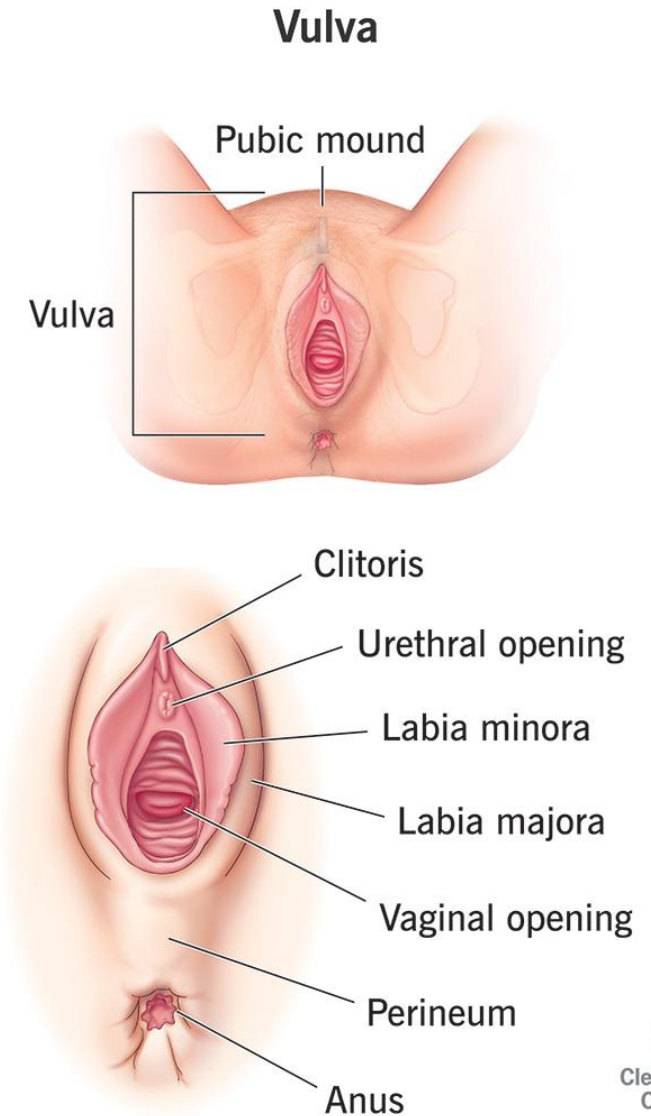
5.2.4 Vagina

- Tubular structure (10 cm)
- Location : **between urinary bladder & rectum**
- Functions :
 - **passageway for menses (*menstrual flow*) & childbirth**
 - **receive penis during sexual intercourse**
- Inside the vagina tubule = rugae
- Inferior = vaginal orifice [opening]
- At the vaginal orifice have the membrane that form a border around the vagina opening called = **hymen**



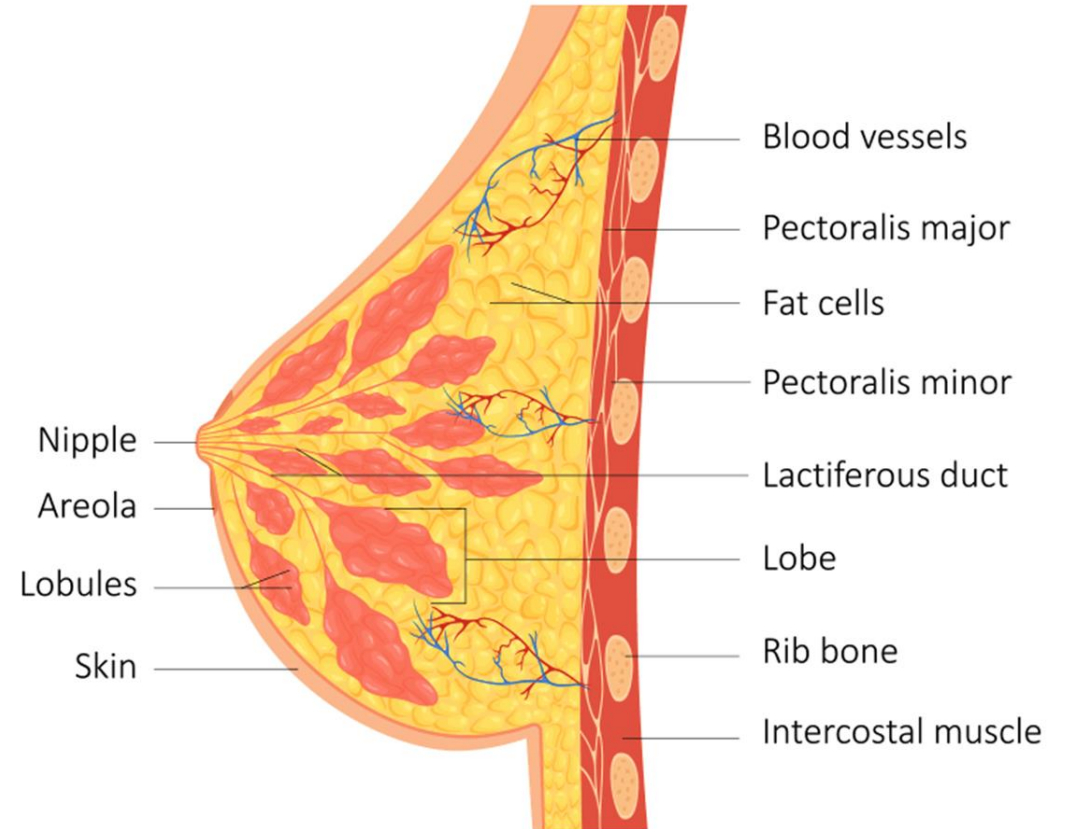
5.2.5 Vulva

- External genitals of female
- Components of the external genitals of female :
 - mons pubis
 - labia majora
 - labia minora
 - clitoris
 - external urethral orifice
 - vaginal orifice
- Functions : ***sexual pleasure, reproduction, urination, menstruation***

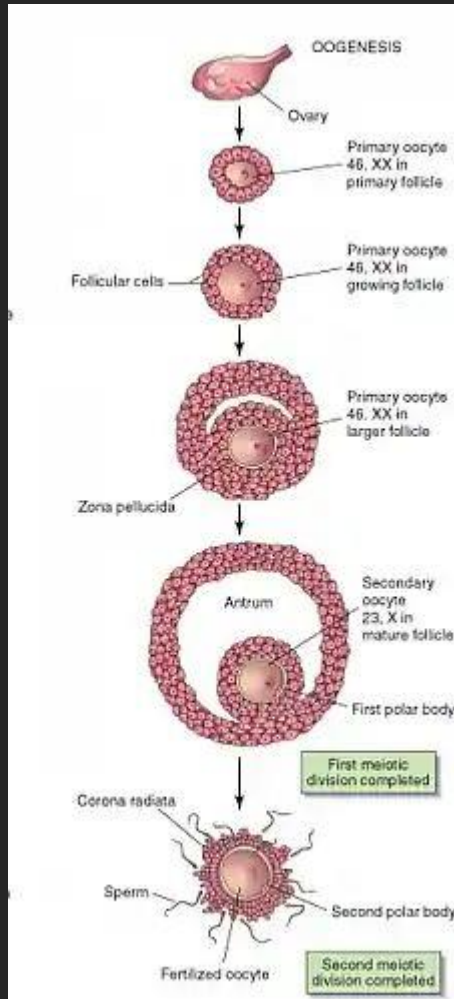


5.2.6 Mammary Glands

- Modified sudoriferous glands that produce milk
- Easily known as = **BREAST**
- Location → anterior chest (laterally)
→ lie over the pectoralis major muscle
- Components :
 - **Nipple** ----- pigmented projection
 - **Lactiferous ducts** ----- opening of nipple
 - **Areolar** ----- circular pigmented area around the nipple
 - **Mammary duct** ----- transport milk from the milk-producing lobules (glandular tissue) to the nipple
 - **Lobule** ----- milk secreting glands
 - **Cooper's ligament** ----- function is to support the breast
 - **Adipose tissue** ----- determines the size of breast



5.3 Oogenesis



DEFINITION

- The formation of secondary oocyte (pure female gamete) before it's become matured & known as ovum

WHERE IT'S HAPPEN?

- Inside ovaries

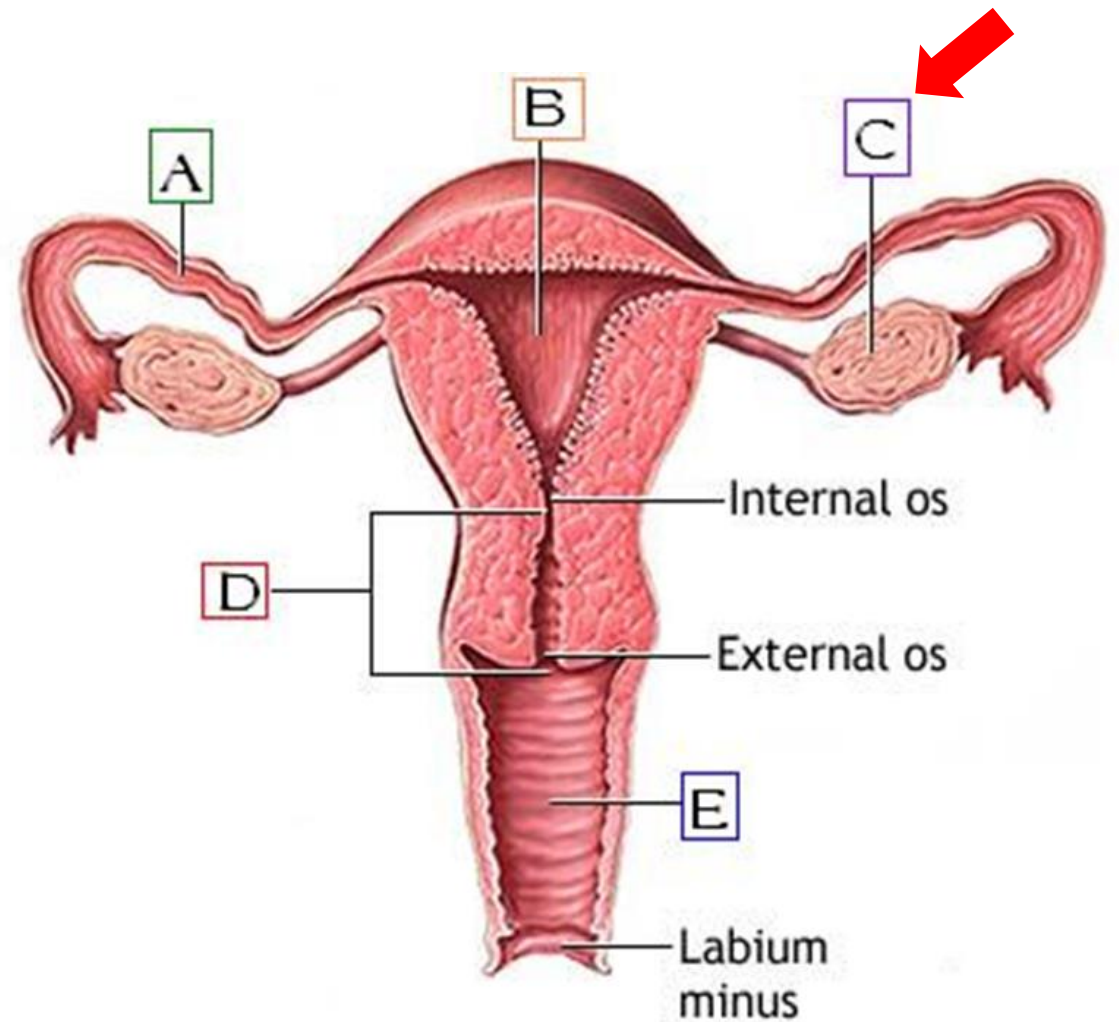
WHAT PROCESS INVOLVED?

- meiosis & ovulation

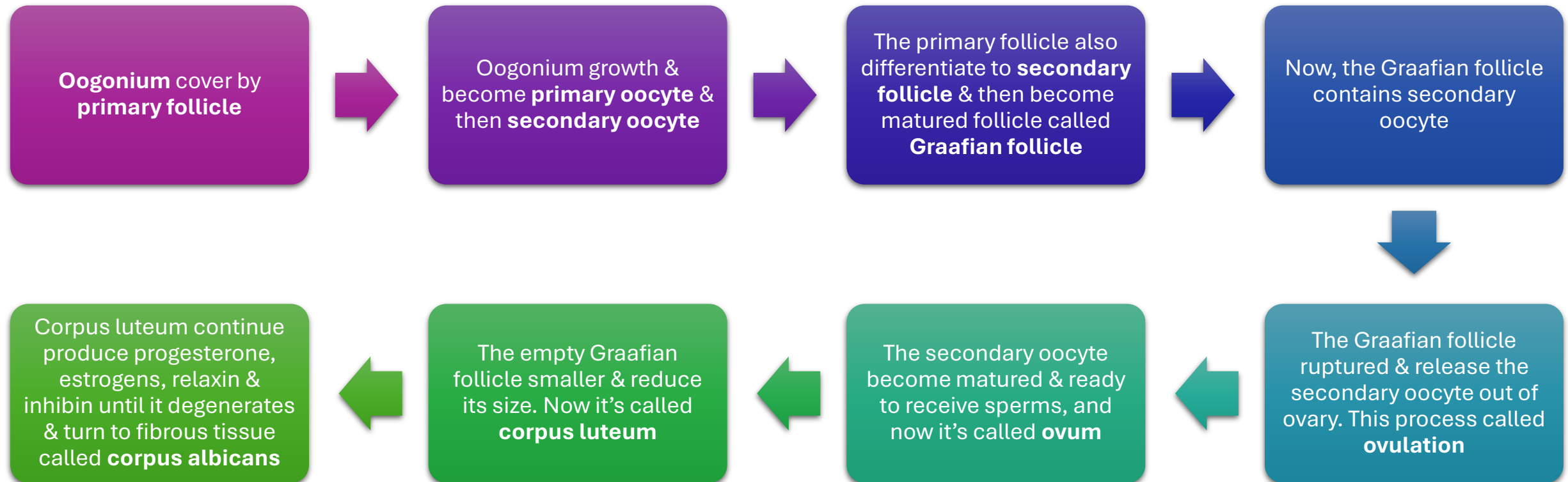
#What process in male reproductive system that is homolog to this process?

5.3 Oogenesis

Which structure done the oogenesis?



5.3.1 Mechanism of Oogenesis



5.3.1 Mechanism of Oogenesis

MEIOSIS I

- Oogonium ($2n$) $\rightarrow$ Primary oocyte ($2n$) $\rightarrow$ Secondary oocyte (n)

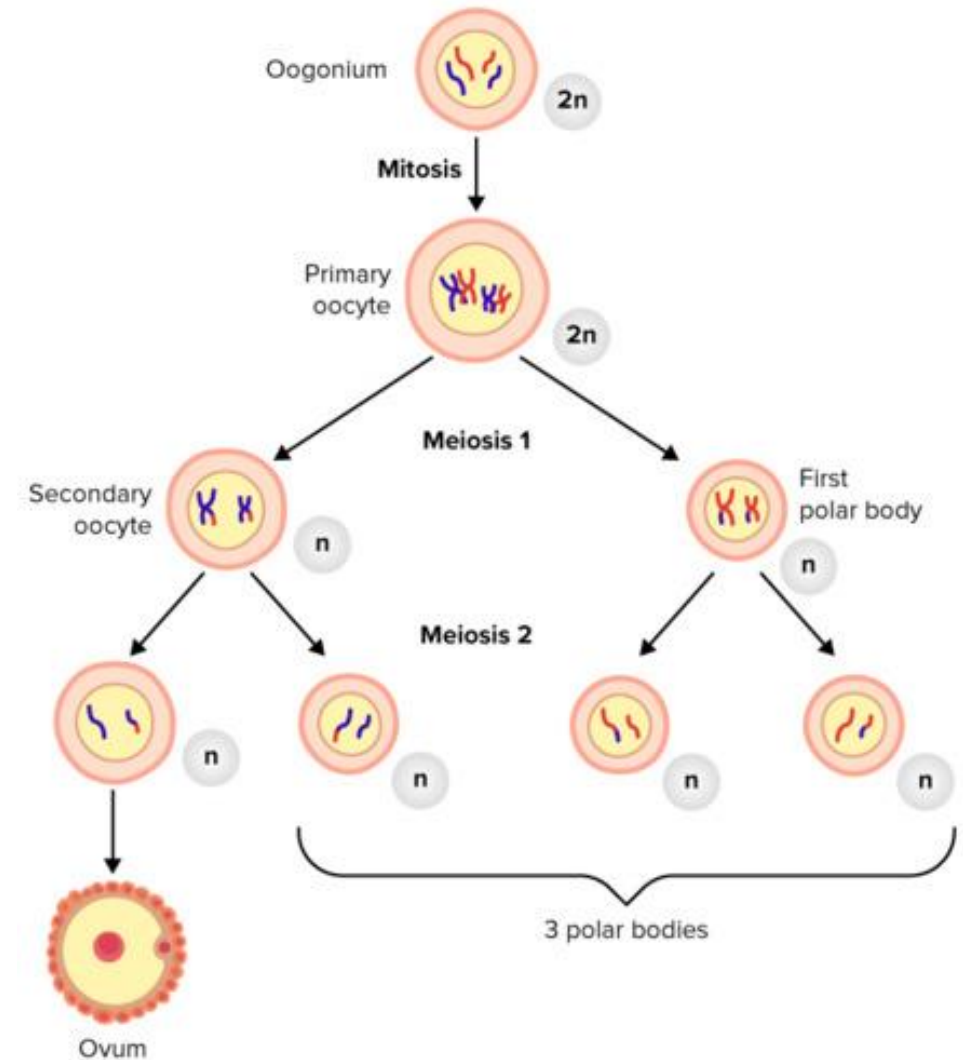
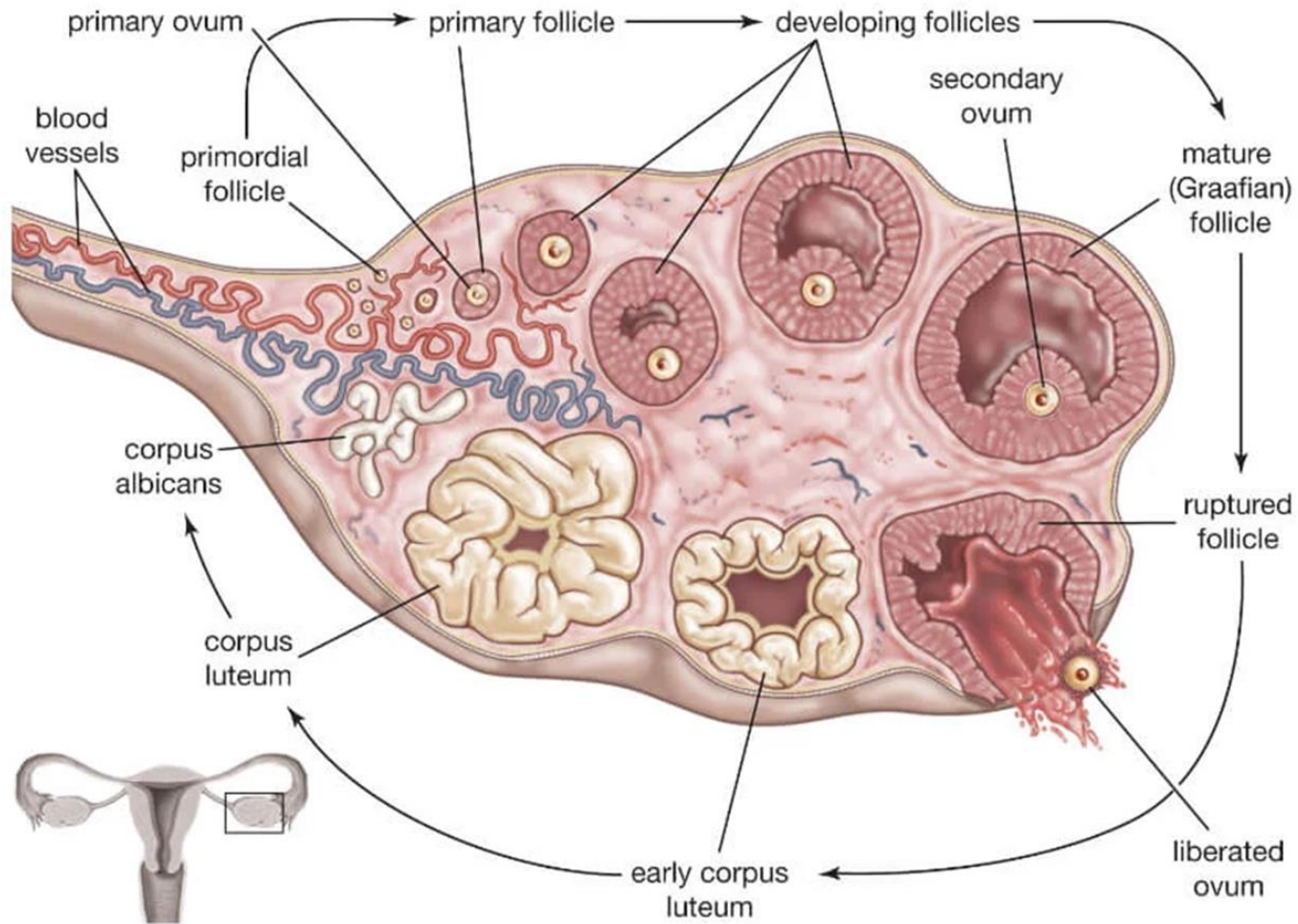
MEIOSIS II

- Secondary oocyte (n) $\rightarrow$ matured secondary oocyte (n) $\rightarrow$ ovum

OVULATION

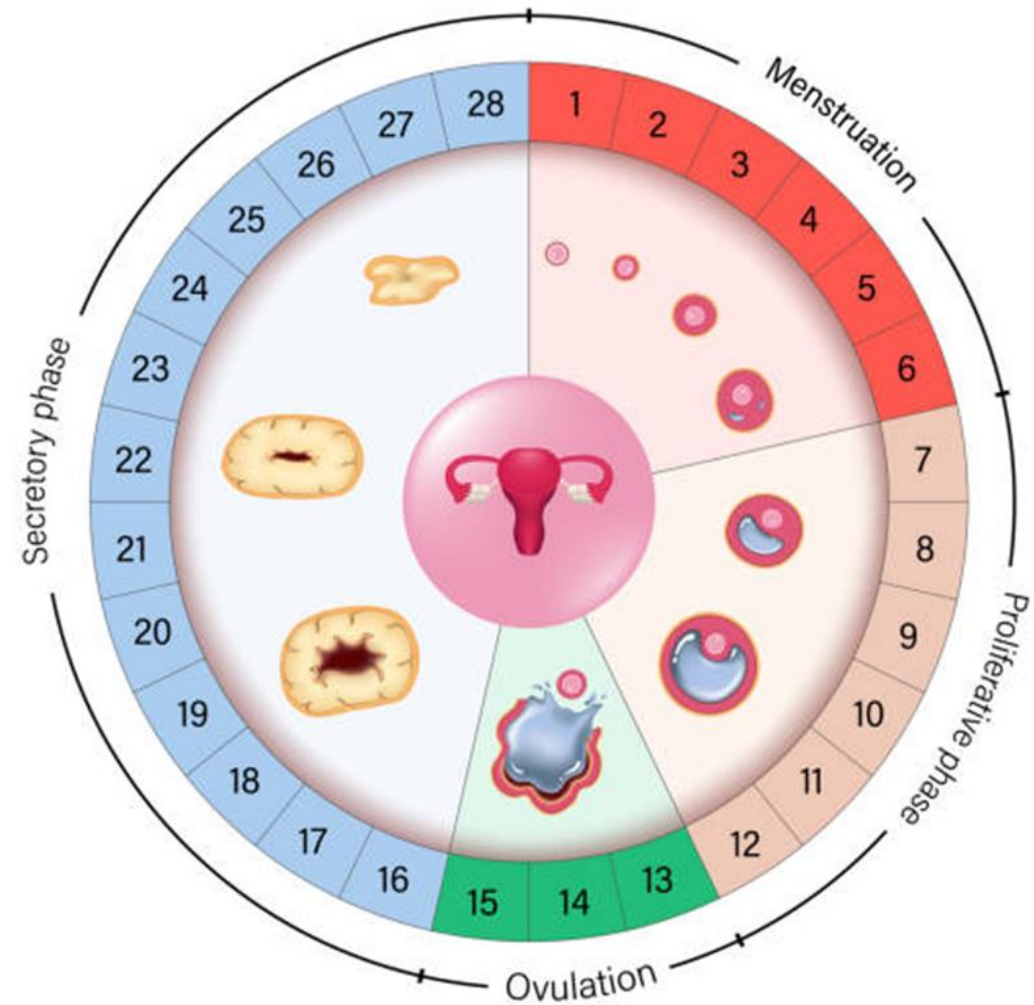
- Process where secondary oocyte are released out from ovary

5.3.1 Mechanism of Oogenesis



5.4 Menstrual Cycle

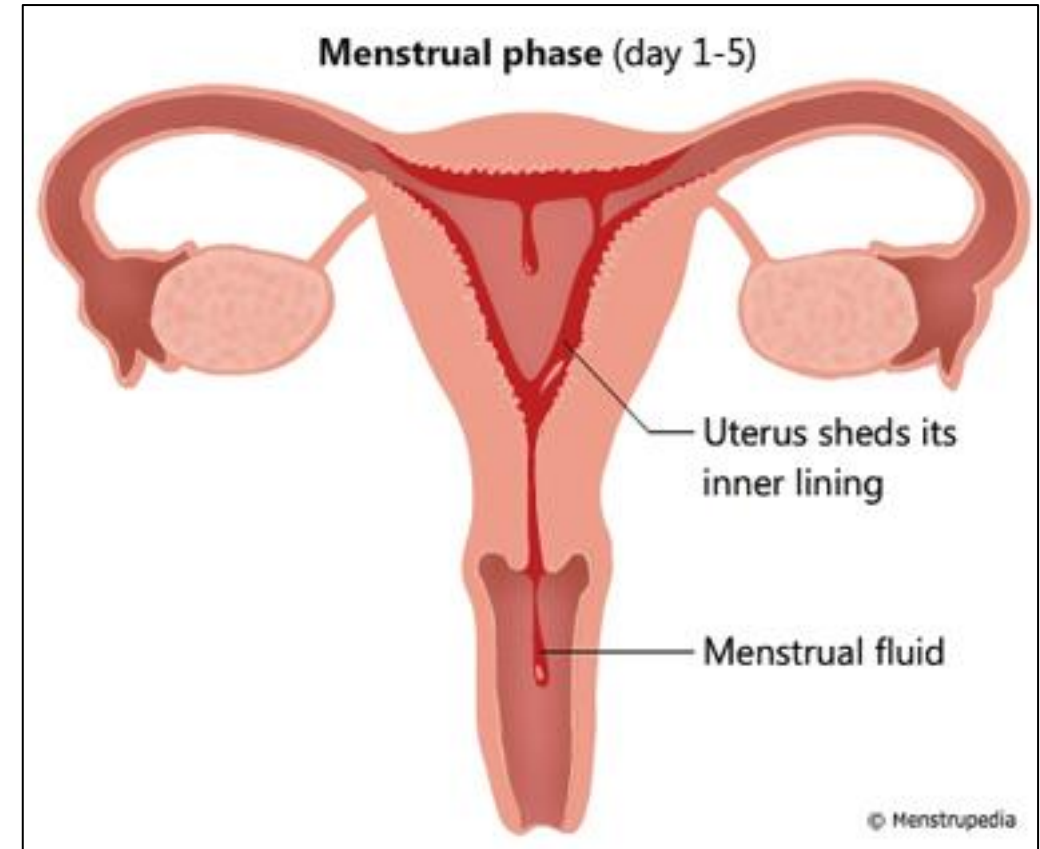
- The duration of the female reproductive cycle typically assume **28 days**
- 28 days = 1st day menses to next 1st day menses
- FOUR (4) mains hormones that regulate during 28 days cycle are:
 - **Estrogens**
 - **Progesterone**
 - **LH (Luteinizing Hormone)**
 - **FSH (Follicle - Stimulating Hormone)**



5.4.1 Stages of Menstrual Cycle

STAGE 1 – MENSTRUAL PHASE

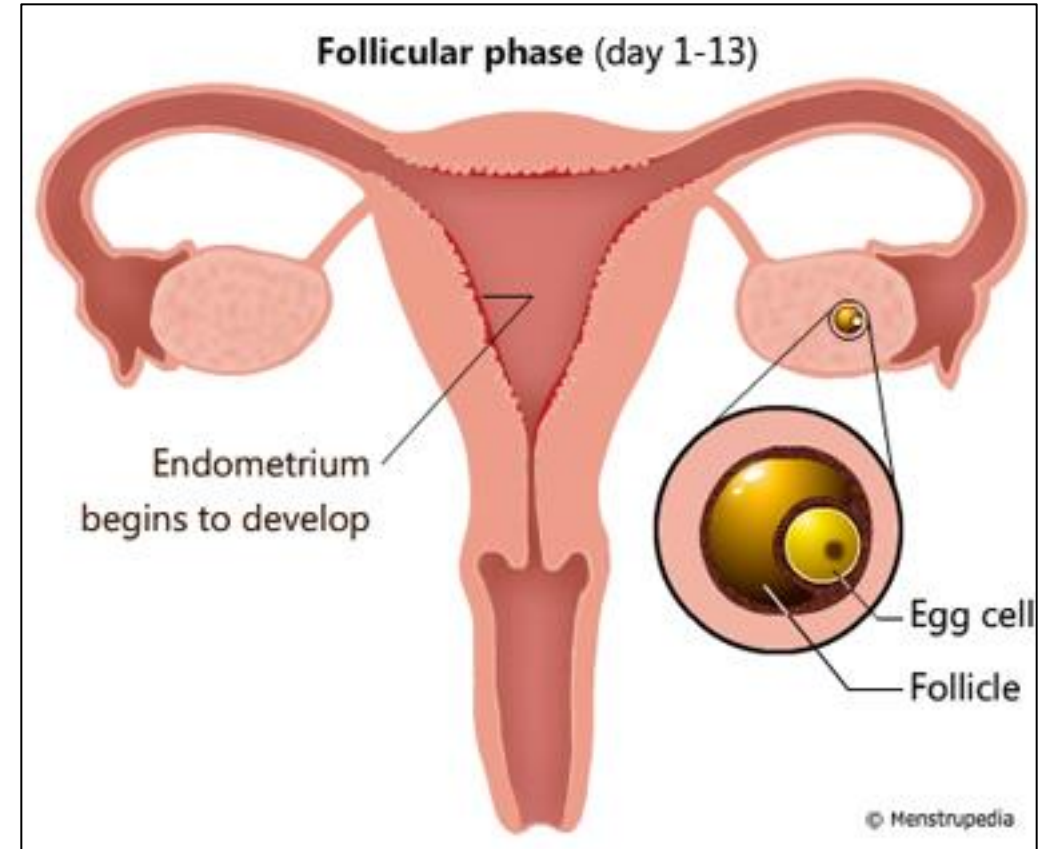
- Days 1 – 5
- Secondary follicles begin to enlarge
- Menstruation (bleeding) occurs
- The lining of the uterus disintegrates and is shed
- This is due to low levels of progesterone



5.4.1 Stages of Menstrual Cycle

STAGE 2 – FOLLICULAR PHASE

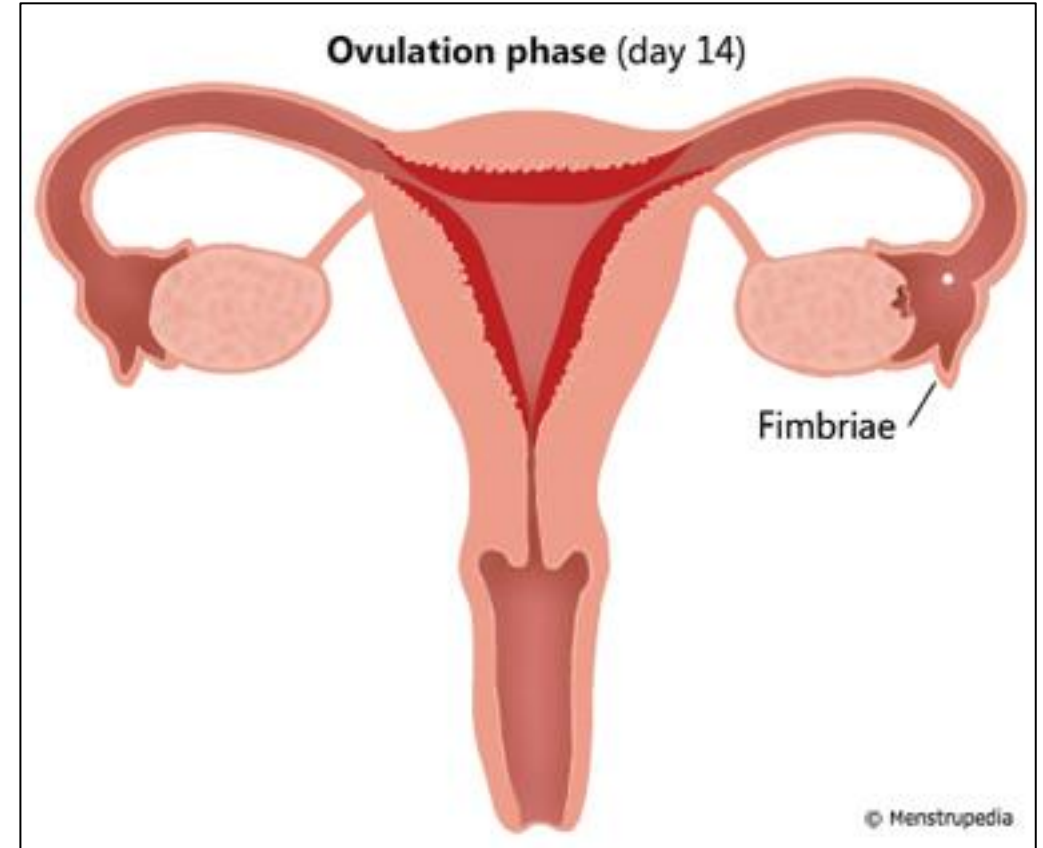
- Days 6 – 13
- Only one growth follicle become dominant & known as Graafian follicle
- Repairing of endometrium (become thicker)
- Estrogens increase until day 12 & then declining
- The LH hormone level start increase gradually at day 11 & arrive at the peak level at day 12 or 13, just before the ovulation phase



5.4.1 Stages of Menstrual Cycle

STAGE 3 – OVULATION PHASE

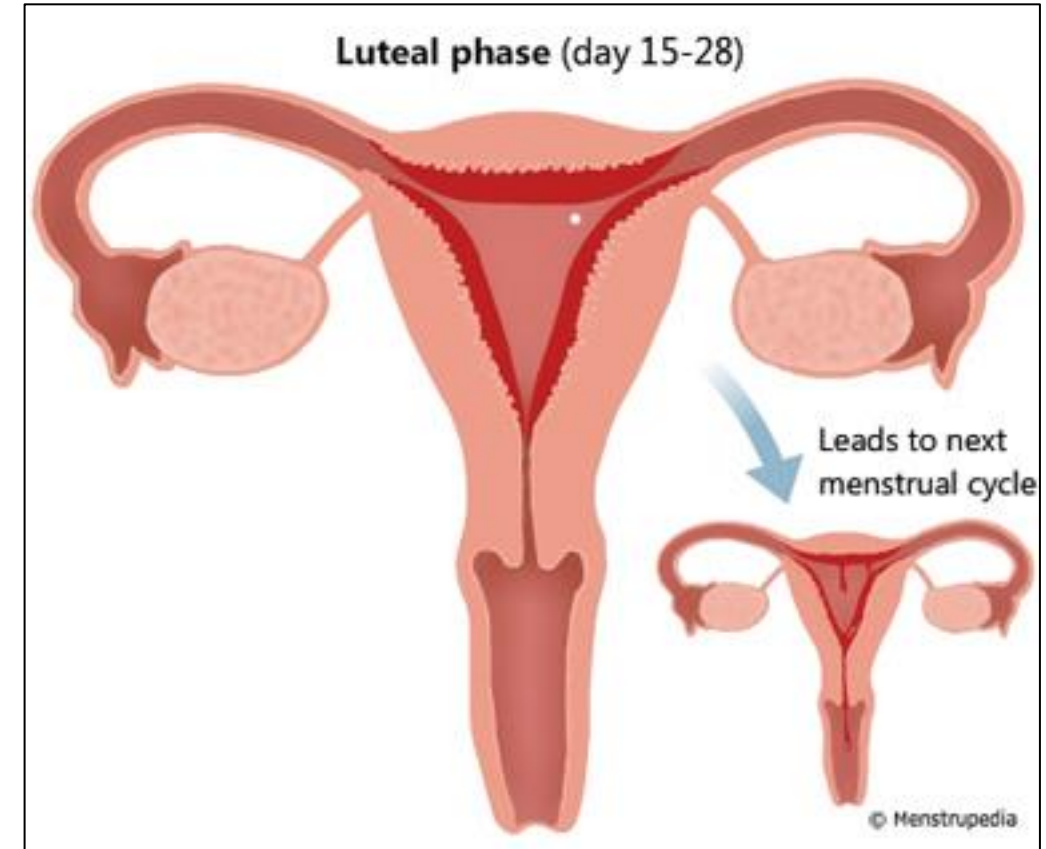
- Day 14
- The uterus wall continue thicken
- LH level decline gradually
- Rupture of Graafian follicle & the secondary oocyte are released
- The oocyte travel inside the Fallopian tube & ready to receive sperms
- Very fertile phase



5.4.1 Stages of Menstrual Cycle

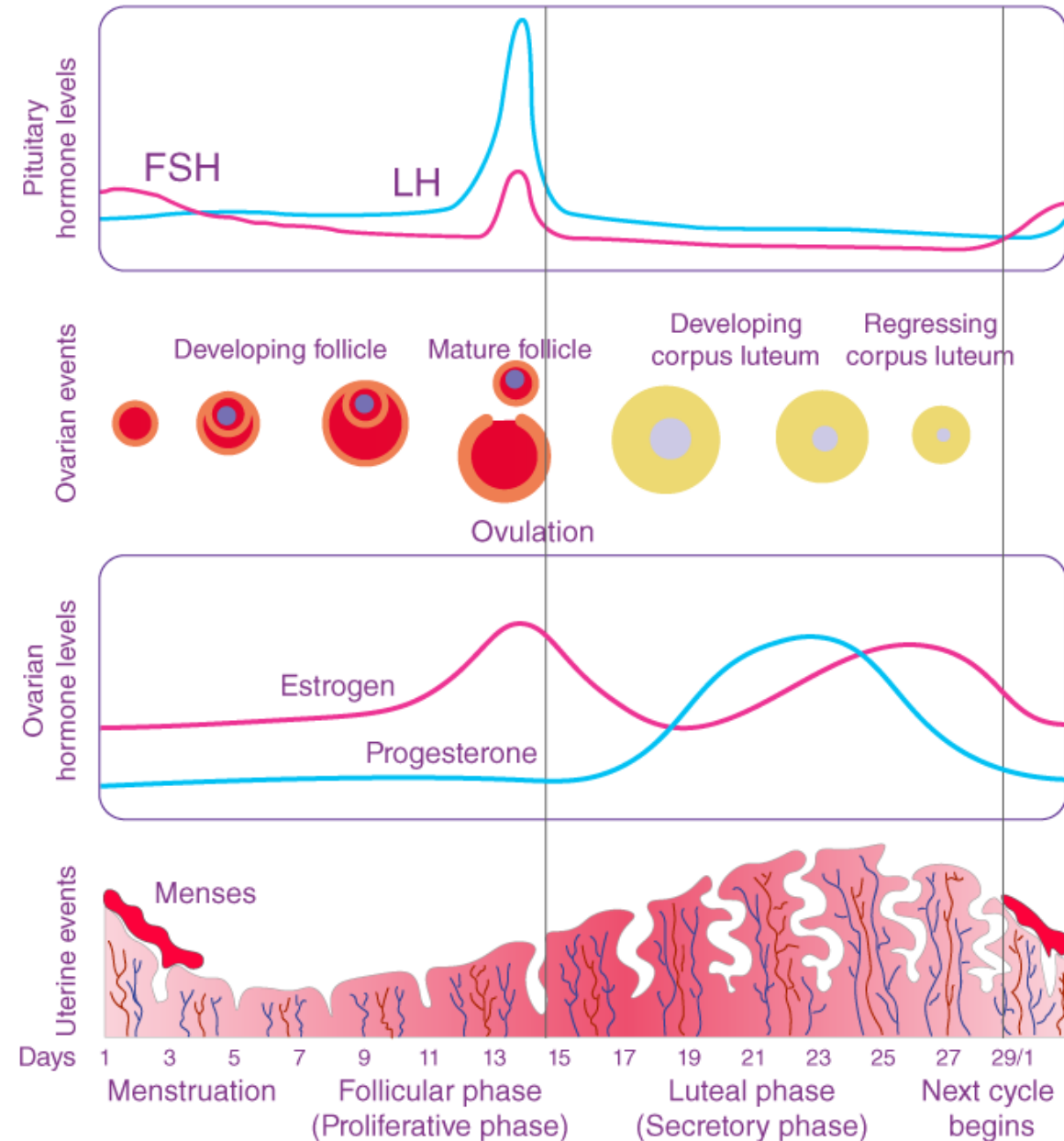
STAGE 4 – LUTEAL PHASE

- Day 15 – 28
- The uterus wall continue thickened
- The empty Graafian follicle convert to corpus luteum
- Corpus luteum secrete progesterone & increasing it's slightly, before decrease at the end of the cycle
- The level of LH & FSH hormones continue decrease



5.4.1 Stages of Menstrual Cycle

MENSTRUAL CYCLE



5.4.2 Hormonal Interaction

Estrogen

- Causes growth of the uterine lining
- Inhibits FSH
- Stimulates release of LH and hence release of the egg
- Inhibits LH after ovulation

Progesterone

- Maintains the uterine lining
- Inhibits LH after ovulation

LH

- Stimulates the release of the egg (called ovulation)
- Stimulates estrogen and progesterone production

FSH

- Stimulates egg development and the release of estrogen

5.5 Menopause

DEFINITION?

- The permanent cessation of menses

WHEN?

- Normally between 40 → 50 years old

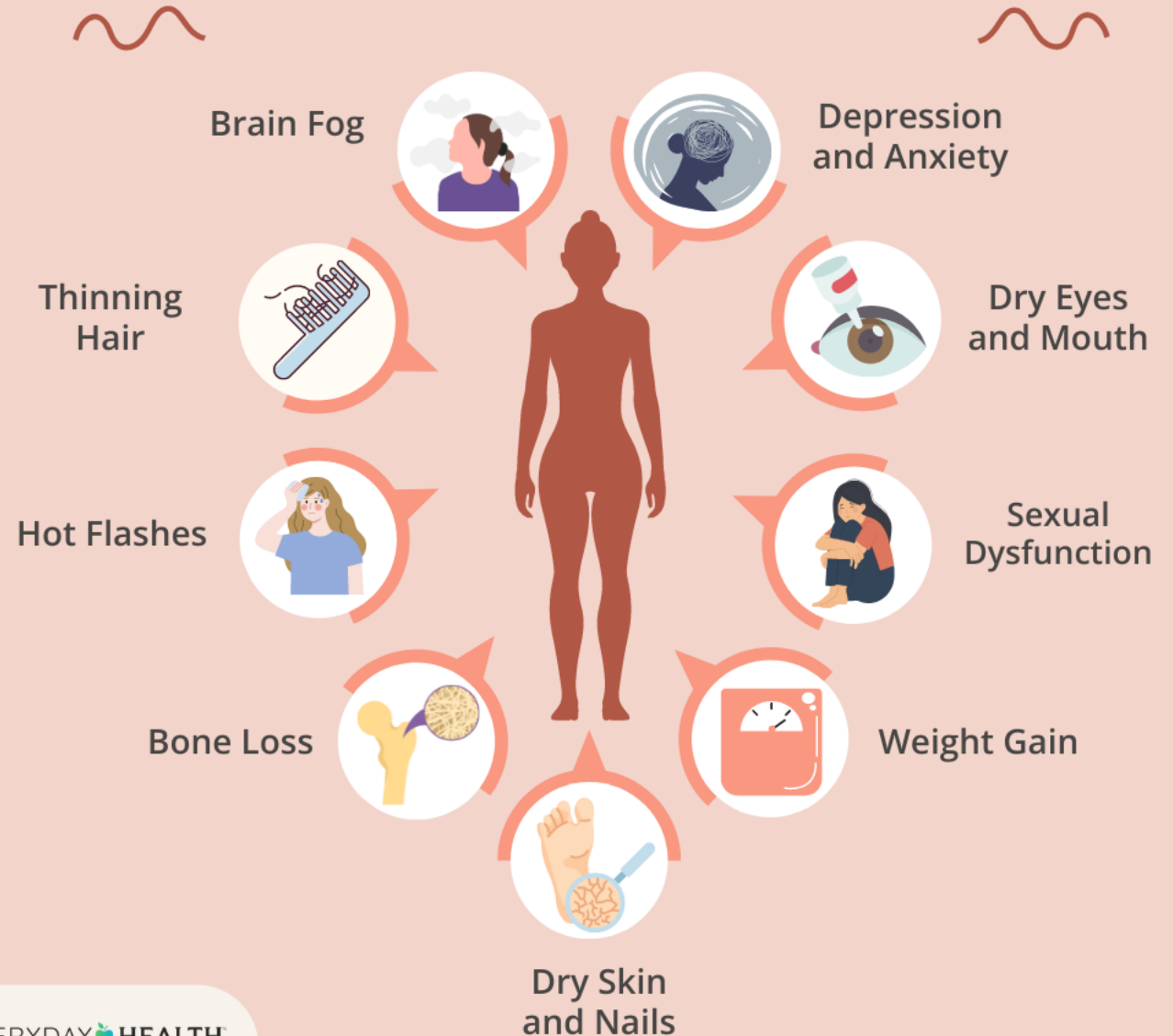
SYMPTOMS?

- Hot flashes, Sweating, Headache

EFFECT OF MENOPAUSE?

- Osteoporosis because diminished level of estrogens
- Continuous secretion of FSH and LH
- Female reproductive organs undergo varying degrees of regressive changes

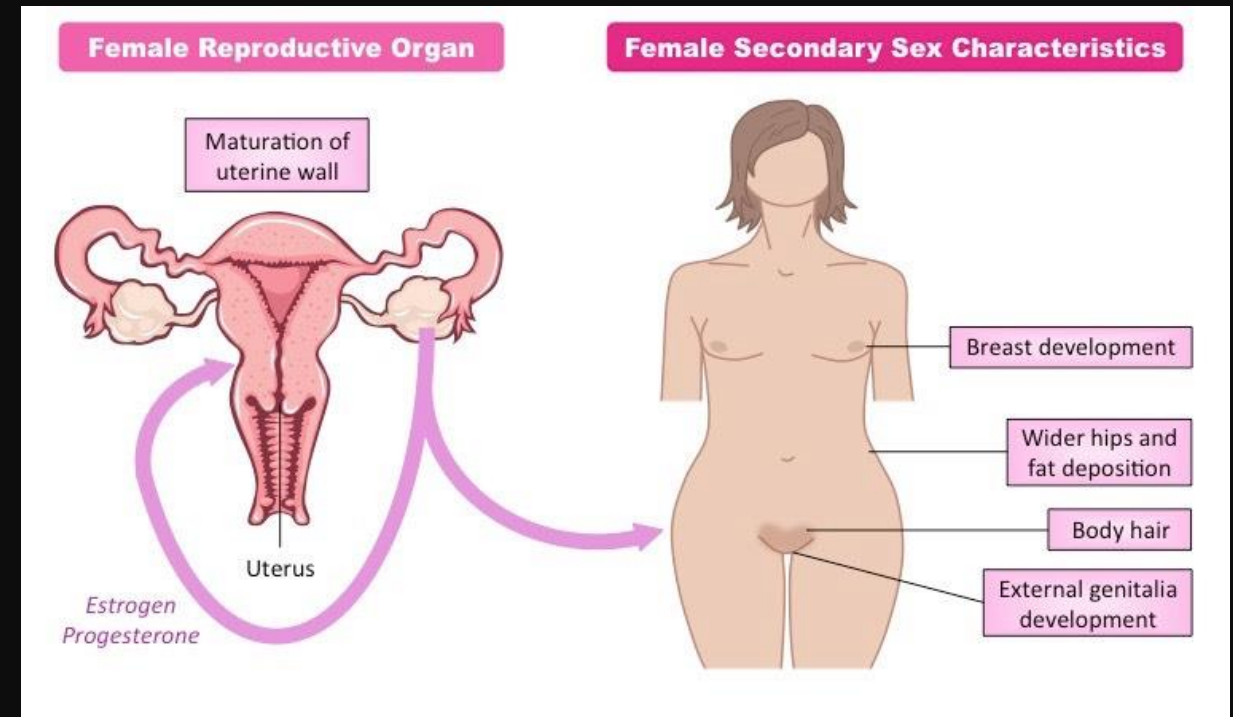
How Menopause Affects the Body



5.6 Secondary Sex Characteristics - FEMALE

Examples of secondary sex characteristics for FEMALE:

- a) Growth of breasts
- b) Increased deposition of subcutaneous fat (especially in the hips and breasts)
- c) Widening and lightening of pelvis
- d) Growth of axillary and pubic hair





References

- Human Anatomy & Physiology, 11th edition. Marieb E.N & Hoehn K (2018), USA: Benjamin Cummings
- Fundamentals of Anatomy & Physiology, 11th edition. Martini FH (2017): Pearson Benjamin Cummings, USA

THANK YOU

