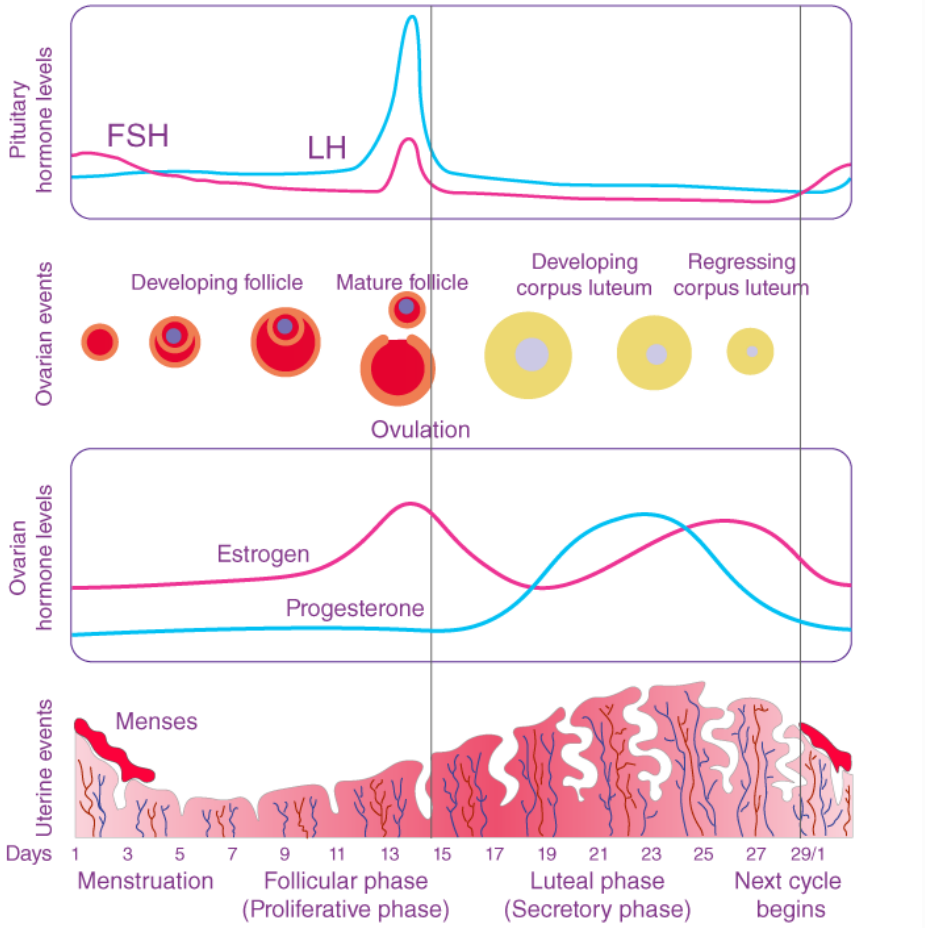
Menstrual cycle

- The reproductive cycles in female primates (Monkey, Apes & Human) is called menstrual cycle. In non-primates oestrus cycle takes place.
- Starts at puberty and first menstrual cycle is called **menarche**.
- It Consist of 28/29 days.
- In one menstrual cycle one ova is released from one ovary and in next cycle from another ovary and so on.
- Menstrual cycle occurs only if released ova is not fertilised.
- Lack of menstruation is indicative of pregnancy or may also occur due to stress, poor health or any sexually transmitted disease.
- In Humans Menstrual cycle ceases at age of 50 years termed as **Menopause.**



Phases of Menstrual Cycle-

(1) **Menstrual Phase: 1 to 3/5 days** (3-5 days)

(i) LH Decrease ⟶ Corpus Luteum Degenerate ⟶ Progesterone & Estrogen decrease
(ii) The endometrium of uterus breaks down & menstruation begins.
(iii) The cells of endometrium secretions, blood (50-150ml) & unfertilised ovum constitutes the menstrual flow that comes out through vagina.

(2) **Follicular/Proliferative Phase: 6 to 13 days** (7-8 days)

(i) FSH leads to development of Follicles and the ovarian follicle secrete oestrogens.
(ii) Oestrogen stimulates proliferation of the endometrium.
(iii) The endometrium becomes thicker by rapid cell multiplication and this is accompanied by an increase in uterine glands & blood vessels. Mucus lining of oviduct & vagina is also formed.

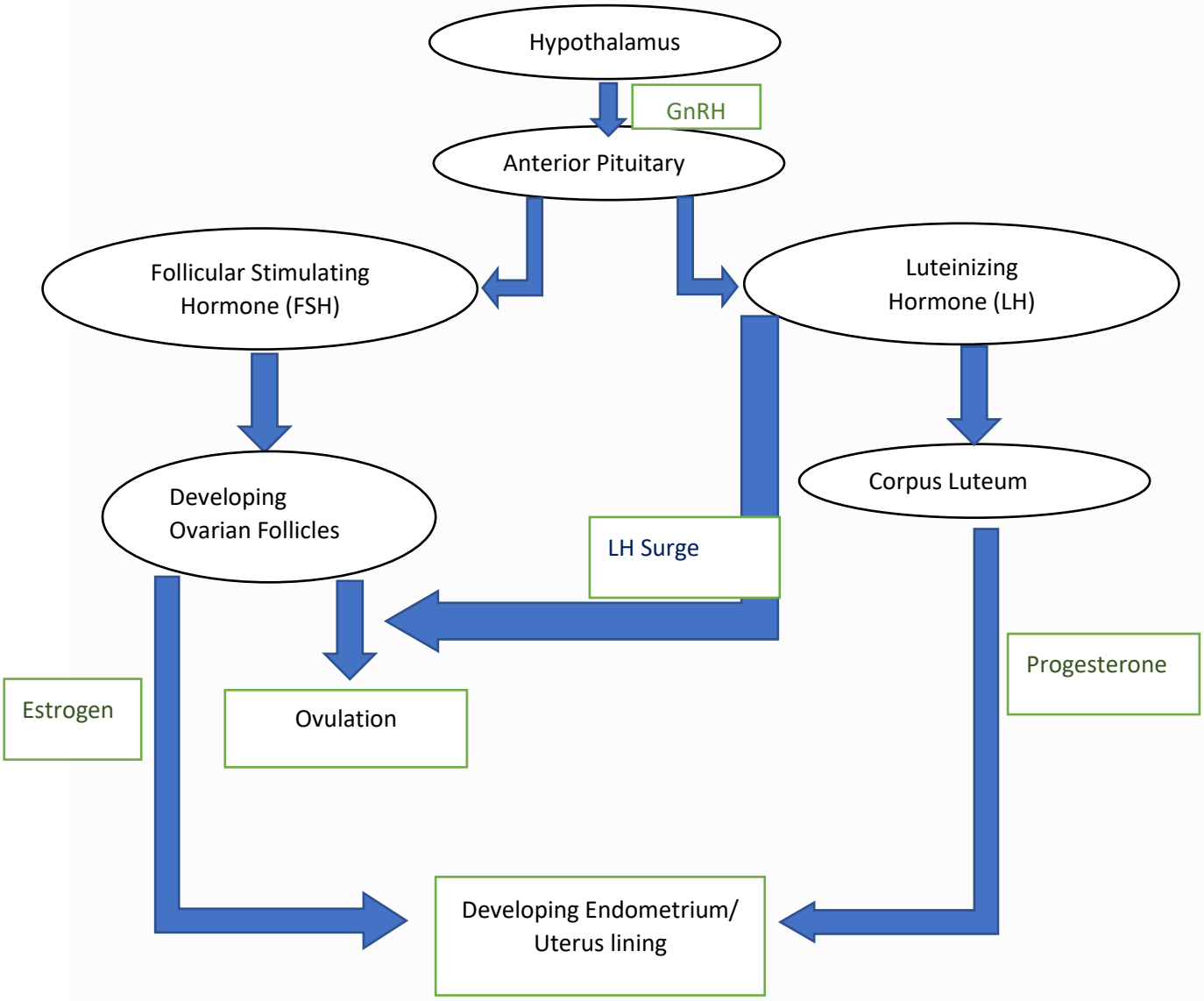
(3) Ovulatory Phase: 14th day

(i) Oestrogen concentration in blood increases leads to high secretion of LH.
(ii) Both LH & FSH attain a peak level.
(iii) Rapid secretion of LH (LH Surge) induces rupturing of graafian follicle and thereby Ovulation i.e. the release of ovum.

(4) Luteal Phase: 15-28 day (14 days)

(i) Remanent of Graafian follicle forms Corpus luteum ⟶ secretes progesterone.
(ii) High level of progesterone maintains endometrium (thickens & glandular) & makes uterus ready for implantation. It inhibits FSH Secretion to prevent development of second ovarian follicle.
(iii) **In case Ova is not fertilised**

- Lower level of LH leads to degenerate Corpus luteum to Corpus Albicans.
- Result in low level of progesterone and breakdown of endometrium.



High level of Estrogen & Progesterone inhibits release of GnRH (Negative Feed Back)

Fertilisation Events

The process of fusion of sperm with ovum is called fertilisation.

- During coitus (copulation/mating/sexual intercourse) semen is released by penis into vagina.
- Motile sperms swims to
  Vagina ⟶ Cervix ⟶ Uterus ⟶ **Ampulla-Isthmus Junction**
  (Fertilization take place here)
- Fertilization only occurs if Ovum (released from ovary on 14th day) & Sperm reach Ampullary region Simultaneously that why not all copulation leads to fertilization and pregnancy.

Entry of Sperm into Ovum

- Acrosome of sperm releases certain sperm lysins which dissolve the egg envelopes and make the path for the penetration of sperm.

Sperm Lysin (Hydrolysing Enzyme)	Egg/Ova Envelope
Hyaluronidase Enzyme	Act on Hyaluronic acid that bind corona Radiata
Corona Penetrating Enzyme	Dissolve Corona Radiata
Zona lysin/Acrosin	Digest Zona Pellucida

Prevent Polyspermy

It ensures fertilization of egg by only one sperm by preventing the entry of multiple sperms.

As one sperms enter the secondary oocyte the following reactions take place.

1st Reaction (Fast) - (Short lived) Depolarisation of ova membrane (Plasma membrane becomes +ve charged) prevent entry of polyspermy.

2nd Reaction (Slow)- **Cortical Reaction-** Cortical granules present in cytoplasm of secondary oocyte present beneath the plasma membrane release chemical substance peri-vitelline space (Space between plasma membrane and zona pellucida) forming hard Fertilization membrane (Impervious to any other sperm).

Activation Of Ovum- As Sperm enters Secondary Oocyte Second Meiotic Division (Arrested at Metaphase-II) completes now forming one haploid Ova and one 2nd polar body.

The haploid gametes fuse together to form diploid zygote.

Fertilization Events:

1. **Syngamy-** Fusion of Sperm & Ova
2. **Plasmogamy-** Fusion of Cytoplasm
3. **Karyogamy-** Fusion of Nucleus
4. **Amphimixis-** Mixing of DNA
5. **Formation of Zygote**