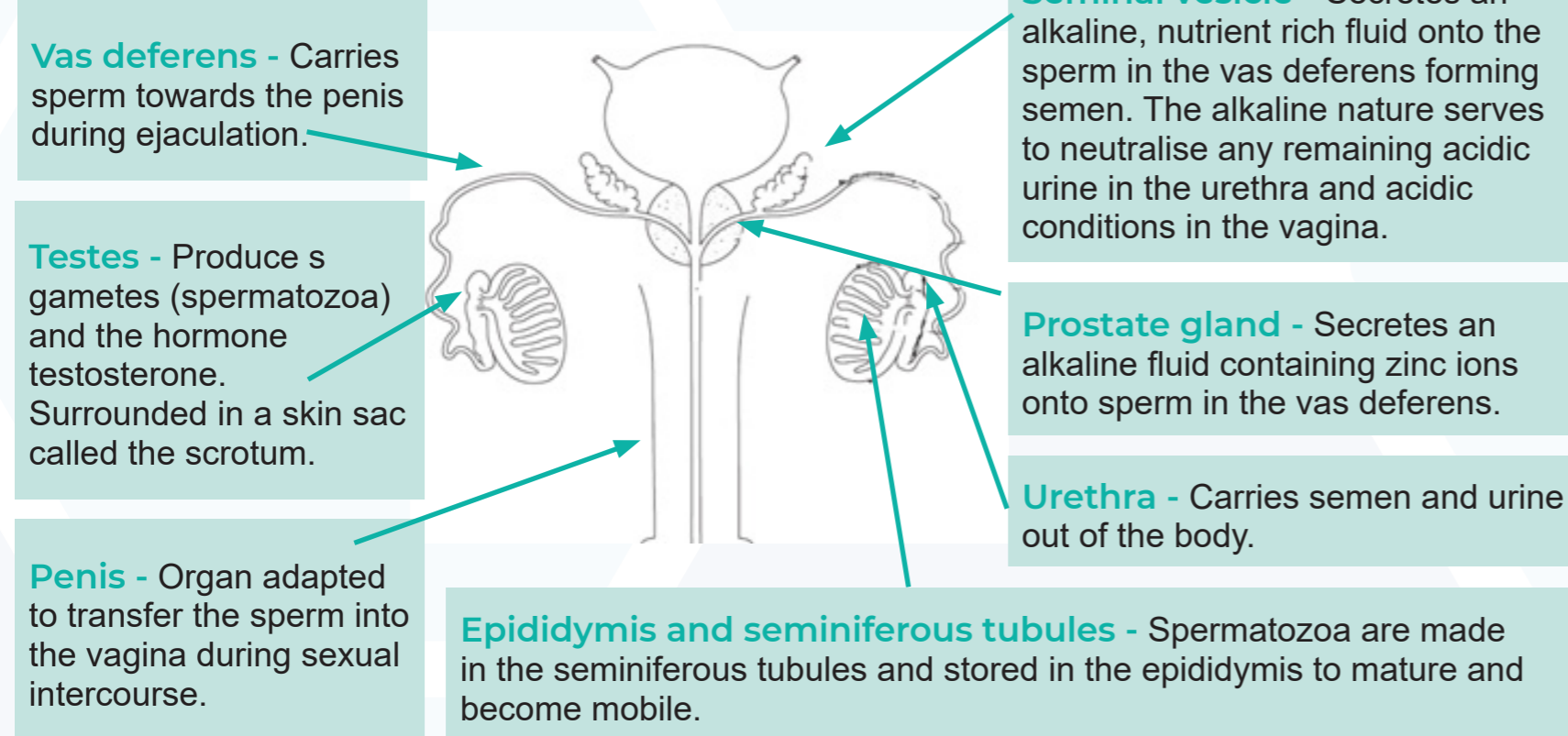
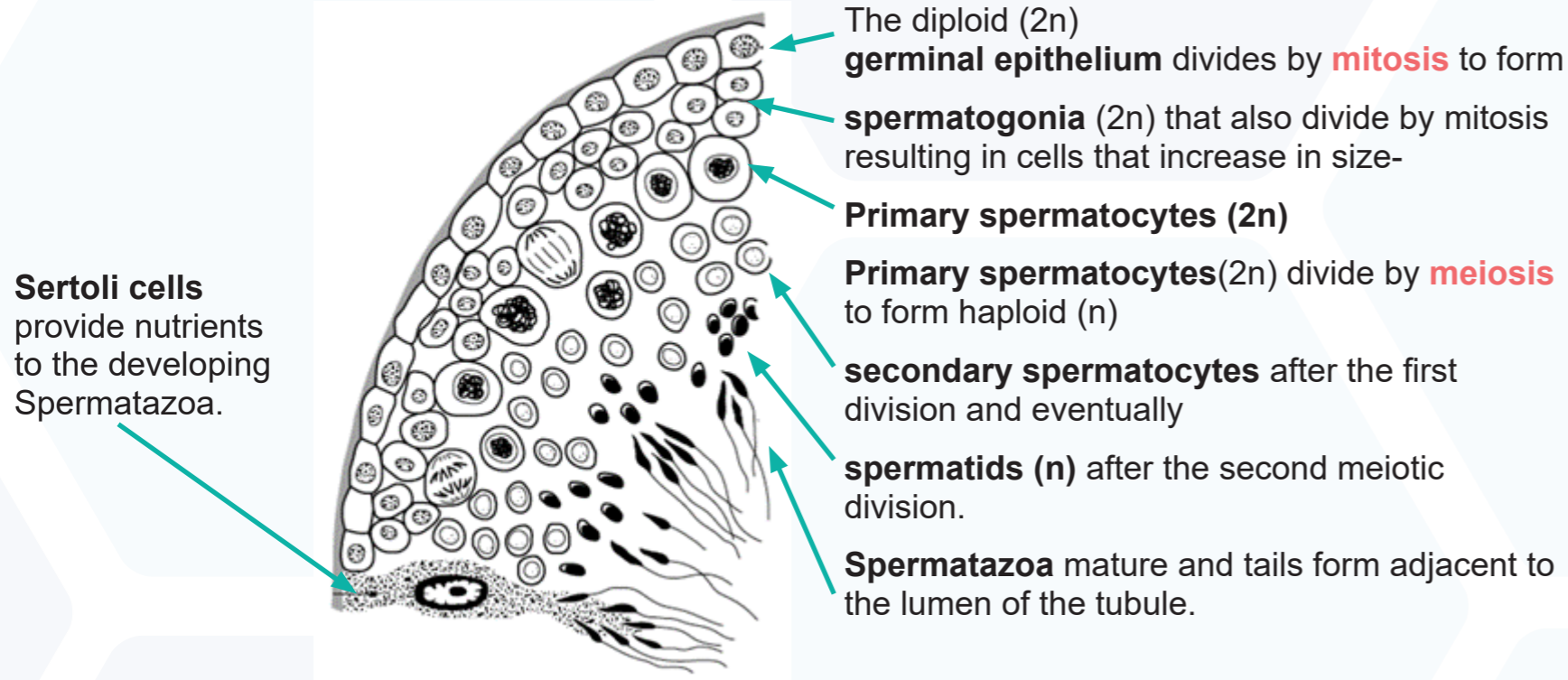


Sexual Reproduction in Humans 1

Male reproductive system - A system adapted for creation of the male gamete, spermatozoa and sexual reproduction.

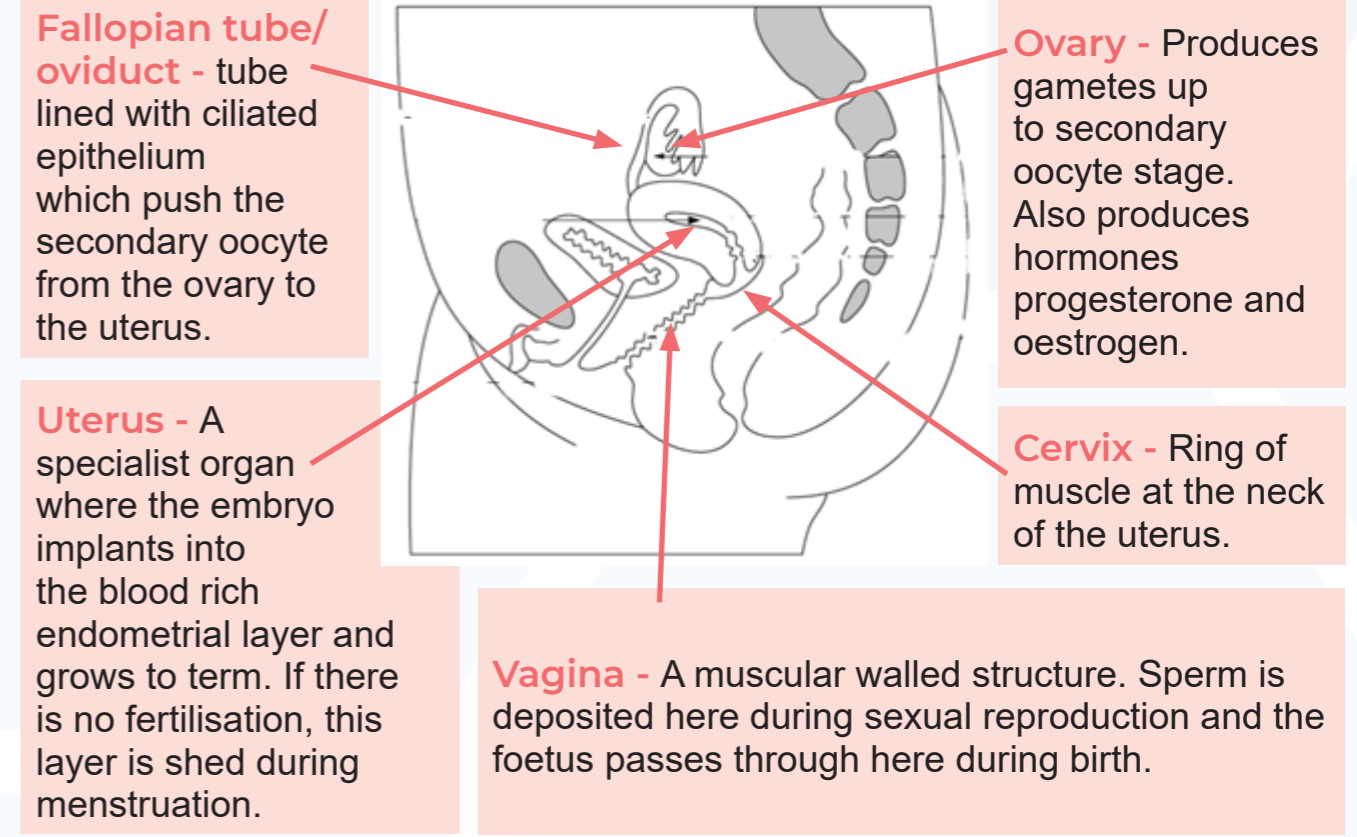


Spermatogenesis - This occurs in the seminiferous tubules of the testes. A cross section is shown below.

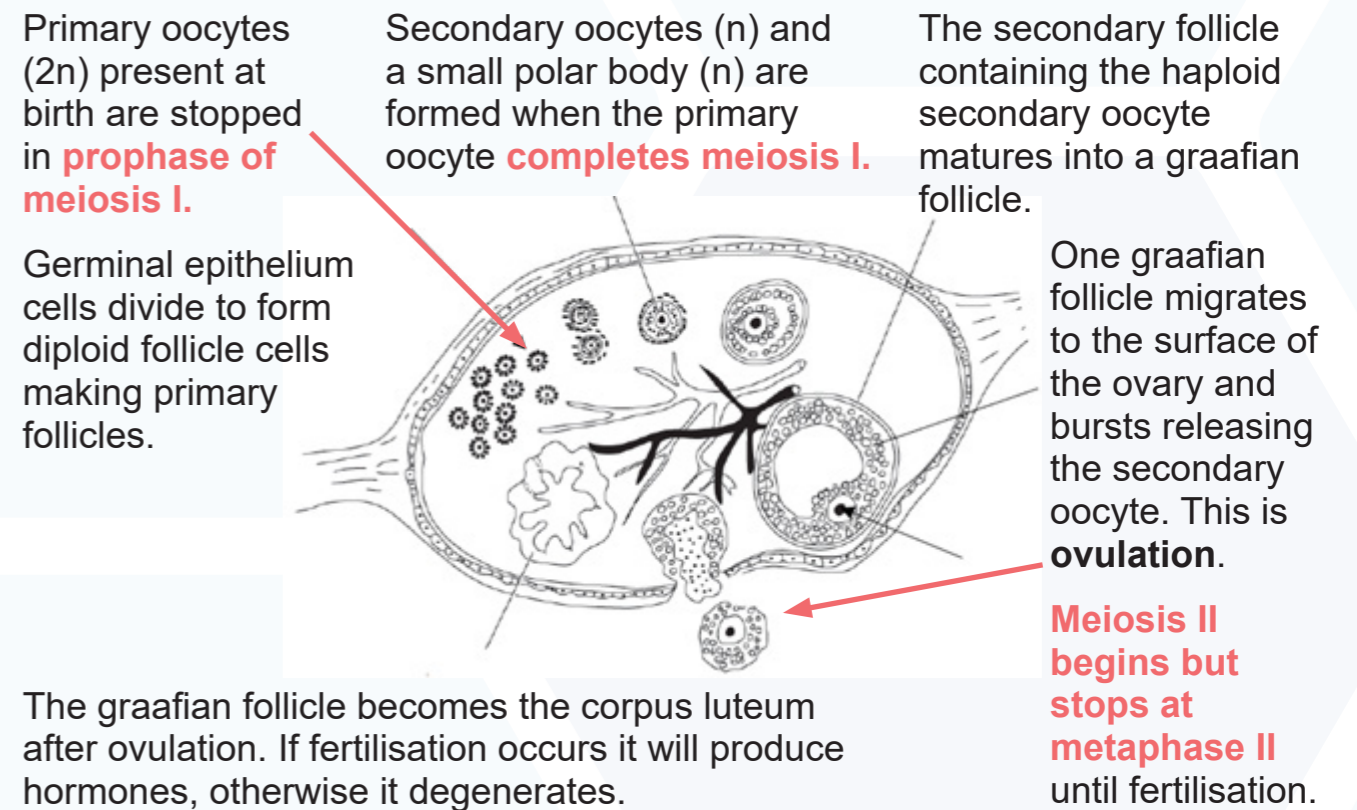


Interstitial cells (Leydig cells) in-between seminiferous tubules secrete testosterone to stimulate spermatogenesis.

Female reproductive system



Oogenesis - Takes place in an ovary up to secondary oocyte stage. Diploid germinal epithelium cells (2n) divide by **mitosis** to make oogonia that will increase in size forming primary oocytes (2n).



Sexual Reproduction in Humans 1

Fertilisation - In sexual reproduction sperm are released into the vagina.

Capacitation and the acrosome reaction

1. Sperm swim to the fallopian tube.
2. Capacitation increases the permeability of the membrane in front of the acrosome.
3. The acrosome releases proteases that digest the corona radiata.
4. The acrosome membrane ruptures releasing hydrolase enzymes which digest the zona pellucida on contact.
5. The membranes of the sperm and secondary oocyte fuse and the genetic material of the sperm enters the secondary oocyte.

Mitochondria in mid-section produces ATP to power microtubules that move tail

Axial filament in tail

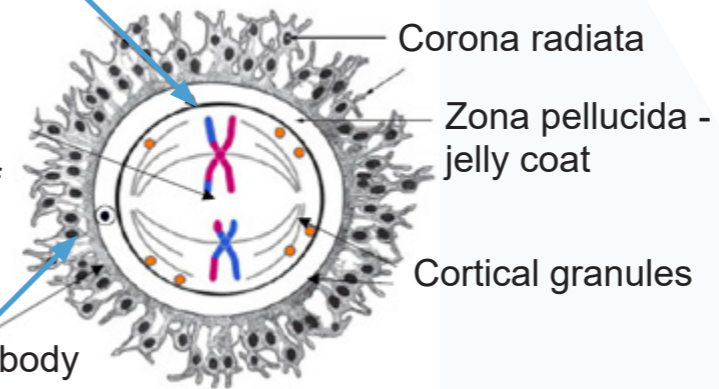
Nucleus in the head



Acrosome containing protease enzymes to digest the cells of the corona radiata.

First polar body

Cell membrane of the secondary oocyte.



Corona radiata

Zona pellucida - jelly coat

Cortical granules

The cortical reaction

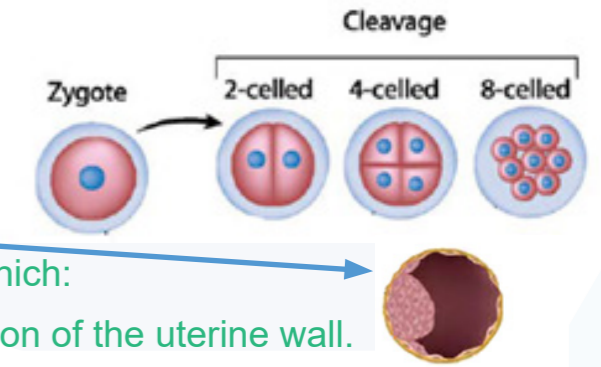
6. Cortical granules fuse with the cell membrane and alter the zona pellucida to form the fertilisation membrane; this prevents polyspermy.
7. Meiosis II completes creating a second polar body.
8. Sperm and ovum nuclei fuse. A zygotic nucleus is formed.

Sexual Reproduction in Humans 2

Hormonal changes

Implantation

Immediately following fertilisation, **mitotic** divisions of the newly formed zygote occur - this is called **cleavage**. A hollow ball of cells called the **blastocyst** is produced and this implants into the **endometrial lining** of the **uterus**.



The placenta forms from the outer blastocyst cells

(trophoblast cells) that extend into the endometrium linking the foetus to the mother's tissues to collect nutrients.

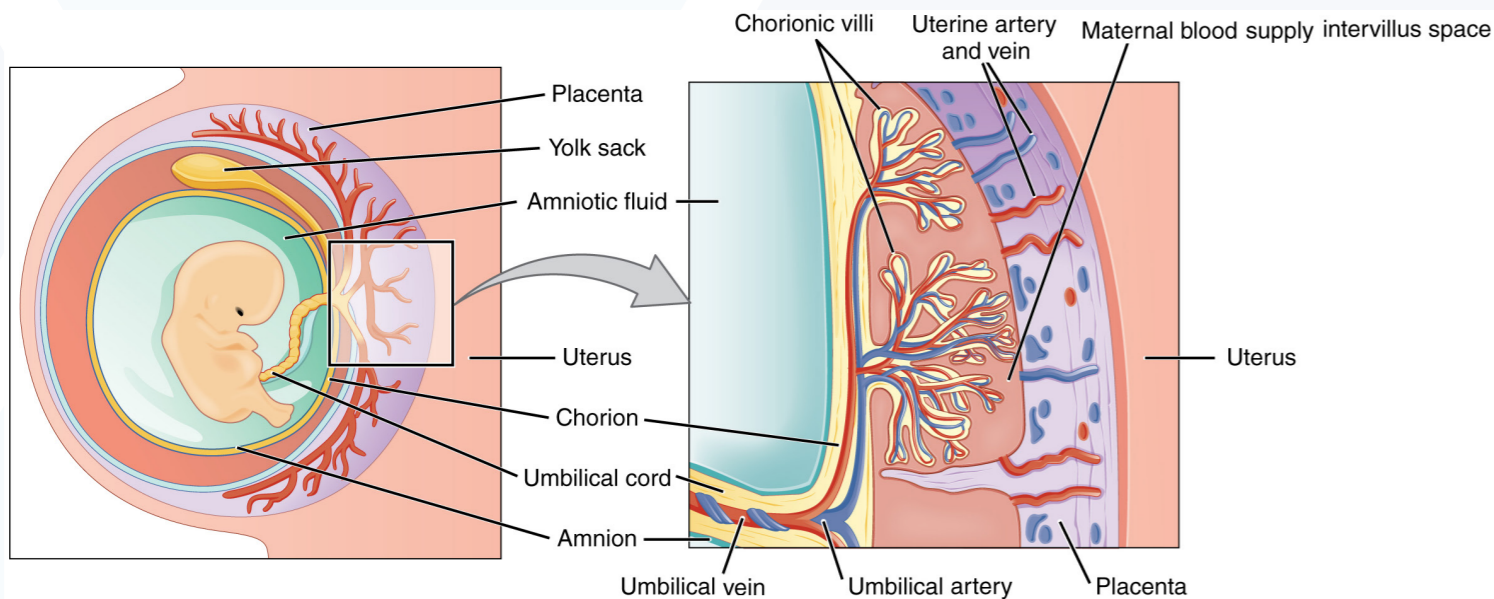
The blastocyst secretes **HCG (human gonadotrophic hormone)** which maintains the corpus luteum. The corpus luteum produces **progesterone** which:

1. Maintains the endometrium.
2. Inhibits the production of **FSH** and **LH**.
3. Suppresses contraction of the uterine wall.

This has the effect of preventing menstruation and the formation of a new follicle.

When formed, the placenta takes over producing HCG and after 16 weeks it takes over the production of progesterone, it also produced **oestrogen** that stimulates the growth of the uterus and the mammary glands.

Pregnancy - The placenta links the mother to the foetus in pregnancy for the exchange of oxygen, carbon dioxide, nutrients and waste products.

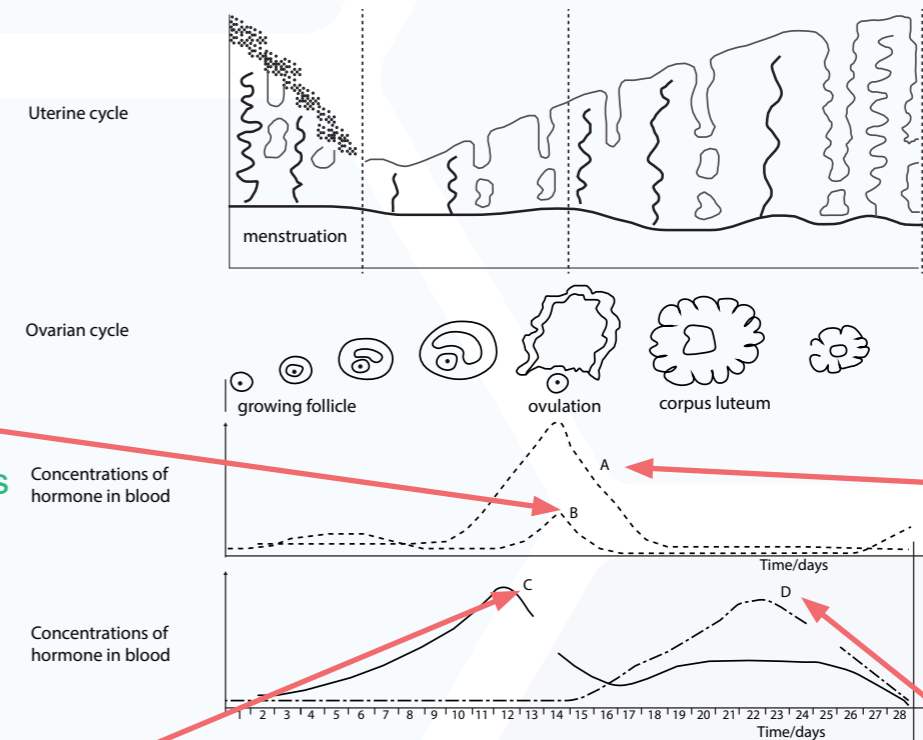


The menstrual cycle - A series of hormonal and physiological changes involving the brain, ovaries and uterus. Controlled by the hormones:

- LH (lutenising hormone)
- FSH (Follicle stimulating hormone)
- Oestrogen
- Progesterone.

Negative feedback

As the concentration of **FSH** increases at the start of a cycle, it stimulates the production of **oestrogen**. **Oestrogen** builds up and inhibits **FSH** secretion, this is **negative feedback** and results in a decrease.



A high level of **LH** from the anterior pituitary gland initiates ovulation and the graafian follicle becomes the corpus luteum.

The level of **oestrogen**, secreted by the developing follicle, increases in the blood which triggers the repair of the endometrium; this inhibits **FSH** production and stimulates **LH** production.

The corpus luteum produces **progesterone** that further develops the endometrium.

With no implantation falling **FSH** and **LH** levels cause the corpus luteum to degenerate. This means **progesterone** levels fall, the endometrium breaks down and is lost during menstruation.

Structure	Function
Chorionic villi	Extend into the maternal blood and have microvilli to increase surface area, thin walls for easy diffusion and blood flows in a counter current direction to the maternal blood to maintain diffusion gradients along the whole blood vessel. Cells also fuse together preventing the mother's white blood cells from entering the foetal blood. Antibodies can pass through though conveying some immunity.
Intervillous spaces	Contain maternal blood and bathe chorionic villi. This means mothers blood and foetal blood do not mix and changes in maternal blood pressure do not damage delicate foetal capillaries.
Umbilical arteries	Carries deoxygenated blood and waste materials away from the foetus to the chorionic villi where gas exchange and excretion occurs.
Umbilical veins	Carries oxygenated blood and nutrients to the foetus.
Amniotic fluid	Acts as a shock absorber protecting the foetus from bumps.

Sexual Reproduction in Humans 2

Birth - After 39 weeks of development, hormonal changes stimulate birth of the foetus.

1. **Progesterone and oestrogen** decrease. As these were inhibiting oxytocin and prolactin these hormones can again be produced.
2. The posterior pituitary gland secretes **oxytocin** that simulates uterine contractions. Positive feedback occurs where the uterine contractions in turn stimulate more oxytocin to be produced.
3. The anterior pituitary gland secretes **prolactin** stimulating the production of milk by the mammary glands.