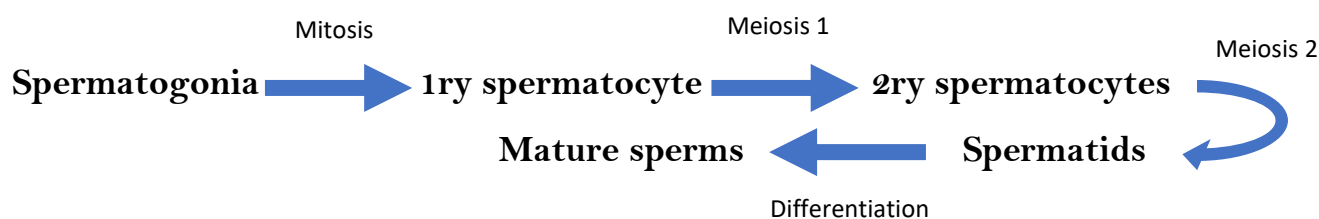


Reproductive Physiology

Spermatogenesis

At birth: There are spermatogonia only (No further division or development until puberty)

At puberty: GnRH level increases.



Part	Secretion
Seminal vesicles	Mucoid material containing fructose, citric acid, nutrients, prostaglandins and fibrinogen
Prostate	Milky alkaline fluid containing Ca, citrate ion, phosphate ion, a clotting enzyme and profibrinolysin
Coming from Epididymis – Vas	Sperms with fluid containing nutrients, estrogens and testosterone, enzymes
Bulbourethral glands	Mucous secretions

* FSH acts on the Sertoli cells to maintain spermatogenesis. Inhibin (produced by the Sertoli cells) inhibits the secretion of FSH from the anterior pituitary. (LOOP)

* LH acts on the Leydig cells to promote testosterone synthesis. Testosterone inhibits the secretion of LH (more LOOPS)

*More actions of Testosterone:

- ✓ Differentiation of epididymis, vas deferens, seminal vesicles, and growth of penis and prostate
- ✓ Spermatogenesis in Sertoli cells
- ✓ Deepening of voice
- ✓ Increased muscle mass
- ✓ Male hair pattern and baldness

- ✓ Sebaceous gland activity (acne formation)
- ✓ Increases bone density, Ca and Na retention, basal metabolism, RBC numbers.

*Hypogonadism = Non-functional testis = no male characteristics

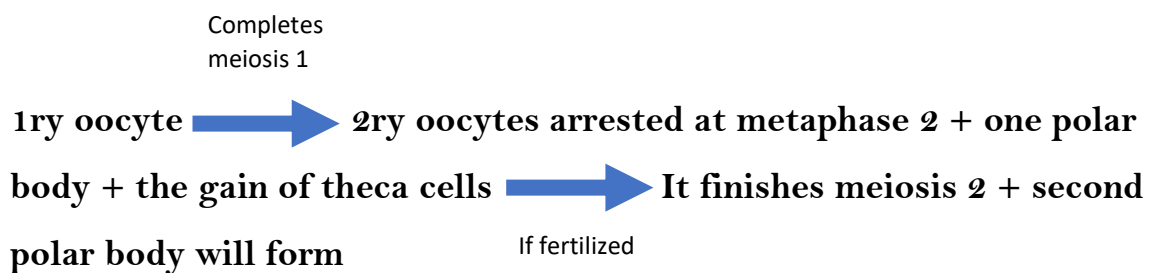
* Cryptorchidism: Failure of the testes to descend in the scrotum

Oogenesis:

At embryonic life: Many primary oocytes (which is an ovum arrested in prophase 1 covered with granulosa cells)

At birth: There are 1-2 million of these and they will NOT increase further

At puberty: each month one oocyte will



*Eventually polar bodies will degenerate

*FSH stimulates granulosa cells to secrete estrogens

*LH stimulates theca cells to secrete androgens (which can diffuse to granulosa cells and get converted into estrogens)

***Actions of estrogen:**

- ✓ Has both negative (default) and positive (during midcycle) feedback effects on FSH and LH secretion.
- ✓ Causes maturation and maintenance of the fallopian tubes, uterus, cervix, and vagina.
- ✓ Causes the development of female secondary sex characteristics at puberty.
- ✓ Causes the development of the breasts.
- ✓ Up-regulates estrogen, LH, and progesterone receptors.
- ✓ Causes proliferation and development of ovarian granulosa cells.
- ✓ Maintains pregnancy.

- ✓ Uterine contraction

*Actions of progesterone

- ✓ Has negative feedback effects on FSH and LH secretion during luteal phase.
- ✓ Maintains secretory activity of the uterus during the luteal phase.
- ✓ Maintains pregnancy.
- ✓ Raises the uterine threshold to contractile stimuli during pregnancy.
- ✓ Participates in development of the breasts

Ovarian Cycle

Follicular phase (days 0-14)

- ✓ A primordial follicle develops to the graafian (preovulatory mature) stage.
- ✓ LH and FSH receptors are up-regulated in theca and granulosa cells.
- ✓ Estradiol levels increase and cause proliferation of the uterus.
- ✓ FSH and LH levels are suppressed by the negative feedback effect of estradiol on the anterior pituitary.
- ✓ Progesterone levels are low.

Ovulation (day 14)

- ✓ A burst of estradiol synthesis at the end of the follicular phase has a positive feedback
- ✓ effect on the secretion of FSH and LH (LH surge).
- ✓ Ovulation occurs because of the estrogen-induced LH surge.
- ✓ Estrogen levels decrease just after ovulation (but rise again during the luteal phase)

Luteal phase (days 14-28)

- ✓ The corpus luteum begins to develop, and it synthesizes estrogen and progesterone.
- ✓ Vascularity and secretory activity of the endometrium increase to prepare for receipt of a fertilized egg.
- ✓ If fertilization does not occur, the corpus luteum regresses at the end of the luteal phase.
- ✓ As a result, estradiol and progesterone levels decrease abruptly.

Menses (days 0-4)

- ✓ The endometrium is sloughed because of the abrupt withdrawal of estradiol and progesterone.

*Amenorrhea = **absence** of menstrual cycle

*Menorrhagia = **Heavy bleeding** of menstruation

*Hypomenorrhea = **Light (low)** menstrual blood

*Dysmenorrhea = **Painful** menstruation

Pregnancy

Fertilization: One sperm reaches the ovum first → Enzymes digest corona radiata → Acrosomal enzymes digest zona pellucida and ZP3 is activated → Fusion of the two nuclei + no more sperms allowed to enter

Cleavage and Implantation

Day	Name	More info
Day 1	1 st cleavage	2-cell stage
Day 2	-	4-cell stage
Day 3-4	morula	8-cell uncompact
Day 4	morula	8-cell compacted
Day 5	Early blastocyst	Has blastocyst cavity
Day 8	Late blastocyst	Actual implantation Composed of trophoblast + inner cell mass

*Trophoblastic projections (cords) form part of the placenta

*Decidua is part of the endometrium surrounding implanted fetus

*Inner cell mass gives rise to all kinds of cells

*There are two umbilical arteries sending unoxygenated blood and one vein bringing oxygenated blood

*Placenta has nutritive, protective, and endocrine roles for the embryo

*It secretes hCG which keeps corpus luteum alive till week 13-17

*hCG peaks at around 10 weeks

*Changes in the pregnant women:

- ✓ Increased size of uterus, vagina, breast, etc

- ✓ Higher metabolic rate, increased appetite, and weight gain

- ✓ Increased retention of Na, Cl, water → Higher blood volume

*Pre-eclampsia = pregnancy hypertension + proteinuria (usually)

*Eclampsia = Pre + seizures, kidney and liver failure

*Factors that induce parturition(normal labor):

- ✓ Increased Estrogen/progesterone ratio
- ✓ Oxytocin (mother and fetus), corticosteroids, prostaglandins (from fetus)
- ✓ Fetus moving and stretching of uterus and cervix → positive feedback
- ✓ Abdominal muscles contraction

*Lactation:

- ✓ Prolactin levels increase steadily during pregnancy because estrogen stimulates prolactin secretion from the anterior pituitary.
- ✓ Lactation does not occur during pregnancy because estrogen and progesterone block the action of prolactin on the breast.
- ✓ After parturition, estrogen and progesterone levels decrease abruptly and lactation occurs.
- ✓ Lactation is maintained by suckling, which stimulates both oxytocin and prolactin secretion.
- ✓ Ovulation is suppressed as long as lactation continues because prolactin inhibits hypothalamic GnRH secretion.

Organ System Development

Pre-natal	Post-natal
Respiratory system not working	Works within 10 minutes
Low blood flow to lungs and high blood flow to placenta	The opposite (no placenta)
Spinal cord reflexes are present High nervous functions are not developed	Nervous system fully develops Myelination is completed at 1 year age
GIT: excrete meconium only	Neonates can digest and absorb just like children but use starch and absorb fat less efficiently

*Respiratory distress syndrome: No enough surfactant

*Closure of foramen ovale, ductus arteriosus, and ductus venosus takes place after birth

*Indomethacin (prostaglandin antagonist) can treat patent ductus arteriosus

*Misusing oxygen therapy for premature infants can cause blindness

*After birth, pulmonary resistance decreases, right heart pressure decreases, while left heart and systemic pressure increases.

Good Luck