

Reproduction

The ability of an organism to give rise/birth to new offspring of its own kind.

How reproduction is different in humans from other living organisms?

Reproduction begins at certain age in humans.

It is not essential for the survival of living organisms.

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Human Reproduction:

Diocious (Unisexal)

Major sexes of sexual reproduction:

① Gametogenesis → Formation of gametes

Sperm
spermatogenesis
Egg
oogenesis

② Fertilization → Fusion of gametes leading to zygote formation

③ Development of zygote (simpler) into adult (very complex)

Internal fertilization

Complete internal development

The ability of an organism to produce new offspring of its own type is called reproduction. It is a unique characteristic of life as it is not essential for the survival of the individual unlike other characteristics of life; it is however, required for the survival of the species. Without reproduction, the species will cease to exist if all of the members of present generation have died.

Puberty age:

♂ = 8-13 years

♀ = 9-14 age

11.1 REPRODUCTIVE SYSTEM OF MAN

Human reproduction needs internal fertilization. The reproductive system is unique in two respects. Firstly, the fact that it does not become functional until it is 'turned on' at puberty by the action of sex hormones. In contrast, all other body systems are functional at birth or shortly thereafter. Secondly, the other organ systems of the body exhibit slight differences in male and female while the reproductive system is quite different in male and female.

11.1.1 Male Reproductive System (Simple system)

The main function of male reproductive system is to produce and maintain sperms.

Structure of male reproductive system

The male reproductive system includes: gonads (testes), accessory ducts (epididymis, ductus deferens, ejaculatory duct and urethra), accessory gland (seminal vesicles, prostate gland, bulbourethral glands) and copulatory organ (penis).

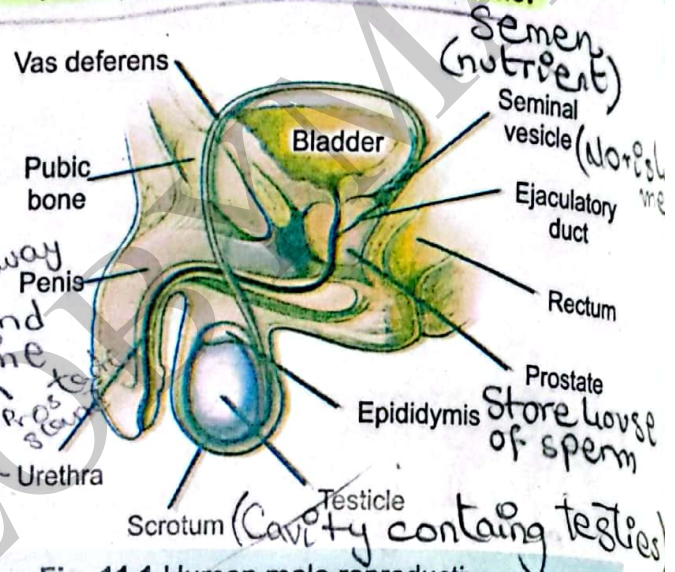


Fig. 11.1 Human male reproductive system. (lateral view)

Gonads (Testes)

The testes are male gonads which are situated outside the abdomen within a skin pouch called scrotum. Each testis is divided into 250 to 300 lobules. Each lobule contains one to four tightly coiled seminiferous tubules.

Accessory ducts

Once spermatozoa are produced, they move through the seminiferous tubules and enter a tubular network called the rete testis for further maturation. The spermatozoa are transported out of the testis by a series of efferent ductules. The epididymis is coiled on the outer surface of the testis. The epididymis functions in the transport and storage of the sperms.

Contain 1000 of Seminiferous tubules. (1-4 in each tubules) lobules: Convert immature cells into mature cells.

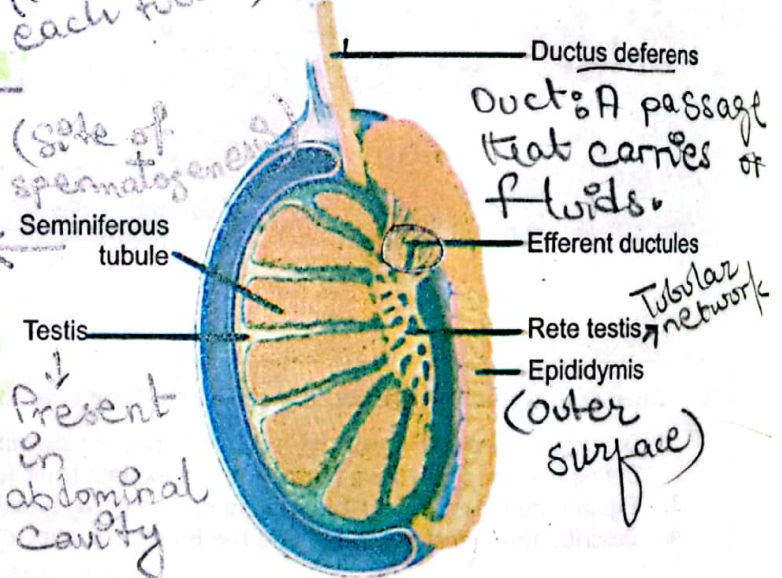


Fig. 11.2. Anatomy of testis (gonads)

Testes are present outside the body because their temperature is lower than the body temperature.

Despite the long length of seminiferous tubules how are they adjusted into the testis? (they are highly coiled).

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• All the seminiferous tubules combine and open at a certain point called Rete testis.

• Why are testis present outside the body? (Body temp is 37°C and testis work/survive at 35°C temp so they are placed outside so that they can survive at their optimum temp.

Important features of Male Reproductive System

- > A pair of testis (also called gonads)
- > Present in abdominal cavity
- > Accessory duct
- > Accessory gland

Glands:

1- Seminal vesicles: Produce seminal fluid which nourishes and protects sperm.

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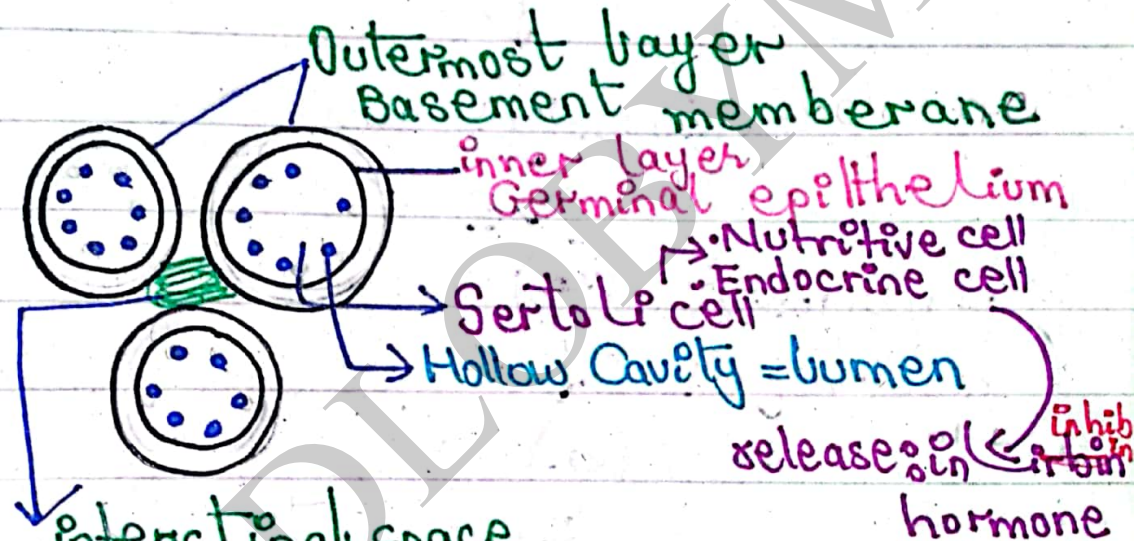
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2- Prostate glands: Produces prostate fluid, which makes up a significant portion of semen and helps sperm survive.

3- Bulbourethral glands: Produce pre-ejaculate fluid, which lubricates the urethra and prepares it for ejaculation.

Function of $\Rightarrow$ Regulate the sperm
inhibin hormone production

Structure Of Seminiferous tubules



Interstitial space
(Made of interstitial cell)

- Also called Leydig cell
- Function: Production and release of testosterone (male specific hormone)

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Germinal epithelium cell



Primordial germ cell



Spermatogonial mother cell

$2n$



Mitotic Division

$2n$



Mitotic

Primary Spermatocyte

$2n$

Meiosis I



Secondary Spermatocyte

$2n$

$2n$



Meiosis II

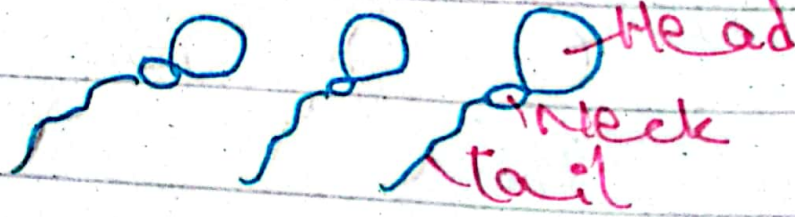
Early Spermatids

$2n$

$2n$

$2n$

$2n$



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Female Reproductive System

- > Gonads (ovaries) (Pair)
- > Oviduct (Fallopian tubes) (Pair)
- > Uterus
- > Vagina (Birth Canal)
- > Cervix

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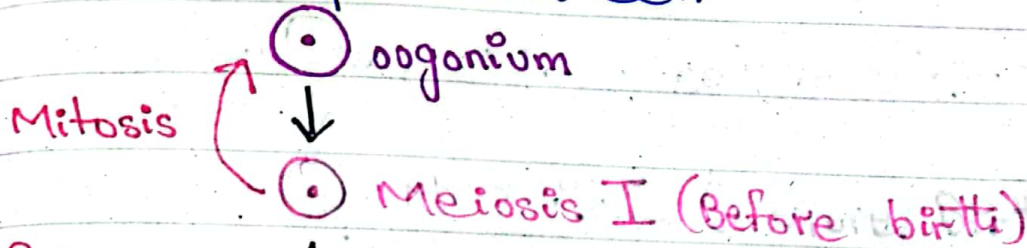
*Ovulation is the process of releasing egg from graafian Follicle.

⇒ Endometrium is the layer present inside the uterus which contains blood vessels. This layer sheds off during menstrual phase.

Oogenesis

Meiosis II will start at Secondary oocyte and stop at metaphase II and will continue **IF** the egg gets sperm.

General epithelium cell



Primary oocyte

(Puberty age)

Primary Oocyte

2n

Meiosis II

First polar Body
(Disintegrate)

Secondary (immature egg)
Oocyte

(Metaphase II) Ovation begins

If sperm is present then further process will happen



Second polar Body
(Disintegrate)

zygote

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Cyclic Activities

Reproductive cycle / Menstrual Cycle

> Start → Puberty age → Menarche

> End → Late 40s / → Menopause
early 50s

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* First time: Menstrual cycle

↳ Follicular stage / Pre ovulatory phase

↳ Ovulation phase

↳ Luteal phase / Secretory / Post ovulatory phase

↳ Menstrual phase

• The endometrium layer (which contains blood vessels) burst out, leading to the flow of blood.

• Ovarian hormones (Hormones on ovary) are at their lowest levels.

• FSH levels rise

• Continue for **3-7 days**

↳ Proliferative/pre-ovulatory phase

- Oogenesis occur
- Blood vessels began to gather.
- LH blood level increase
- Stimulate the release of more than 1 Follicle
- Promotes the process of oogenesis.

> Estrogen ^{negative} _{Influence} → FSH

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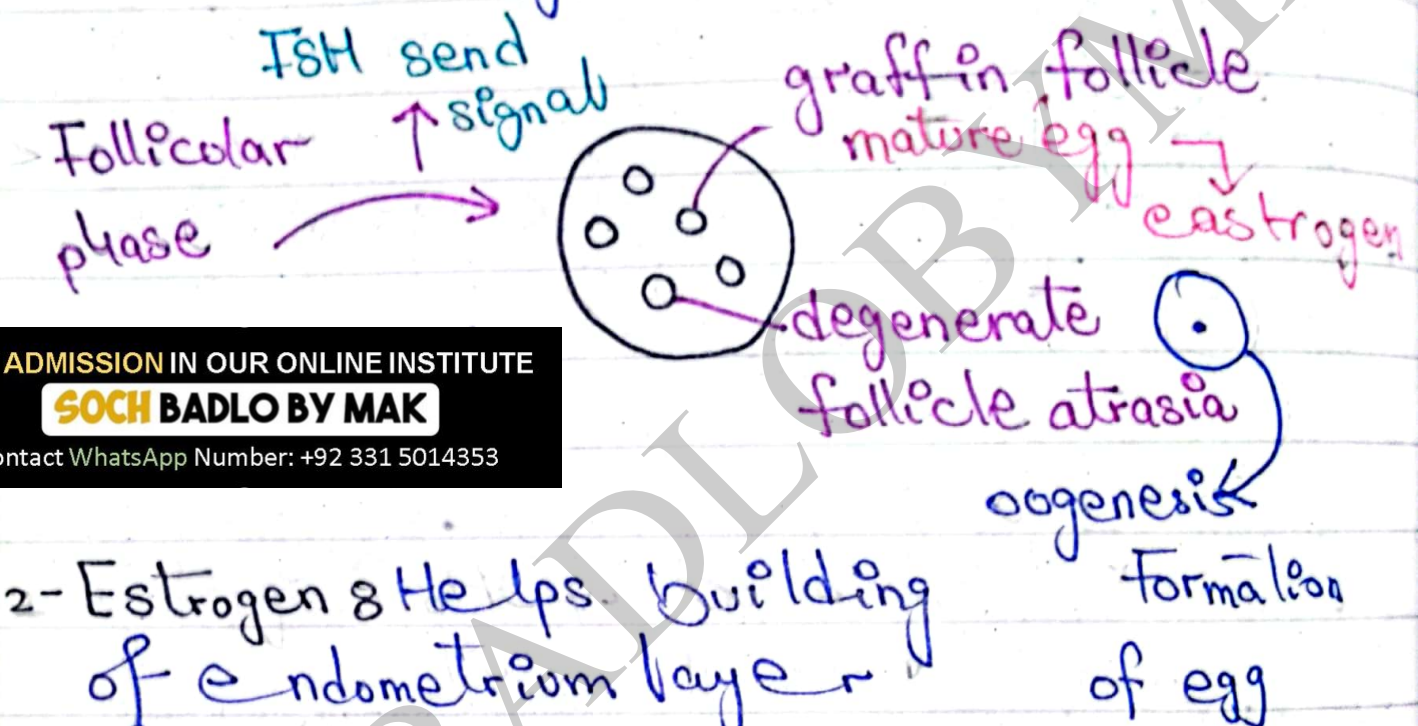
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↳ Secretory/Post-ovulatory phase

- Endometrium ~~level decreases~~ is built again.
- LH blood level decreases
- Glycogen give nutrients to the embryo for the re-formation of endometrium layer.
- Progesterone further prepares the endometrium for establishment of pregnancy (conception) and maintain it
- If fertilization doesn't occur corpus luteum degenerates.

Hormones

1- FSH → Produce follicles stimulate growth in follicle (which forms estrogen hormone).



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2- Estrogen helps building of endometrium layer if in case pregnancy occurs.

> Once follicle established, so estrogen hormone decreases the growth/rise of FSH.

(Negative feedback)

> Formed in between the cycle (ideal cycle 28 days).