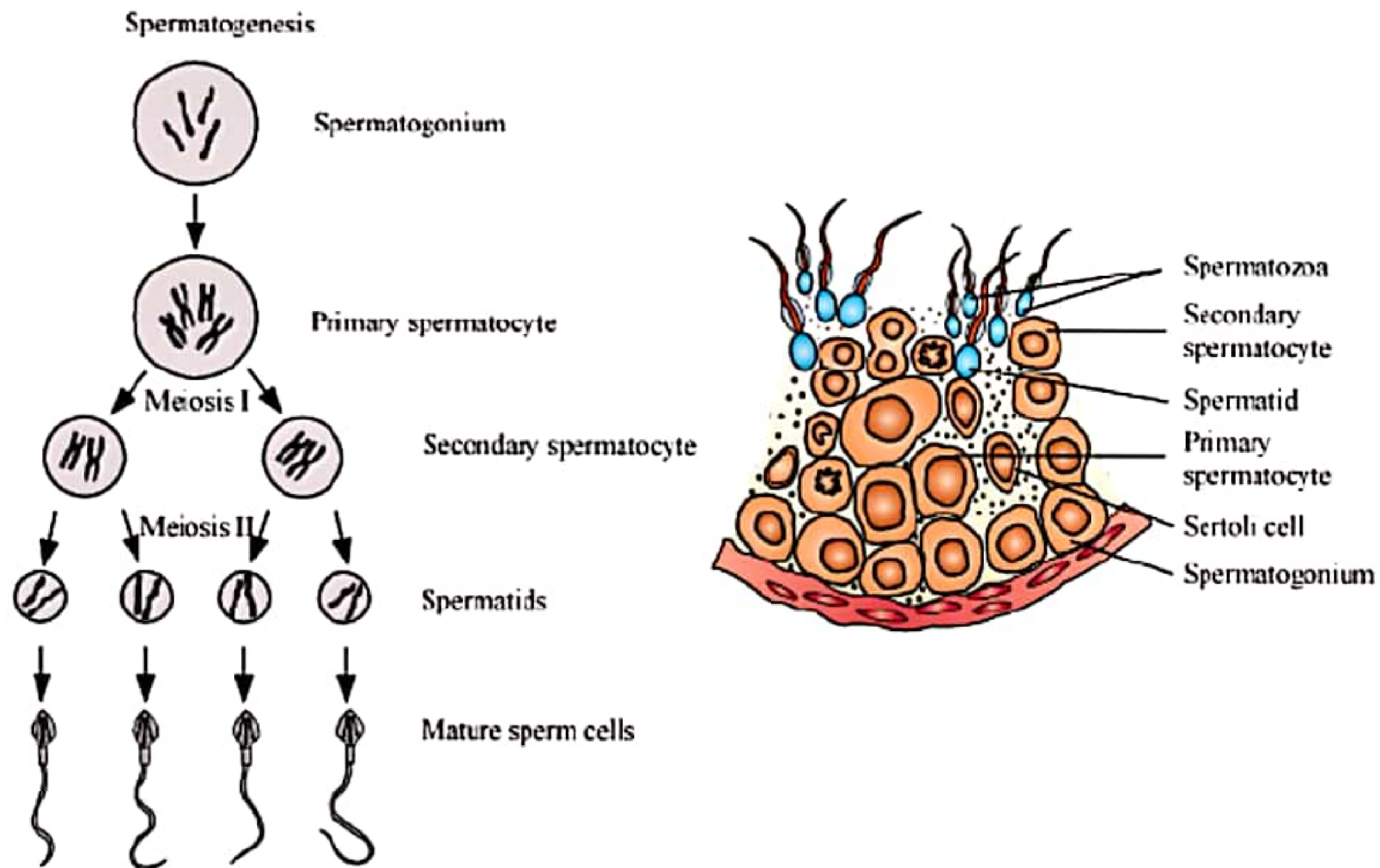


Gametogenesis

The testis and ovary produce the male and female gametes respectively by gametogenesis (spermatogenesis in males and oogenesis in females).

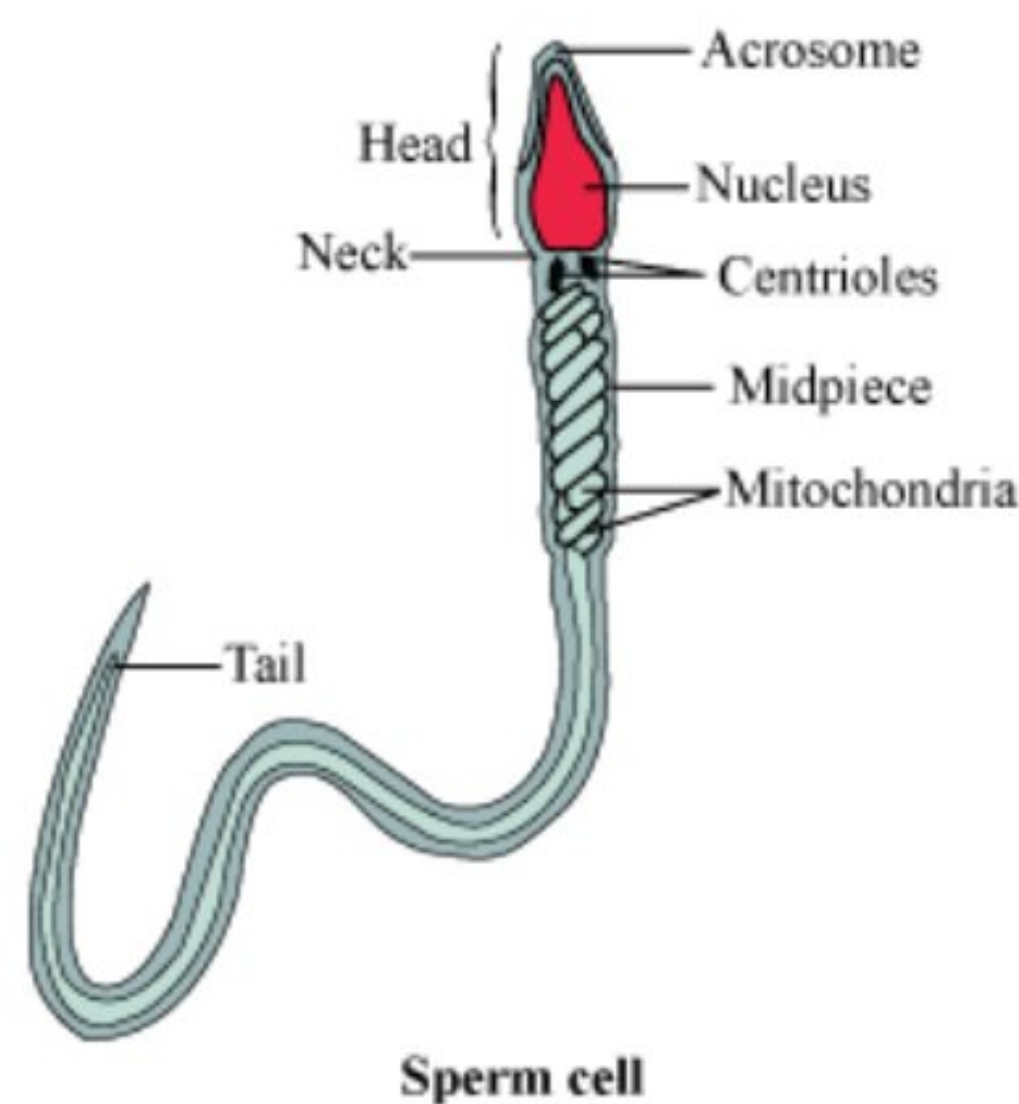
Spermatogenesis



- In males, sperms are produced by the **spermatogonia** (immature germ cells), which are present in the inner walls of the seminiferous tubules.
- Spermatogonia increase in number by mitosis. These are diploid.
- Some of the spermatogonia called **primary spermatocytes** periodically undergo meiosis.

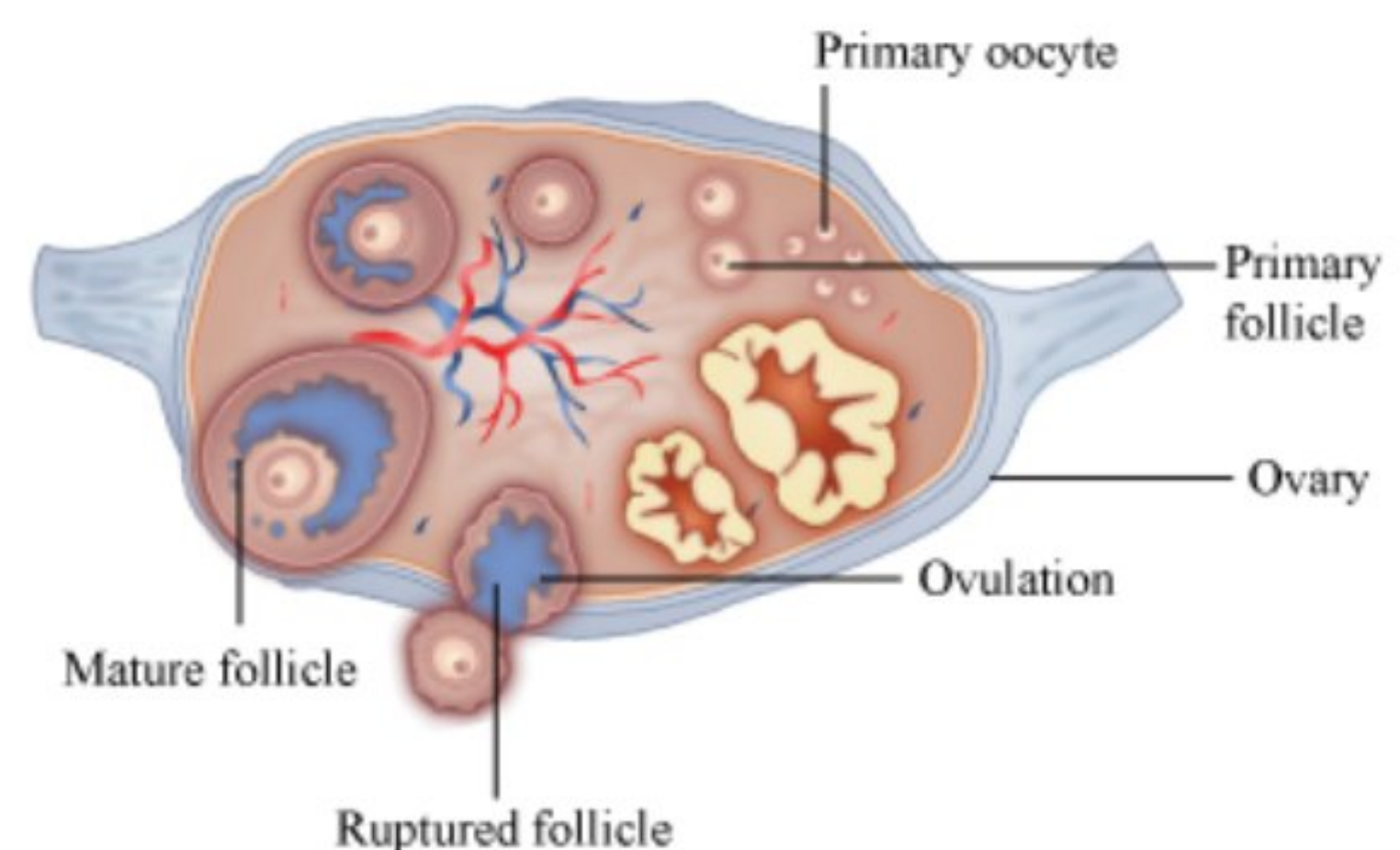
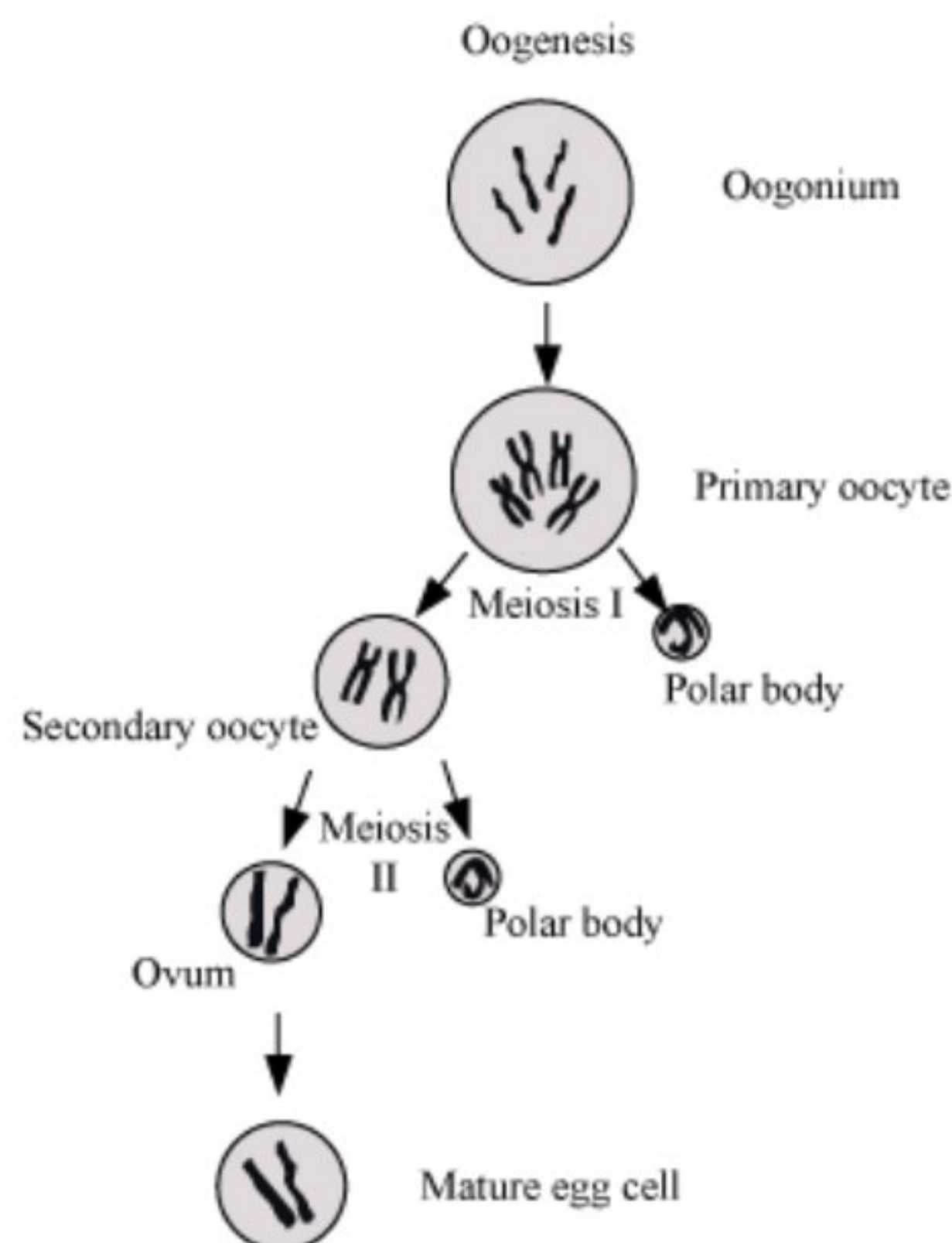
- After the first meiotic division, two haploid and equal **secondary spermatocytes** are formed.
- These further undergo meiosis to give rise to four haploid **spermatids**.
- These spermatids are converted into sperms by **spermiogenesis**.
- The sperm head gets embedded in the Sertoli cells after spermiogenesis and is released from the seminiferous tubules by **spermiation**.
- Spermatogenesis starts at puberty by the action of the gonadotropin releasing hormone (GnRH), which in turn causes the release of two gonadotropins called Luteinizing Hormone (LH) and Follicle Stimulating Hormone (FSH).
- LH acts on Leydig cells and causes them to release androgens, which stimulate the process of spermatogenesis while the FSH acts on the Sertoli cells, which help in spermiogenesis.

Structure of a Sperm



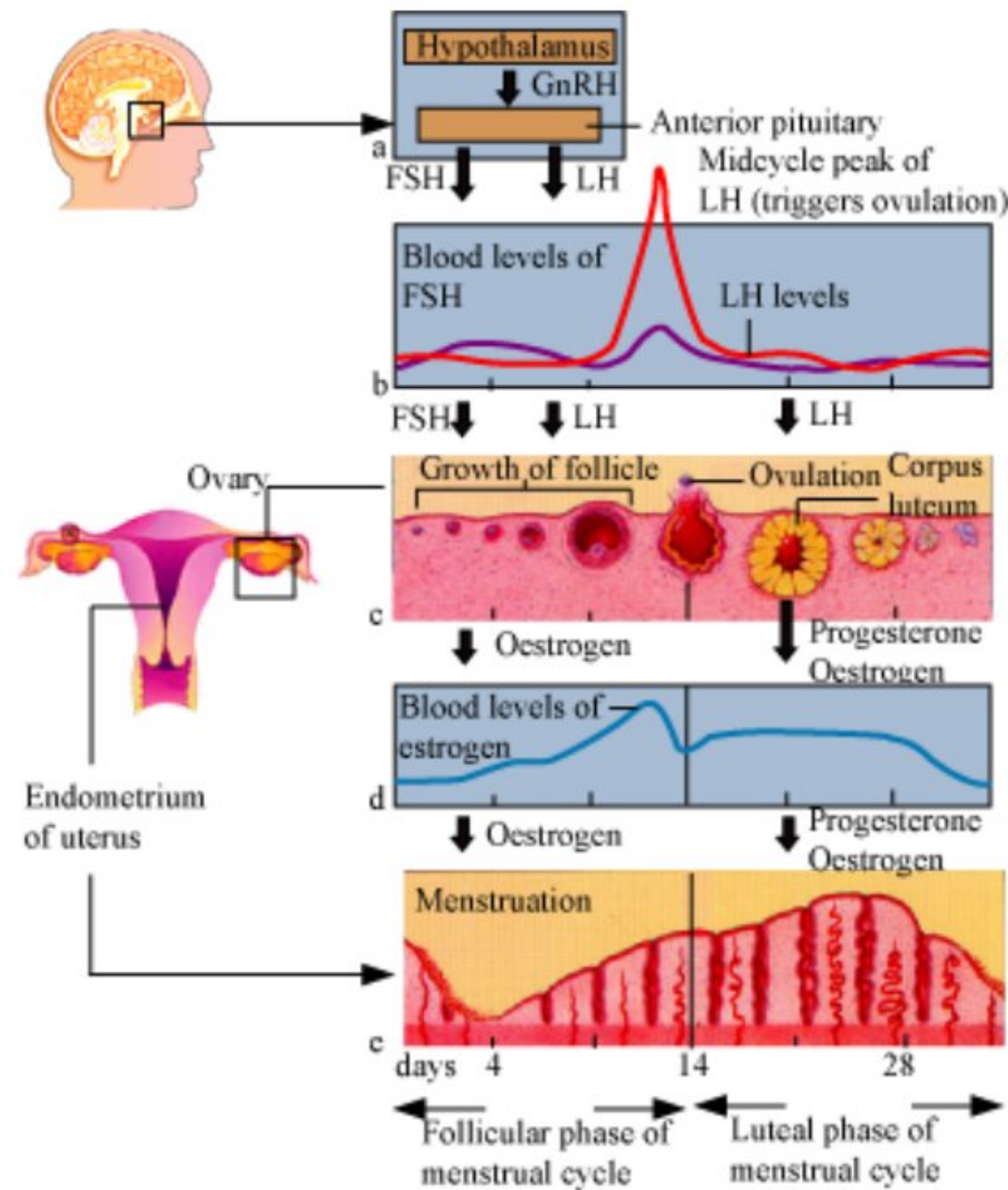
- A mature sperm consists of:
 - Head
 - Neck
 - Middle piece
 - Tail
- The whole sperm is enclosed in a plasma membrane.
- The head consists of a haploid nucleus and a cap-like **acrosome**, which contains enzymes that aid in fertilisation.
- The middle piece contains several mitochondria, which produce energy for the motility of the sperm.
- Sperms released by the seminiferous tubules are transported by the accessory ducts.
- Secretions of epididymis, vas deferens, seminal vesicles, and prostate are essential for maturation and motility of sperms.

Oogenesis



- The ovum is formed by the process of oogenesis.
- It starts during embryonic growth and millions of gamete mother cells (**oogonia**) are formed in the foetal ovary.
- These cells undergo meiosis, but get temporarily arrested at the prophase and are called **primary oocytes**.
- Before reaching puberty, a large number of primary oocytes degenerate and the remaining ones get surrounded by layers of granulosa cells and new theca and are called **secondary follicles**.
- The secondary follicles are then converted into **tertiary follicles** that have characteristic fluid-filled cavity called antrum. At this stage, the primary oocyte present within the tertiary follicle completes meiosis, which results in the formation of haploid secondary oocyte and a tiny polar body.
- This tertiary follicle further changes into the **Graafian follicle**. The secondary oocyte is surrounded by the zone pellucida.
- Then the Graafian follicle ruptures to release the ovum by **ovulation**.

Menstrual Cycle & Fertilisation



- Menstrual cycle is the reproductive cycle in all primates and begins at puberty (menarche).
- In human females, menstruation occurs once in 28 to 29 days. The cycle of events starting from one menstruation till the next one is called the **menstrual cycle**.
- During the middle of the menstrual cycle, one ovum is released (ovulation).
- The cycle starts with the **menstrual flow** (3 to 5 days), caused due to the breakdown of the endometrium of the uterus. Blood vessels in liquid state are discharged, but this occurs only when the ovum is not fertilised.
- It is followed by the **follicular phase**. In this phase, the primary follicles mature into the Graffian follicles. This causes the regeneration of the endometrium.

These changes are brought about by ovarian and pituitary hormones. In this phase, the release of gonadotropins (LH and FSH) increases. This causes follicular growth and the growing follicles produce oestrogen.

- The LH and FSH are at their peak in the middle of the cycle (14th day), and cause the rupture of the Graffian follicles to release ovum. This phase is called the **ovulatory phase**.
- The remains of the Graffian follicles get converted into the corpus luteum, which secretes progesterone for the maintenance of the endometrium.
- In the absence of fertilisation, the corpus luteum degenerates, thereby causing the disintegration of the endometrium and the start of a new cycle.
- In humans, the menstrual cycle ceases to operate at the age of 50 years. This phase is known as the **menopause**.