

# Difference Between Male and Female Gametogenesis

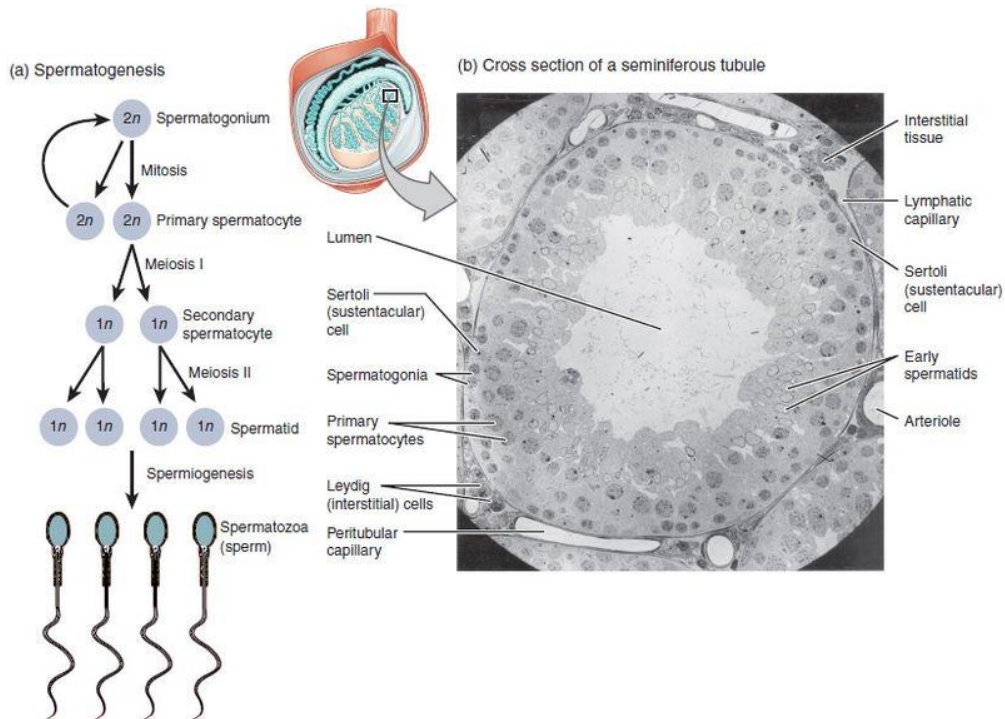
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## Key Difference - Male vs Female Gametogenesis

In the context of reproduction, gametogenesis is an important aspect. Reproduction could be divided into three (03) main stages; gametogenesis, fertilization, and embryo development. Gametogenesis is a process by which gametes are formed. The **key difference** between male and female gametogenesis is that **male gametogenesis involves the production of sperms known as spermatogenesis while female gametogenesis involves the production of the ovum (eggs) known as oogenesis**. The two processes take place in the gonads; spermatogenesis in the testis and oogenesis in the ovaries. Both processes initiate development through the outer layer of the cells of the gonads known as germinal epithelium. Both processes involve three stages; multiplication, growth, and maturation. Spermatogenesis and oogenesis involve meiosis, which results in the formation of two sets of haploid (n) chromosomes; secondary spermatocyte and oocyte from diploid (2n) primary spermatocyte and oocyte. Both maturation divisions take place and get completed in the testis. First maturation division occurs in the ovaries, and secondary maturation division takes place outside the ovaries once the fertilization is initiated.

## What is Male Gametogenesis?

Male gametogenesis process is known as spermatogenesis; results in the production of sperms. It takes place in the testis of males, and the process is initiated from the epithelial cells of the germinal layer of the seminiferous tubules, a structure present within the testis. Due to mitosis and repeated cell division in the germinal epithelium, many spermatogonia are produced. These spermatogonia grow and develop into primary spermatocyte. The primary spermatocytes are haploid (2n) which undergo meiotic division (meiosis I) to develop secondary spermatocytes which are haploid (n). From one primary spermatocyte, two secondary spermatocytes are produced. These haploid (n) spermatocytes undergo meiosis II to produce four (04) spermatids (n). Mature sperms (n) are produced from each spermatid (n). A sperm is a long structure with two distinct parts; the head region and the tail. It is of 2.5µm in diameter and 50 µm in length. The head region consists of an acrosome, modified lysosome which helps in penetrating into the ovum and a nucleus with a haploid number of chromosomes (23 pairs).

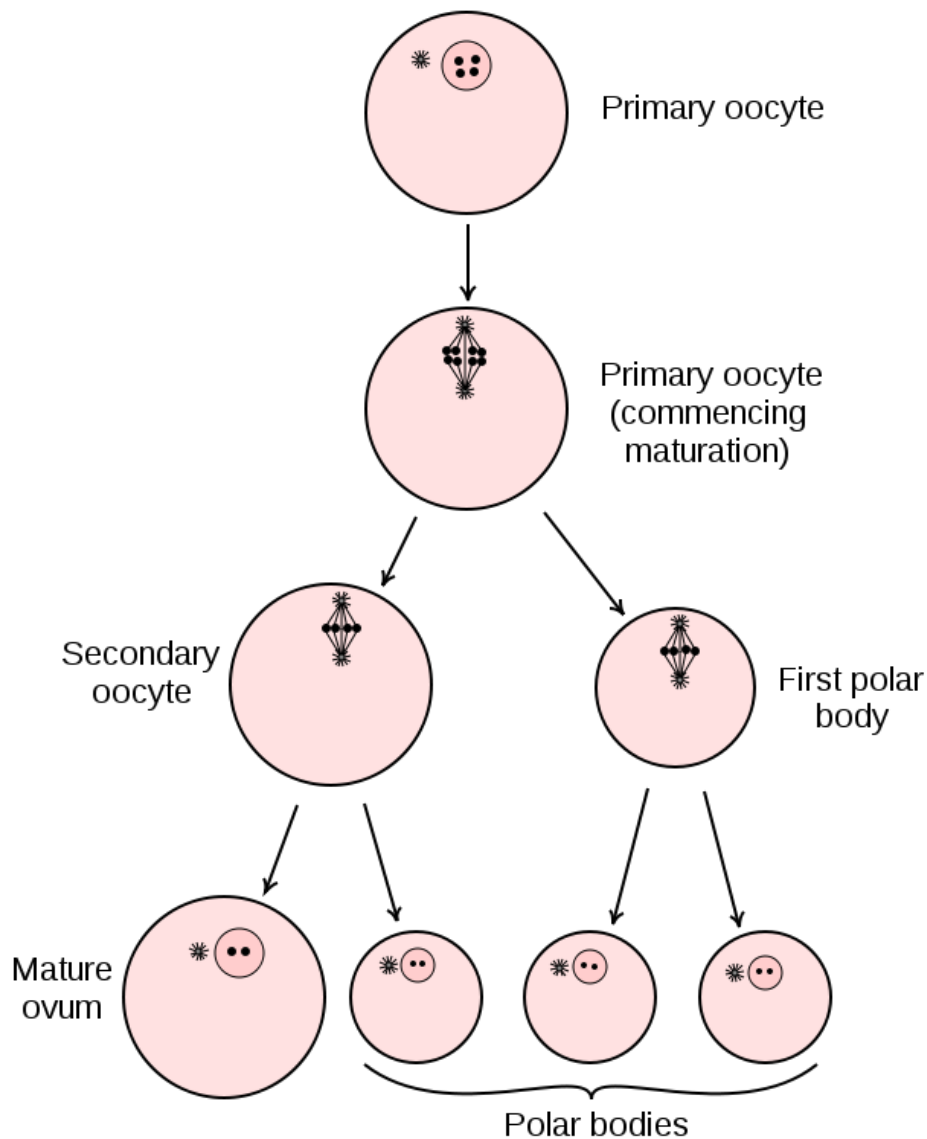


**Figure 01: Spermatogenesis**

Spermatogenesis is regulated by the action of the hypothalamus and anterior pituitary. The hypothalamus secretes a hormone known as gonadotropin-releasing hormone (GnRH) which activates the anterior pituitary in order to release two gonadotrophin hormones; follicle stimulating hormone (FSH) and Luteinizing hormone (LH). LH stimulates the production of testosterone which is a steroid hormone that involves in the development of the spermatogonia in the production of sperms. Inhibin, a glycoprotein hormone is released from the Sertoli cells (somatic cells of the testis) which create a negative feedback mechanism to reduce the rate of spermatogenesis by affecting the anterior pituitary to inhibit the secretion of FSH.

## What is Female Gametogenesis?

Oogenesis is a process of formation of female gametes known as female gametogenesis. This occurs initially in the germ cells known as Oogonium. The eggs are produced in females before birth. During the development of the female fetus, numerous oogonia are produced. These oogonia undergo rapid mitotic division in order to produce primary oocytes. These primary oocytes remain in the prophase of meiosis I during the whole period of childhood. The primary oocyte is enclosed within a layer of cells known as granulosa cells. This results in a structure known as primordial follicles. At birth, around two million of primordial follicles exist. But with the occurrence of puberty, this number reduces to 60000 to 80000 of primordial follicles in each ovary. The follicles contain fluid-filled cavity known as the antrum.



**Figure 02: Oogenesis**

The primary oocytes complete two maturation divisions; Meiosis I and Meiosis II. During meiosis I two unequal haploid ( $n$ ) daughter cells are produced; one large secondary oocyte ( $n$ ) and a small first polar body. This polar body undergoes meiosis II and produces the second polar body. Also, meiosis II of secondary oocyte develops the ovum which is haploid ( $n$ ) with two polar bodies attached. These polar bodies do not involve in any reproductive processes thus degenerate with time. Hormones involved in oogenesis are similar to that of spermatogenesis which includes GnRH from the hypothalamus to initiate the release of LH and FSH from the anterior pituitary. Progesterone involves limiting oogenesis.

## What are the Similarities Between Male and Female Gametogenesis?

- Both processes involve meiosis.
- Both processes initiate with the cells in the germinal epithelium.

- Both processes involve three stages of development (multiplication stage, growth stage and maturation stage).

## What is the Difference Between Male and Female Gametogenesis

Male Gametogenesis vs Female Gametogenesis	
Male gametogenesis is known as spermatogenesis which results in the production of sperms.	Female gametogenesis is a process which forms female gametes.
Location	
Both maturation divisions took place and completed in the testis during male gametogenesis.	First maturation division occurs in the ovaries and secondary maturation division take place outside the ovaries once the fertilization is initiated during the oogenesis.
Primary Division	
A primary spermatocyte develops through division into two secondary spermatocytes in male gametogenesis.	One secondary oocyte and a polar body are developed through primary oogenesis in female gametogenesis.
Secondary Division	
Two spermatids are developed by the division of secondary spermatocyte in male gametogenesis.	An ovum and a polar body are formed by the division of secondary oocyte in female gametogenesis.
Formation of polar bodies	
No polar bodies are formed during male gametogenesis.	Polar bodies develop through the division of both primary and secondary oocytes in female gametogenesis.
Results	
Four spermatozoa are produced from a spermatogonium during male gametogenesis.	Oogonium forms only one ovum during female gametogenesis.

### Summary - Male vs Female Gametogenesis

Gametogenesis is the process of formation of gametes. This includes spermatogenesis; male gametogenesis and oogenesis; female Gametogenesis. Spermatogenesis takes place in the testis. Oogenesis takes place in the ovaries of females and is initiated at the fetus level. Both processes are initiated from the cells of the germinal epithelium of the gonads and involve meiosis. In spermatogenesis, both maturation divisions took place and completed in the testis. In oogenesis, first maturation division occurs in the ovaries and secondary maturation division take place outside the ovaries once the fertilization is initiated. This is the difference between male gametogenesis and female gametogenesis.

**Image Courtesy:**

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2.'Gray5.svg'By Henry Vandyke Carter - Henry Gray (1918) Anatomy of the Human Body at Bartleby.com: Gray's Anatomy, Plate [Available here](#) (Public Domain) via [Commons Wikimedia](#)

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APA: Difference Between Male and Female Gametogenesis. (2017, October 2). Retrieved (date), from <http://differencebetween.com/difference-between-male-and-vs-female-gametogenesis/>

MLA: " Difference Between Male and Female Gametogenesis" Difference Between.Com. 19 September 2017. Web.

Chicago: "Difference Between Male and Female Gametogenesis." Difference Between.Com. <http://differencebetween.com/difference-between-male-and-vs-female-gametogenesis/> accessed (accessed [date]).



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