

Difference Between Gametogenesis and Embryogenesis

www.differencebetween.com

Key Difference - Gametogenesis vs Embryogenesis

In the context of reproduction, gametogenesis and embryogenesis are two important aspects. The continuation of life on earth solely depends on the reproduction of organisms. During sexual reproduction, gametes are formed by gametogenesis. In humans, two types of gametes are produced. They are female gametes (eggs) and male gametes (sperms). The gametes unite to form a zygote through fertilization. Embryogenesis is the development of the zygote into a fetus. With respect to mitosis and meiosis, **gametogenesis involves cell division by both mitosis and meiosis but, during embryogenesis cell division occurs only through mitosis.** This is the **key difference** between gametogenesis and embryogenesis.

What is Gametogenesis?

The process of formation of gametes is known as gametogenesis. It is an important aspect in the context of reproduction. Gametogenesis is of two types, male gametogenesis (spermatogenesis) and female gametogenesis (oogenesis). Spermatogenesis and oogenesis take place in the gonads; testis and ovaries respectively. Both processes complete three stages; multiplication, growth, and maturation. Gametogenesis involves meiosis where two sets of haploid (n) chromosomes are produced by both spermatogenesis and oogenesis.

Spermatogenesis is the process which produces male gametes; sperms. This process takes place in the epithelial cells of the seminiferous tubules. The seminiferous tubules are structures present in the testis. Initially, mitosis takes place in the epithelium where rapid cell division leads to the formation many spermatogonia which then develops into diploid (2n) primary spermatocyte. The primary spermatocyte undergoes the first stage meiosis (meiosis I) which results in haploid (n) secondary spermatocytes. Each primary spermatocyte gives rise to two secondary spermatocytes. The secondary spermatocytes complete meiosis II which results in the formation of 04 spermatids from each secondary spermatocyte. The spermatids give rise to mature sperms.

The process is regulated by the hypothalamus and anterior pituitary. The hypothalamus secretes GnRH (gonadotrophin releasing hormone) which stimulates the anterior pituitary to release follicle stimulating hormone (FSH) and Luteinizing hormone (LH). Both hormones involved in the development and maturation of sperms. LH also stimulates the production of testosterone which causes the development of spermatogonia. The rate of spermatogenesis is controlled through a negative feedback mechanism induced by a glycoprotein hormone; inhibin released by Sertoli cells. Inhibin decreases the rate of spermatogenesis by affecting the anterior pituitary which inhibits the release of FSH.

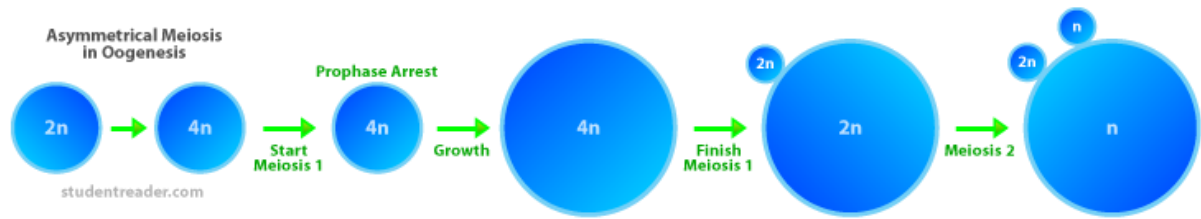


Figure 01: Gametogenesis

The process of production of female gametes is known as oogenesis. Oogenesis initially occurs in the Oogonium, and the female eggs are produced before birth. Oogonia are produced during the fetal stage. They undergo mitosis, and primary oocytes are produced through rapid cell division. It is covered by a layer of cells called granulosa cells. The whole structure is referred to as primordial follicles. During birth, a female child possesses two millions of primordial follicles. During the whole period of childhood, the primary oocytes remain in the prophase stage of the first stage of meiosis (meiosis I). With the onset of puberty, the number of primordial follicles decreases to 60000 to 80000 in each ovary. Meiosis I completes the formation of haploid (n) secondary oocyte. The mature ovum completes meiosis II once the fertilization process is completed. Similar to spermatogenesis, GnRH, LH, and FSH involve in the regulation of oogenesis. The rate is controlled by progesterone.

What is Embryogenesis?

Embryogenesis is the process by which the development of the zygote occurs once the fertilization process is completed. Fertilization process is the first step of embryogenesis. The zygote is developed through the fusion of haploid (n) male sperm with the haploid (n) female ovum. The zygote is a diploid ($2n$) structure. The zygote undergoes different development stages which include division of cells, formation, and reorganization of different tissue layers and the development of organs and organ systems. This whole process is known as embryogenesis.

Initially, the zygote divides rapidly which give rise to a structure which consists of many cells known as blastocyst. The cells in the blastocyst divide and lead to the formation of a hollow cavity known as blastocoel. The hollow cavity plays an important role in the development of different tissue layers of the body.

The blastocyst moves along the fallopian tube into the uterus and attaches to the uterine wall. This process is known as implantation. The uterus is the location where all the development processes of the fetus will take place. Once attached, the cells of the uterine wall divide and grow around the blastocyst. This leads to the formation of the amniotic cavity.

Next stage is gastrulation, which is an important step during embryogenesis. This process leads to the formation of the three germ layers; ectoderm, endoderm, and mesoderm. The ectoderm gives rise to the nervous system and outer layers of the body which includes nails and skin etc. The endoderm involves in the formation and development of the lining of different systems of the body; excretory system, digestive system and respiratory system. The mesoderm gives rise to

the skeletal system, cardiovascular system, reproductive system and to muscles and kidneys.

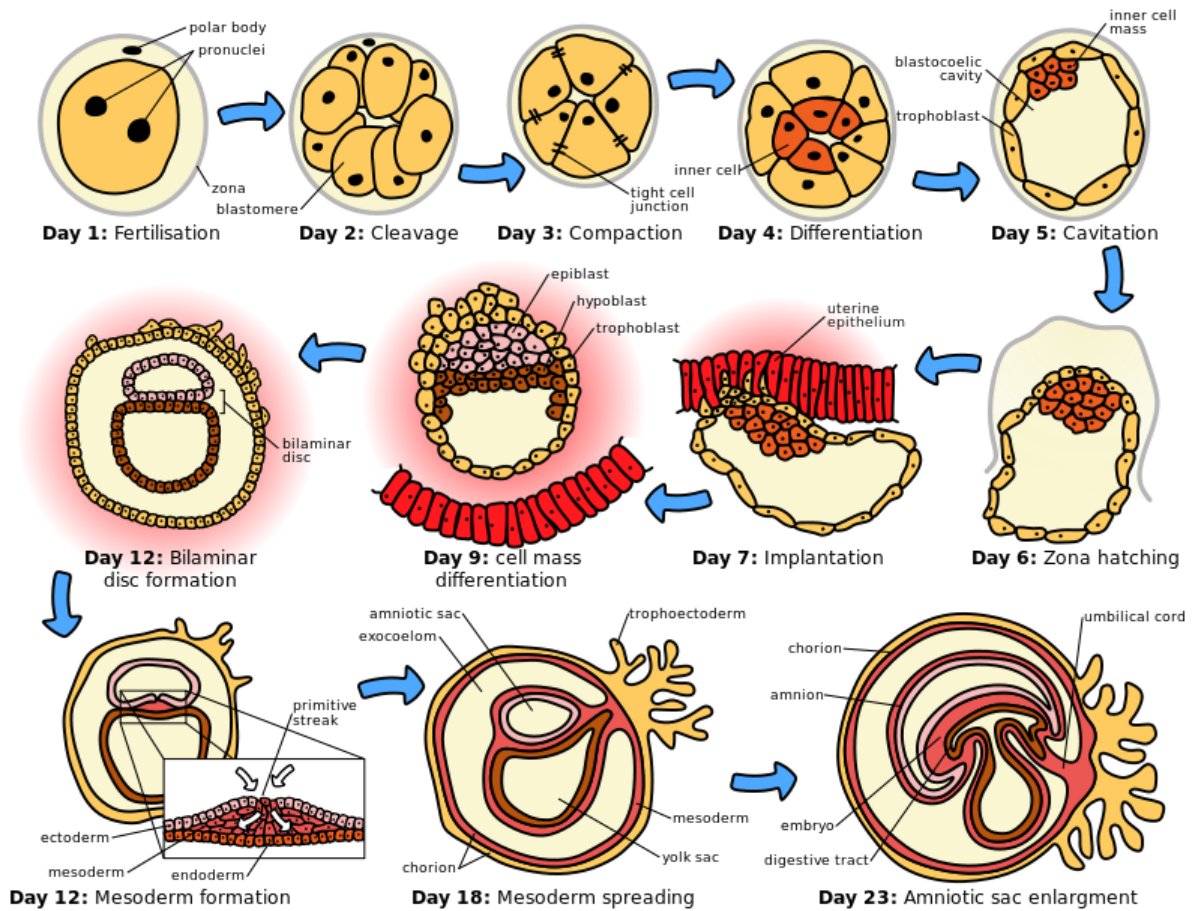


Figure 02: Embryogenesis

Once gastrulation is completed neurulation is initiated. During neurulation, the neural plate developed by the ectoderm folds which transfers it to a neural tube. This is followed by the complete development of the nervous system. Embryogenesis proceeds and completes through blood cell development and organogenesis and finally ends up in formation of a complete fetus once all the development stages are completed.

What are the Similarities Between Gametogenesis and Embryogenesis?

- Both processes involve in the process of reproduction.
- Both processes involve cell division.

What is the Difference between Gametogenesis and Embryogenesis?

Gametogenesis vs Embryogenesis	
Gametogenesis is the process by which male and female gametes are produced.	Embryogenesis is the formation and development of the embryo once the zygote is formed through fertilization.
Type of cell produced	
Gametogenesis produces gametes which are haploid (n) cells.	Embryogenesis produces an embryo which is a diploid (2n) cell.
Mitosis or Meiosis	
During gametogenesis, both mitosis and meiosis take place.	During embryogenesis, only mitosis takes place.

Summary - Gametogenesis vs Embryogenesis

The process of formation of gametes is referred to as gametogenesis. Gametogenesis includes spermatogenesis and oogenesis which results in the formation of haploid (n) sperms and eggs. Cells divide by meiosis and mitosis. Embryogenesis is the development of a zygote through the fusion of male and female gametes. The zygote develops into an embryo and then into a complete fetus. Embryogenesis utilized only mitosis for cell division. This is the difference between Gametogenesis and Embryogenesis.

Reference:

1. "Human embryogenesis." Khan Academy, June 2015, [Available here](#)
2. "Human Reproductive Anatomy and Gametogenesis." Lumen - Boundless Biology, June 2013. [Available here](#)

Image Courtesy:

1. 'Oogenesis-polar-body-diagram' By Studentreader - Own work, [\(CC BY-SA 3.0\)](#) via [Commons Wikimedia](#)
2. 'HumanEmbryogenesis' By Zephyris - SVG version [\(CC BY-SA 3.0\)](#) via [Commons Wikimedia](#)

How to Cite this Article?

APA: Difference Between Gametogenesis and Embryogenesis.(2017 November 15). Retrieved (date), from <http://differencebetween.com/difference-between-gametogenesis-and-vs-embryogenesis/>

MLA: " Difference Between Gametogenesis and Embryogenesis" Difference Between.Com. 15 November 2017. Web.

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



Copyright © 2010-2017 Difference Between. All rights reserved