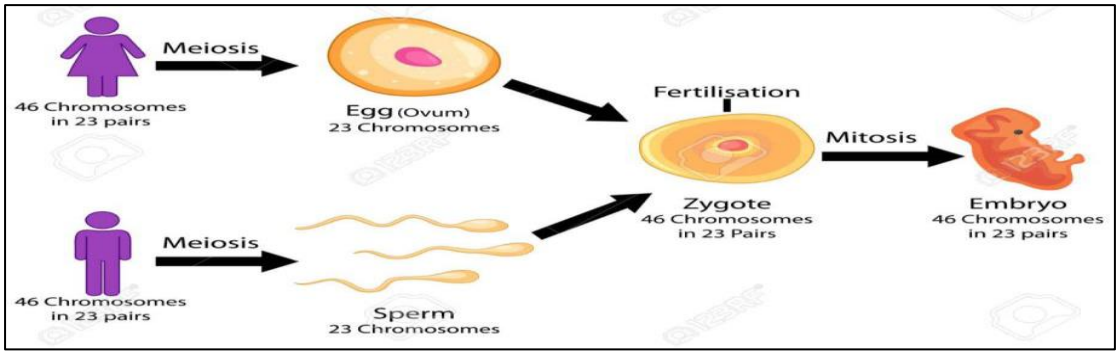
Sexual Reproduction

Sexual reproduction is the process in which new organisms are created, by combining the genetic information from two individuals of different sexes. The genetic information is carried on chromosomes within the nucleus of specialized sex cells called *gametes*. In males, these gametes are called **sperm** in male and in females the gametes are called **eggs.** During sexual reproduction the two gametes join together in a fusion process known as **fertilization,** to create a **zygote**.



Sexual reproduction in human

Cell Division

Growth and development of every organism depend on multiplication, enlargement and differentiation of its cells, beginning from the zygote. Cell division increases the number of cells; both the somatic cells and the sex cells depended directly on cell division, so the division of the cells includes two types:

1- Nuclear division (karyokinesis)
2- Cytoplasmic division (cytokinesis)

The nuclear material of the living body cells both somatic and reproductive cells requires division before the division of the cytoplasm, therefore there are two types of nuclear division

1- **mitosis**
2- **meiosis**
In the multicellular organisms there are two types of the nuclear division:
1- **Mitosis** >>> a nuclear division occur in the **somatic cells.**
2-**Meiosis** >>> occur in gametes (**sex cells**).

Embryology: is the study of the formation and development of embryo and fetus.

Gametogenesis: it is a biological process thereby a haploid cell (n) is formed from a diploid cell (2n) through meiosis cell and differentiation.

Gametogenesis consists of two types:-

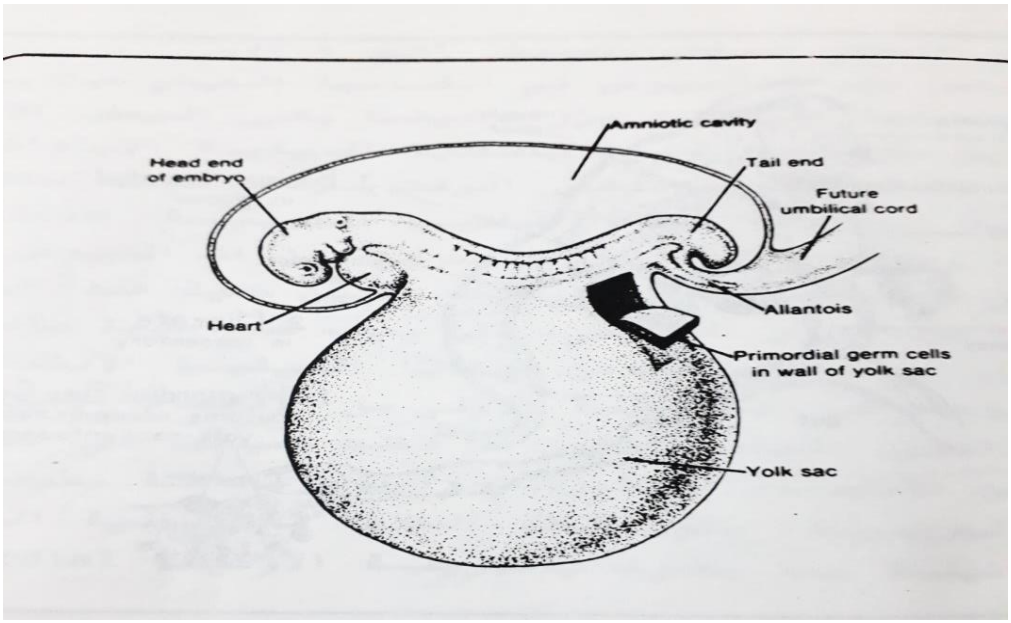
1) **Spermatogenesis** in a male.
2) **Oogenesis** in a female.

There are two types of gametes:

1- Male gametes (sperm).
2- Female gametes (ovum).

Primordial Germ Cells(PGCs)

Both male and female gametes are derived from the primordial germ cells(PGCs) during the embryogenesis. Primordial germ cells **(**PGCs) are the embryonic precursors of the gametes that are formed in the epiblast and that move to the wall of the yolk sac and then migrate from the yolk sac toward the developing gonads (ovaries or testes). Mitotic divisions increase their number during their migration.



رسم لجنين عمرة ثلاثة اشهر يظهر مكان الخلايا الجرثوميه الاولية في جدار الكيس المحي (عن سادلر)

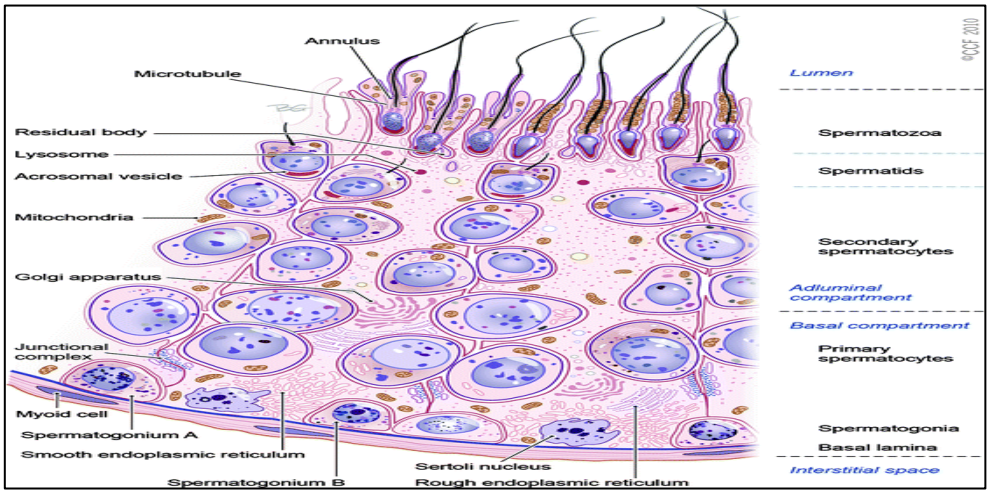
Spermatogenesis

Spermatogenesis is the process by which the primordial germ cells develop into mature **spermatozoa** (sperm) in the male genital system. Therefore the **Spermatogenesis** occur in the wall of seminiferous tubules

The human testis consists of many lobes opened in one end into the vas deferens or sperm ducts.so the Spermatocytogenesis process consist from

1) **Spermatogonium**

- have spherical or oval nuclei and rest on the basement membrane of the seminiferous tubules
- Derived from the mitotic division of the PGCs.
- Contain duplicating chromosomes Diploid cells **(2n).**
- Each one enters many divisions of mitosis to form two daughter cells the primary spermatocytes.



مقطع مستعرض في نبيبات خصوية بشرية(عن ايري)

2) Primary Spermatocytes

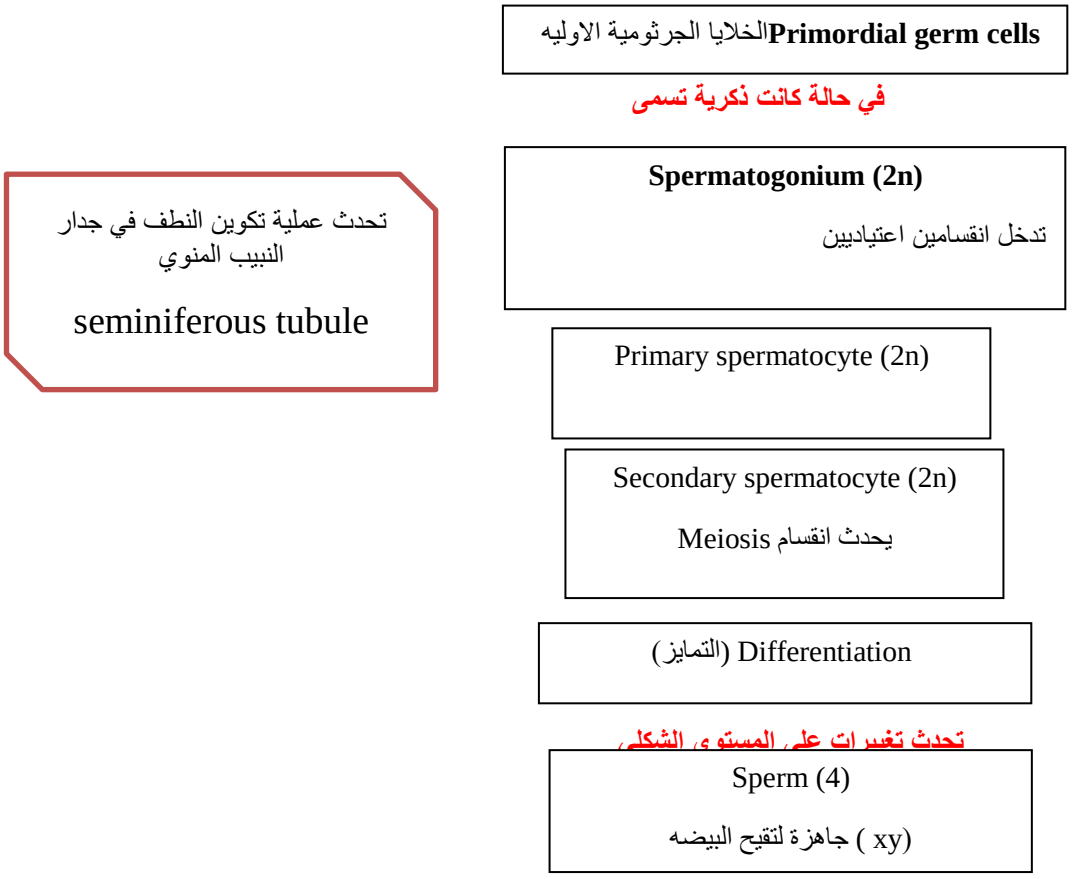
- Bigger than the spermatogonia
- Locate beyond the spermatogonia
- Contain duplicating chromosomes Diploid cells **(2n).**
- Do not enter another mitosis but enter the **meiosis I.**
- These cells develop into **2 haploid secondary spermatocytes (1n)**

3) Secondary Spermatocytes

- Smaller than the primary spermatocytes.
- Locate next to the primary spermatocytes
- Enter the **meiosis II.**
- Give 2 haploid **spermatids (1n).**

4) Spermatids

- Spherical small (round) cells.
- The nucleus not in the center of the cytoplasm.
- Some of them have a **tail bud.**
- Not capable of functioning as male sperms.
- They are Haploid cells **(1n).**
- Don’t inter another divisions
- Inter another process called Spermiogenesis.



مخطط يوضح الاحداث الحاصلة خلال المرحلة الاولى والثانية من الانقسام الاختزالي (عن سادلر)

Spermiogenesis

Spermeiogenesis is the metamorphosis of spherical **spermatids** into elongated **spermatozoa (sperm)**. No further mitosis or meiosis takes place.

During this process the following events occur:

- Formation of the acrosome.
- Formation of the flagellar apparatus.
- Most excess cytoplasm (the residual body) is separated and left in the Sertoli cell.
- Spermatozoa are released into the lumen of the seminiferous tubule.

Spermatozoa (Sperm)

- Very active and mobile cell.
- Found near the cavity of the seminiferous tubules.
- Long head, thin and dark body, long tail.

Sperm regions

1- The head
2- Middle piece
3- Tail