

INTRODUCTION TO EMBRYOLOGY

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Objectives

- After this lecture you should be able to :
- Define Embryology.
- Define the developmental periods.
- Define the significance of embryology.
- Define the different embryological terminology.
- Define the nomenclature used to describe body parts, positions, and relationships.
- Describe in brief the important events in embryology.

Definition of Embryology

- This term generally refers to **prenatal development** of embryos and fetuses.
- “Human embryology” is the science concerned with the origin and development of a human being from a zygote to birth of an infant.
- Development does not stop at birth. Important changes, in addition to growth, occur after birth (**postnatal changes**) e.g., development of teeth and female breasts.

Significance of embryology

Importance of Embryology :

- The study of prenatal stages of development, **especially** those occurring during the **embryonic period** helps us understand the **normal body structure** and the **cause of congenital anomalies**.
- So, It concerned with various genetic and /or environmental factors that disturb normal development and produce birth defects.

Developmental periods :

- Developmental periods are divided into:

1- Prenatal development.

The main developmental changes occurring before birth, including the embryonic and fetal periods.

- The **embryonic period** : starts from the fertilization to the end of 8th week.
- The **fetal period** : begins from the 9th week until birth.

Con.

2- **postnatal development.**

The changes occurring after birth, like teeth and breast.

- Prenatal development is more rapid than postnatal development and results in more striking changes.

Critical Periods of Human Development

- This is the **stage of development of an embryo** that is susceptible to an agent, such as a drug or virus, which can lead to congenital abnormalities.
- Development of the embryo is **most easily disrupted** when the tissues and organs are forming **during the embryonic period**.

Common terms :

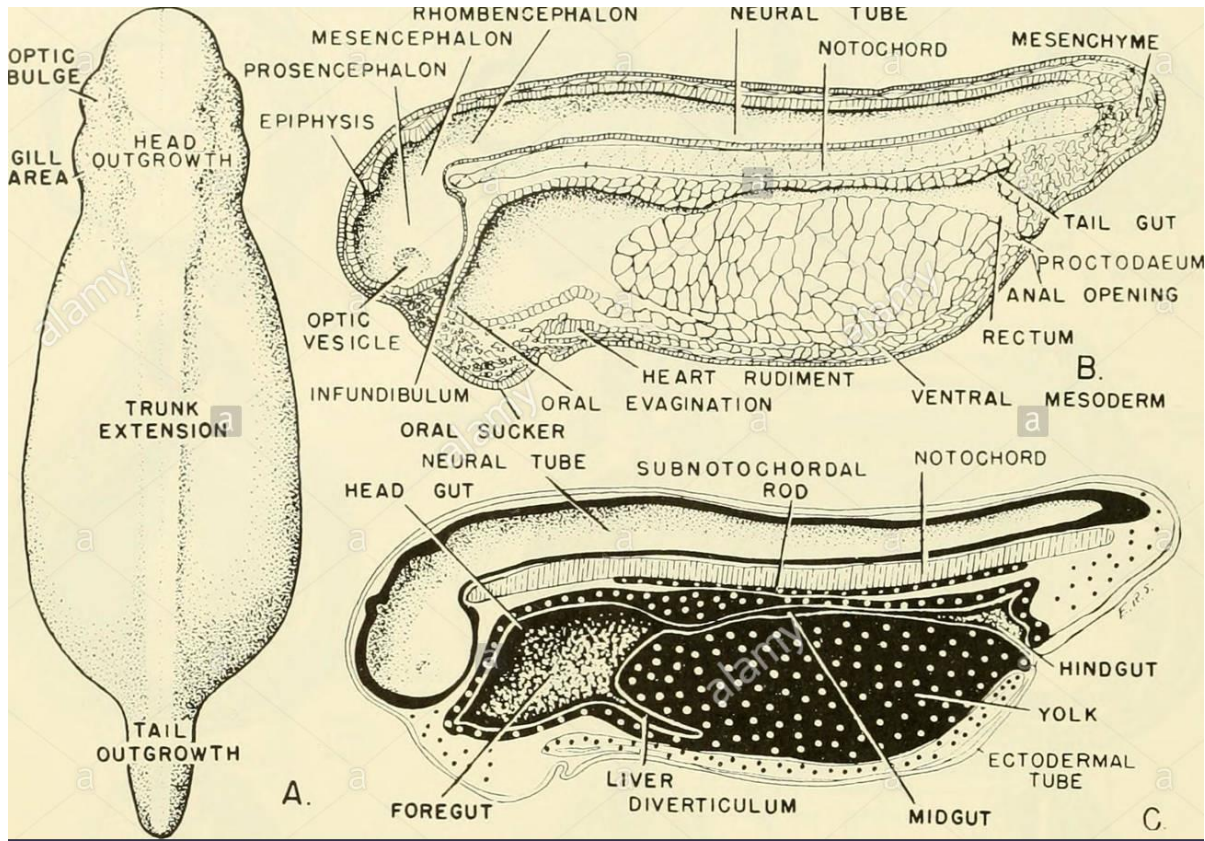
- Oocyte; the immature ovum, female germ cell.
- Ovum; the mature female germ cell.
- Sperm; the mature male germ cell.
- Zygote; the fertilized ovum.
- Cell division; one cell divides into two cells; there are two types of cell division:
 - A- Mitotic; the cell produces 2 cells each contains 44 autosomes and 2 sex chromosomes
 - B- Meiotic; (reduction) it occurs in the primitive germ cells in the testes or the ovaries, it produces 2 cells each contains 22 autosomes and one sex chromosomes.

Descriptive Terms:

- Directions:
- Cranial; the top of the embryo or the head.
- Cephalic; superior or the head.
- Caudal; inferior or the tail end.
- Dorsal; back of the embryo.
- Ventral; anterior or the belly side.
- Medial; near to the midline.
- Lateral; flank side.

Descriptive Terms:

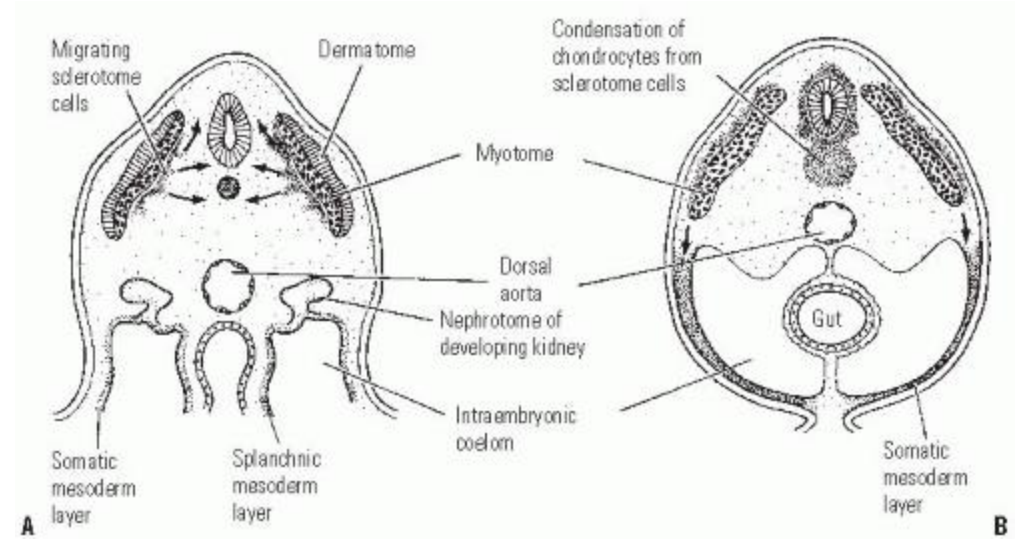
- Plans of sections:
- Longitudinal; median or sagittal.
- Coronal; frontal.
- Transverse; horizontal



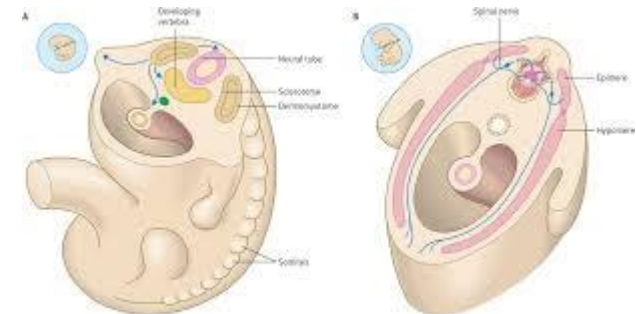
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Longitudinal



Transverse; horizontal



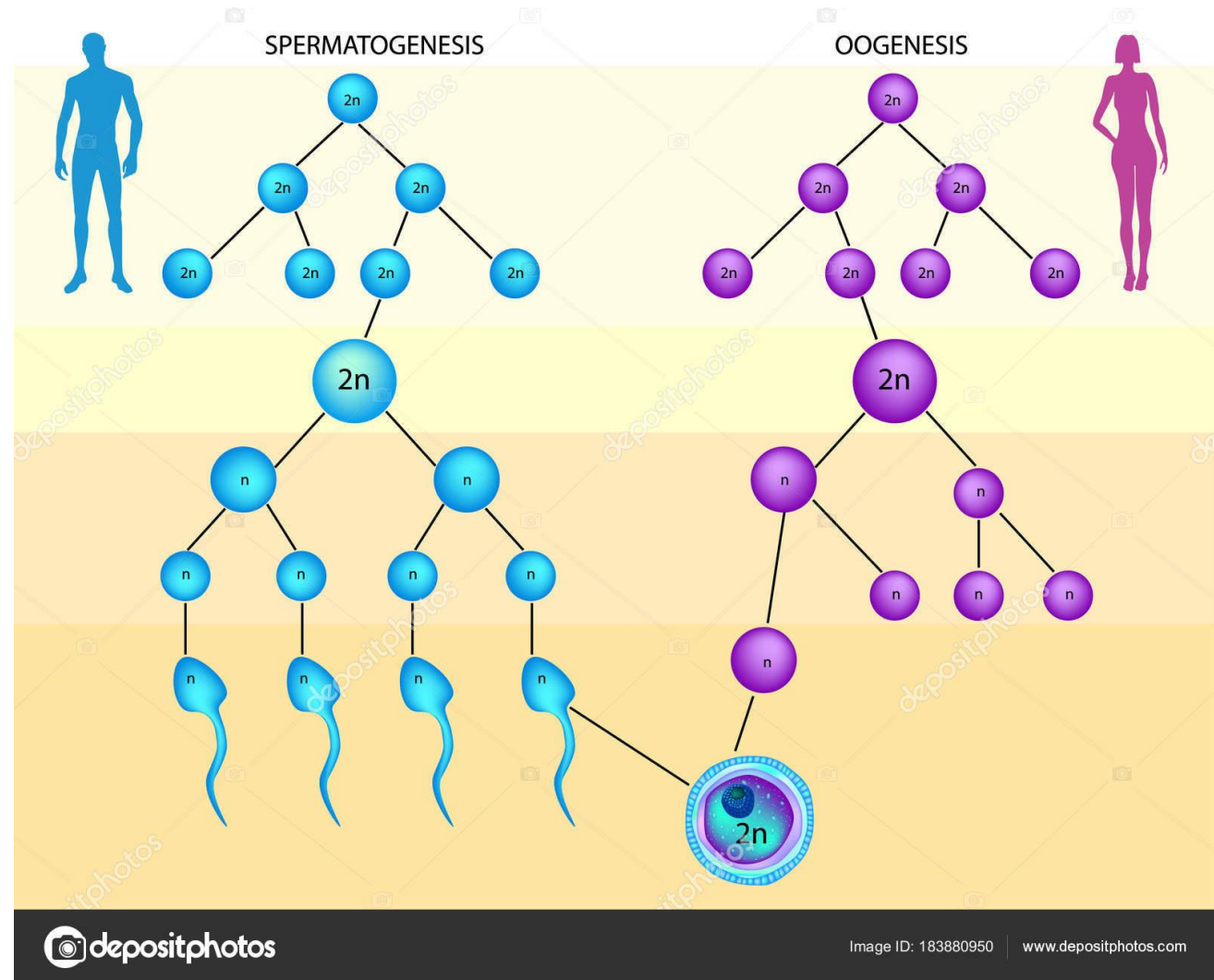
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Major events during embryonic period

- Gametogenesis : occurs at 1st week.
- Fertilization : 1st week
- Implantation : begins one week after fertilization
- Development of the Central Nervous System : 3rd week
- Embryonic Folding : 4th week

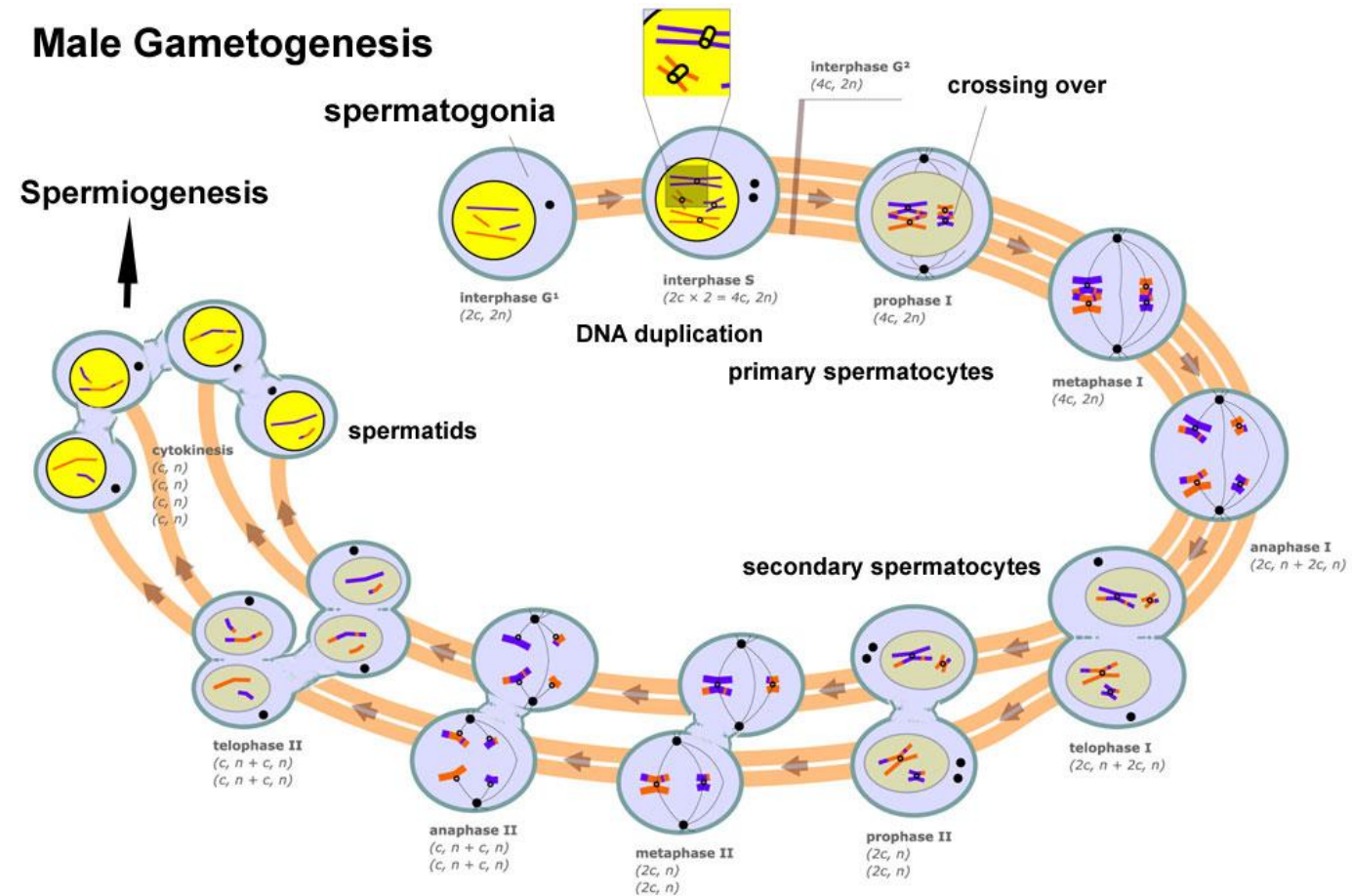
Gametogenesis

- It is the production of mature gametes (sperm and ova) by gonads (testes in males and ovaries in females).
- It is divided into:
 - 1- Spermatogenesis.
 - 2- Oogenesis.



Spermatogenesis

- It is the process of formation of mature sperms, takes place in the seminiferous tubules, occurs continuously from puberty till old ages.

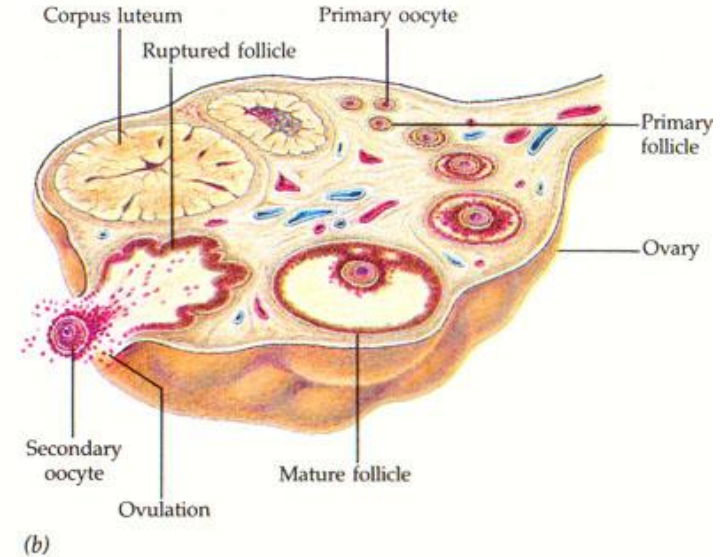
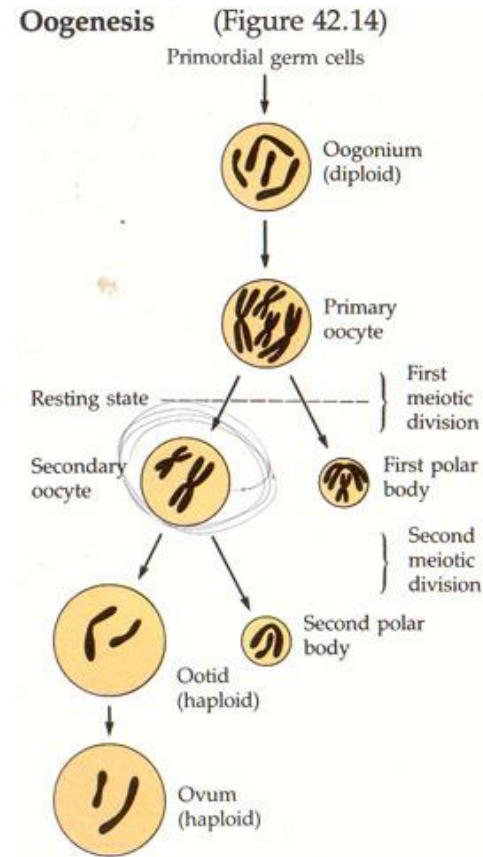


- **Results of spermatogenesis;**

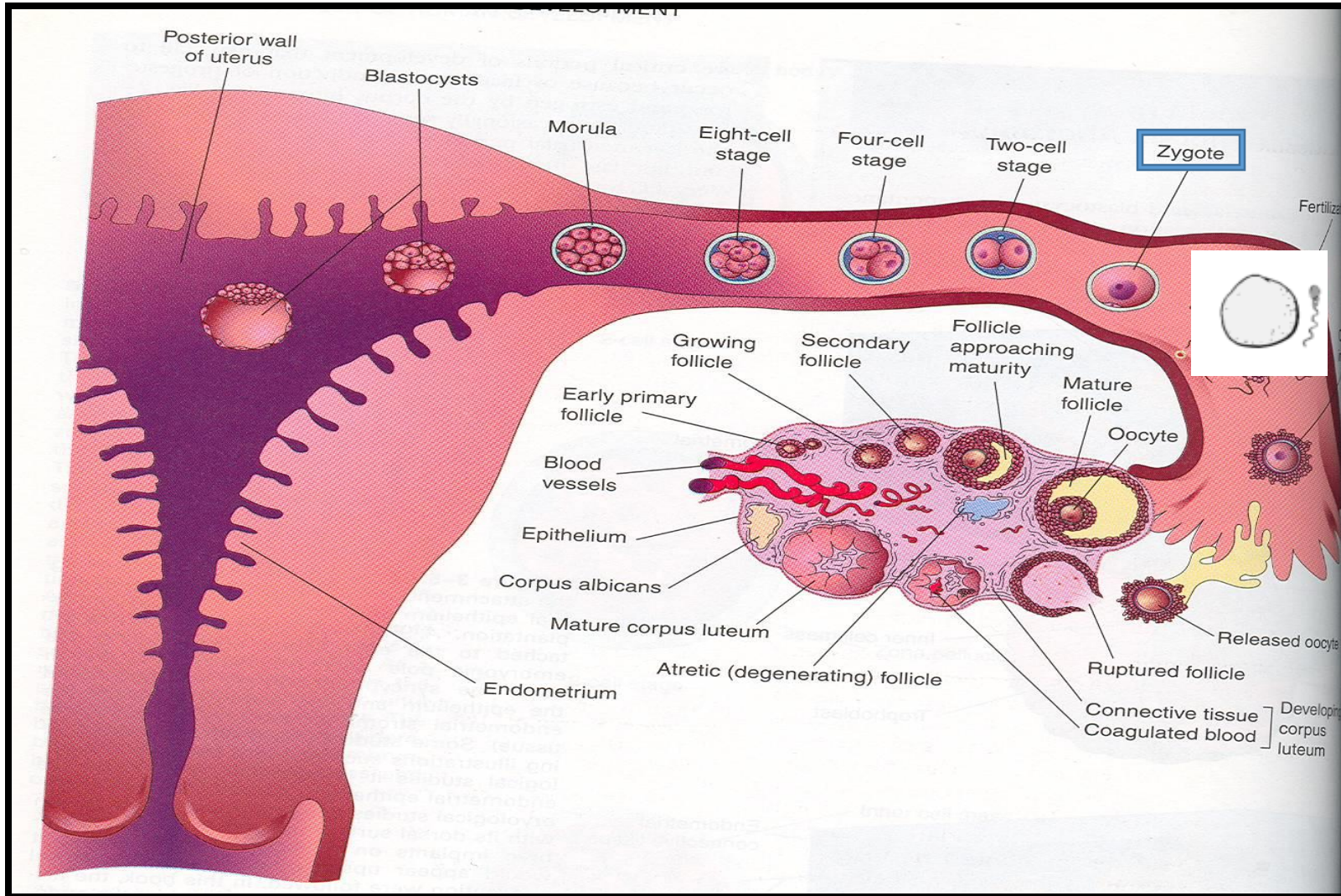
- 1- Reduction of chromosomal number from the diploid to the **haploid number**.
- 2- Change the germ cell to the motile sperm.
- 3- Increase the number of the sperms.

Oogenesis

- It is the process of formation of mature ovum, occurs in the cortex of the ovary, starts during fetal life, continues after puberty, and fertilization, till menopause.
- It ends by haploid number of chromosomes.



Fertilization



- **Definition:**
- It is the process during which a male gamete (**sperm**) unites with a female gamete (**oocyte**) to form a single cell (**ZYGOTE**).

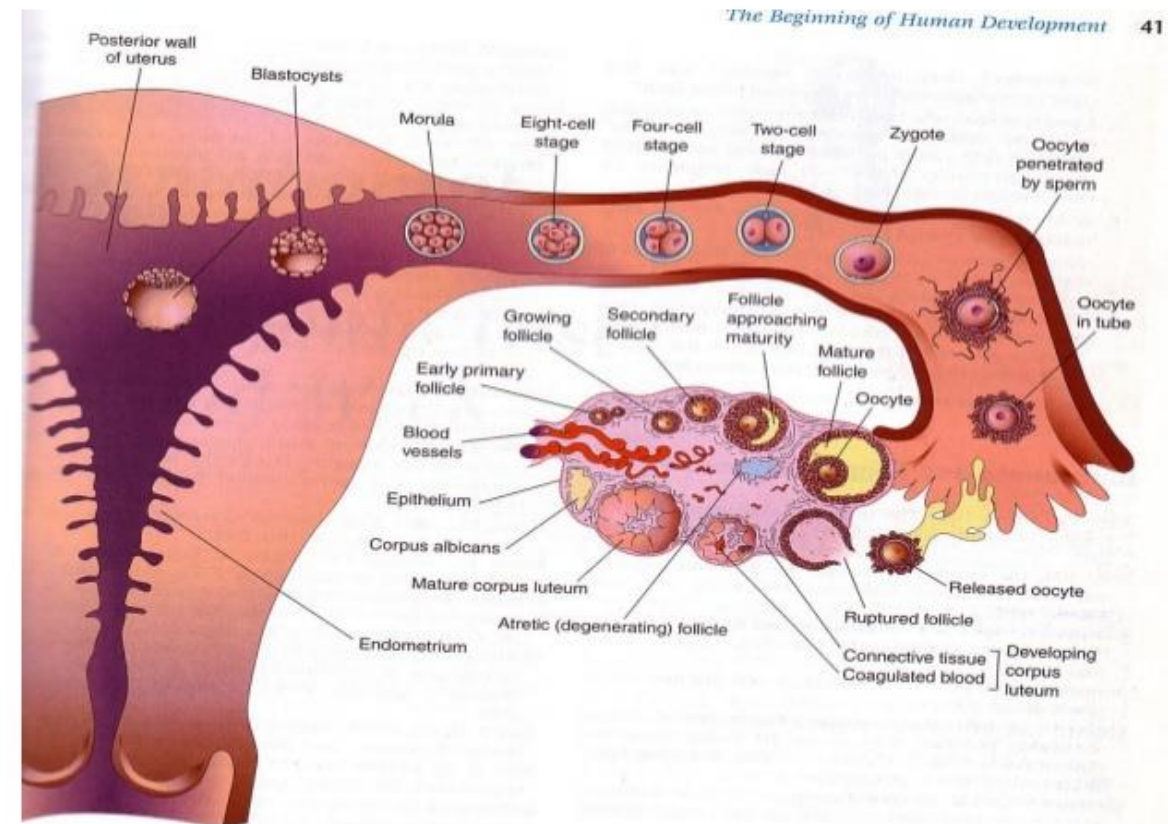
Implantation

- The process of embedding of the blastocyst in the endometrium of the uterus,
- It **begins** one week after fertilization.
- It is **completed** by the **12th day** after fertilization.
- Normal site of implantation;

In the upper part of the posterior surface of the uterus near the funds,

Abnormal site of implantation (ectopic pregnancy);

Most of ectopic pregnancies occurs in the uterine tube.



Bilaminar disc

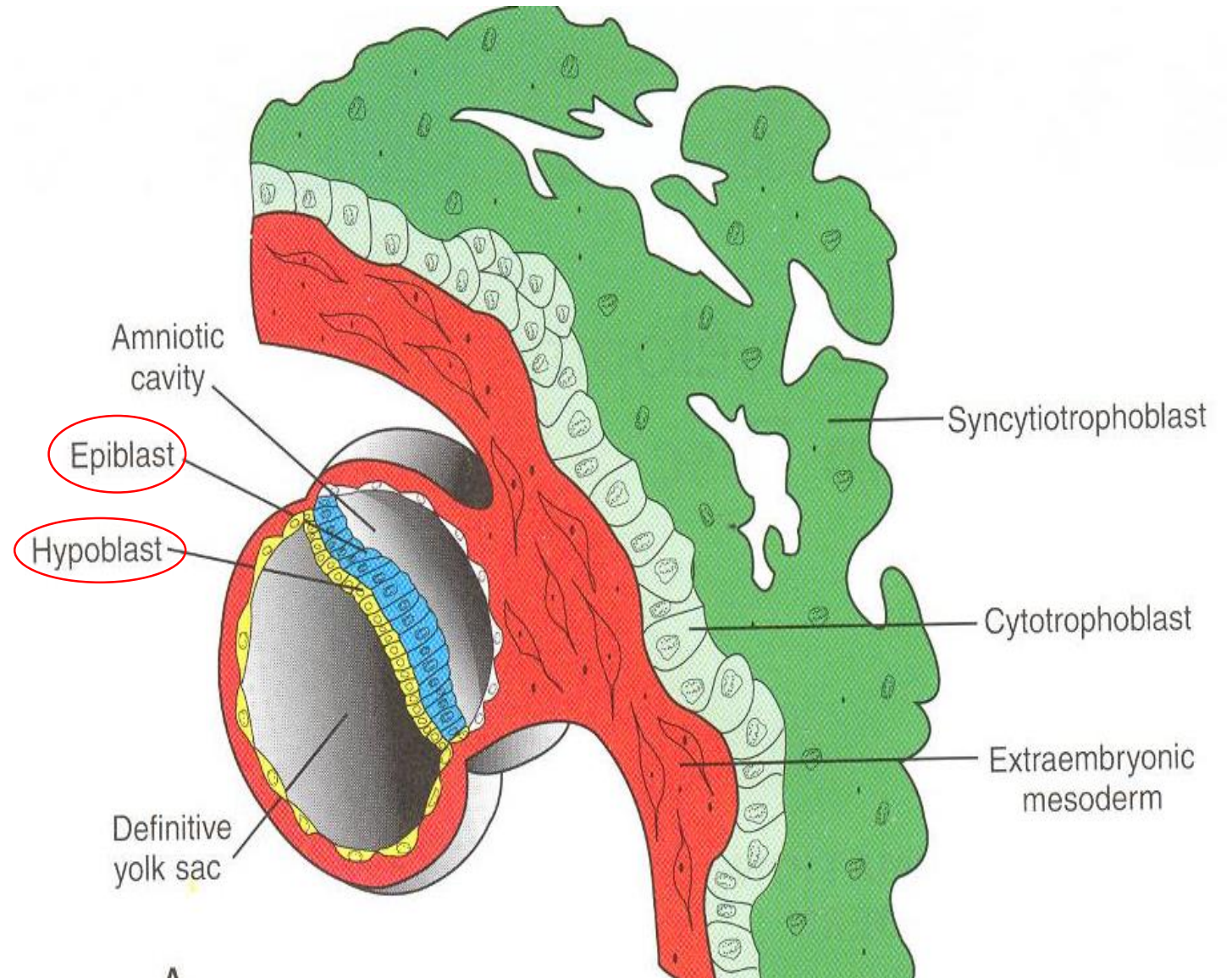
It is The differentiation of the cells into Two layers :

(A) Epiblast

High columnar cells adjacent to the amniotic cavity.

(B) Hypoblast

Small cuboidal cells adjacent to Yolk sac.

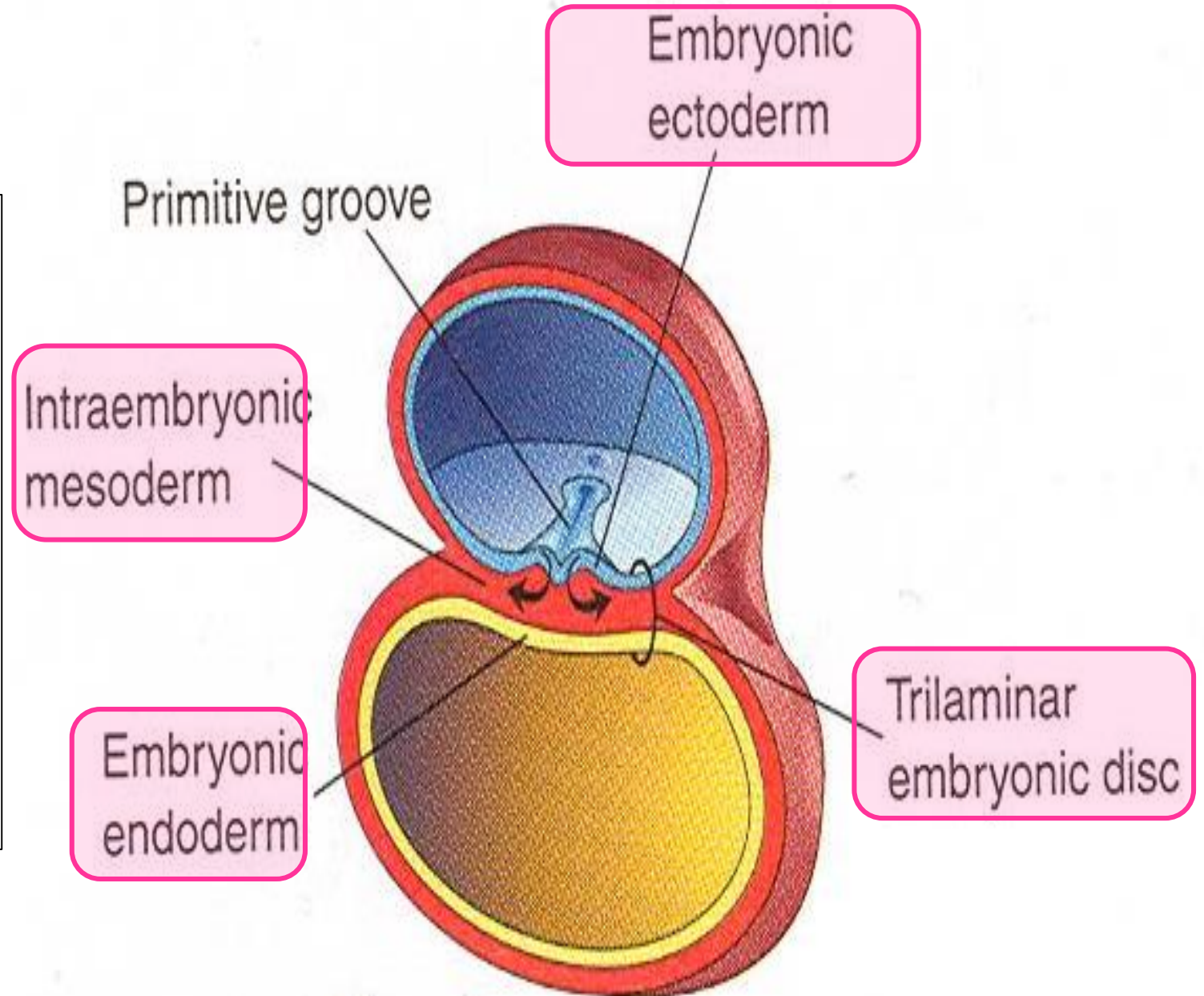


Trilaminar disc

Now the embryonic disc is formed of 3 layers :

- *Embryonic Ectoderm*
- *Intraembryonic Mesoderm.*
- *Embryonic Endoderm.*

Cells in these layers will give rise to all tissues and organs of the embryo.



Thank you