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 referes 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** help 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 peroids.

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

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 :

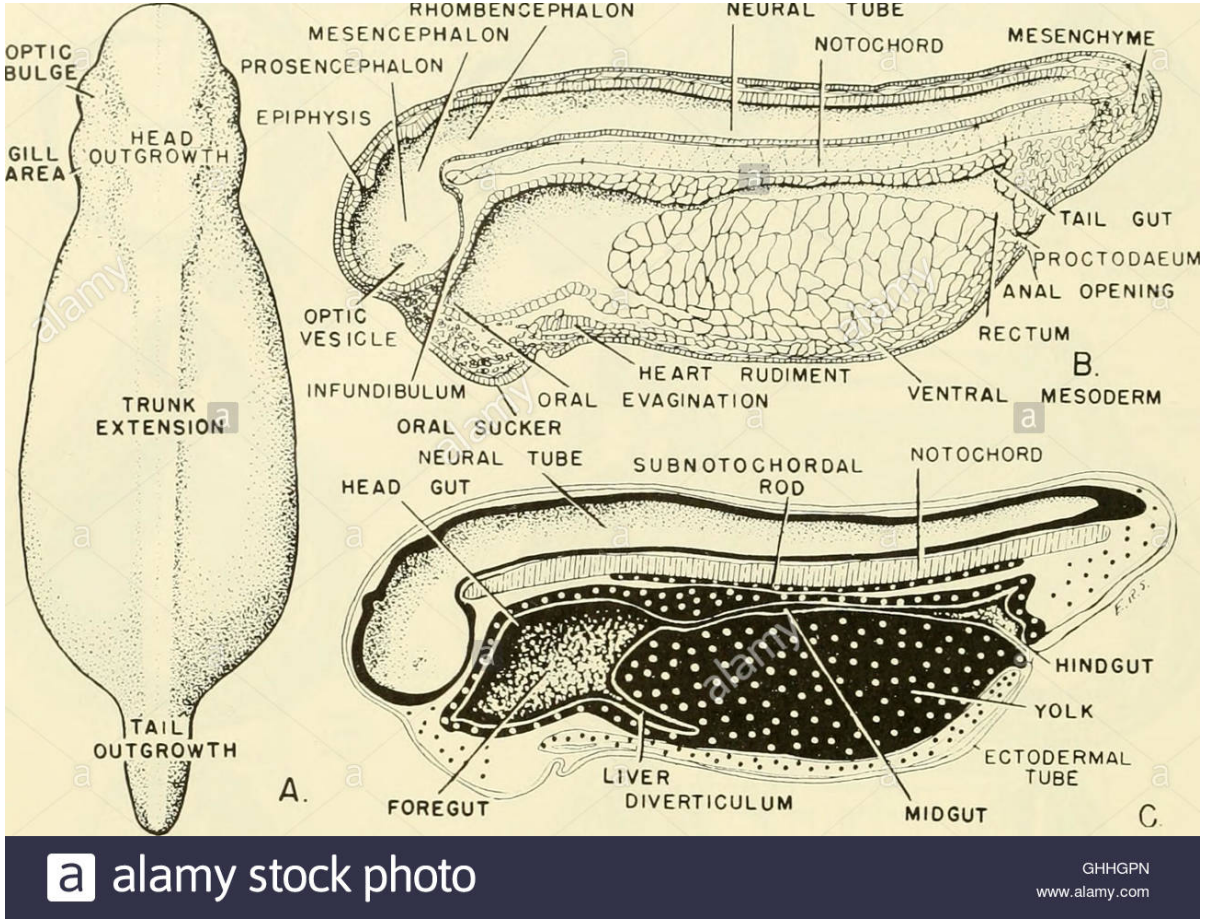
- **Oocyte;** the immature ovum, female germ cell.
- **Ovum;** the mature female germ cell.
- **Sperm;** the mature male germ cell.
- **Zygote;** the fertilized ovum.
- **Cell division;** one cell divides into two cells; there are two types of cell division:
- **A- Mitotic;** the cell produces 2 cells 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:

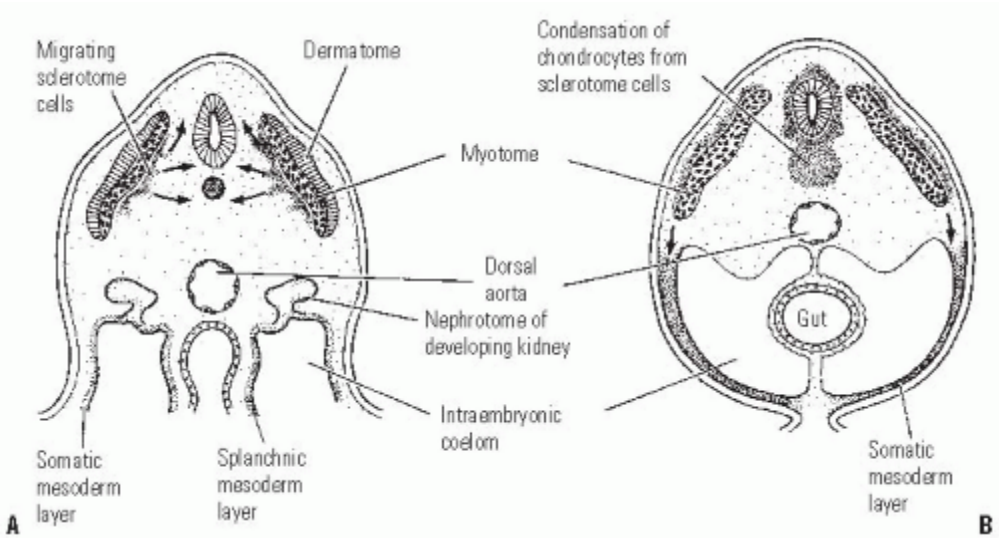
- **Directions:**
- Cranial; the top of the embryo or the head.
- Cephalic; superior or the head.
- Caudal; inferior or the tail end.
- Dorsal; back of the embryo.
- Ventral; anterior or the belly side.
- Medial; near to the midline.
- Lateral; flank side.

Descriptive Terms:

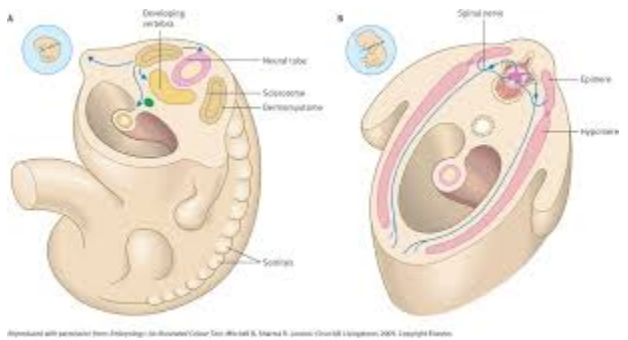
- **Plans of sections:**
- Longitudinal; median or sagittal.
- Coronal; frontal.
- Transverse; horizontal



Longitudinal



Transverse; horizontal



Major events during embryonic period

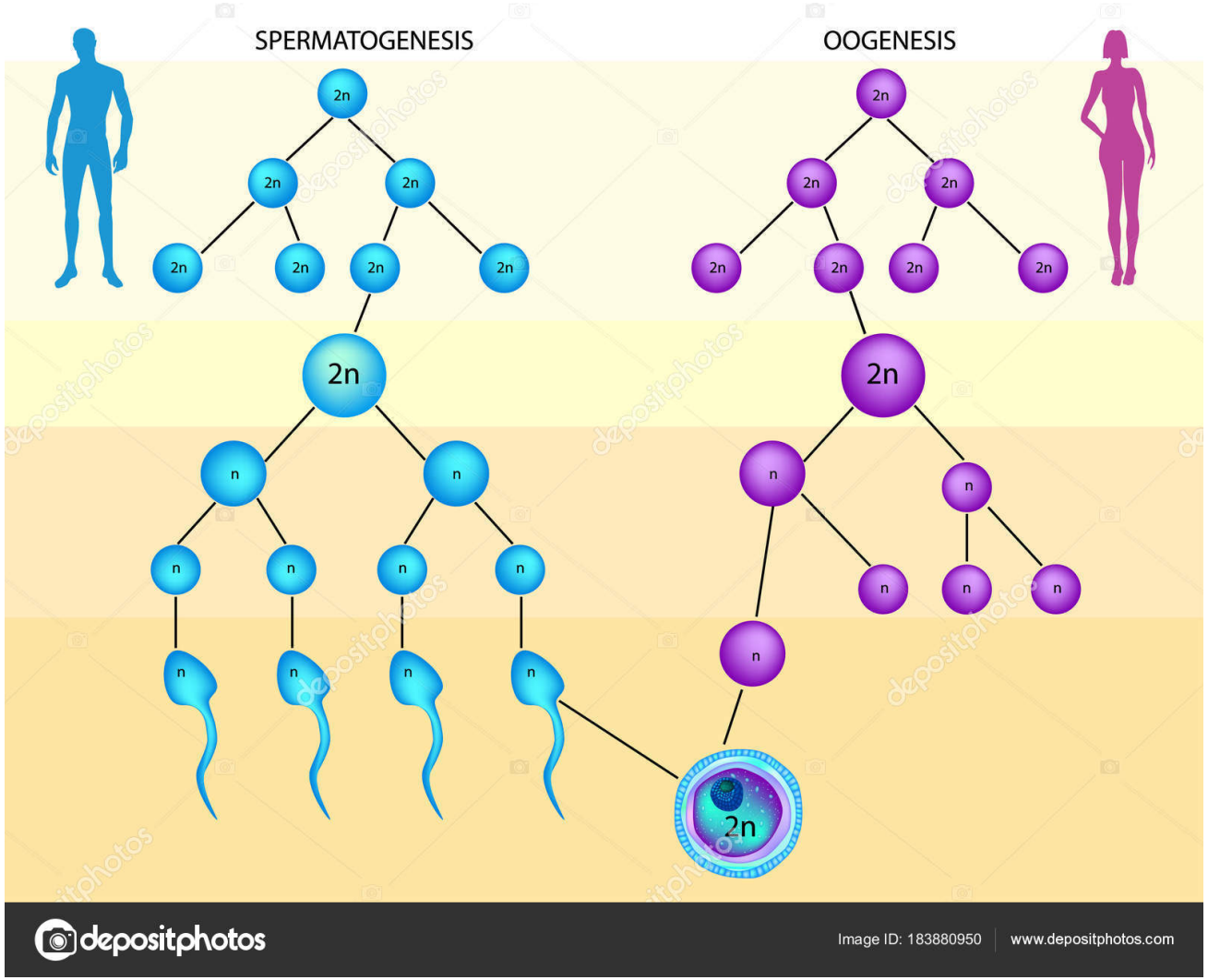
- Gametogenesis : occurs at 1st week.
- Fertilization : 1st week
- Implantation : begins one week after fertilization
- Development of the Central Nervous System : 3rd week
- Embryonic Folding : 4th week

GAMETOGENESIS

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

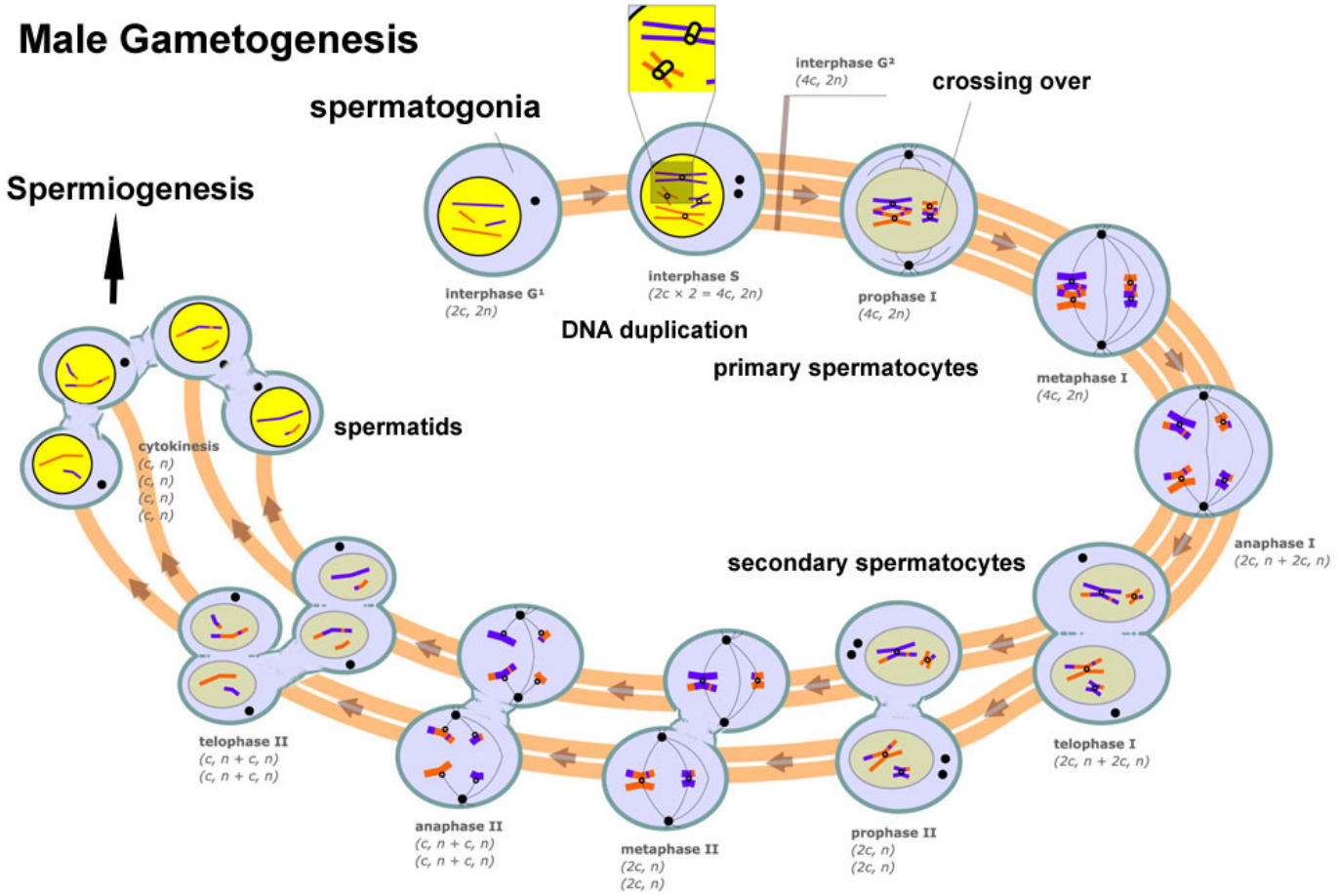
1- Spermatogenesis.

2- Oogenesis.



SPERMATOGENESIS

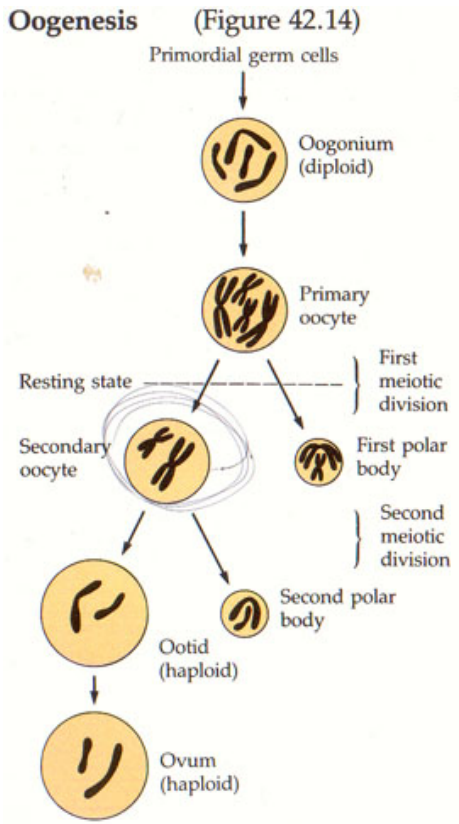
- It is the process of formation of mature sperms, takes place in the semenifrous tubules, occurs continuously from puberty till old ages.

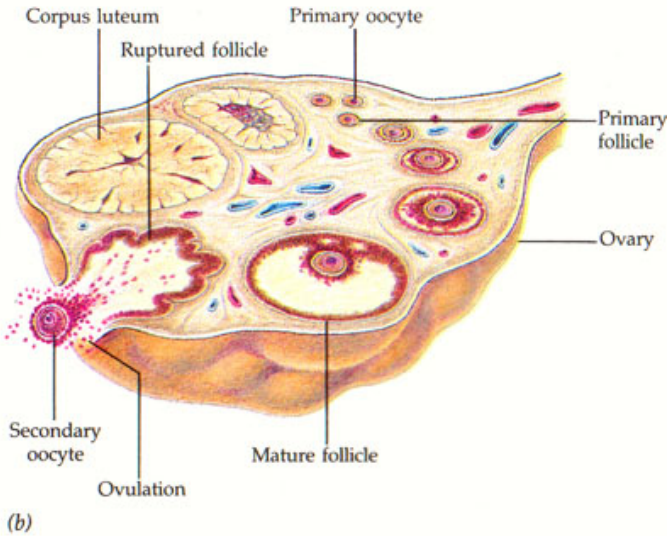


- **Results of spermatogenesis;**
- 1- Reduction of chromosomal number from the diploid to the **haploid number.**
- 2- Change the germ cell to the motile sperm.
- 3- Increase the number of the sperms.

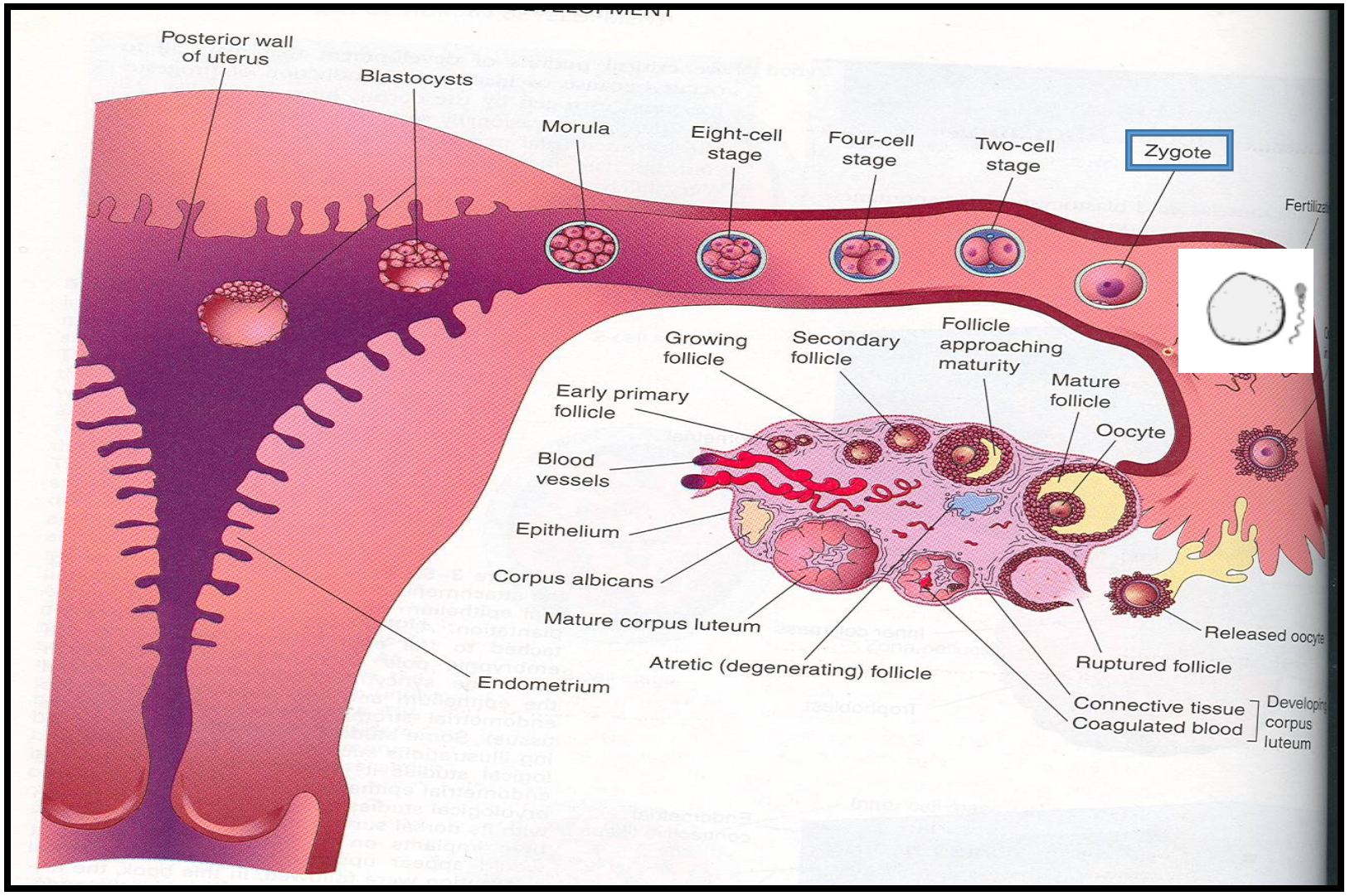
OOGENESIS

- 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).
- Site : **It occurs in the uterine tube.**

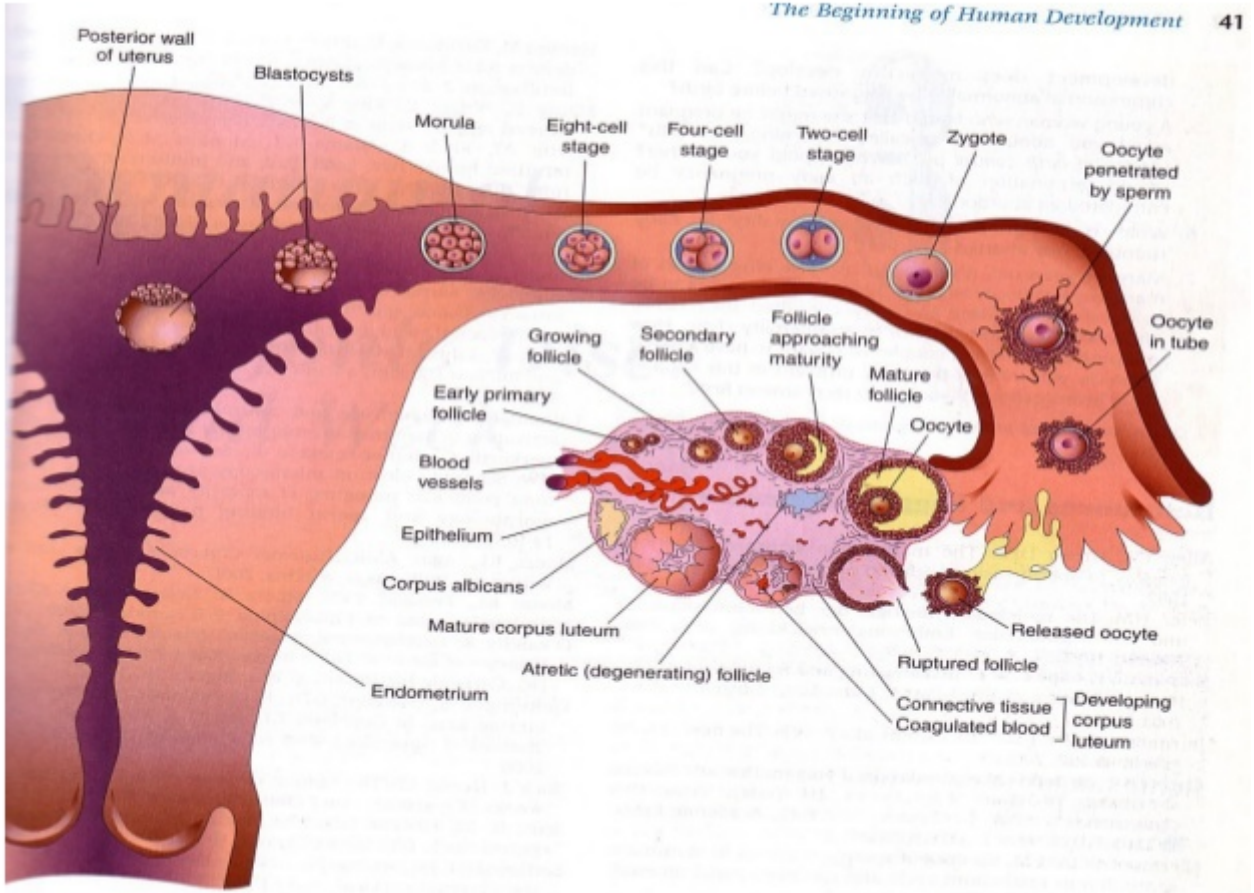
IMPLANTATION

- The process of embedding of the blastocyct 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

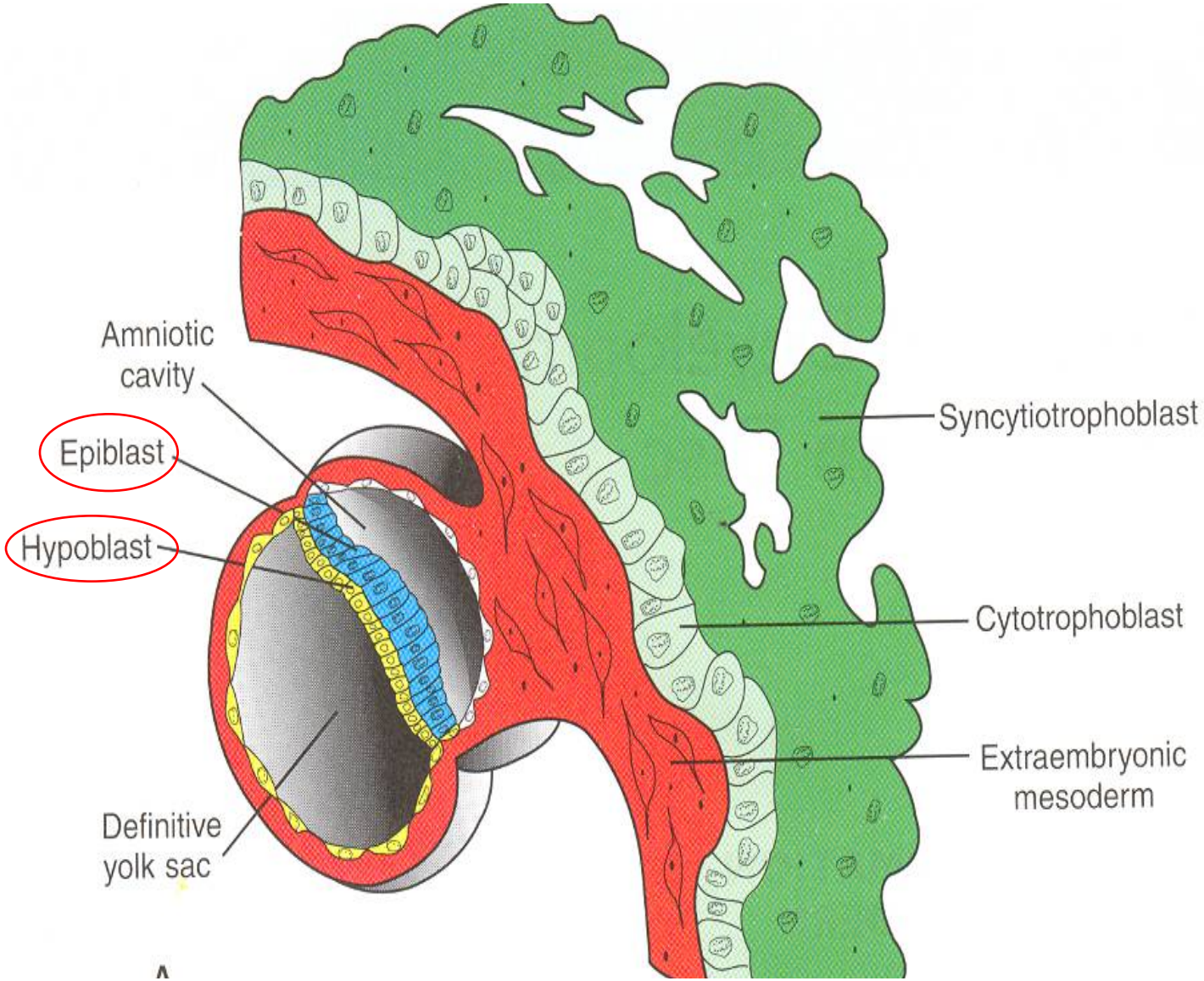
It is The differentiation of the cells into Two layers :

(A) *Epiblast*

***High columnar cells* adjacent to the amniotic cavity.**

(B) Hypoblast

***Small cuboidal cells* adjacent to Yolk sac.**

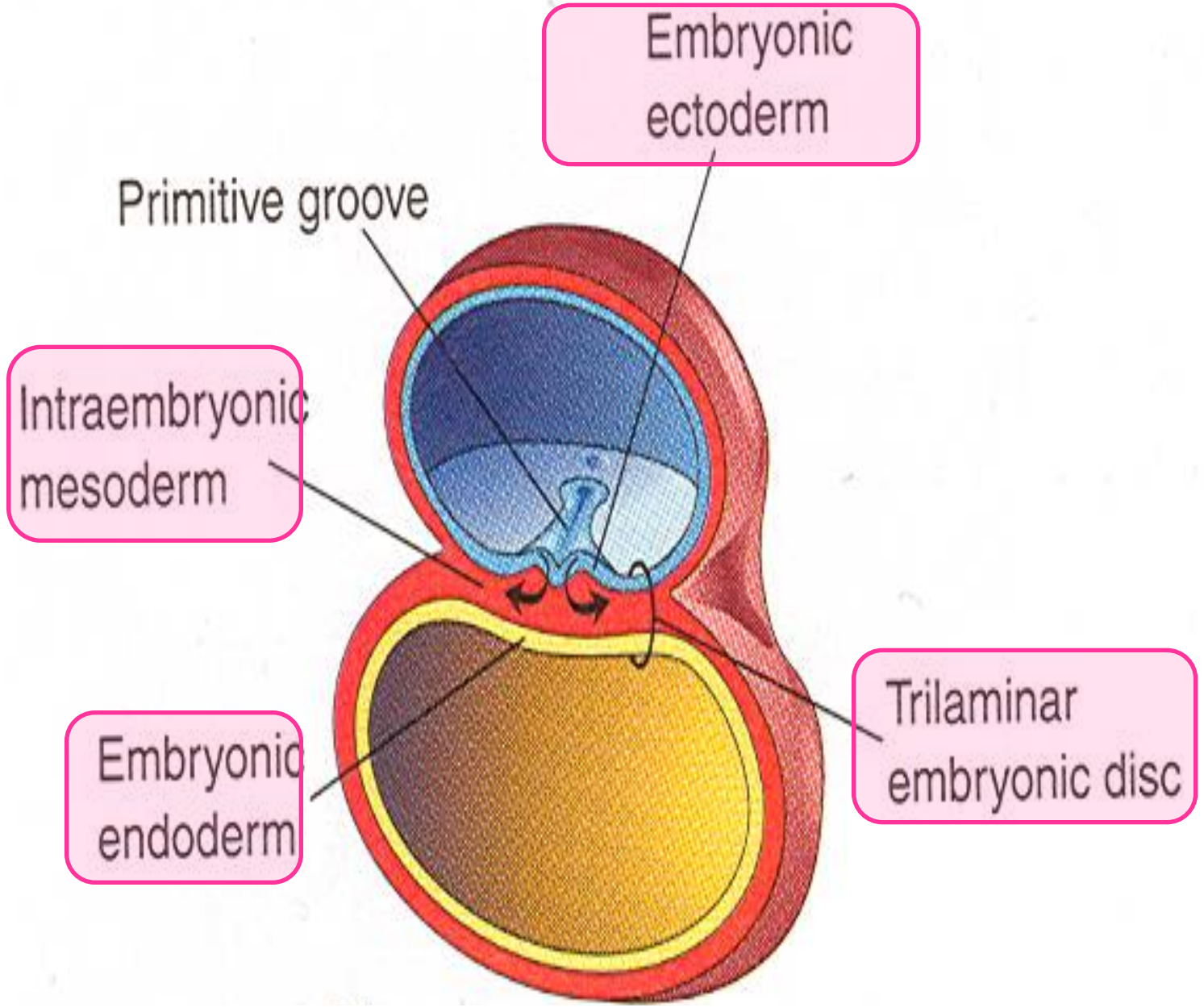


TRILAMINAR DISC

Now the embryonic disc is formed of 3 layers :

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

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



Thank you