



**Reivew on the general
embryology**



fertilization

- ❖ **Concept of fertilization:**

Fertilization is the process of male and female gametes fusing.

- ❖ **The normal site of fertilization:**

It is ampullary of uterine tube.

The process of fertilization

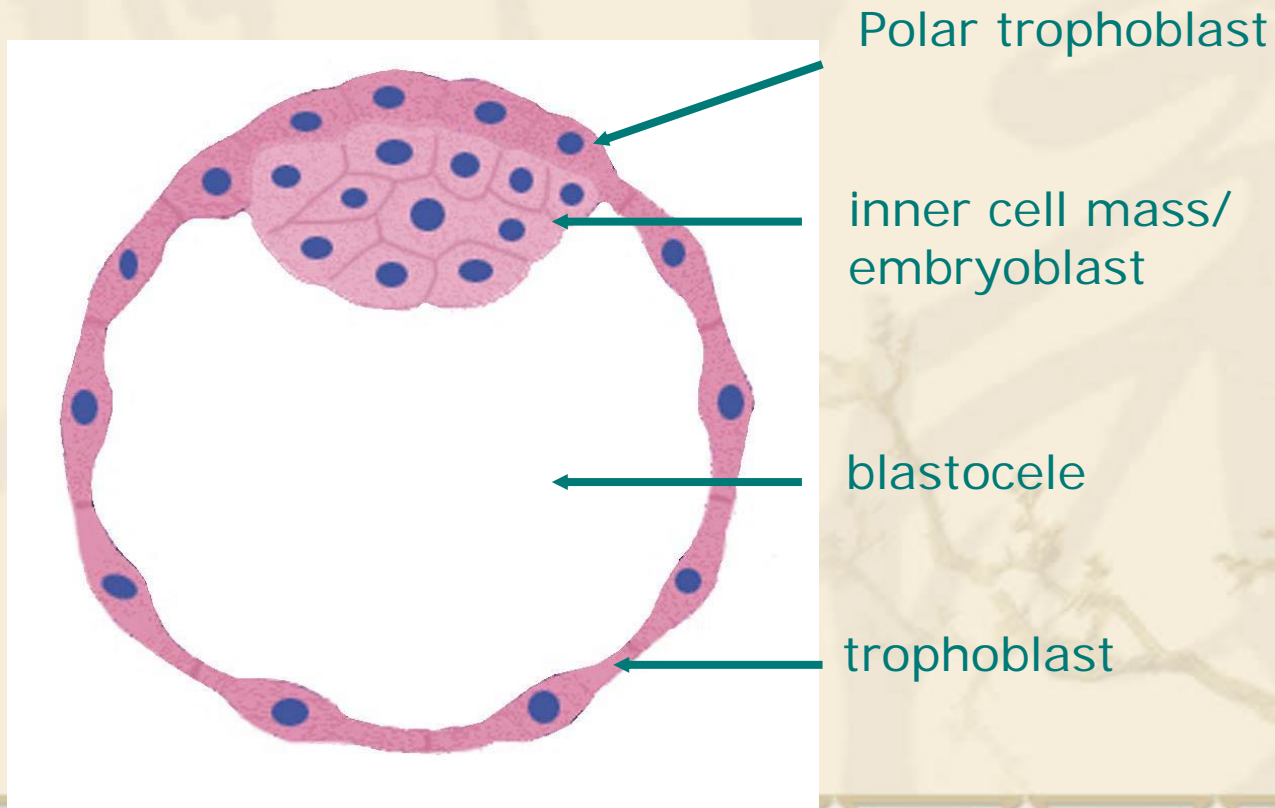
- ❖ Sperm Capacitated
- ❖ Acrosome reaction
- ❖ Fusing of sperm and egg's membrane
- ❖ Zona pellucida reaction
- ❖ Fusion of maternal and paternal genetic material forms the zygote

cleavage

- ❖ **Mitotic division of zygote is called cleavage.**
- ❖ **Zygote undergo cleavage to form morula.**
- ❖ **The cells of morula rearrange to form blastula.**

The structure of blastula

- ❖ It consists of inner cell mass, trophoblast and blastular cavity.



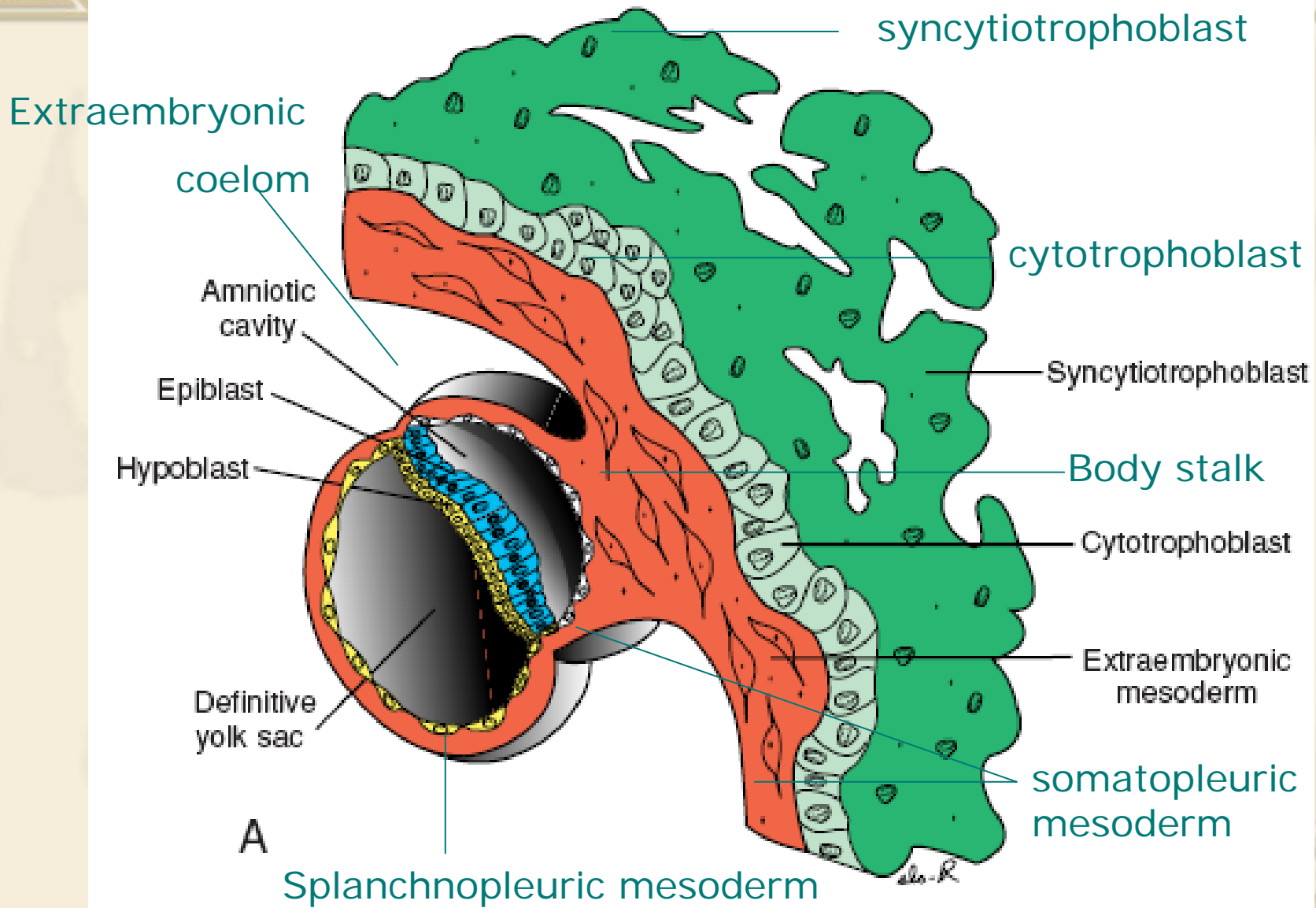
Implantation

- ❖ **Concept of implantation:**

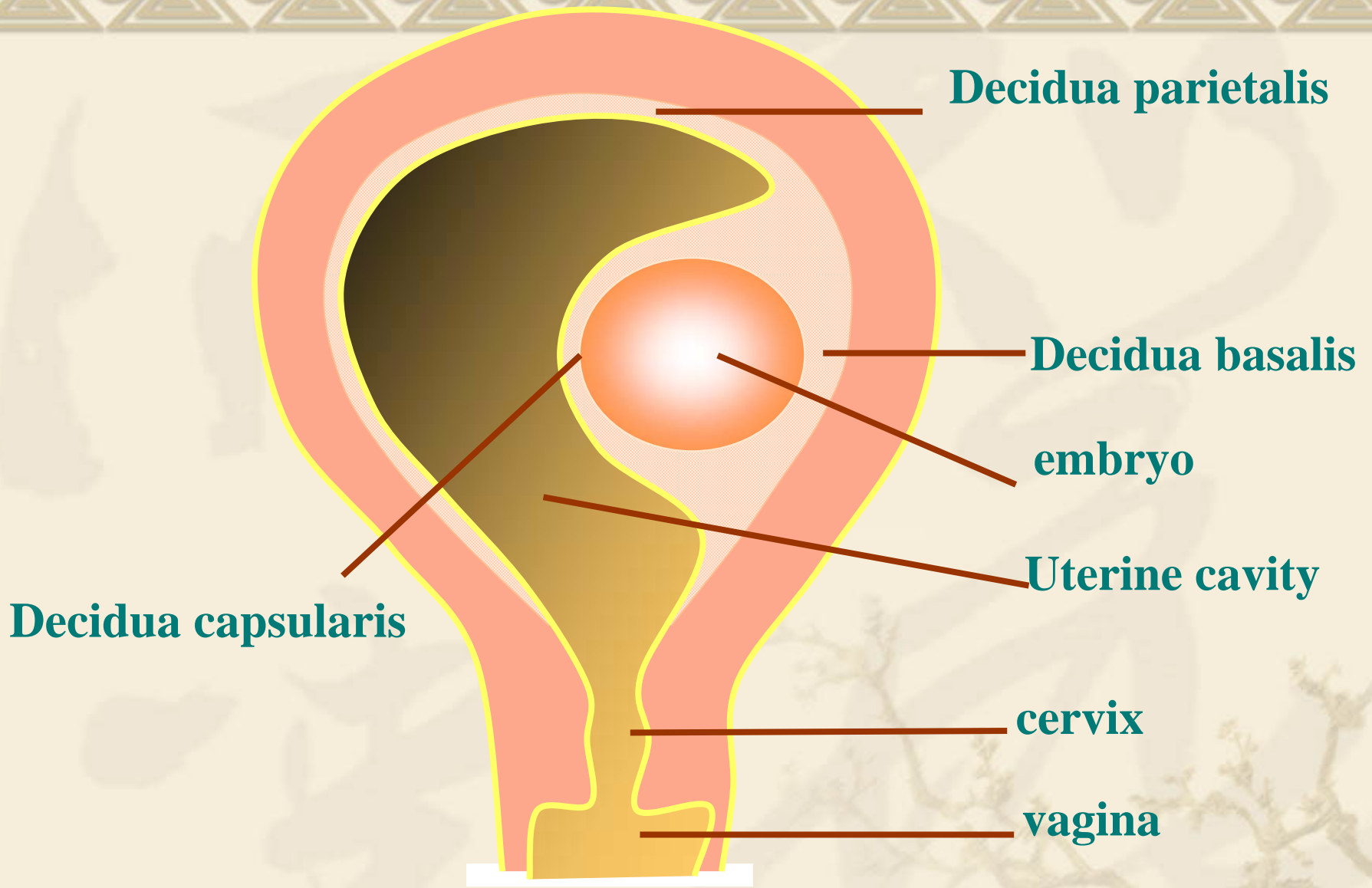
It is a process that blastula is embedded in the endometrium.

- ❖ **The normal site of implantation:**

In the fundus or body of the uterus.

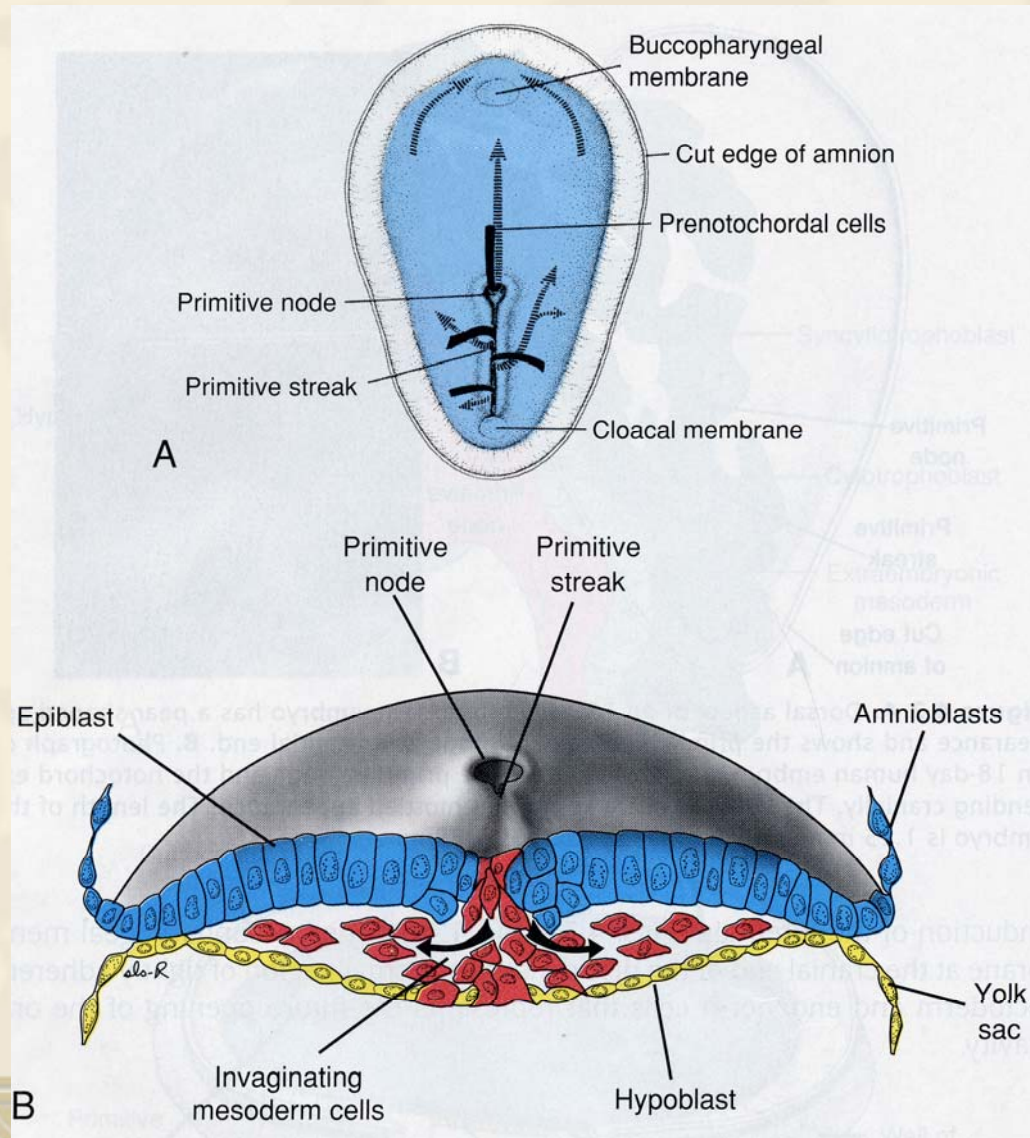


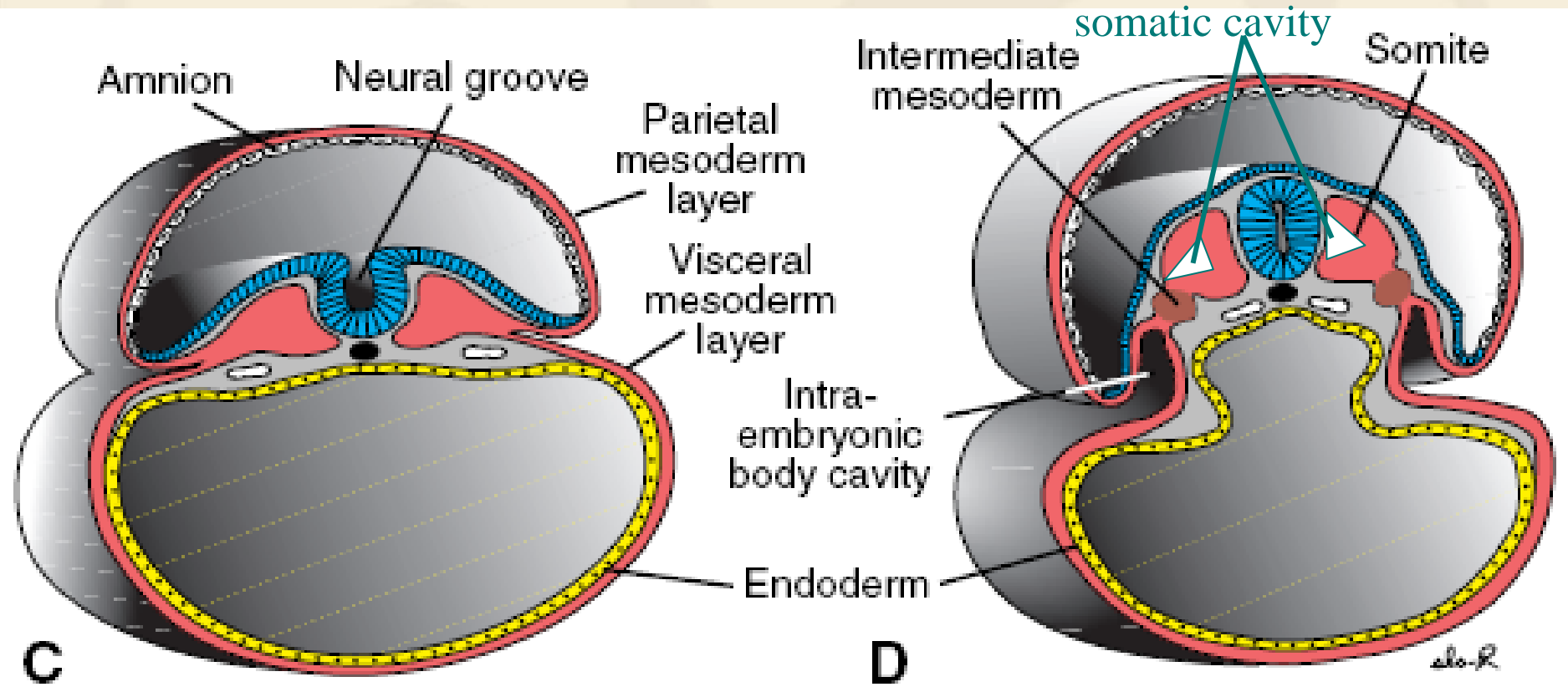
The formation of bilaminar germ disc



Relationship between the embryo and the endometrium

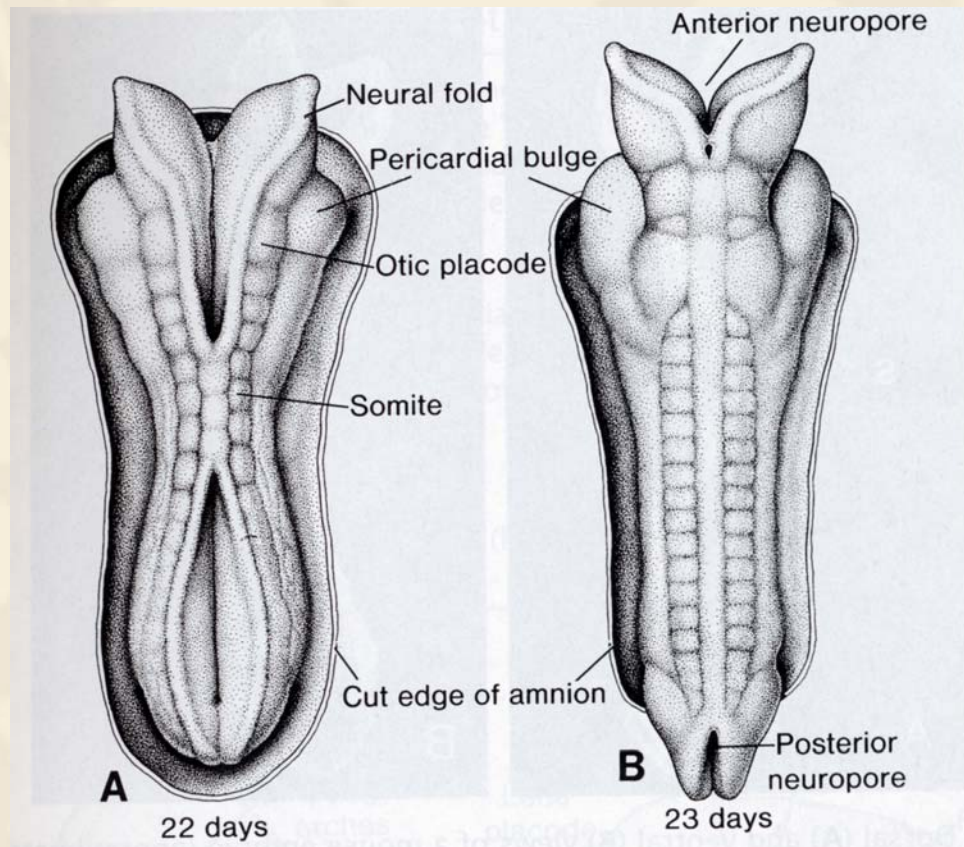
Formation of trilaminar germ disc





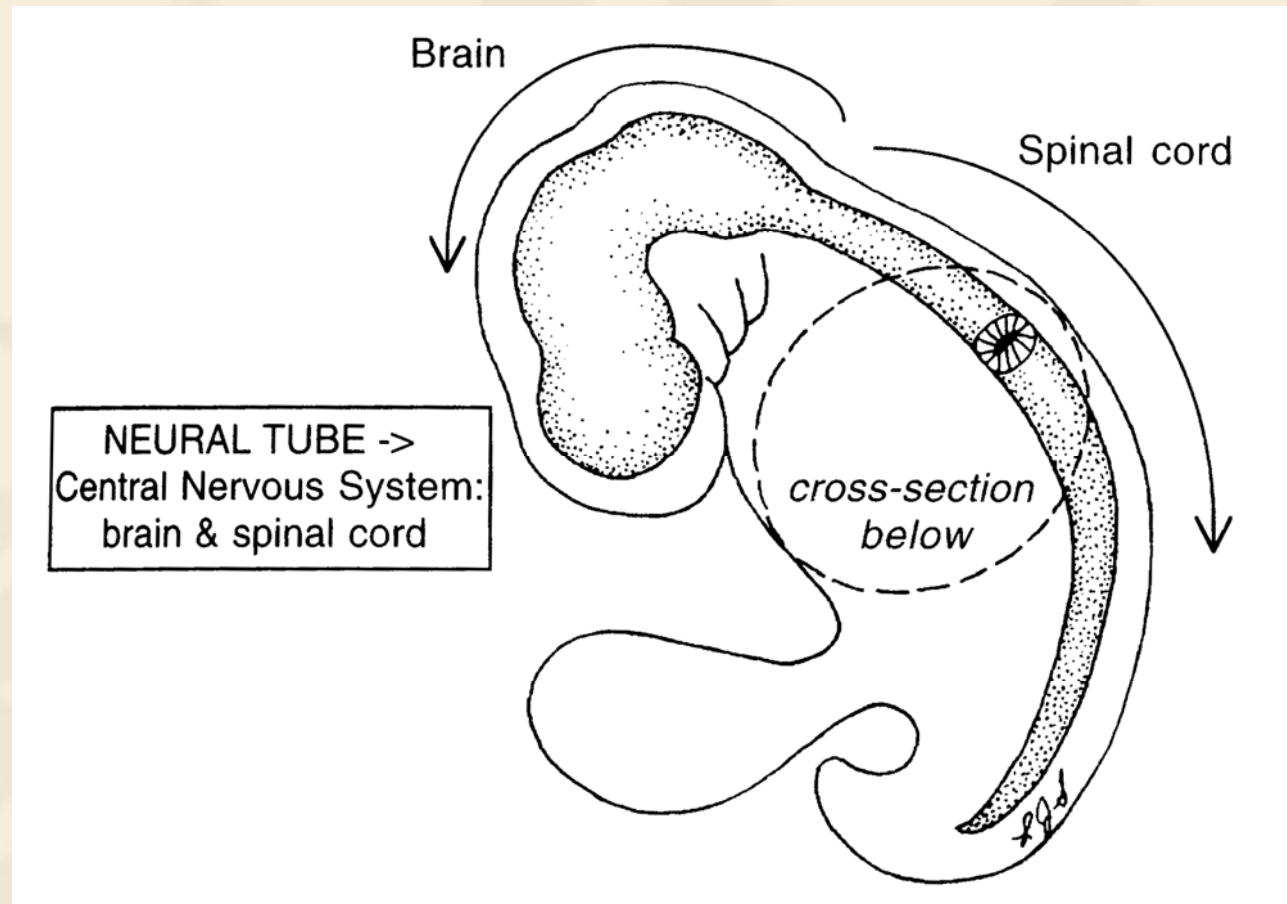
The formation of neural tube

- ❖ Anterior neuropore Posterior neuropore



Derivatives of neural tube

- ❖ Brain
- ❖ Spinal cord



- ❖ Unclosing of cranial neuropore causes anencephalic child or meningocele.

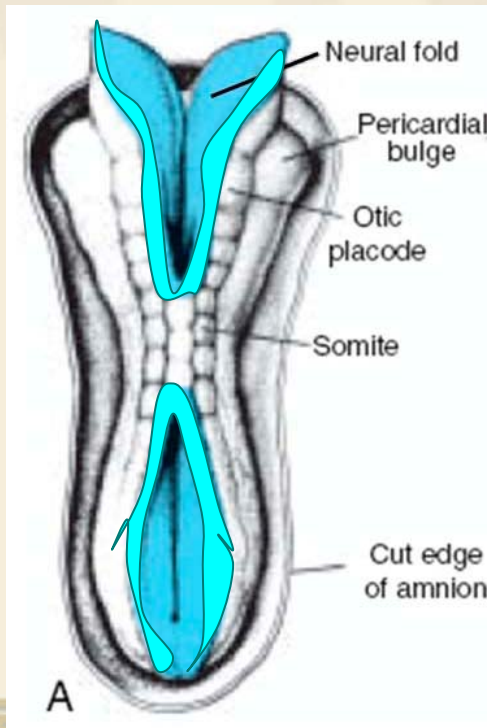


- ❖ Unclosing of posterior neuropore results in rachischisis or meningocele.

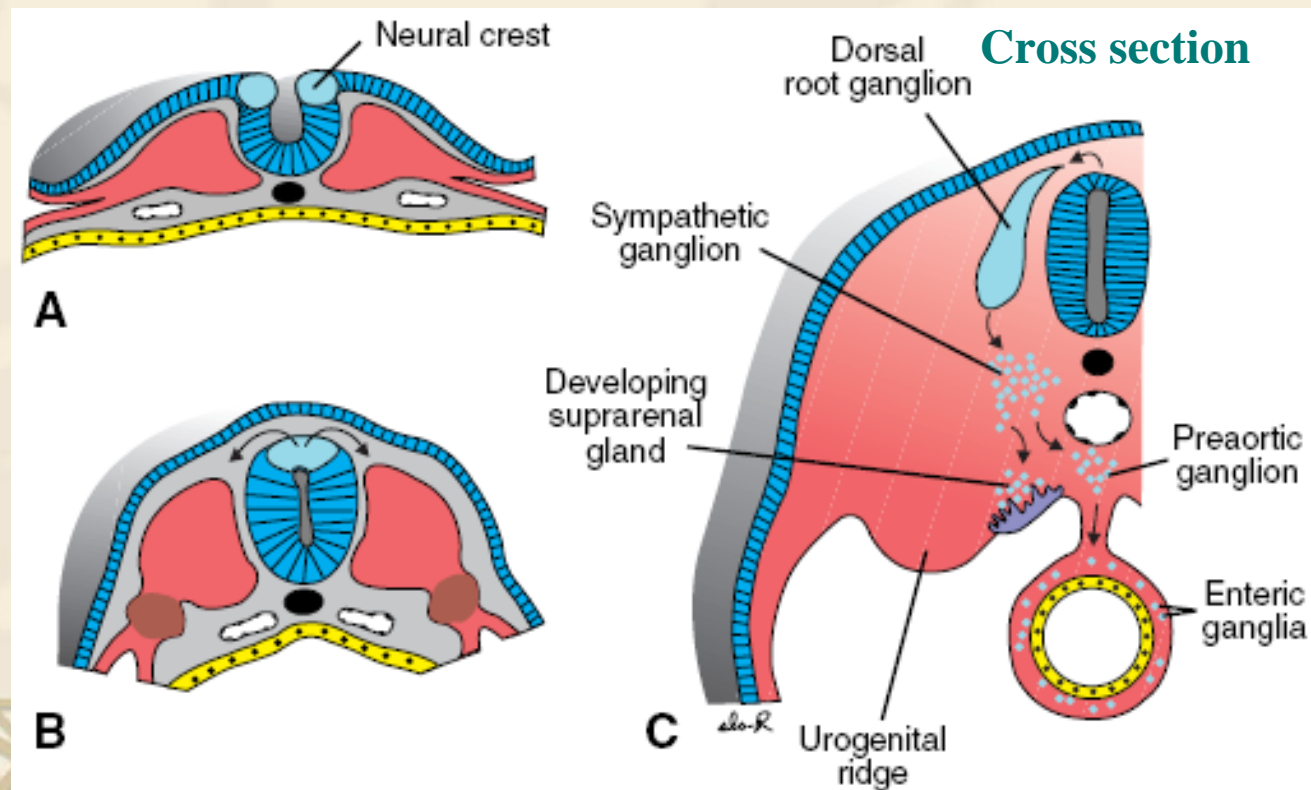


Formation of neural crest

- ❖ The neural crest form peripheral nervous system, melanocytes in skin, endocrine cells in adrenal gland medulla.



Dorsal view



Derivatives of the ectoderm

- ❖ Epidermis
- ❖ Special structure of skin

Derivatives of paraxial mesoderm

- ❖ Inner and ventral sclerotome form axial skeleton including vertebral column, ribs and some skull in head.
- ❖ Lateral dermatome form dermis and subcutaneous tissue of skin.
- ❖ Medially myotome contributes to all skeletal muscles of body, head and limbs.

Derivatives of intermediate mesoderm

- ❖ **Urinary system**
- ❖ **Reproductive system**

❖ The parietal mesoderm will form:

- ❧ most connective tissue and smooth muscle of body wall
- ❧ tissues of limbs including cartilage, bones and girdles
- ❧ parietal layer of pleural membrane, cardiac pericardium and peritonium.

❖ The visceral mesoderm layer will form:

- ❧ smooth muscle and connective tissue of endoderm-linked organs,
- ❧ cardiovascular system
- ❧ visceral layer of pleural membrane, cardiac pericardium and peritonium.

❖ The intraembryonic cavity will form:

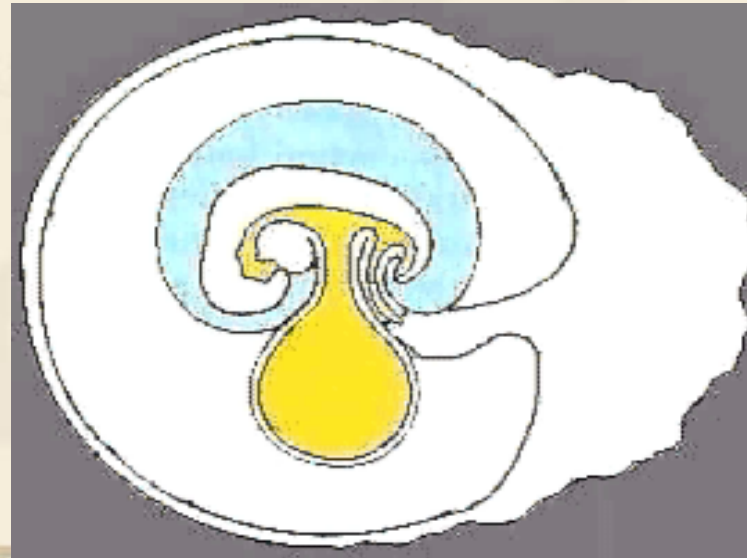
- ❧ peritoneal, pleural, and pericardial cavities.

Fetal membranes and placenta

- ❖ Fetal membrane include amnion, chorion, yolk sac, allantois and umbilical cord.
- ❖ They originate from the trophoblast.

Amnion

- ❖ **Structure of amnion:**
amnion includes the amnion and extraembryonic mesoderm.
- ❖ **amniotic liquid:**



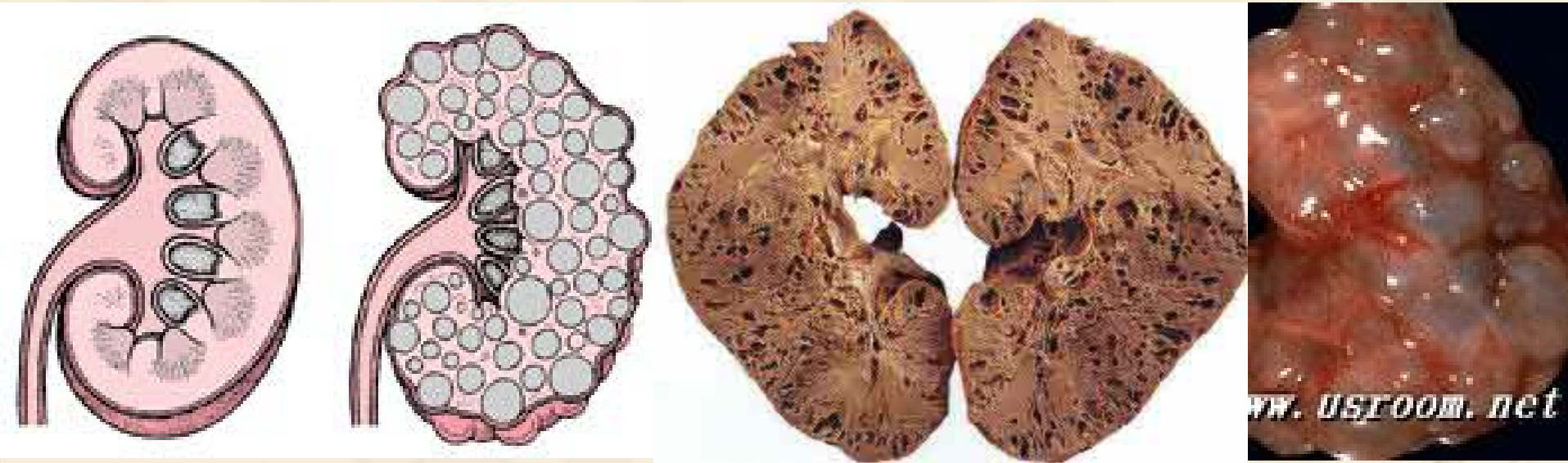
❖ Hydramnios /polyhydramnios:

∞ >2000 ml, abnormal CNS or digestive system



❖ oligohydramnios:

☞ <500 ml, abnormal urinary system



normal kidney

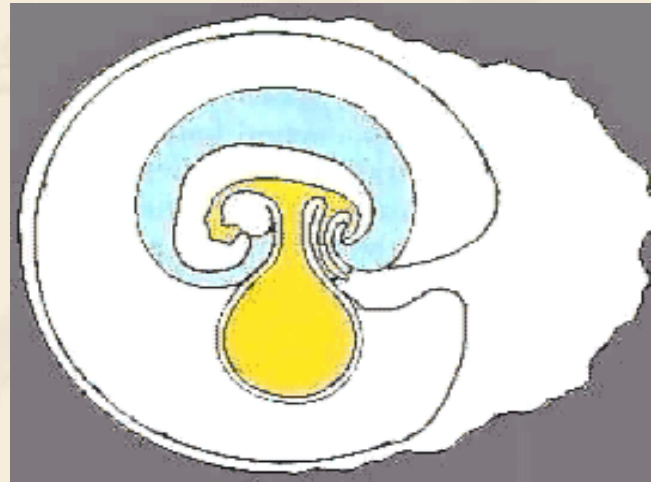
polycystic kidney

sagittal section

Superficial view

Yolk sac

- ❖ The yolk sac outside of embryo body will degenerate.
- ❖ The vitelline duct will close and degenerate.



- ❖ Meckel's or ileal diverticulum.
- ❖ vitelline cyst.
- ❖ umbilical fistula or vitelline fistula

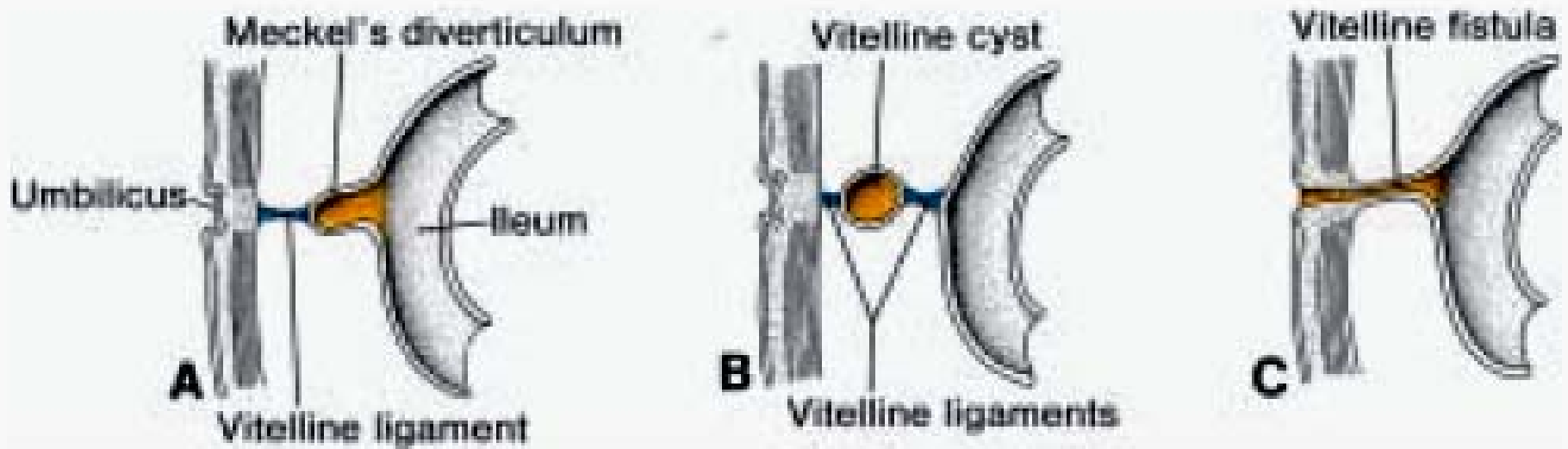


Figure 13.32 Remnants of the vitelline duct. **A.** Meckel's, or ileal, diverticulum combined with fibrous cord (vitelline ligament). **B.** Vitelline cyst attached to the umbilicus and wall of the ileum by vitelline ligaments. **C.** Vitelline fistula connecting the lumen of the ileum with the umbilicus.

The mesoderm covering yolk sac forms blood island

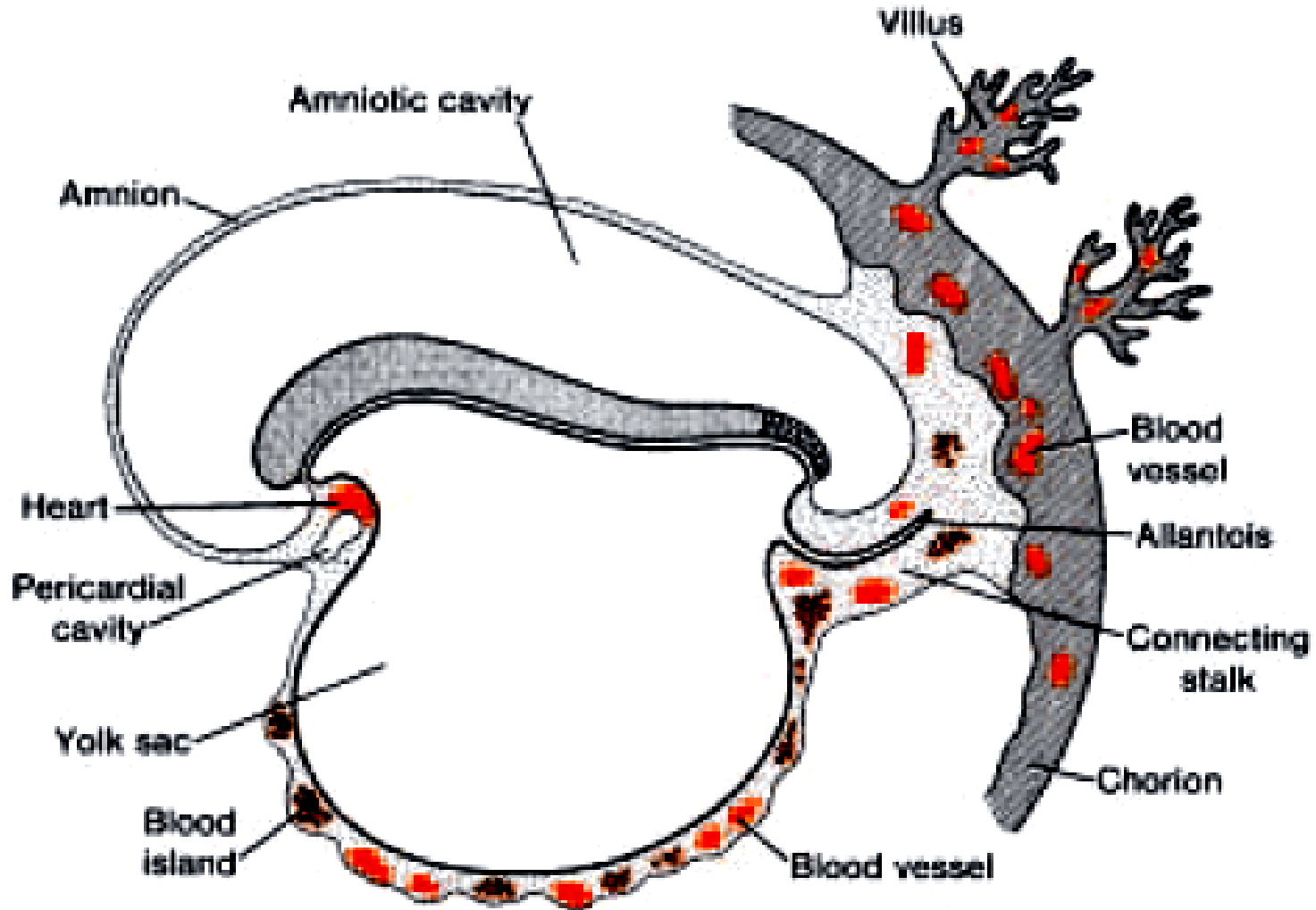
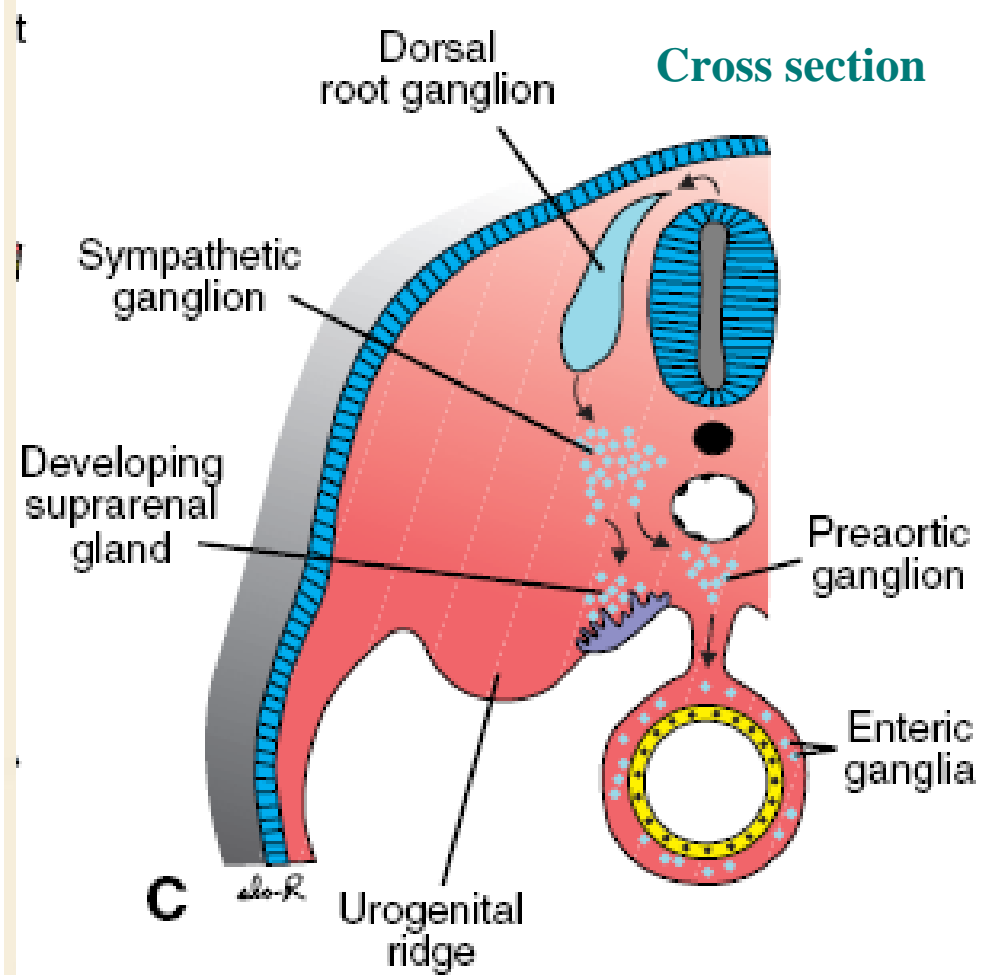
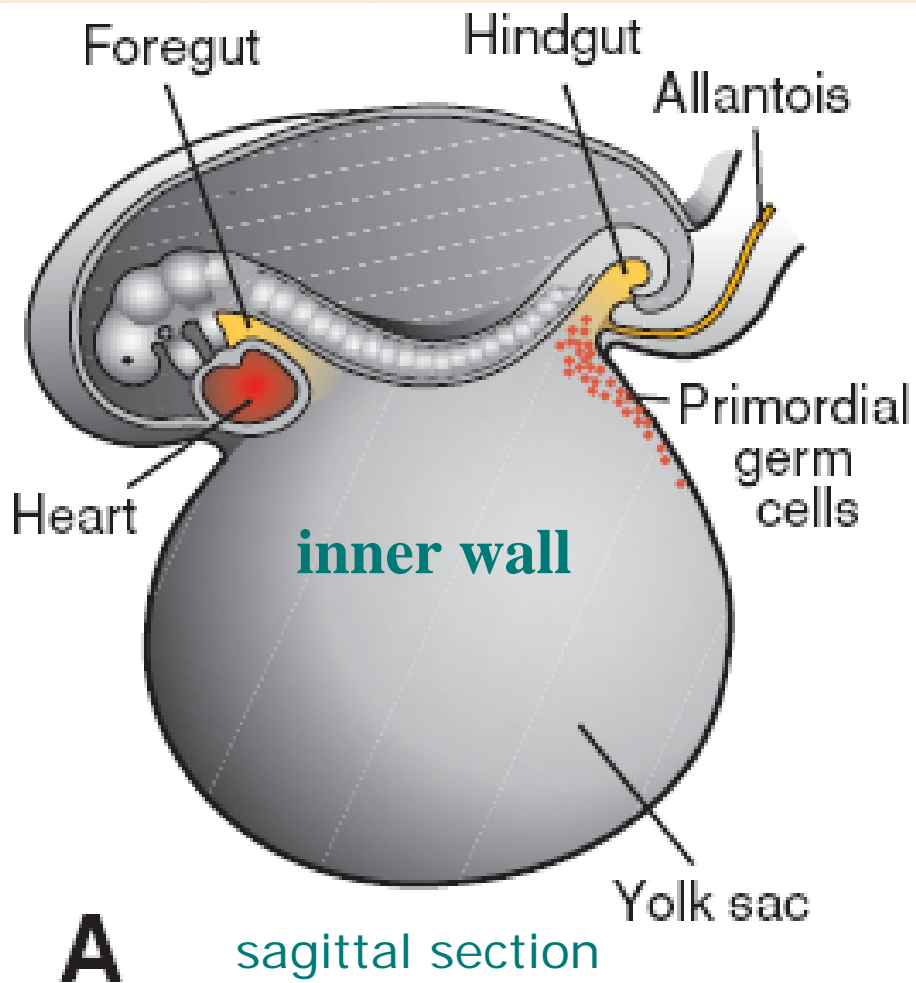


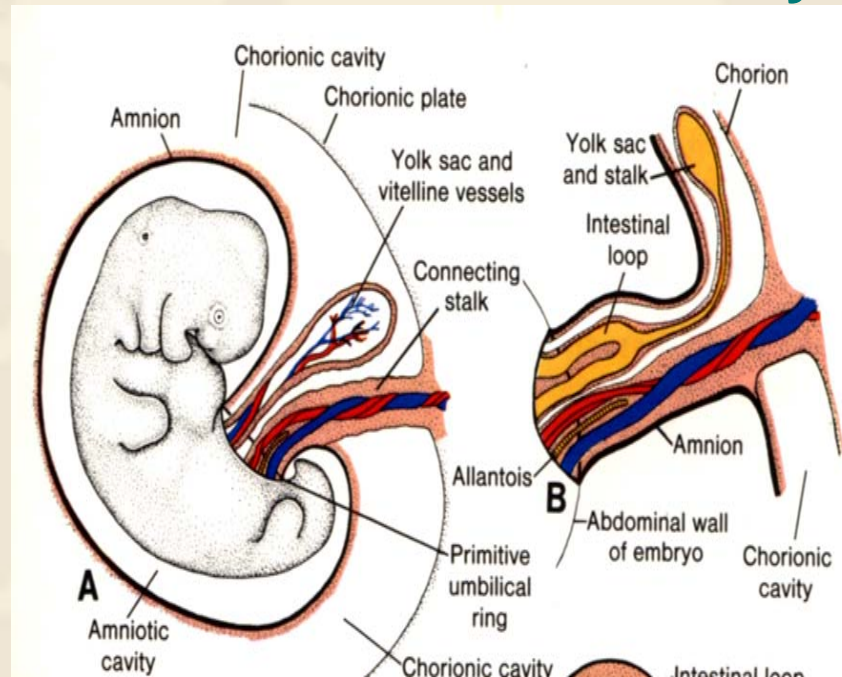
Figure 5.15 Extraembryonic blood vessel formation in the villi, chorion, connecting stalk, and wall of the yolk sac in a presomite embryo of approximately 19 days.



A 3-week-old embryo showing primordial germ cells in endoderm lining inner wall of yolk sac close to attached allantois.

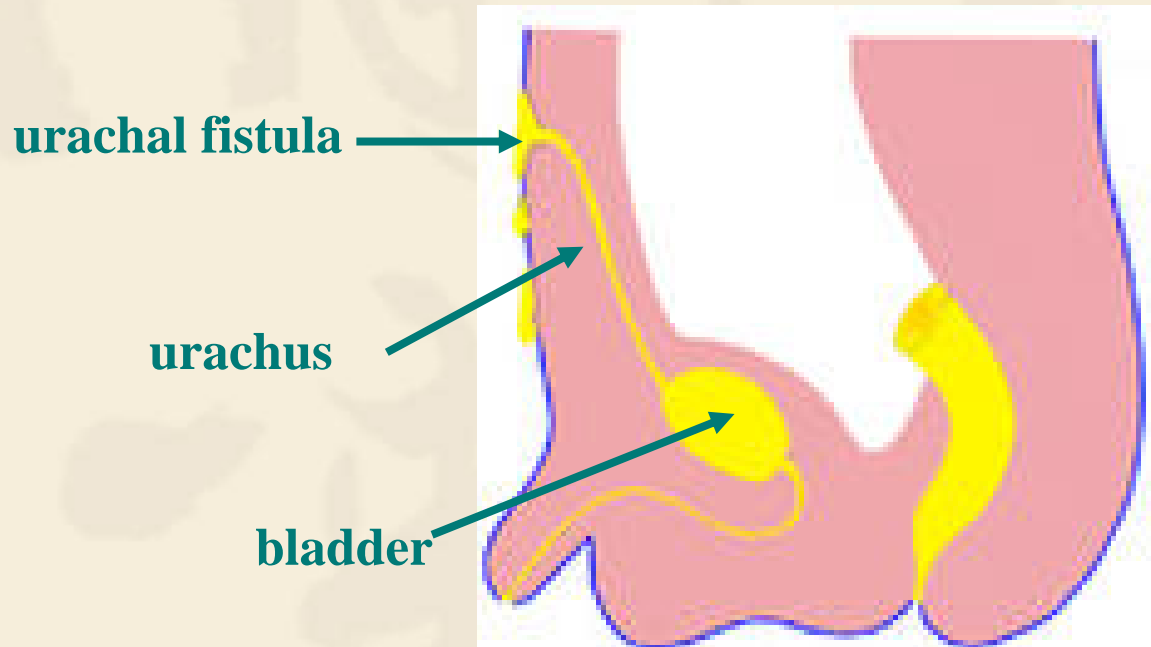
Umbilical cord

- ❖ Umbilical cord consists of connecting stalk, amnion, vitelline duct and allantois during early stage of embryonic development.
- ❖ The vitelline duct and allantois will degenerate before birth.
- ❖ The surface of umbilical cord is covered by amnion cells.



The development of allantois

- ❖ Distal portion of allantois is obliterated to form urachus.
- ❖ If the urachus remains open over, urachal fistula is formed. A urinary discharge may then be found at the umbilicus.
- ❖ urachal diverticulum ; urachal cyst.



Chorion: villous and smooth chorion

❖ Villus

❧ primary villus

❧ secondary villus

❧ tertiary villus

❖ stem villus

❖ free villus

❖ chorionic plate

❧ trophoblast

❧ extraembryonic mesoderm

❧ Amnion

❧ decidua parietalis

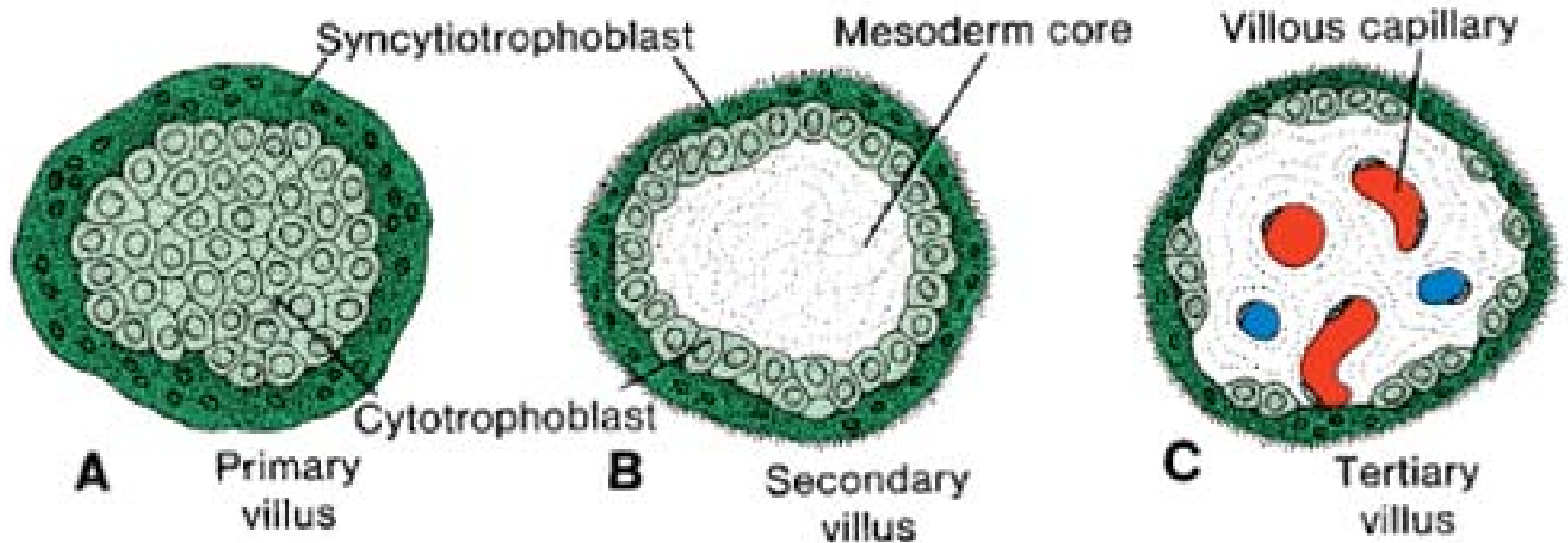
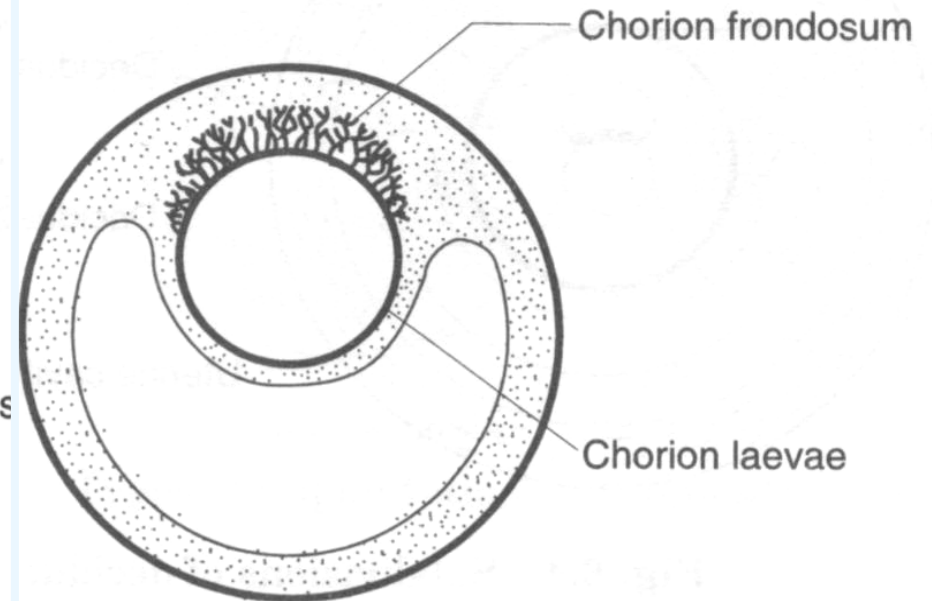
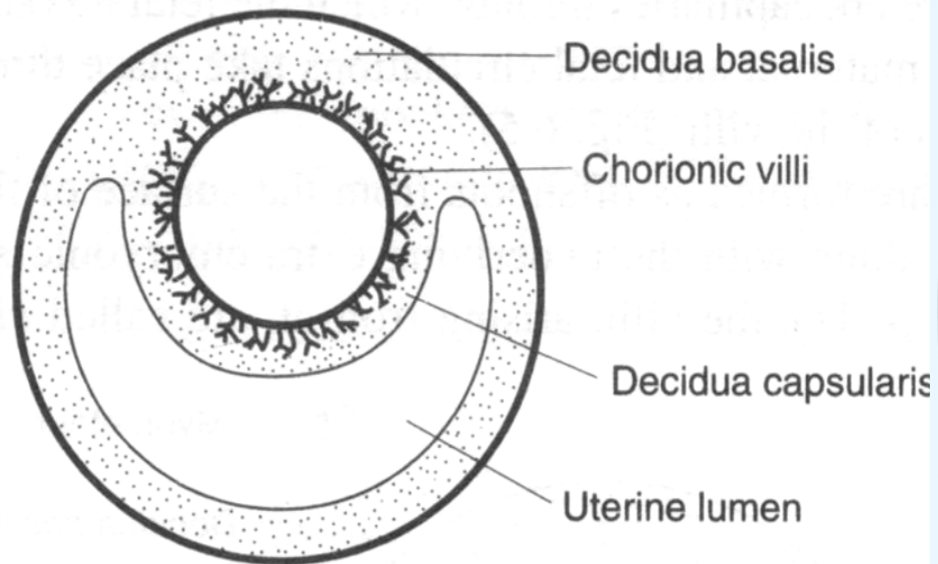


Figure 4.15 Development of a villus. **A.** Transverse section of a primary villus showing a core of cytotrophoblastic cells covered by a layer of syncytium. **B.** Transverse section of a secondary villus with a core of mesoderm covered by a single layer of cytotrophoblastic cells, which in turn is covered by syncytium. **C.** Mesoderm of the villus showing a number of capillaries and venules.

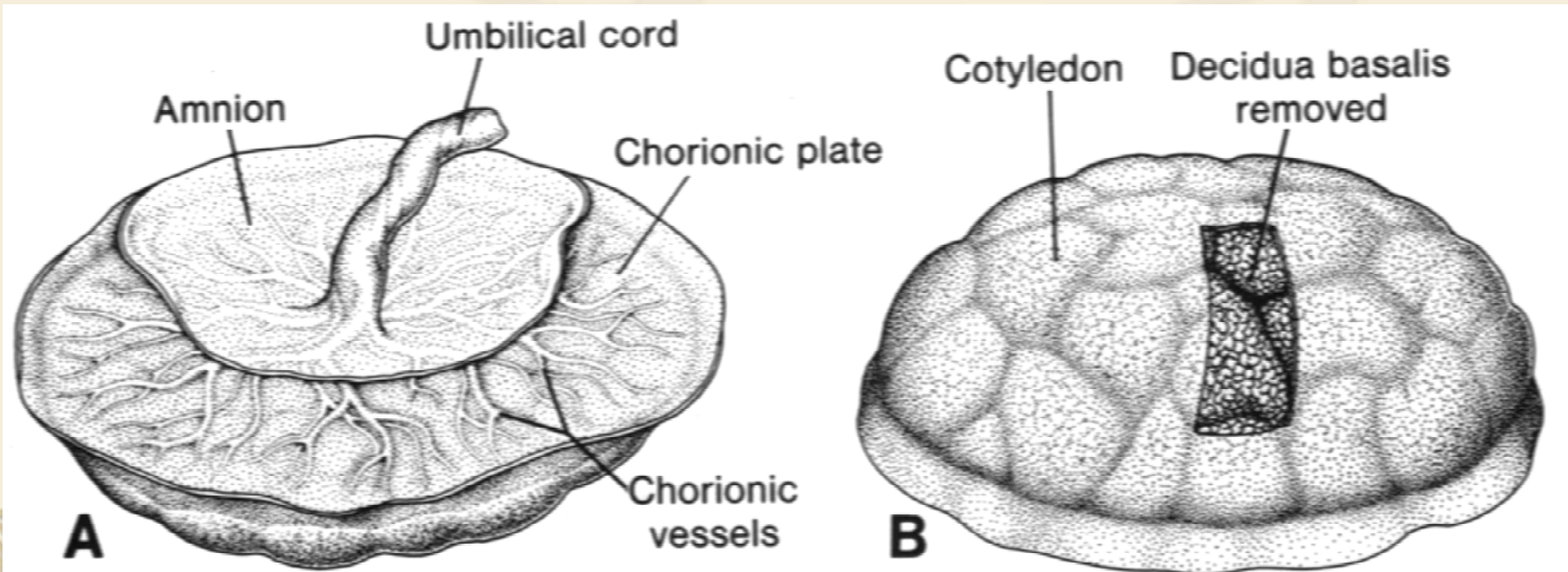
❖ **Villous chorion or chorion frondosum.**

❖ **Smooth chorion or chorion laeve.**



Placenta

- ❖ The placenta has two components: fetal portion and maternal portion.
- ❖ The fetal portion is villous chorion
- ❖ The maternal portion is decidua basalis.



placental barrier:

- ❖ Between fetal and maternal blood
- ❖ Components:

Early period

- ❧ Endothelium & basement membrane of fetal capillaries
- ❧ thin layer of connective tissue in the villus core
- ❧ cytotrophoblast and basement membrane.
- ❧ syncytiotrophoblast.

Later period

- ❧ Endothelium & basement membrane of fetal capillaries
- ❧ Syncytiotrophoblast



Function of the placenta

- ❖ Exchange material
- ❖ Production of hormones
syncytiotrophoblast

human chorionic gonadotropin, HCG:

- ⌘ maintains the corpus luteum.
- ⌘ Appear in early stage of gestation & maternal urine, an indicator of early pregnancy



human placental progesterone, HPP
maintains pregnancy

human placental estrogen, HPE
stimulates uterine growth and development of the
mammary glands.

**Somatomammotropin/ human placental lactogen,
HPL**
promotes breast development for milk production



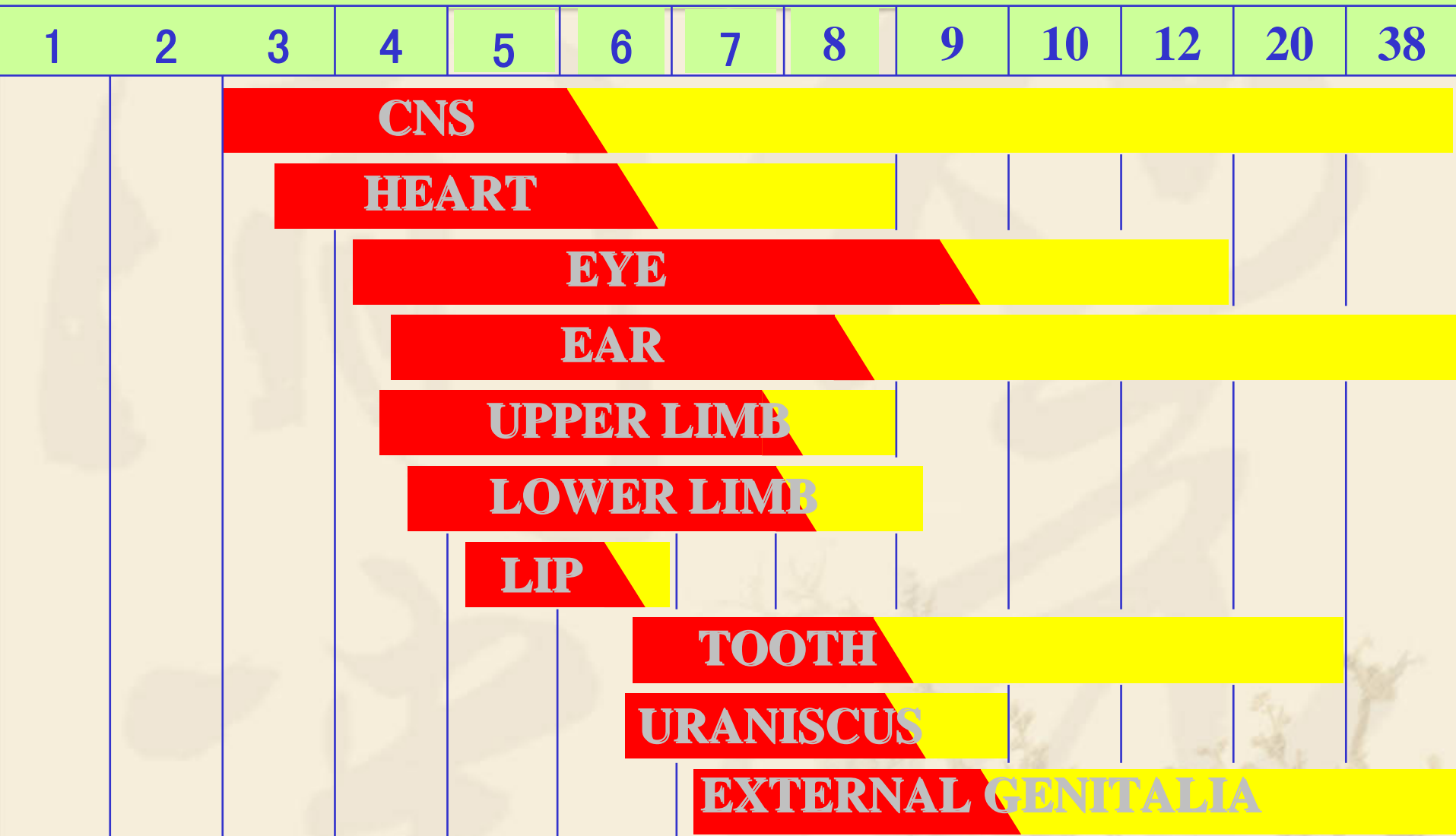
Monozygotic twins **

- ❖ Forming two blastocyst
respective placenta, amnion, and chorion.
- ❖ Forming two inner cell mass in one blastocyst
common placenta and chorion, separate amnion
- ❖ Forming two primitive streaks and two notochords on one germinal disc
common placenta, amnion, and chorion

Conjoined (Siamese) twins

- ❖ **Partial splitting of the primitive node and streak**

The period of embryonic development (week, fertilization age)



■ high sensitivity to teratogenic agent
 ■ low sensitivity to teratogenic agent
 sensitive period to teratogenic agent in human fetus: from 3rd to 9th week.