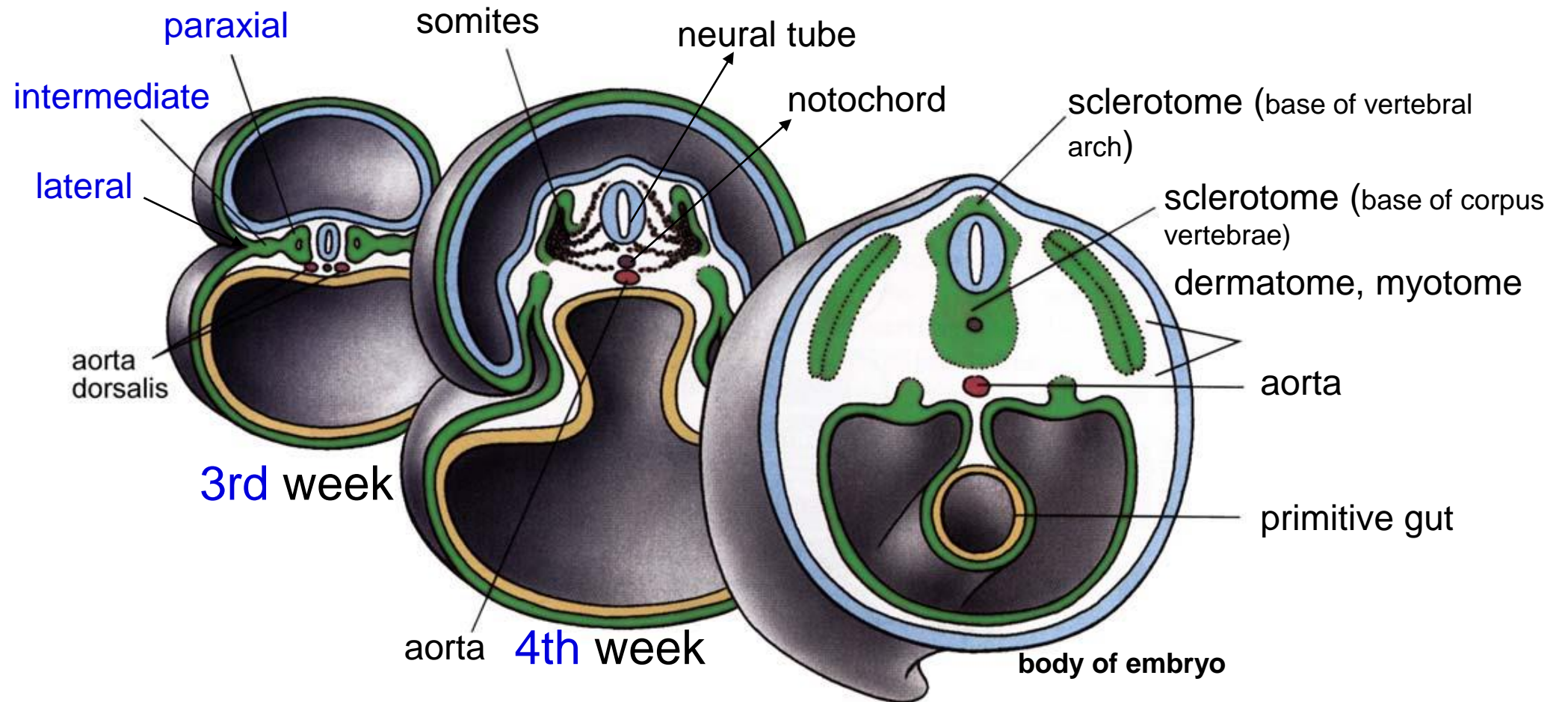


GENERAL EMBRYOLOGY 2

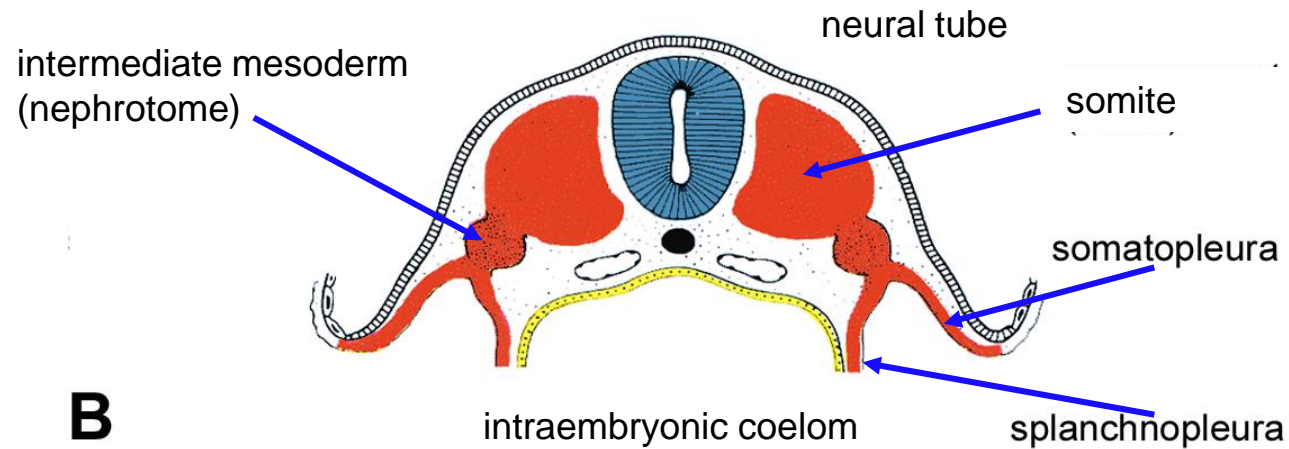
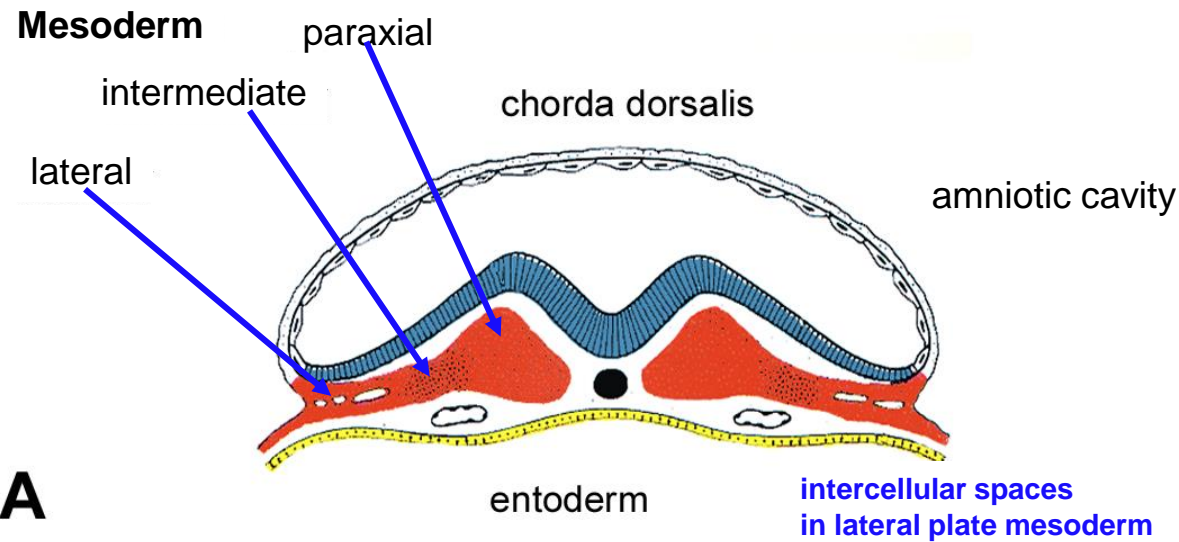
- Folding of the embryo – 4th week of development
- Development of extraembryonic structures – extraembryonic mesoderm, extraembryonic coelom, yolk sac, fetal membranes: amnion and chorion.
- Development of the placenta. Anomalies of the placenta and umbilical cord.

- Multiple pregnancy – arrangement of fetal membranes.
- The length of pregnancy, calculation of delivery date.
- Fetus position in the uterus – *situs*, *positio*, *praesentatio*, and *habitus*. The length and weight of fetus during i.u. development. The rule of Haase.
- Mature and full-term fetus, marks of mature fetus.

4th week – folding of the embryo (flexion)



Differentiation of intraembryonic mesoderm



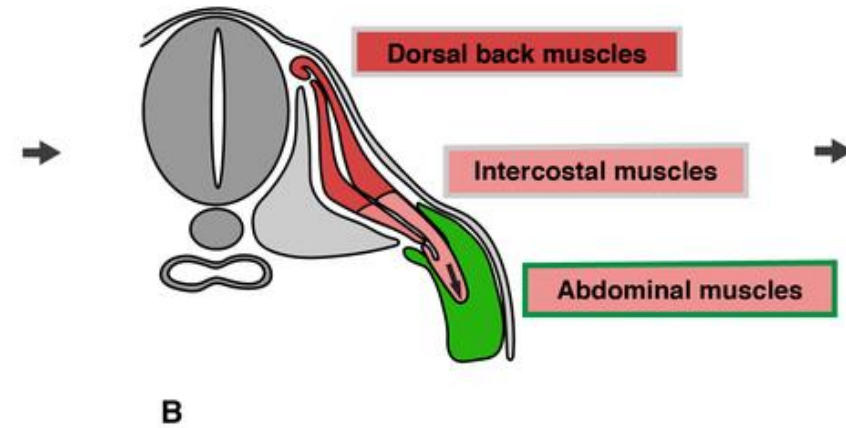
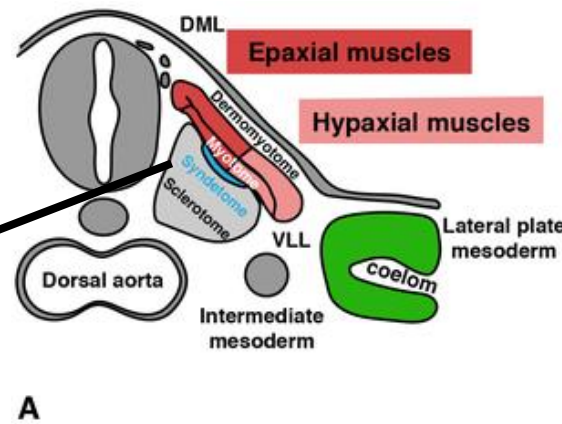
Mesoderm:

- **paraxial mesoderm** – thickened region of mesoderm along neural tube
- **intermediate mesoderm (nephrotome)** – in between paraxial and lateral mesoderm
- **lateral mesoderm** – keeps sheet-like structure

Differentiation of intraembryonic mesoderm – paraaxial (somites)

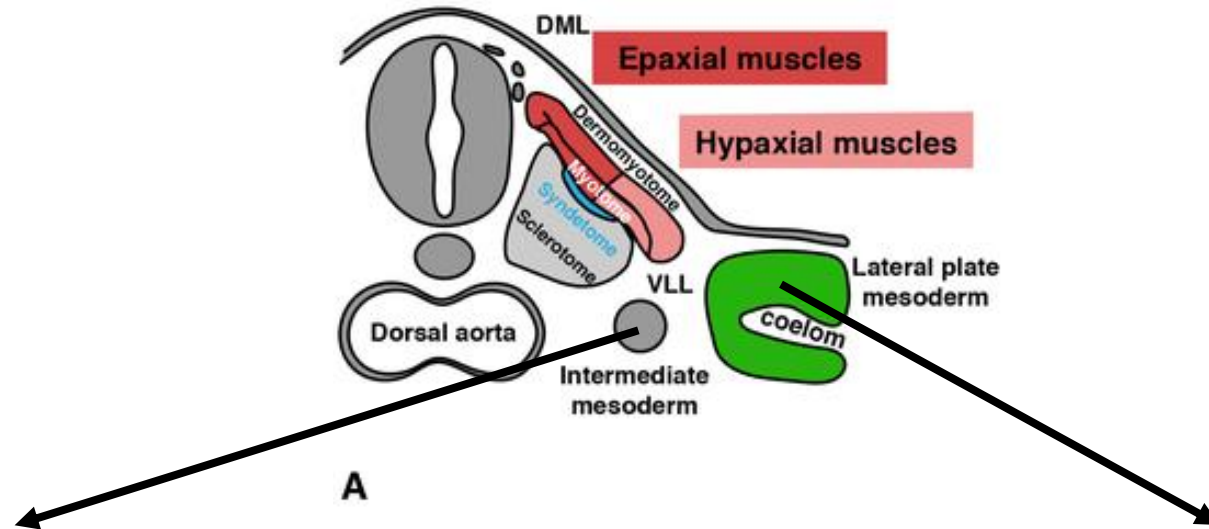
Somite

→ Dermatome, Myotome, Sclerotome



- Epaxial (primaxial); Somite-derived MCT
- Hypaxial (primaxial); Somite-derived MCT
- Hypaxial (abaxial); Lateral plate-derived MCT

Differentiation of intraembryonic mesoderm – intermediate and lateral



Intermediate mesoderm

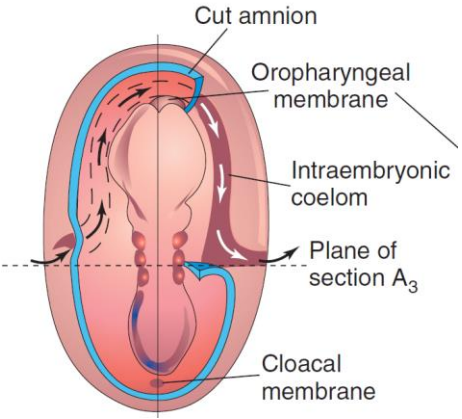
→ urinary system (kidney, ureter),
genital system (gonads, ducts,
accessory glands)

Lateral mesoderm (parietal and visceral layer)

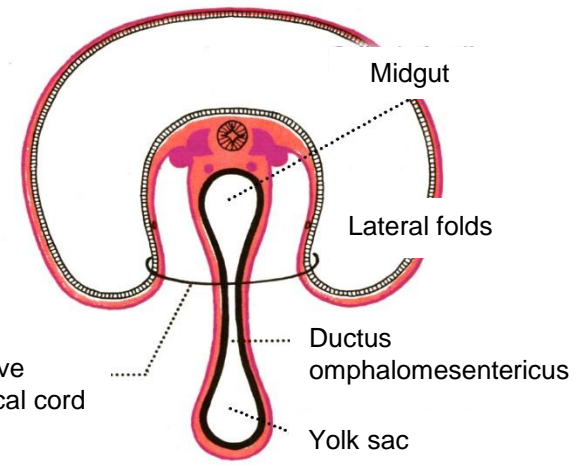
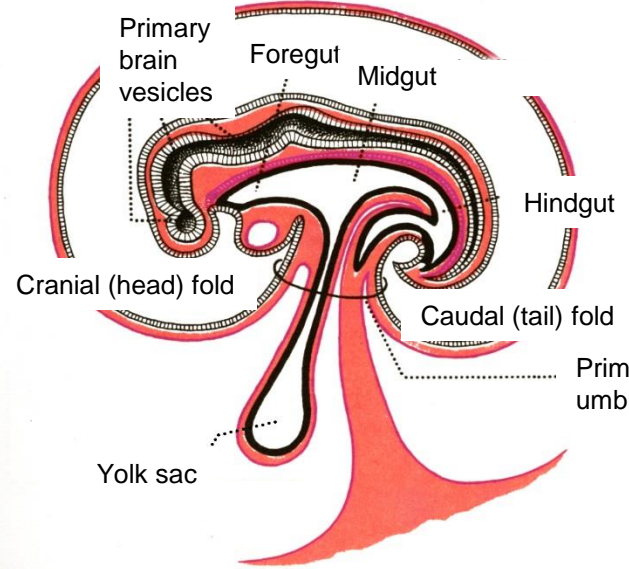
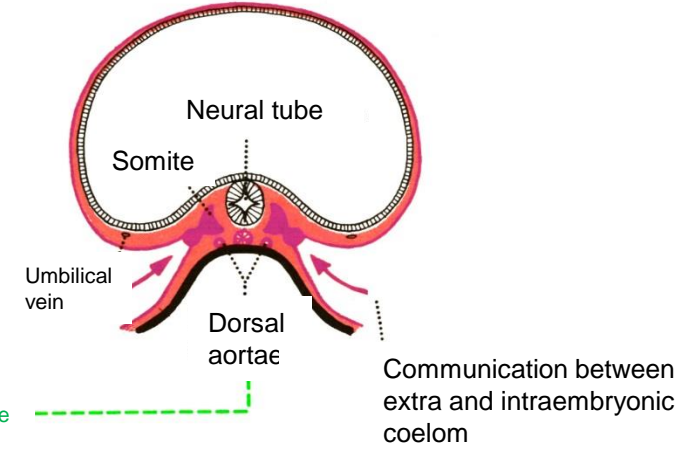
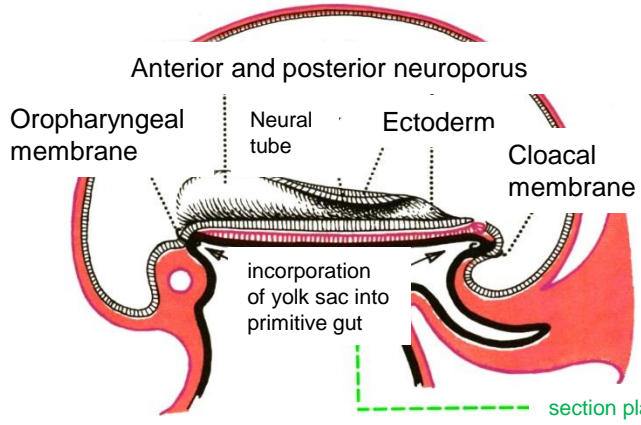
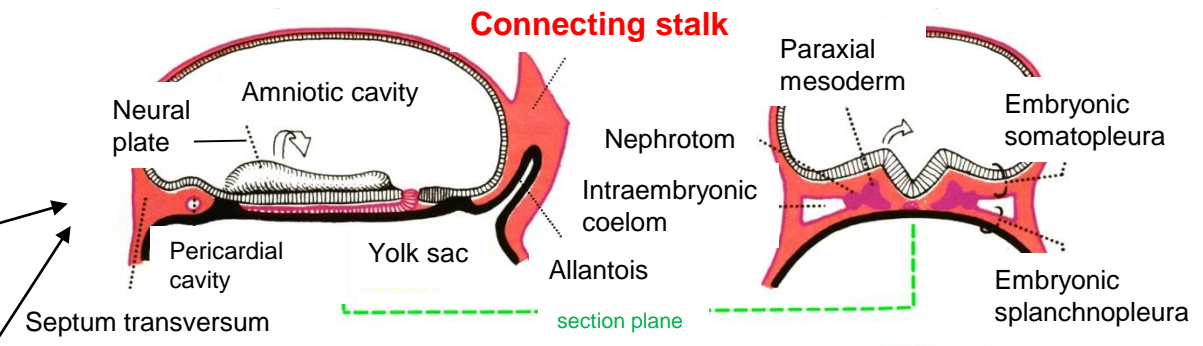
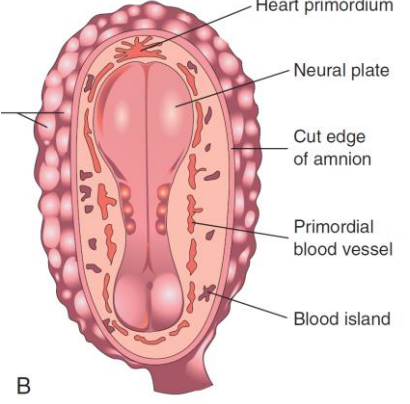
→ dermis, hypodermis of ventral body parts,
connective tissue and muscle of viscera,
serous membranes, blood and lymphatic
vessels, spleen

EMBRYO FOLDING

Intraembryonic coelom – horseshoe shape



Heart primordium



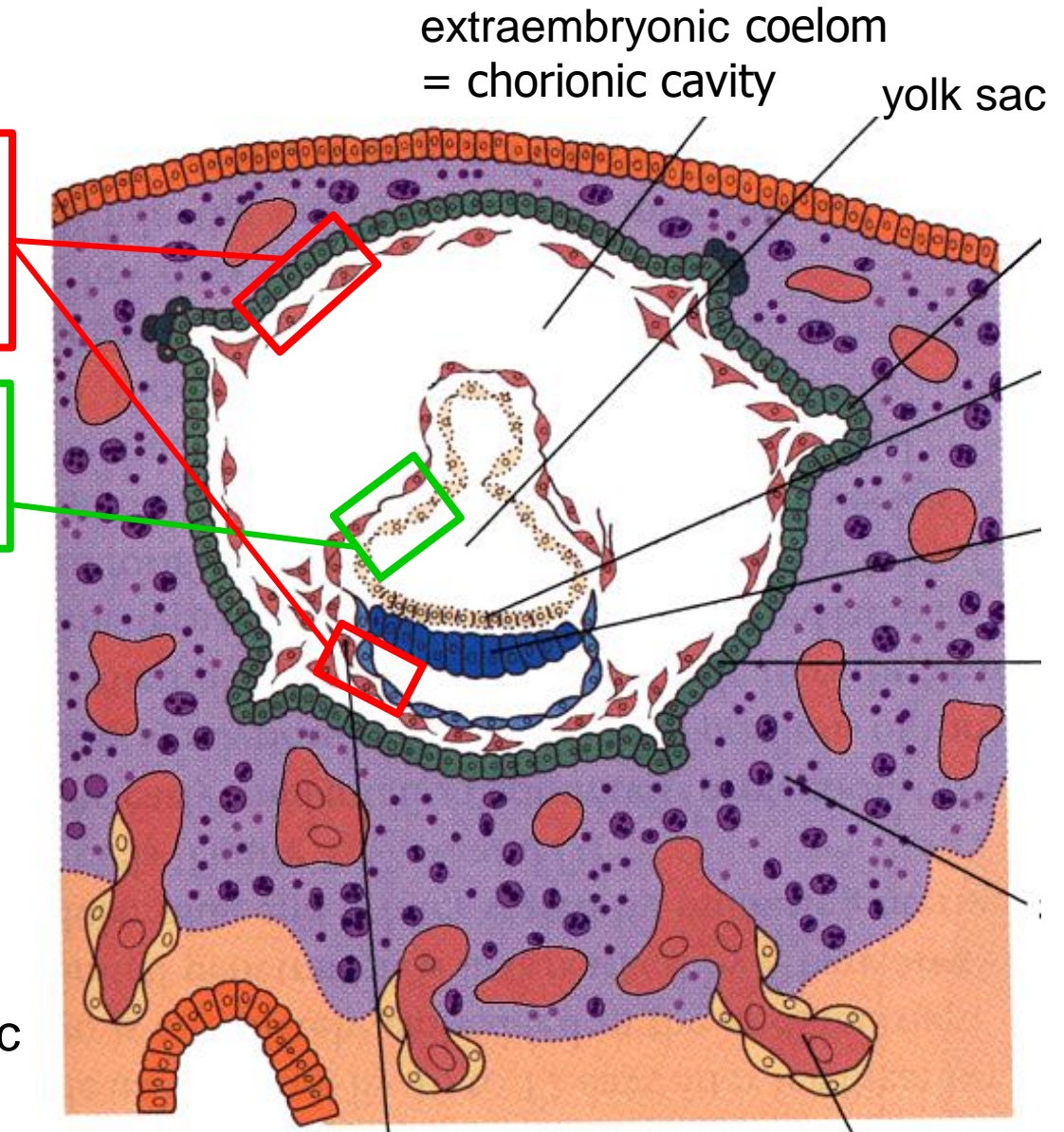
Extraembryonic mesoderm

parietal layer =
extraembryonic somatopleura
+ trophoblast → chorion
+ amniotic ectoderm → amnion

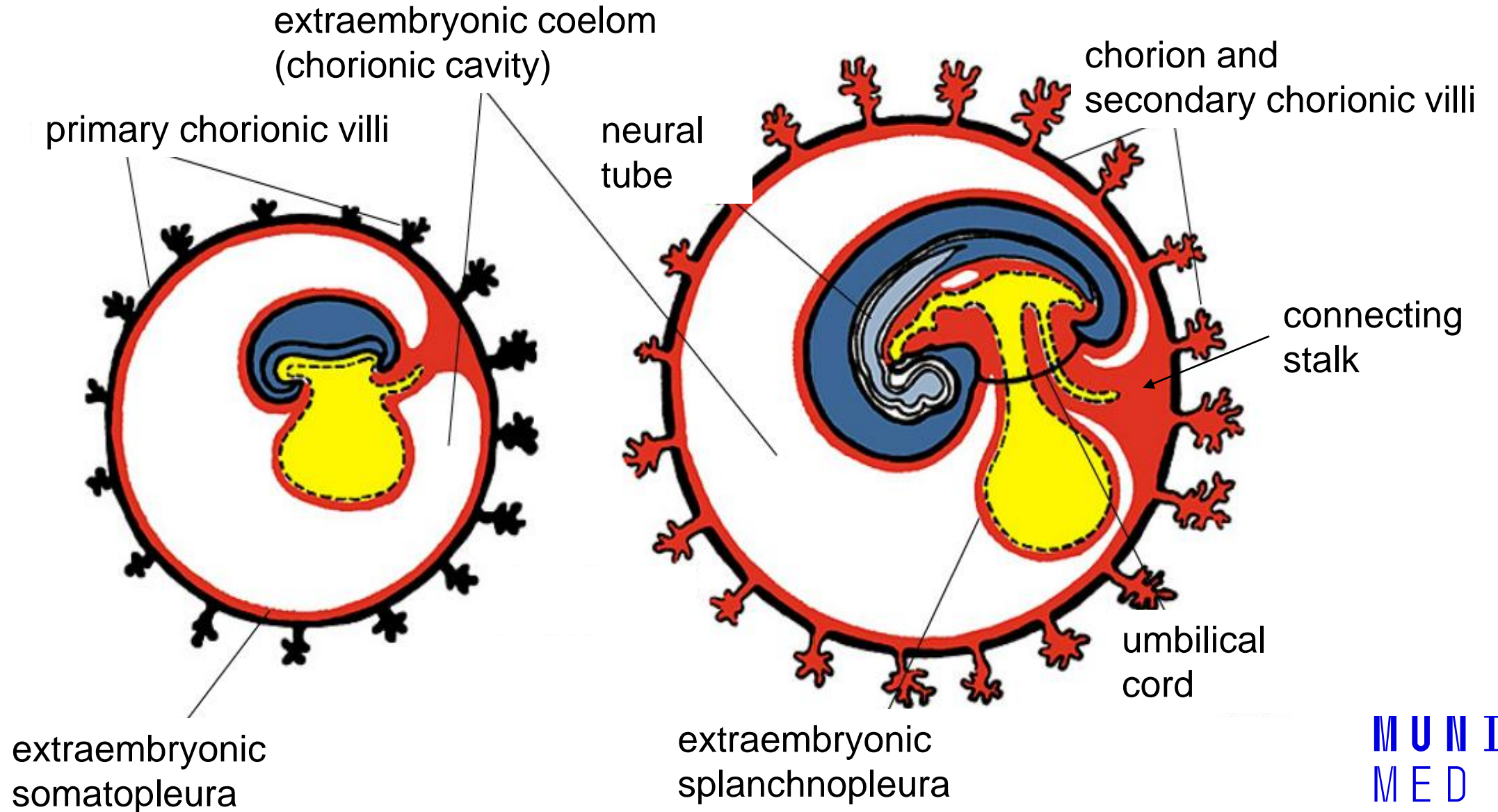
visceral layer =
extraembryonic splanchnopleura
+ extraembryonic endoderm → yolk sac

chorionic villi

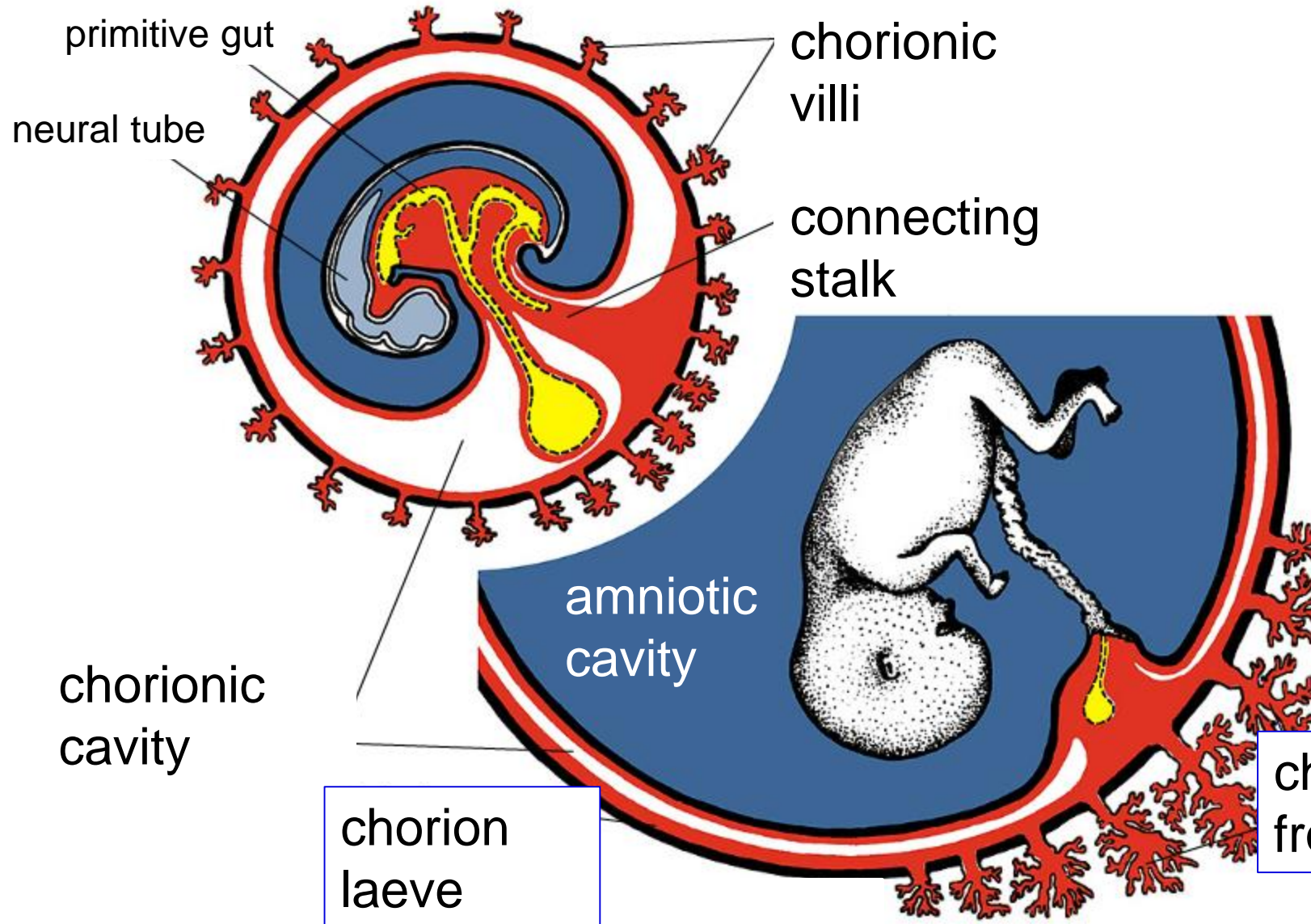
- **primary** – cytotrophoblastic buds (day 10) covered with syncytiotrophoblast
- **secondary** - with extraembryonic mesoderm (days 12-13)
- **tertiary** – vascularized extraembryonic mesoderm (days 17-18)



Yolk sac, amniotic sac, fetal membranes - amnion, chorion



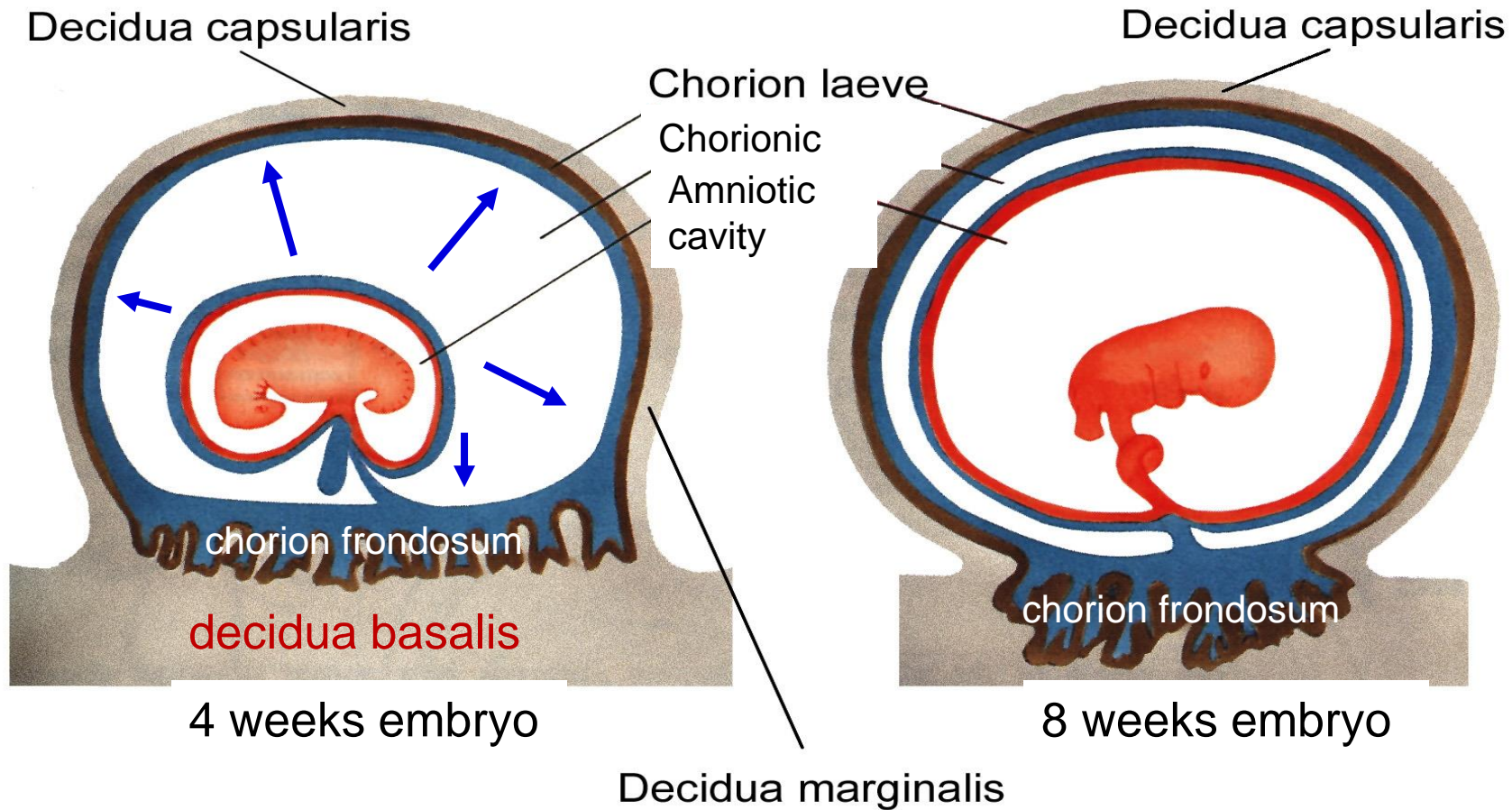
Development of fetal membranes



Different growth of chorionic villi toward **decidua basalis** (partially decidua marginalis) and toward decidua capsularis causes division of chorion into parts:
CHORION FRONDOSUM (toward decidua basalis – with villi) and **CHORION LAEVE** (smooth, without villi)

CHORION = extraembryonic mesoderm + cytotrophoblast + syncytiotrophoblast
AMNION = extraembryonic mesoderm + amniotic **ectoderm**

GROWTH OF AMNIOTIC AND CHORIONIC CAVITY

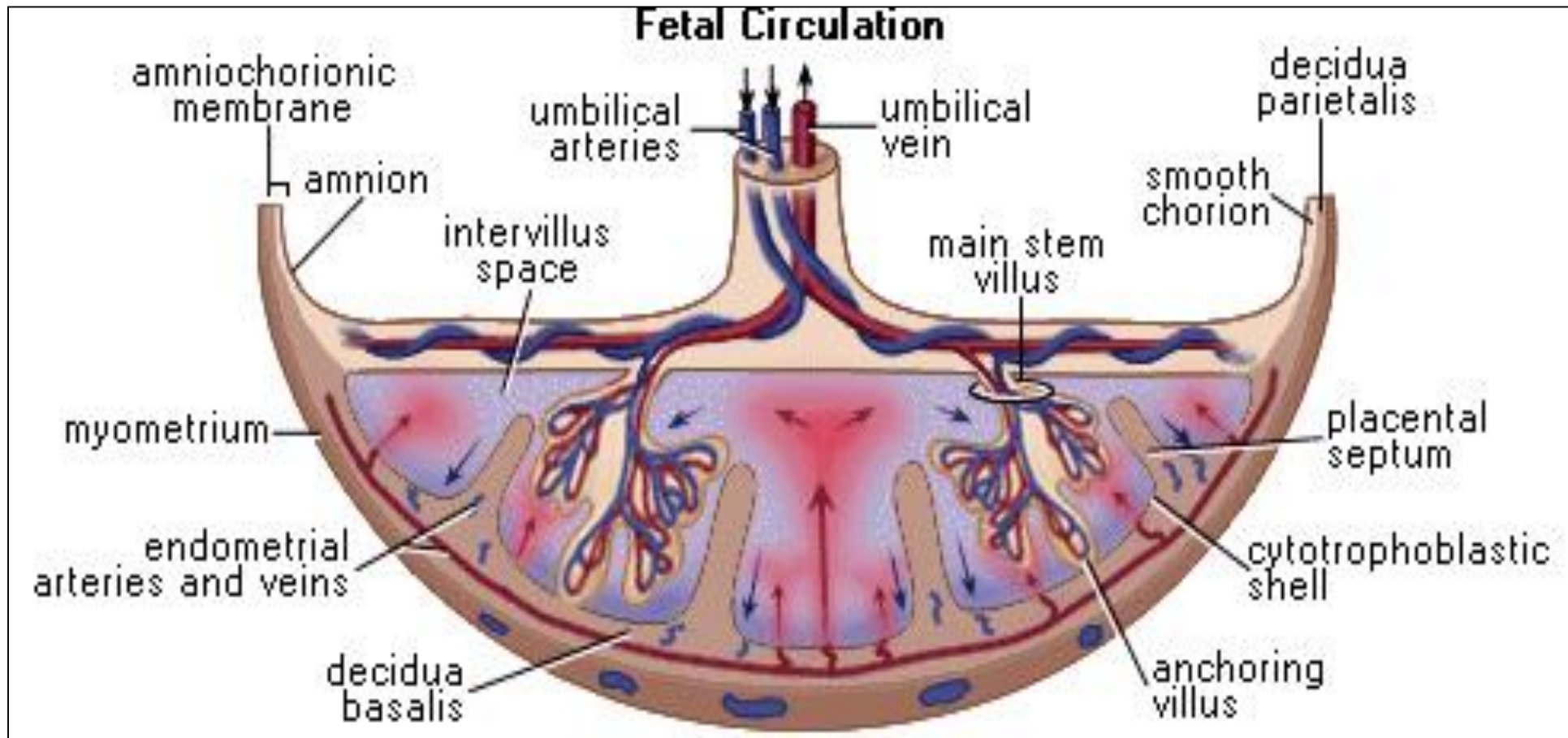


decidua

- basalis
- capsularis
- marginalis
- parietalis

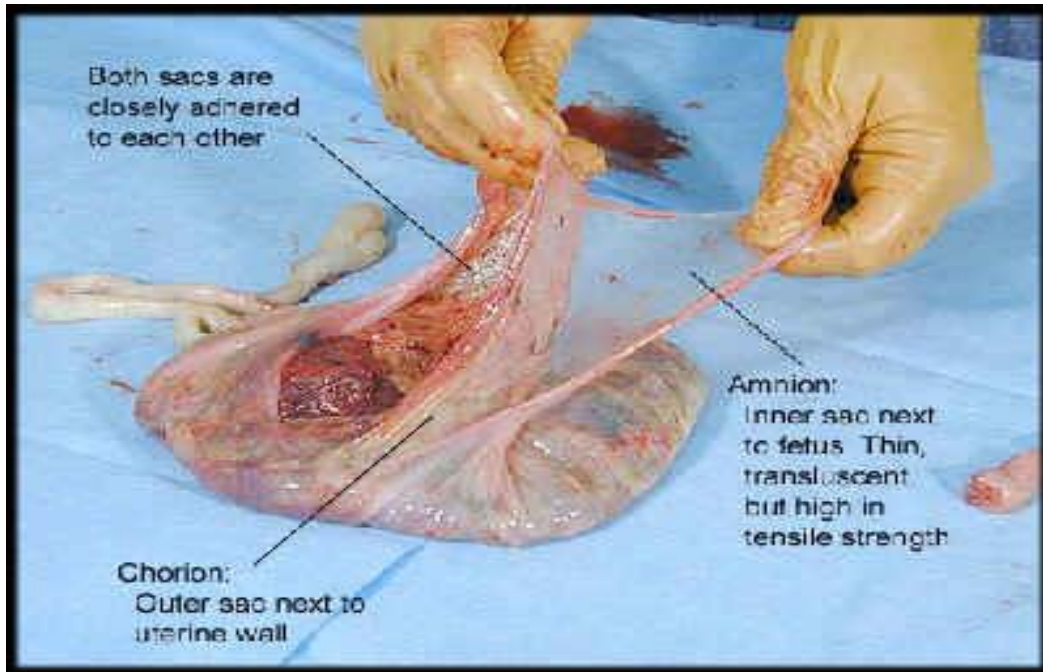
COMPARTMENTS OF PLACENTA:

- ⇒ **PARS FETALIS PLACENTAE** – chorionic plate + chorionic villi, intervillous space
- ⇒ **PARS MATERNA PLACENTAE** = zona functionalis deciduae basalis



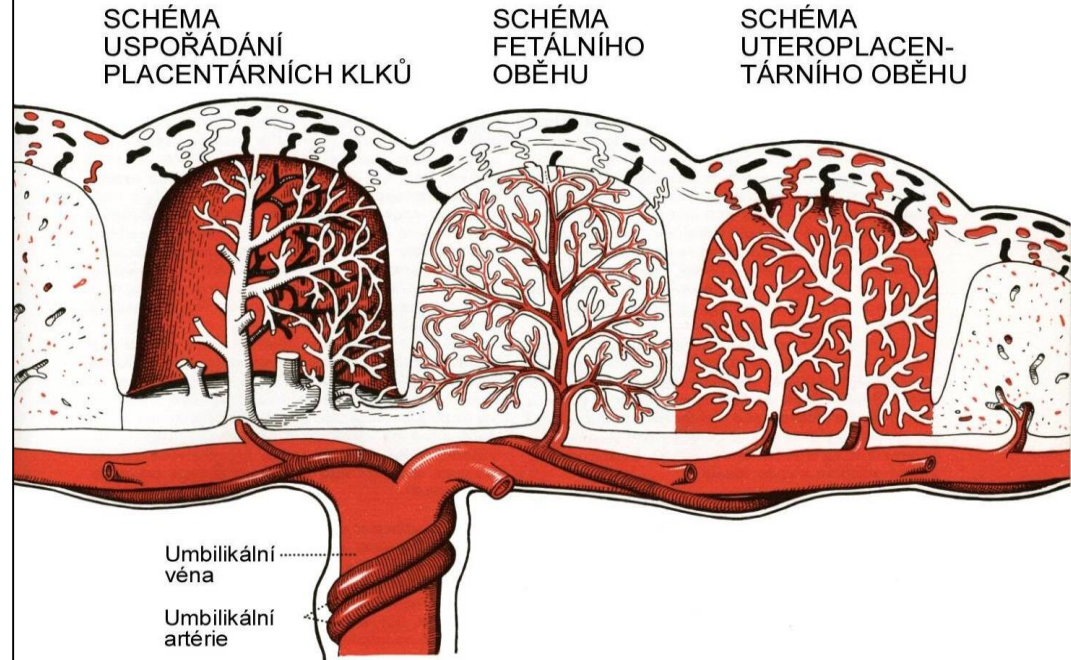
Human placenta

- **discoidalis**
- **olliformis**
- **hemochorialis**



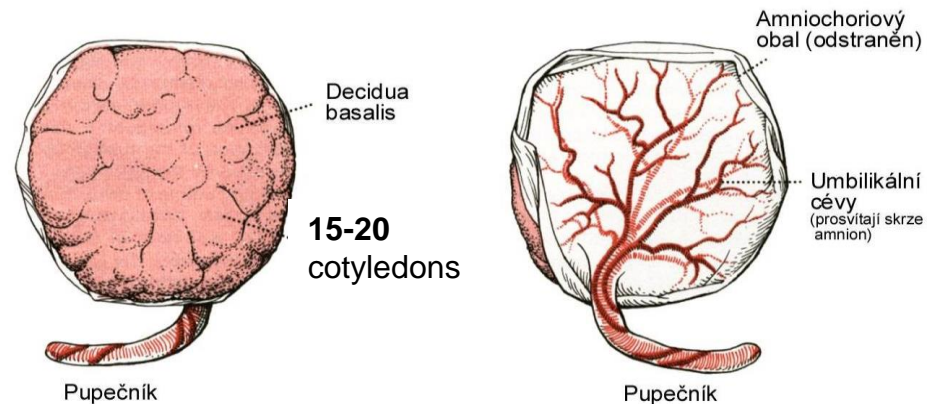
Ø 15-25 cm
width 2-3 cm
weight 500 g

Full-term placenta



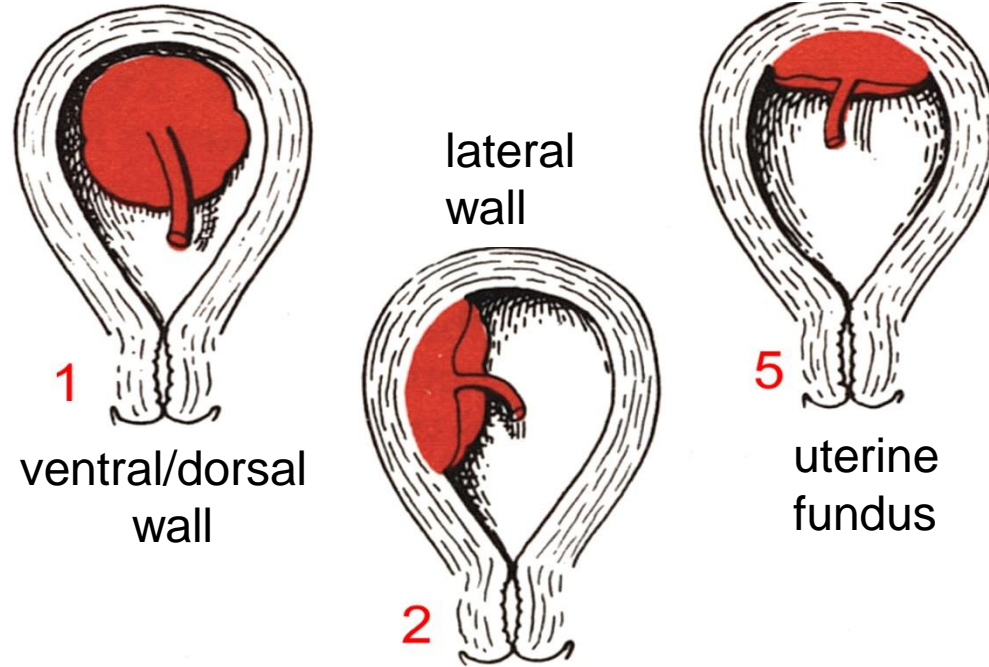
maternal surface

fetal surface

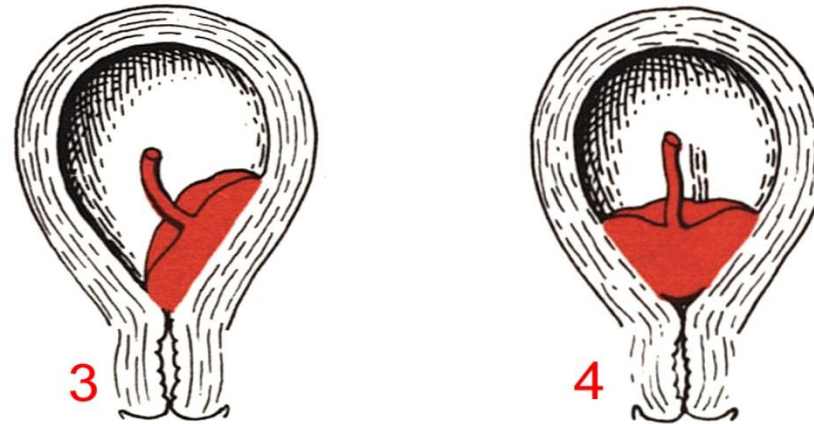


POSITION OF PLACENTA IN UTERUS

normal



anomaly



PLACENTA PRAEVIA

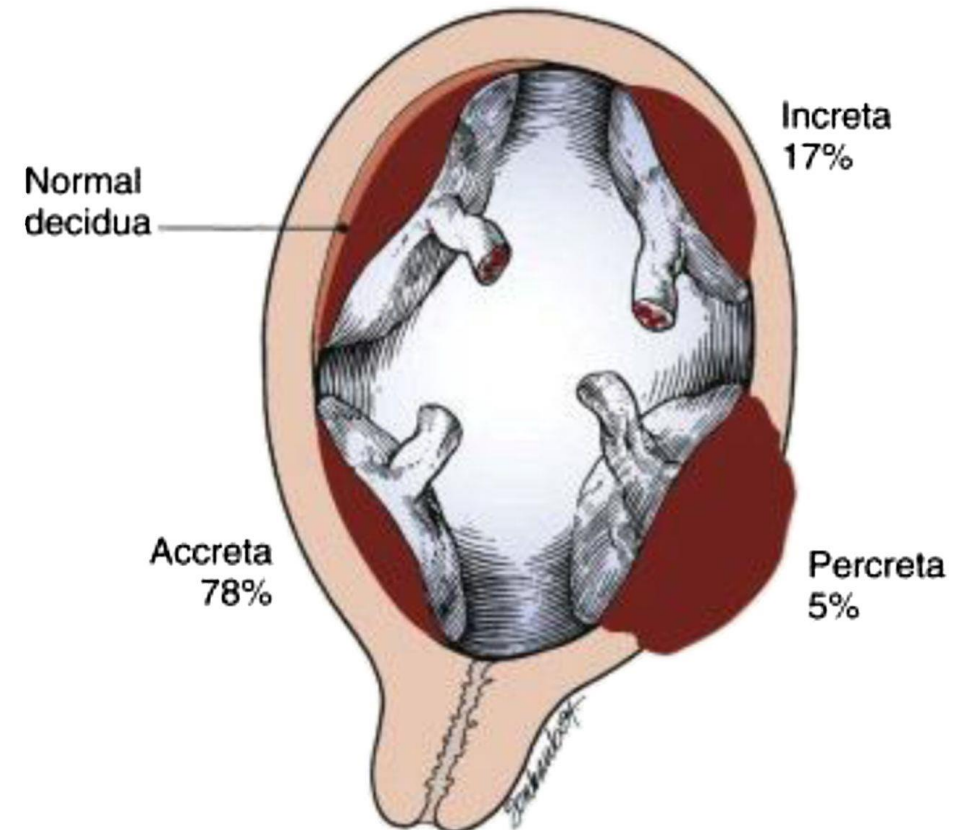
Anomalies of placenta

Anomalies of chorionic villi (1 : 100 pregnancies)

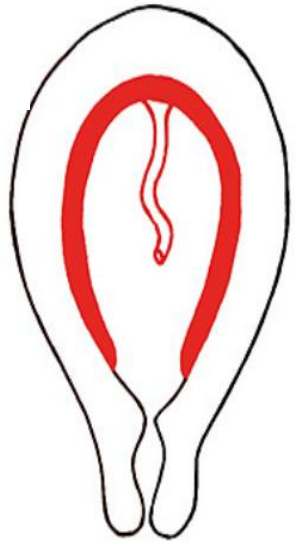
- mola hydatidosa
- chorionepitheliom

Anomalies in location:

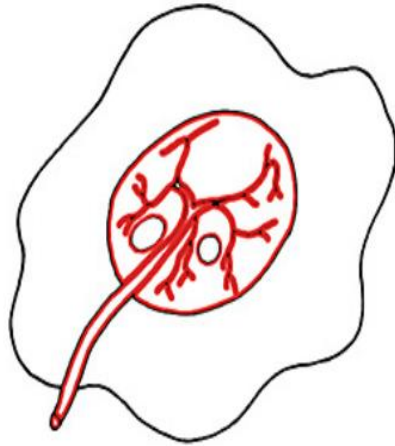
- **placenta praevia** (causes bleeding in week 28)
 - absolute indication to CS
- **placenta accreta** (attached to myometrium)
- **placenta increta** (grown into myometrium)
- **placenta percreta** (grown through myometrium)



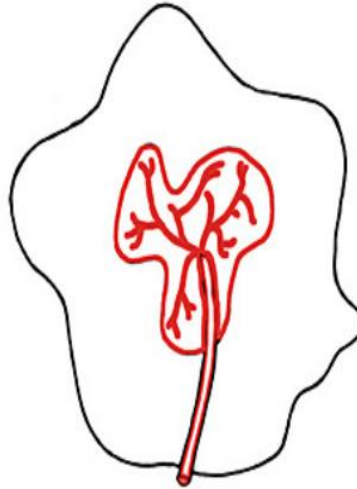
Anomalies of shape of placenta



placenta membranacea



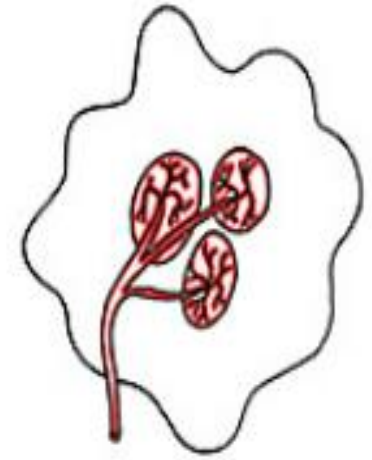
placenta fenestrata



placenta tripartita



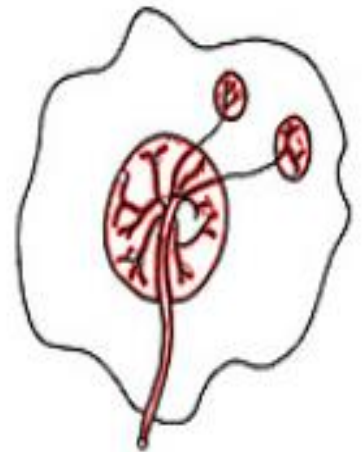
placenta duplex



placenta triplex

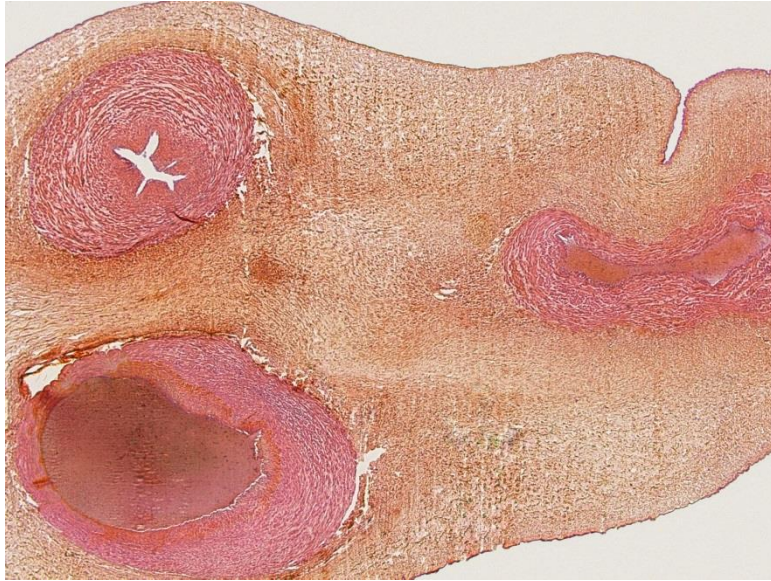


placenta succenturiata

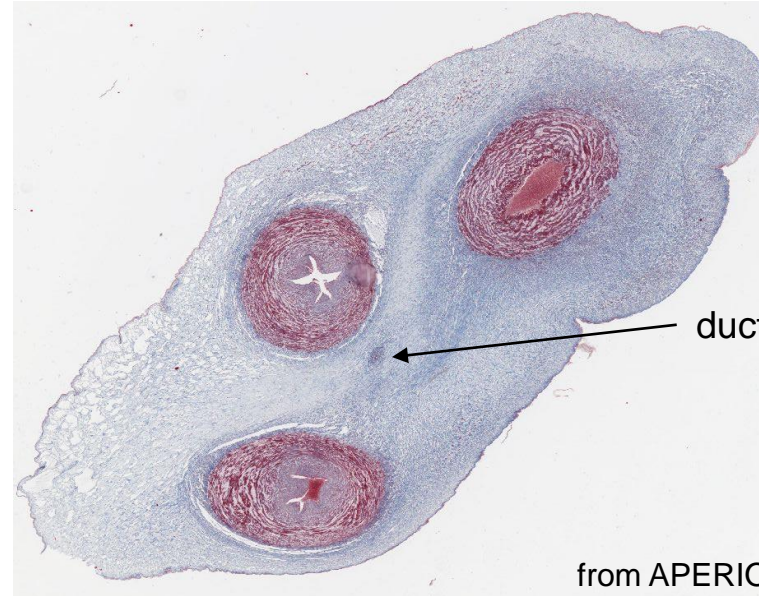


Funiculus umbilicalis (HE, HES, AZAN)

- 50 – 60 cm long
- 1,5 – 2 cm wide
- amniotic ectoderm on the surface
- jelly-like connective tissue with umbilical vessels

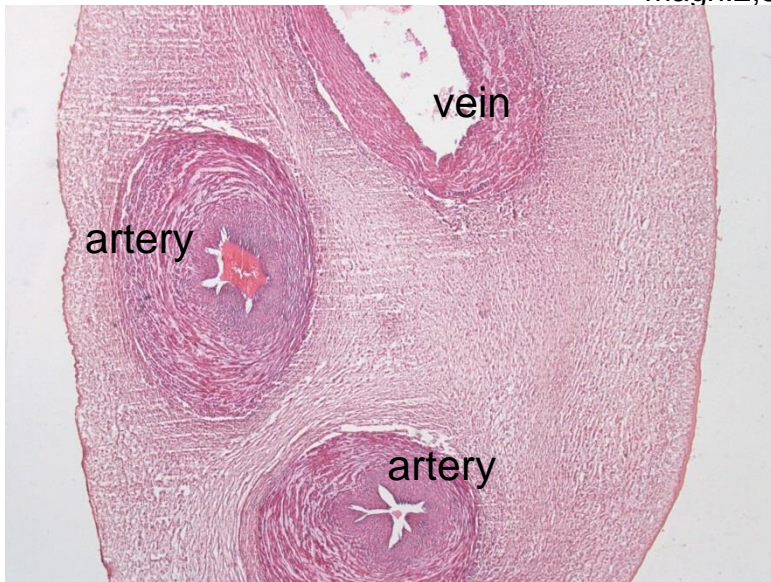


magn:2,5



ductus allantoideus

from APERIO



magn:2.5



Anomalies of umbilical cord

- short (< 40 cm)
- long (> 60 cm)
(danger of strangulation or formation of true knots)
- true and false knots
- absence of 1 umbilical artery
(hypotrophic fetus)



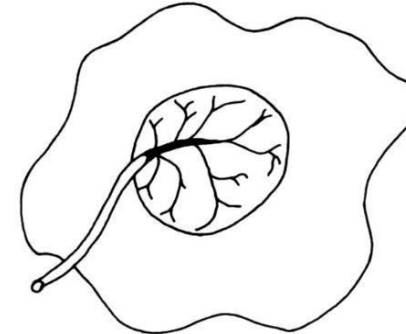
True knot



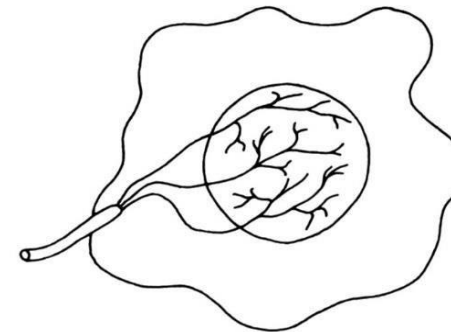
False knot

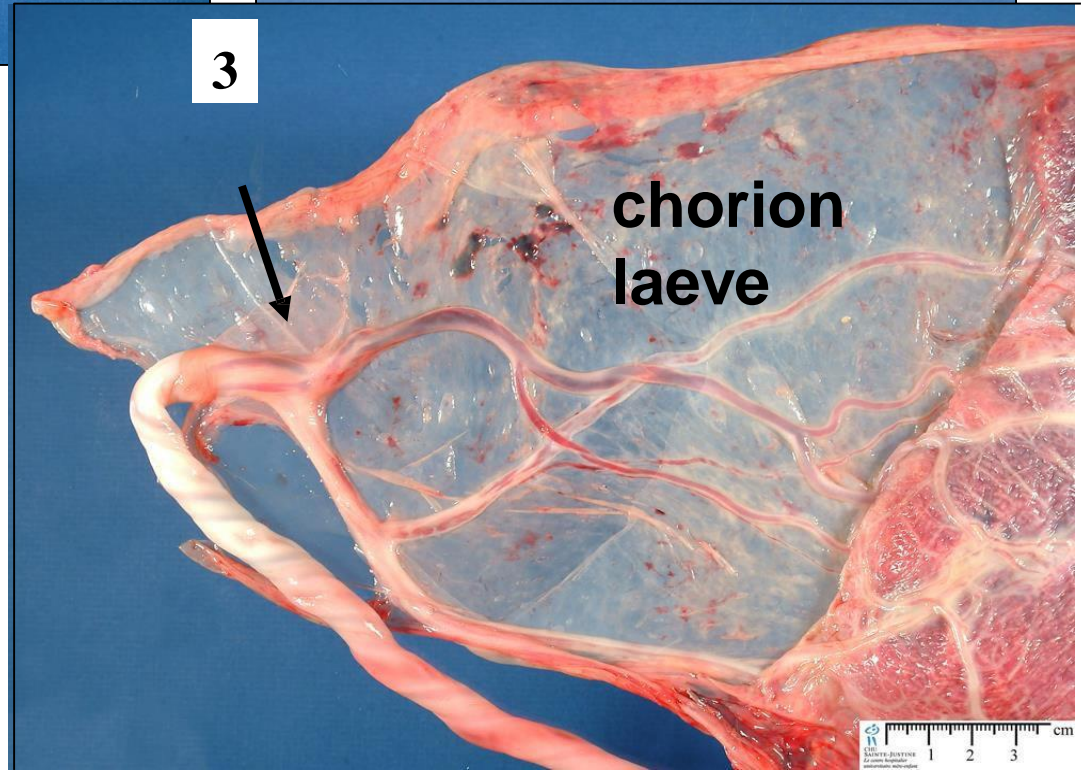
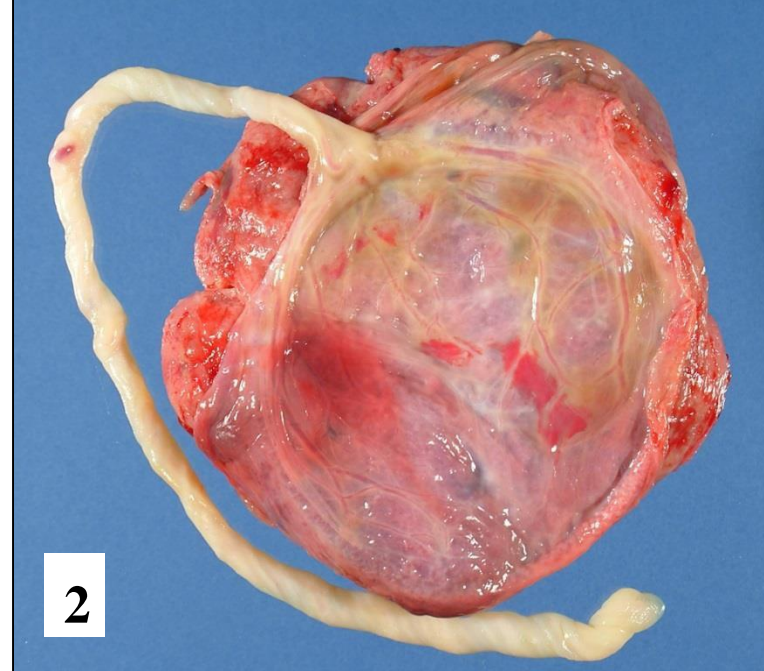
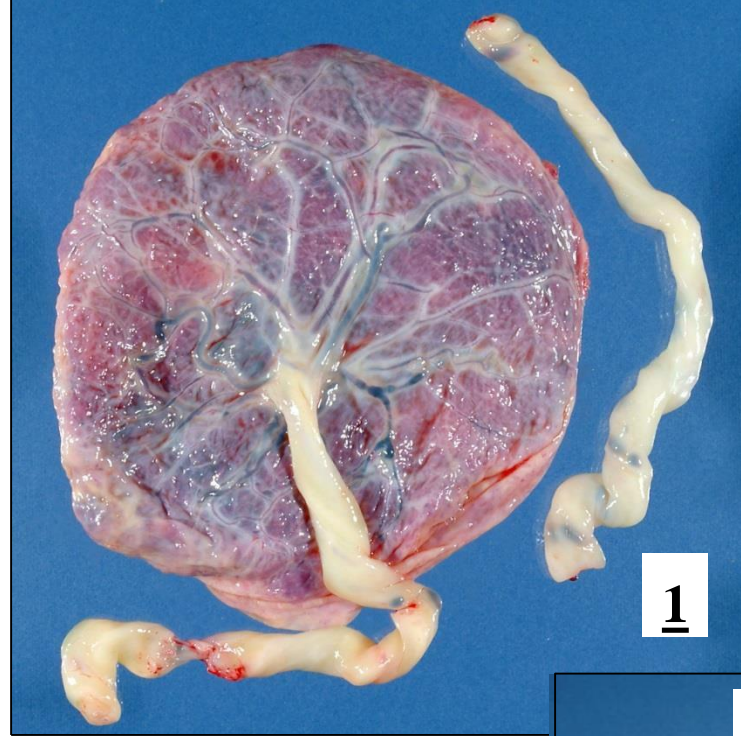


Insertio marginalis



Insertio velamentosa
(placenta velamentosa)





Umbilical cord – placenta insertion

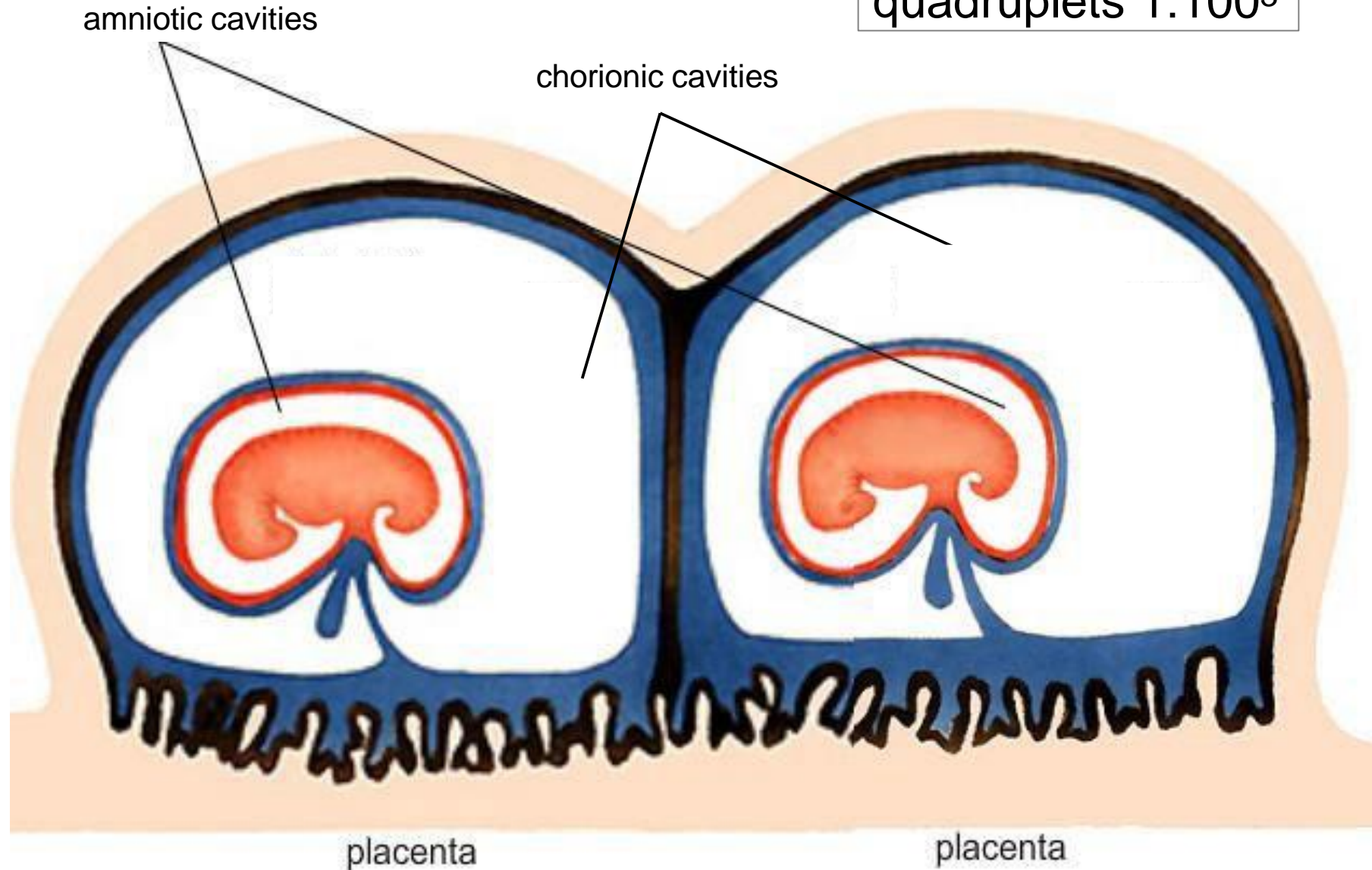
1 – insertio centralis

2 – insertio marginalis

3 – insertio velamentosa

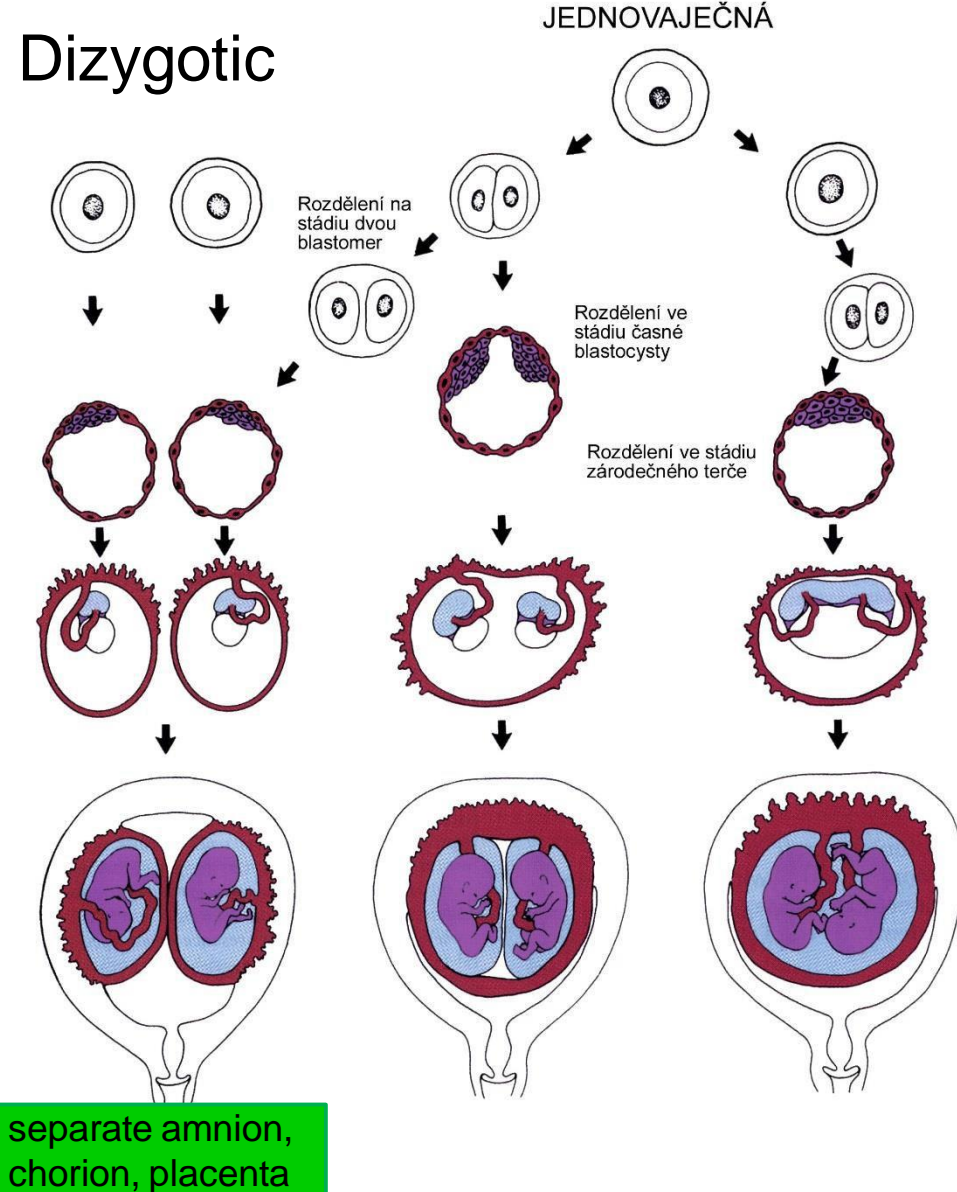
Multiple pregnancy

twins 1:100
triplets 1:100²
quadruplets 1:100³



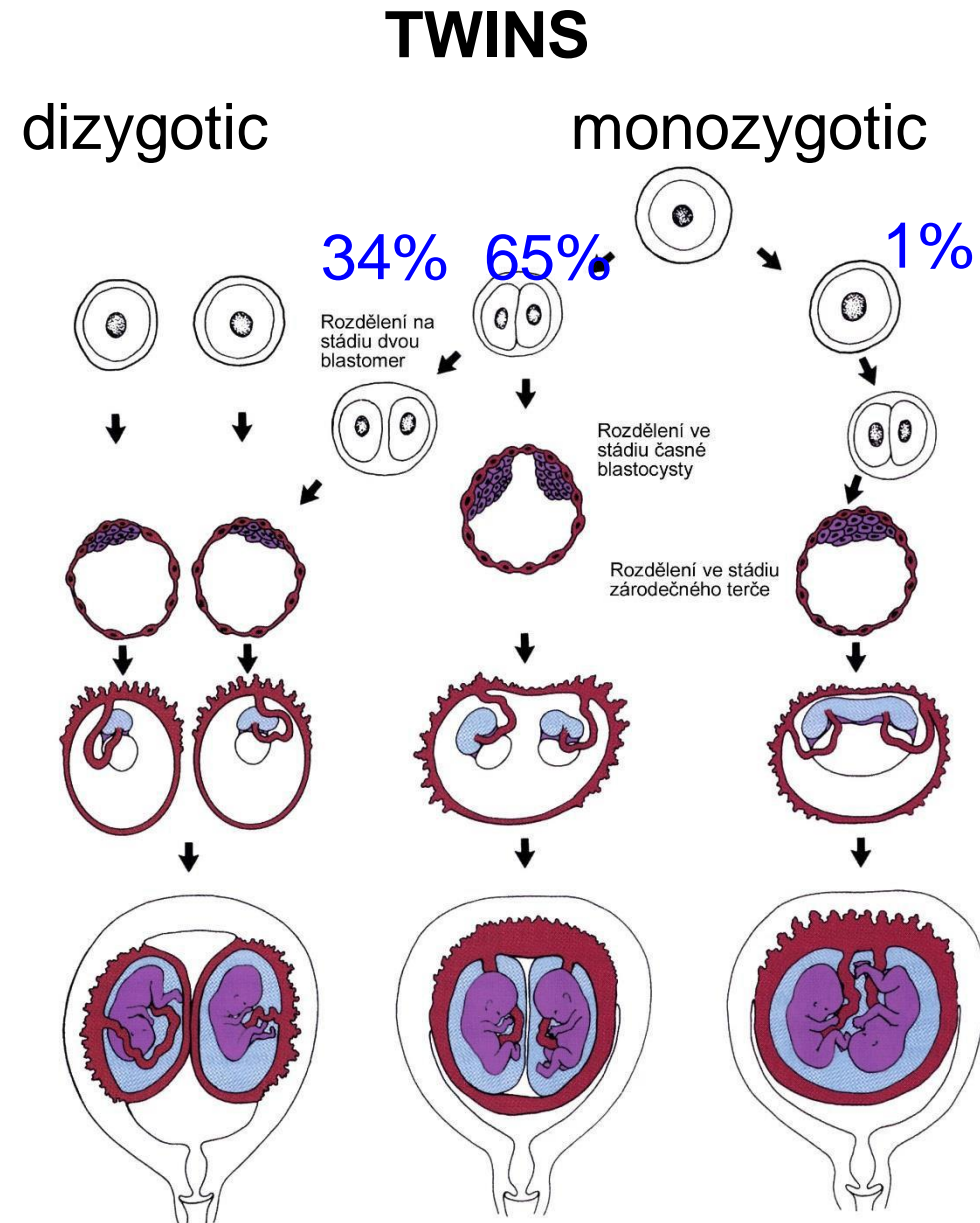
DIZYGOTIC TWINS

- **2 spermatozoa fertilize 2 oocytes**
- each embryo develops separately (has its own amnion, chorion, and placenta)
- twins can be of different sexes
- resemblance of twins as between siblings of different age



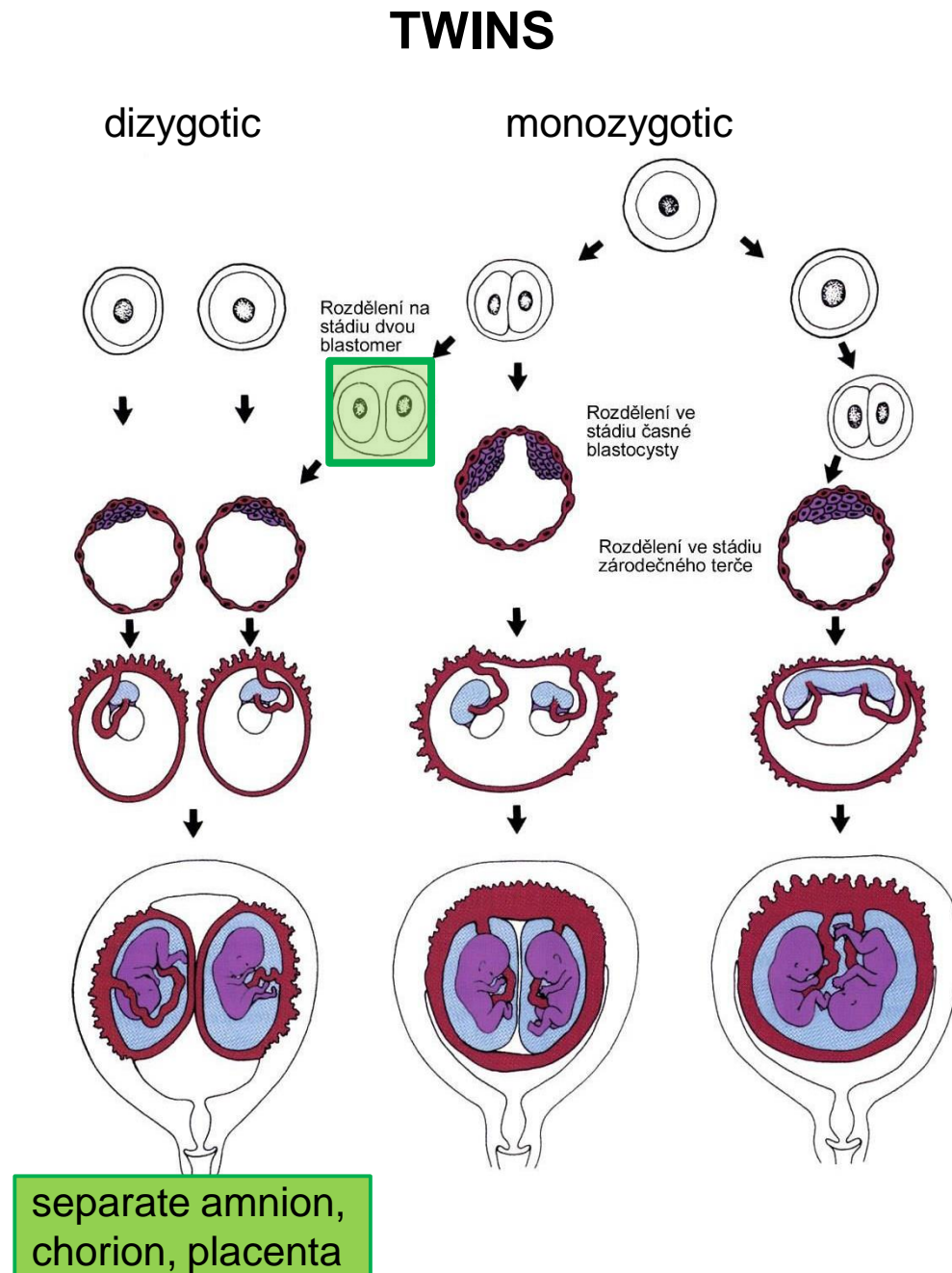
MONOZYGOTIC TWINS

- 1 spermatozoon fertilizes 1 oocyte
- splitting of embryo occurs during the further development
- arrangement of fetal membranes depends on **stage** on which splitting occurs
- **twins are always genetically identical and of the same sexes**



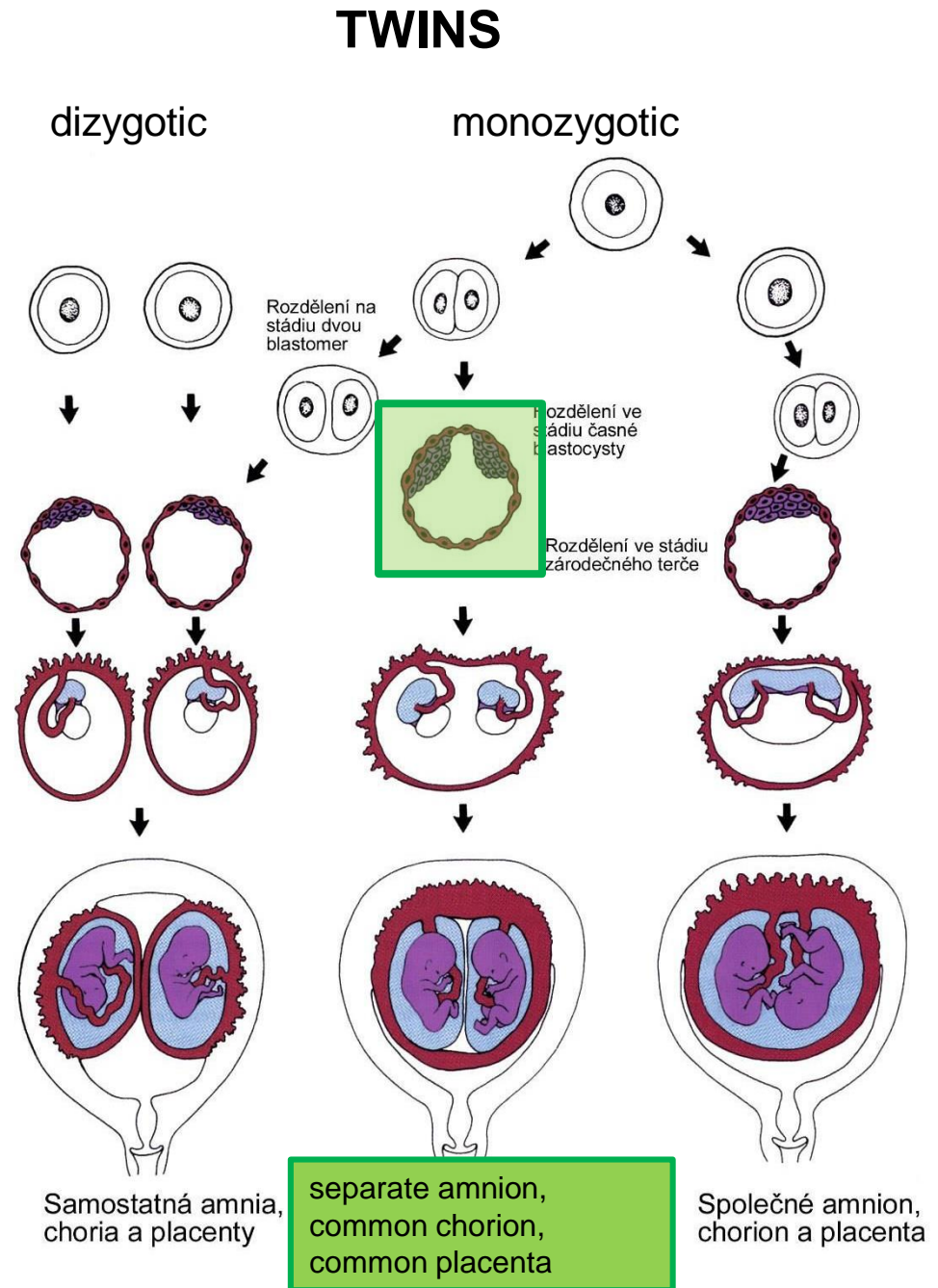
MONOZYGOTIC separated on stage of 2 blastomeres

- each of 2 blastomeres creates 1 embryo
- 2 blastocysts are formed
- they implantate separately
- fetal membranes are as in dizygotic twins: separate amnion and chorion (diamniotic, dichorial), and own placenta



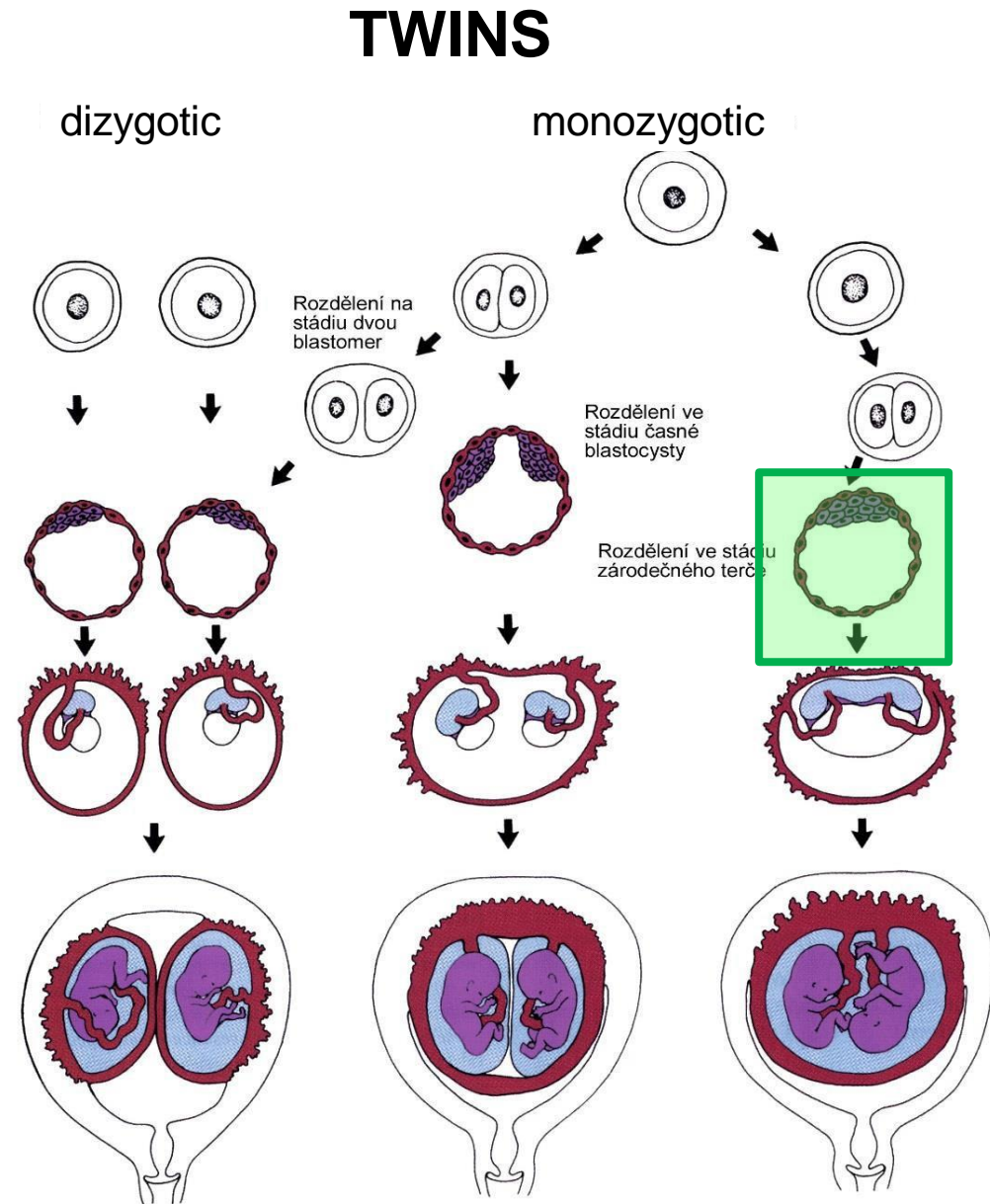
MONOZYGOTIC separated on stage of blastocyst

- embryoblast divides into 2 cell clusters before creation of germ disc
- trophoblast does not separate, remains common
- fetal membranes:** separate amnion (**diamniotic**), common chorion (**monochorial**) and common placenta
- the most frequent (65 %)



MONOZYGOTIC separated on stage of bilaminar germ disc

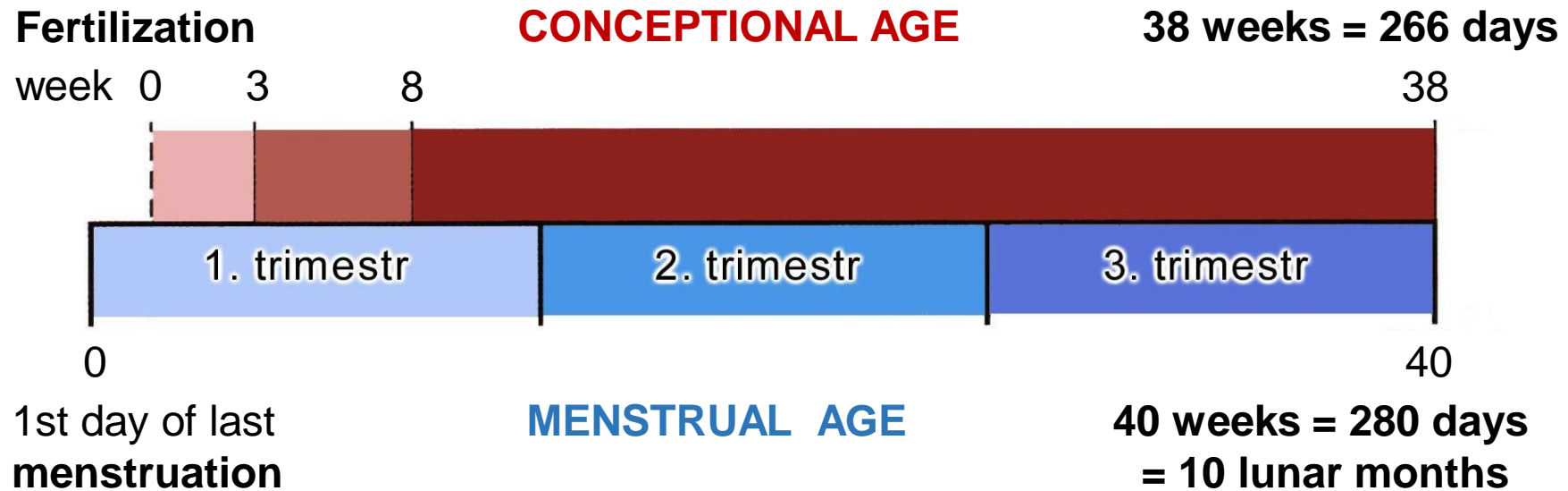
- creation of 2 primitive streaks
- fetal membranes are common – amnion, chorion, placenta (**monochorial, monoamniotic**)
- conjoined „Siamese“ twins develop in case of incomplete separation



common amnion,
chorion, placenta



Length of pregnancy



□ preembryo □ embryo □ fetus

Calculation of the expected date of delivery:

Date of the 1st day of the last menstruation + 9 calendar months + 7 days

Rule of Haase

determine the age of fetus according its length

AGE

(lunar month)

CRL*

(cm)

- 3. 3^2 (the second power of l.m.) = 9 cm
- 4. 4^2 = 16 cm
- 5. 5^2 = 25 cm
- 6. 6×5 (l.m. x 5) = 30 cm
- 7. = 35 cm
- 8. = 40 cm
- 9. = 45 cm
- 10. = 50 cm

1st month - 6-7 mm

2nd month – 2.5 cm

*CRL = crown-rump length

Fetal position in utero

During fetal development, fetus is placed in amniotic sac, which is filled with amniotic fluid. The space of this sac decreases due to the growth of fetus. Therefore, fetus takes up the smallest possible volume, especially in the 3rd trimester.

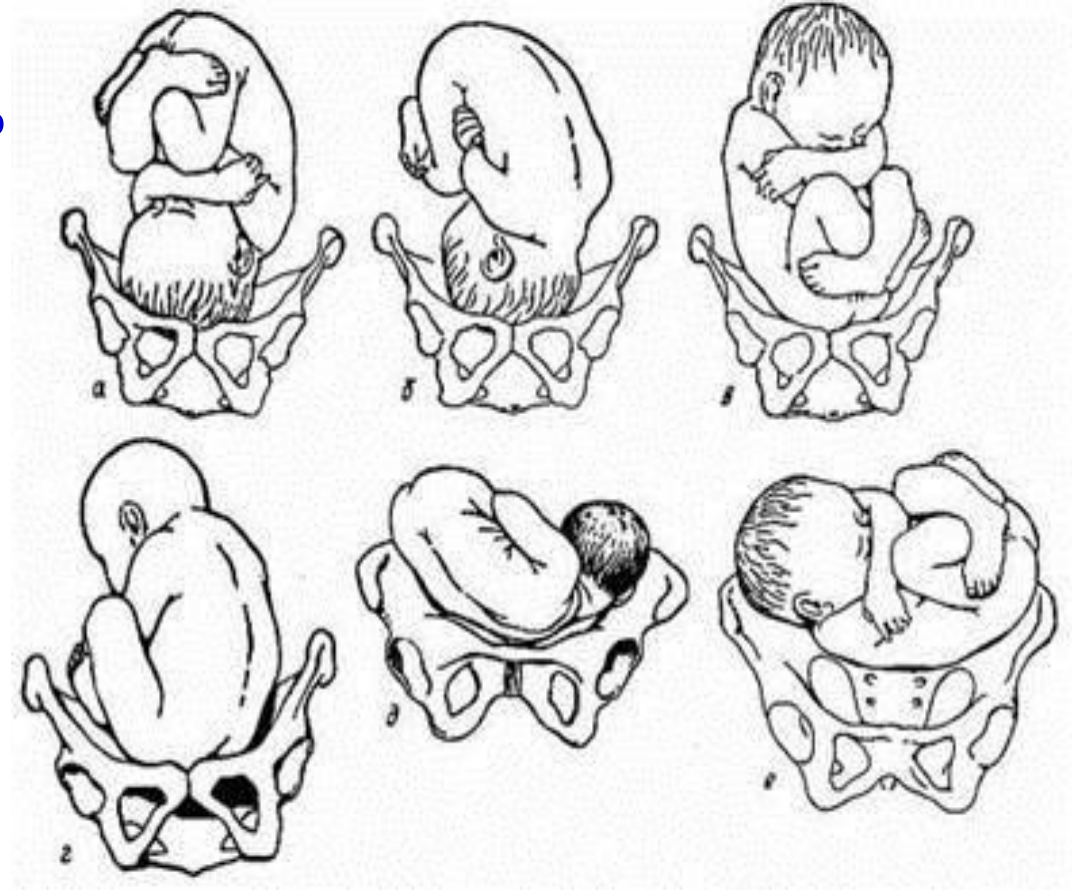
Four characters of fetus arrangement in uterus are followed up and determined before delivery:

- *Situs*
- *Positio*
- *Praesentatio*
- *Habitus*

Situs

relation: long axis of fetus body – long axis of uterus

- longitudinal situs (parallel axes) - 99%
by head (caudally) or by pelvis
- transversal situs
(perpendicular axes) - 1%
- oblique situs - unstable,
moves into longitudinal
or transversal situs

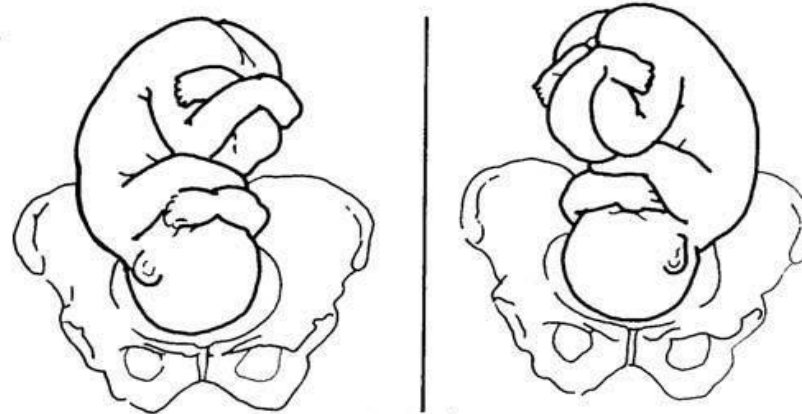


Positio

relation: back (head) of fetus – uterine margin

Second ordinary

to the right,
dorsally

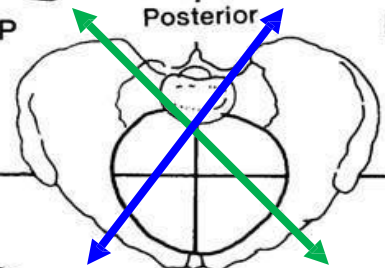


First less ordinary

to the left,
dorsally

2nd

Right

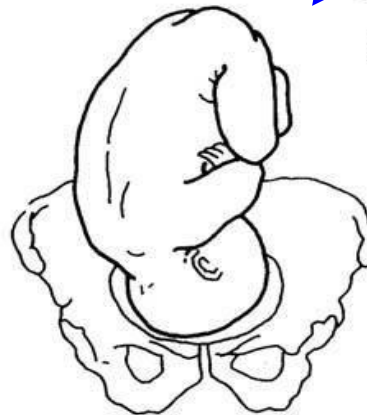


Left

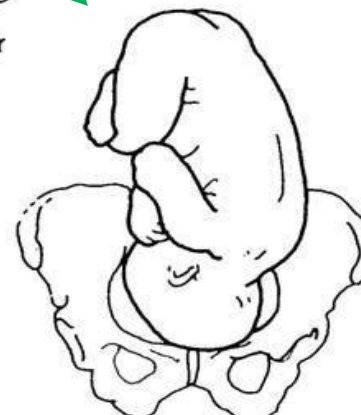
1st

Second less ordinary

to the right,
ventrally



Anterior



First ordinary

to the left,
ventrally

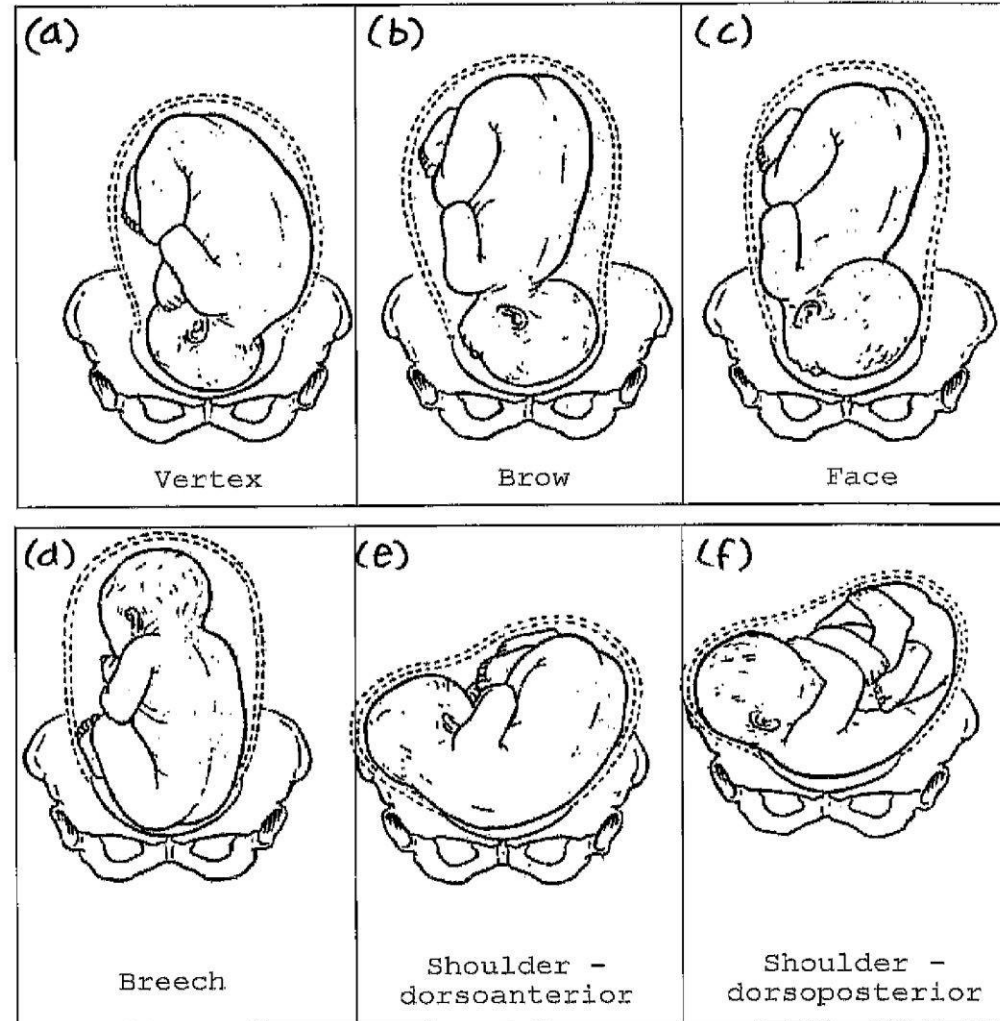
ROA

LOA

Praesentatio

relation: part of fetal body – aditus

- vertex (most frequent)
- forehead, face, occiput (1 %)
- pelvic end and feet
- trunk, shoulder



Habitus

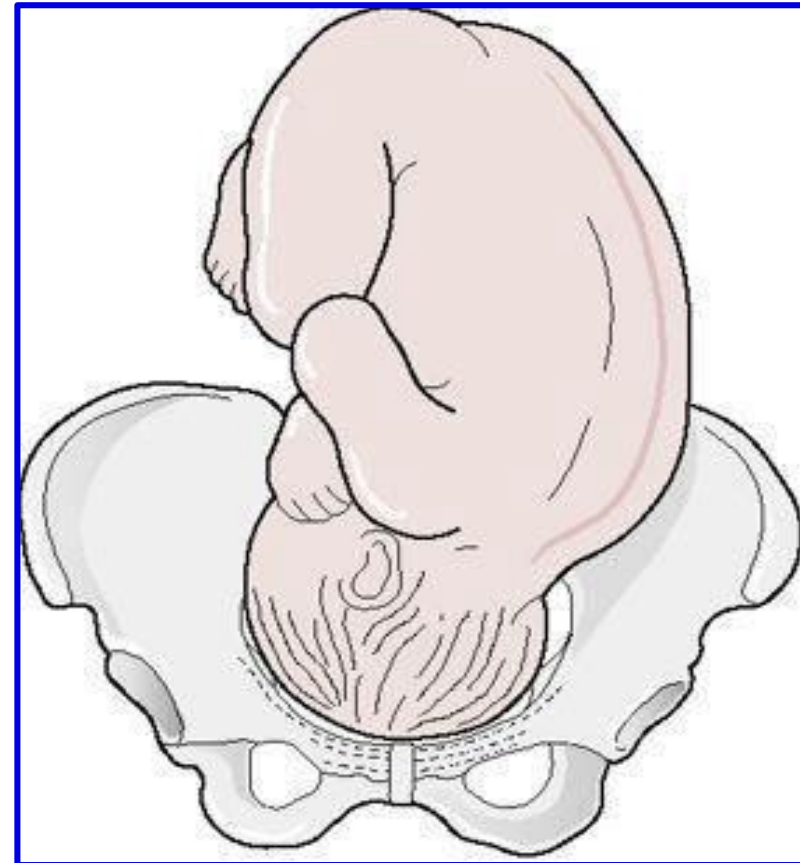
relation: parts of fetal body to one another

- **regular** = flexion of head, chin on chest, limbs flexed in all joints, upper limbs crossed in front of the chest, lower limbs pressed to abdomen, fetus takes up *the smallest possible volume*
- **irregular** = each other



Physiological fetus position in uterus

- longitudinal **situs** by head
- first ordinary **position**
- **praesentatio** by head (vertex)
- regular **habitus**



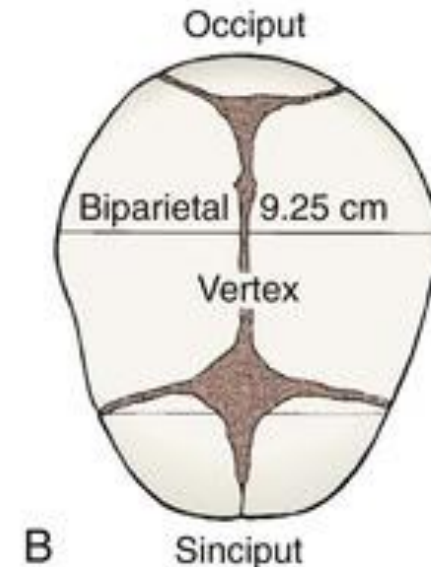
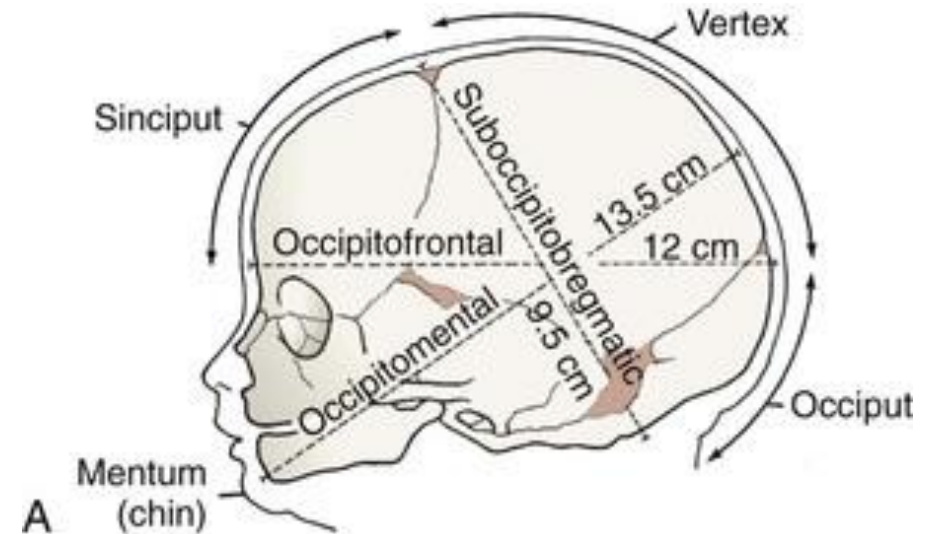
Marks of full-term fetus

Main characters

- length (50-51 cm)
- weight (3,000-3,500 g)
- diameters of the head in norm
- ♂ testes are descended in scrotum
- ♀ labia majora cover labia minora

Auxiliary characters

- fetus is eutrophic, subcutaneous fat is well developed
- skin – rests of lanugo on shoulders and back only
- eyelashes, brow, hair (several cm) are developed, nails overlap free end of fingers
- skull bones are hard, major and minor fontanelles are palpable and separated from each other
- newborn cries and moves



Mature and full-term fetus

- **Full-term fetus** – relates to the length of pregnancy (menstrual age):
 - **preterm** (to 37th week)
 - **full-term** (38 – 40 weeks)
 - **after term** (more than 42 weeks)
 - **Mature fetus** – relates to level of development:
 - **mature**
 - **immature**
-
- **Level of nutrition**
 - **hypotrophic**
 - **eutrophic** (weight 3,000 – 3,500 g, length 50 - 51 cm)
 - **hypertrophic**

GENERAL EMBRYOLOGY 2

- Set of embryological schemes II
- Atlas of Cytology and Embryology – pages 76 – 81

- Discussion
- 3 embryological schemes