

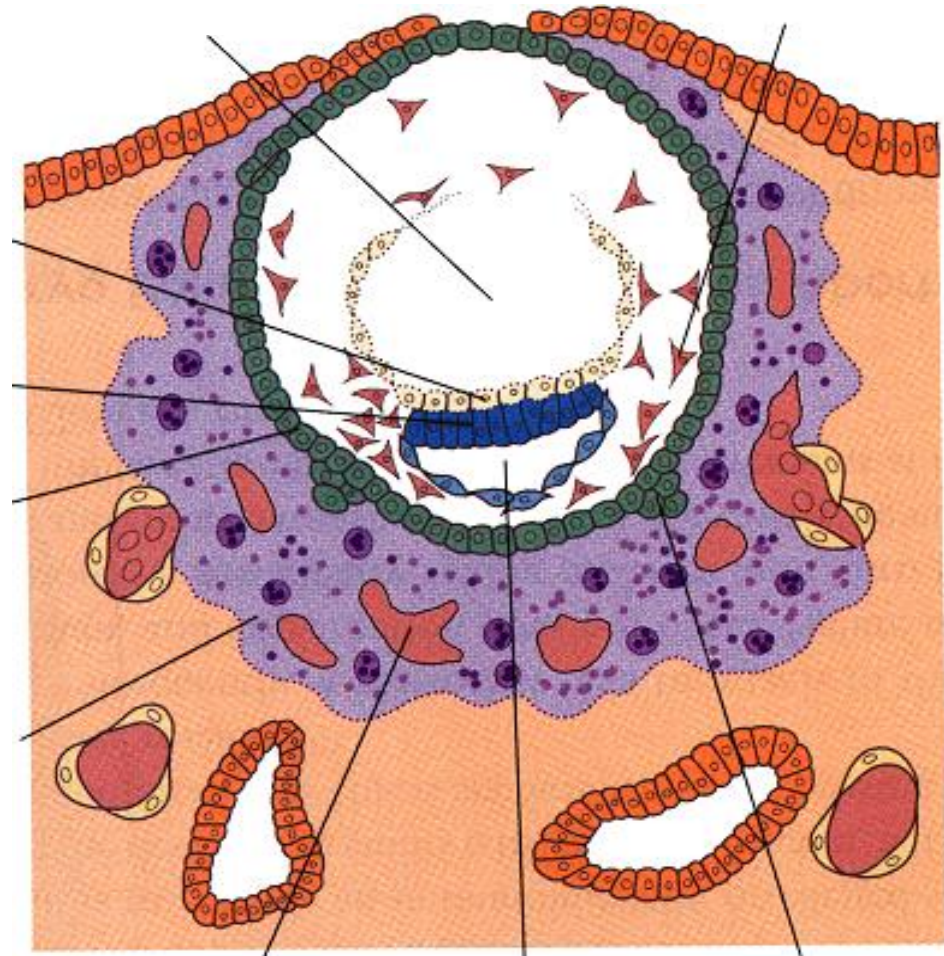


GENERAL EMBRYOLOGY 2

- Development of extraembryonic structures – extra-embryonic 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, presentatio 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.

Extraembryonic mesoderm

- Derives from cytotrophoblast
- cells fill cavity of blastocyst („sparse mesh“)
- by fusion of clefts among cells - **extraembryonic coelom** between 2 layers of mesoderm (visceral and parietal) arises

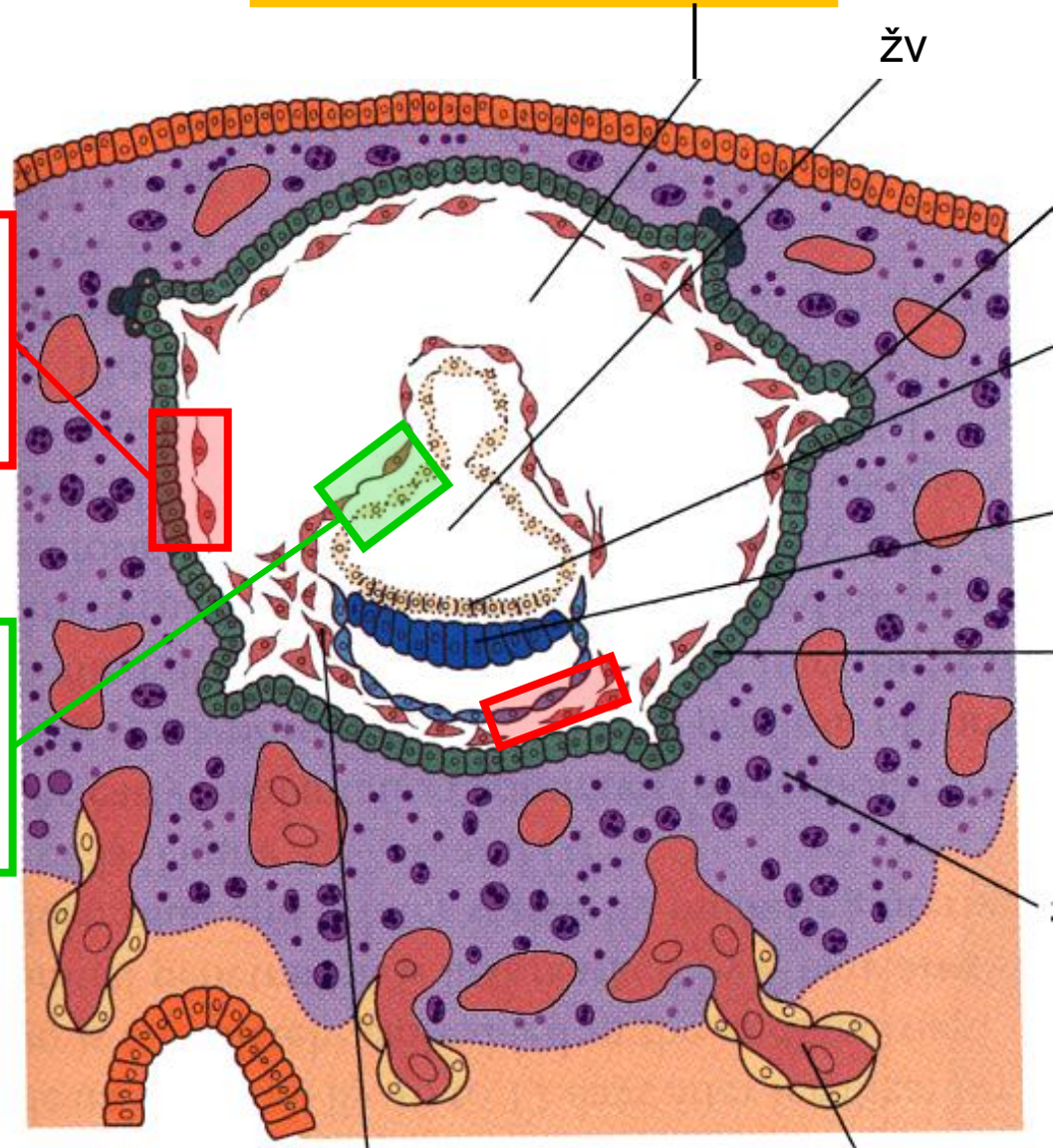


Extraembryonic mesoderm Extraembryonic coelom

extraembryonic coelom
= chorionic cavity

Parietal layer =
extraembryonic somatopleura
+ cytotrophoblast – **chorion**
+ amnionic ectoderm – **amnion**

Visceral layer =
extraembryonic splanchnopleura
is mesoblast of **yolk sac**
(Heuser's membrane)



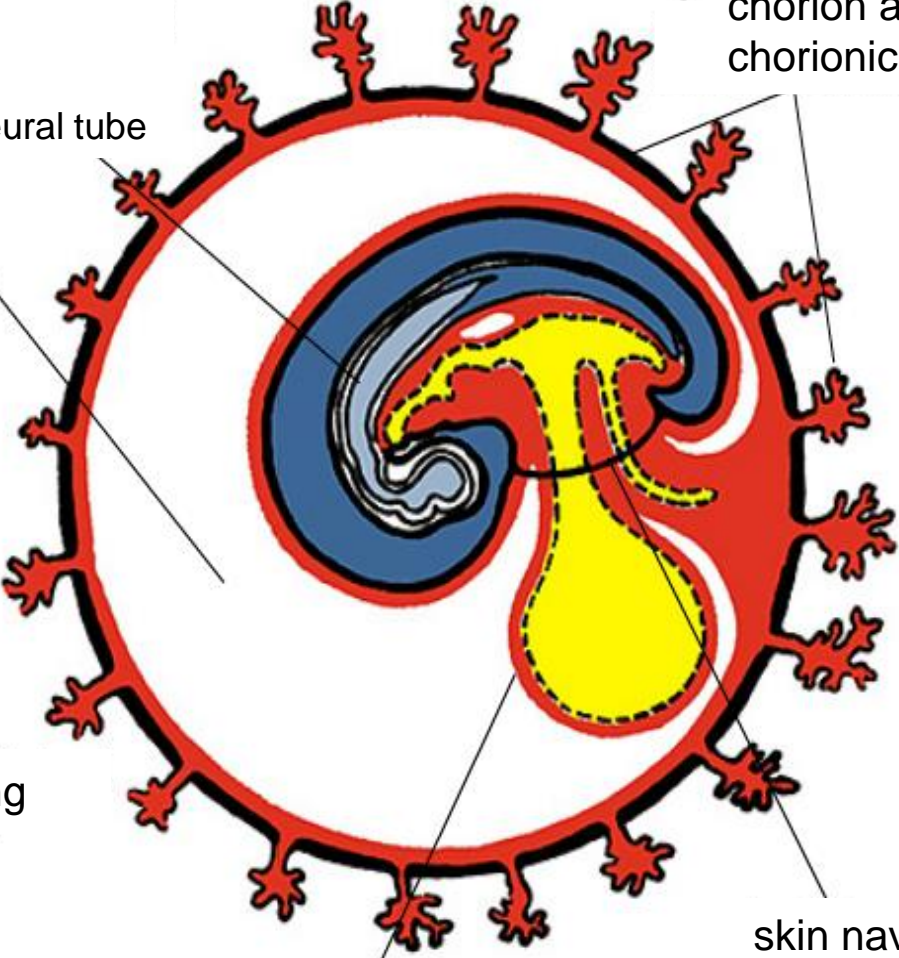
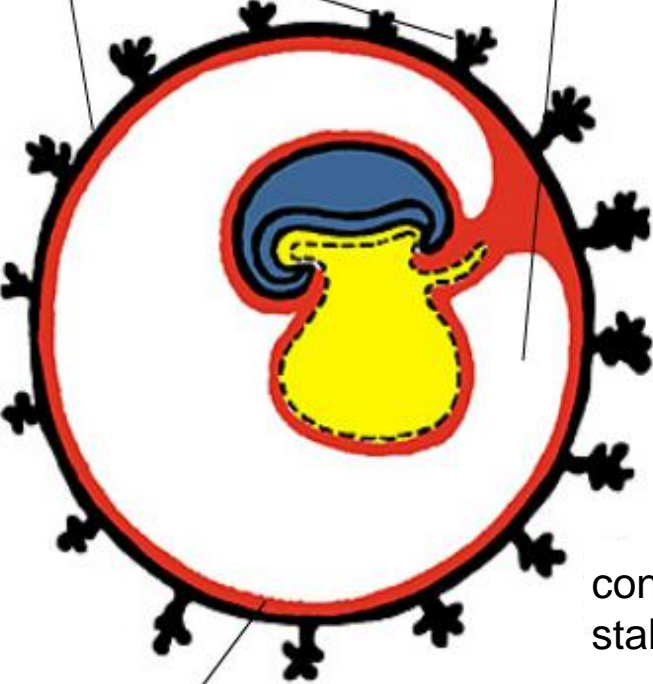
Yolk sac, amnionic sac, fetal membrane - amnion, chorion.

extraembryonic coelom
chorionic cavity

cytotrophoblastic buds

neural tube

chorion and
chorionic villi



connecting
stalk

skin navel

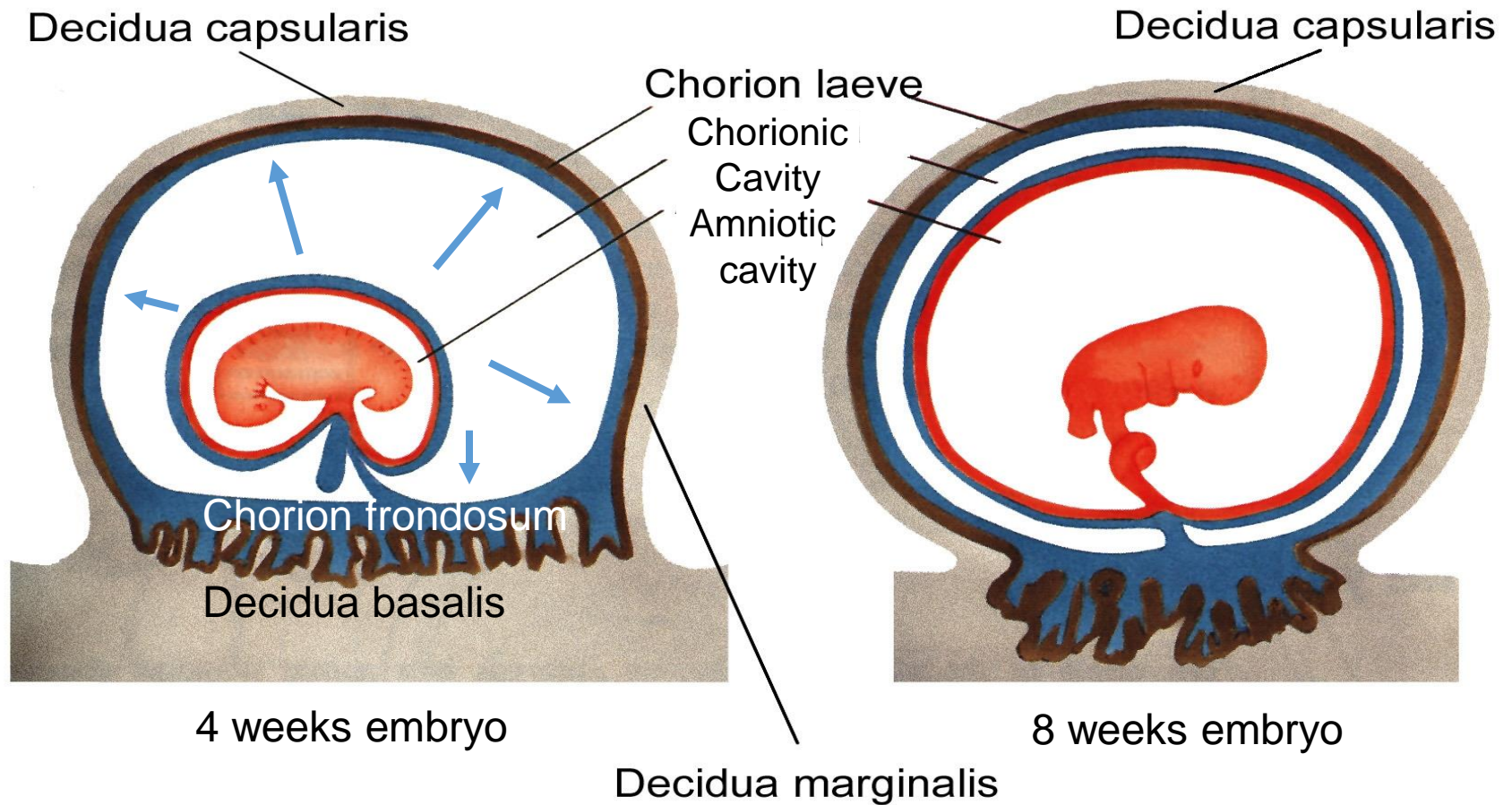
extraembryonic somatopleura

extraembryonic splanchnopleura

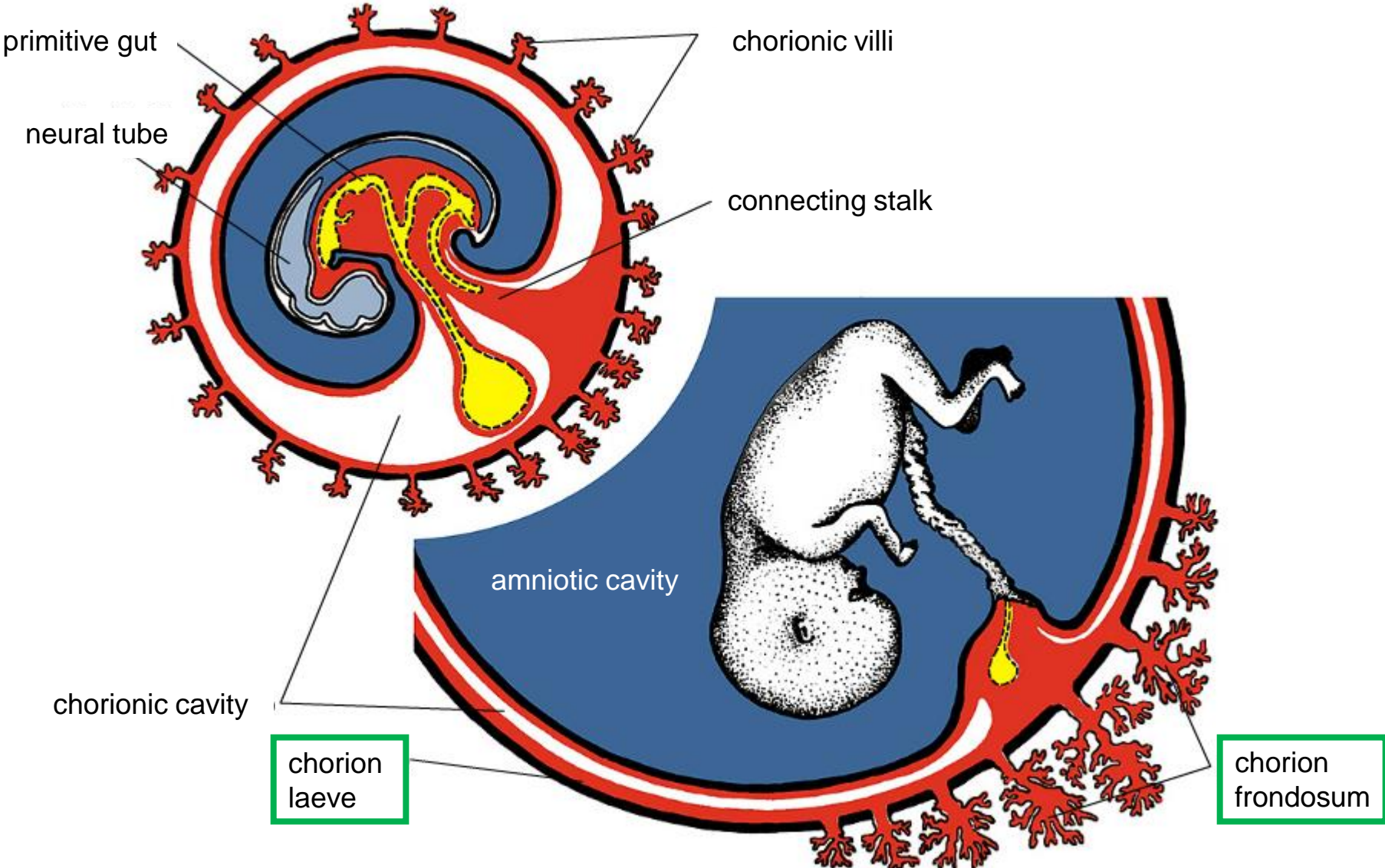
CHORION = cytotrophoblast + syncytiotrophoblast +
extraembryonic mesoderm

AMNION = **extraembryonic mesoderm** + **ectoderm**

GROWTH OF AMNIOTIC AND CHORIONIC CAVITY



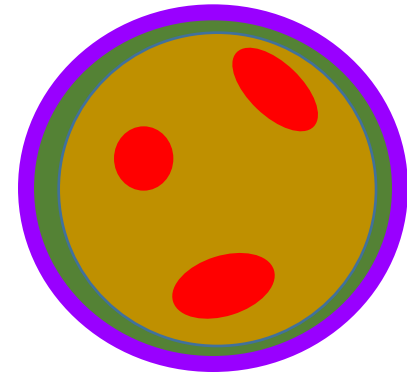
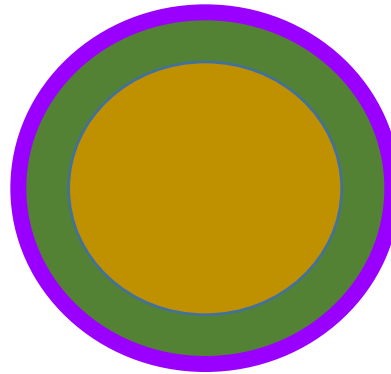
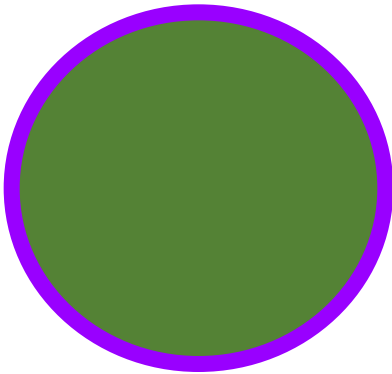
Development of fetal membranes



- **Villi choriales** are based over the whole surface of implanted blastocyst, resp. Its chorionic membrane
- Different growth of villi toward decidua basalis (partially decidua marginalis) and toward decidua capsularis and decidua marginalis causes division of chorion into parts:
 - ⇒ **CHORION FRONDOSUM** (toward decidua basalis – with villi) and
 - ⇒ **CHORION LAEVE** (smooth, without villi)
- **Chorion frondosum** and **decidua basalis** fuse together and creates **placenta**

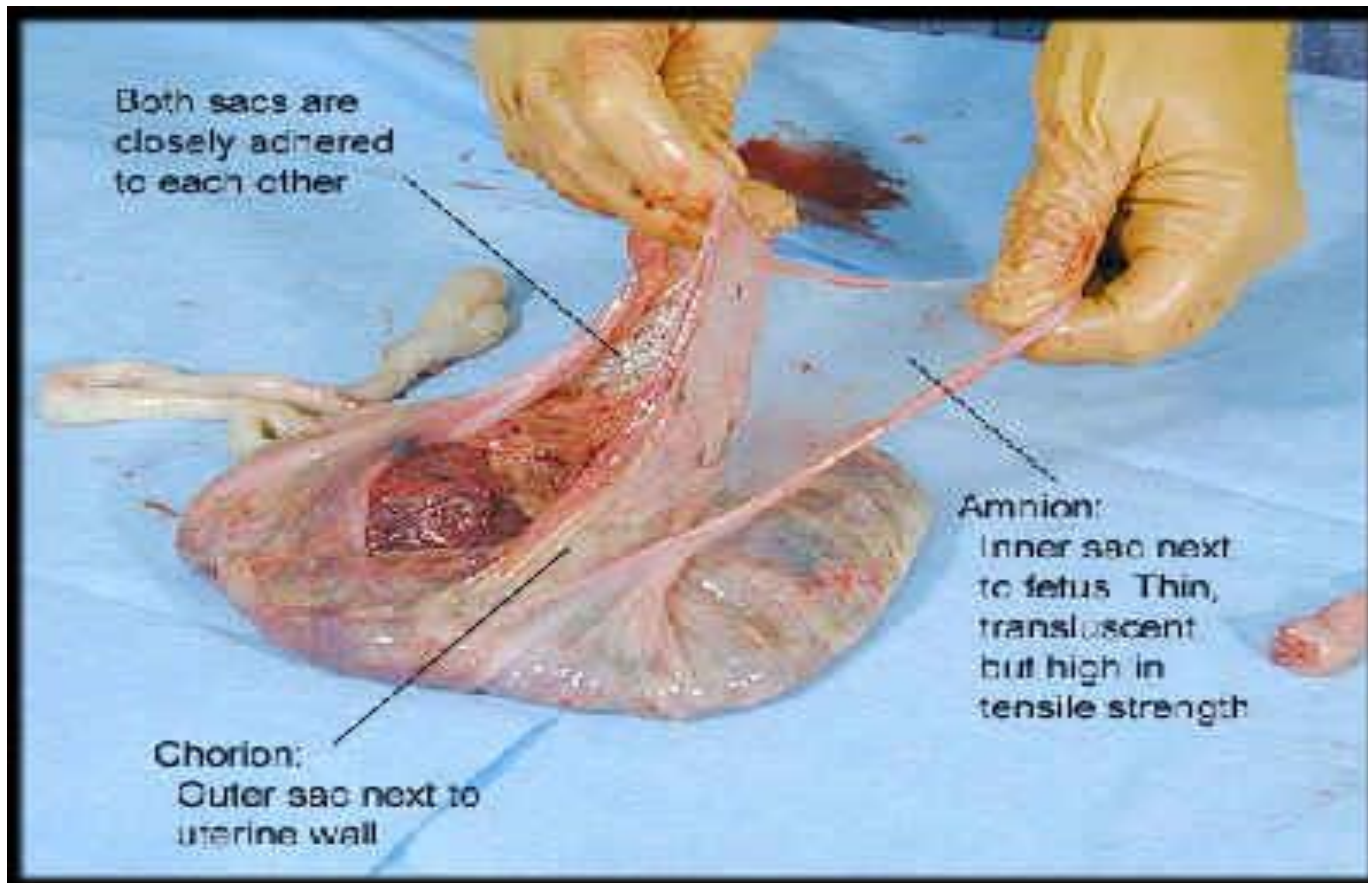
Development of chorionic villi:

- chorionic villi – consist of **cytotrophoblast**, which is covered with **syncytiotrophoblast** (day 10)
- chorionic villi – with **extraembryonic mesoderm** ingrowing from chorionic cavity (day 12-13)
- chorionic villi – with extraembryonic **blood vessels** in mesoderm /vascularized mesoderm/ (day 17-18)



Human placenta

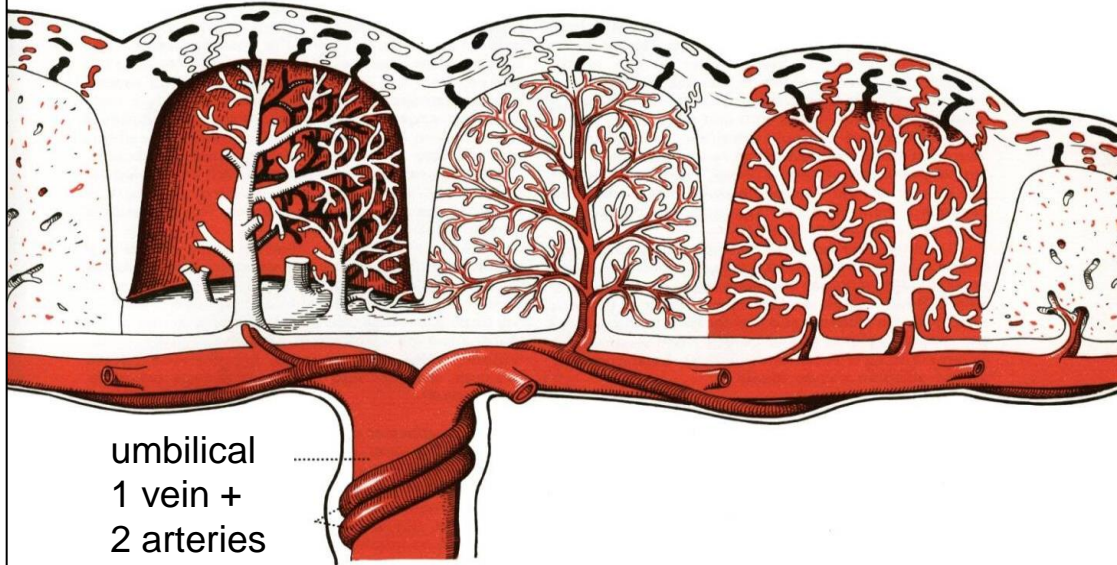
- discoidea
- olliformis
- hemochorialis



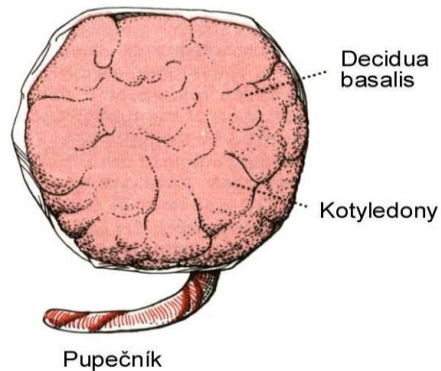
Ø 15 - 25 cm
width up 3 cm
weight 500g

FULL TERM PLACENTA

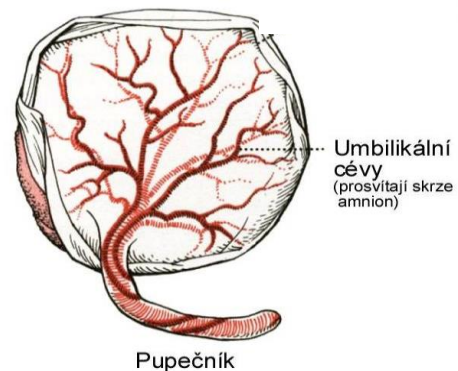
maternal surface (with cotyledons)



materna surface

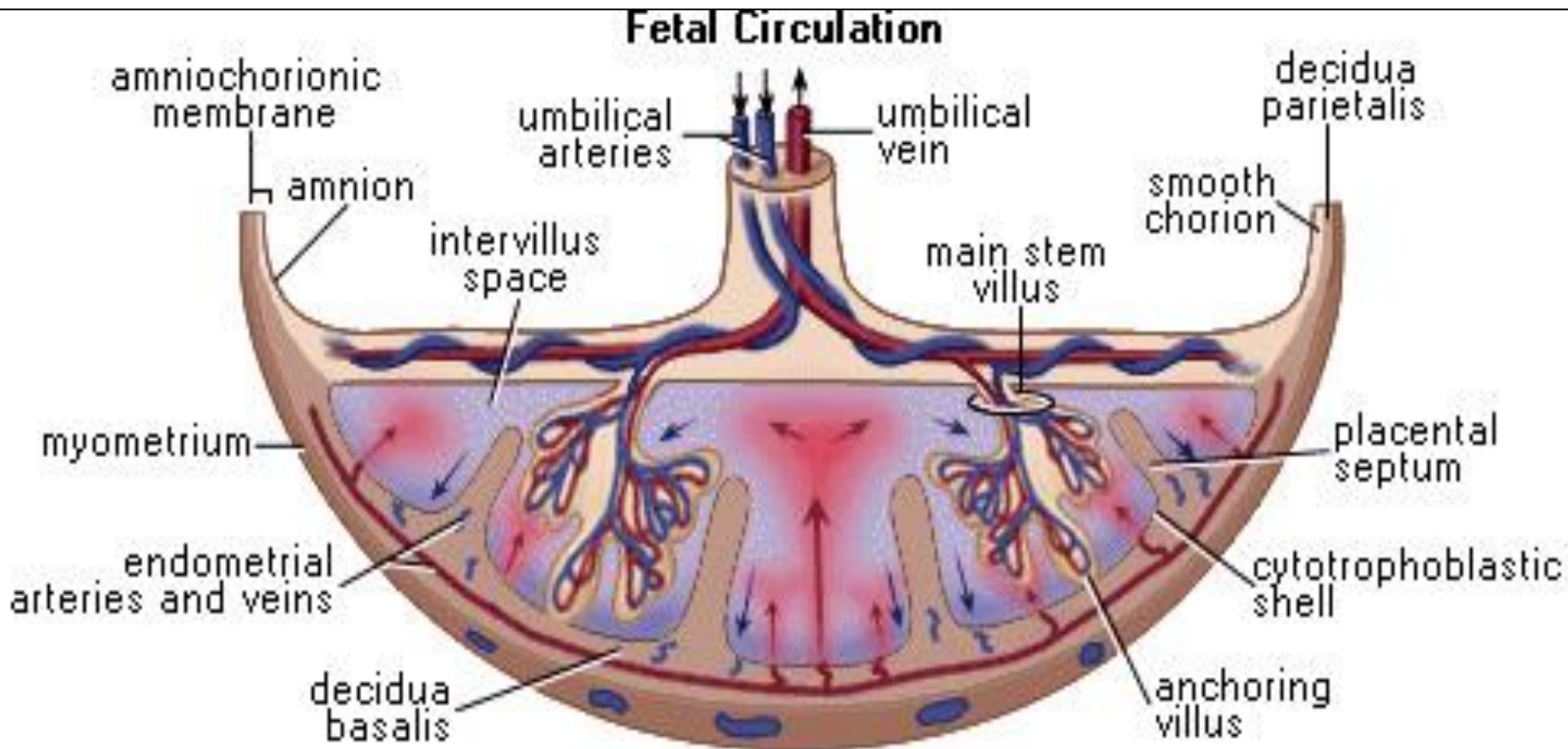


fetal surface

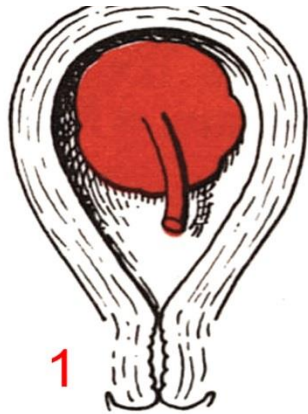


COMPARTMENTS OF PLACENTA:

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



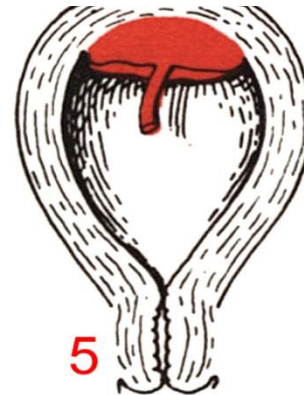
POSITION OF PLACENTA IN UTERUS



1
ventral/dorsal
wall



lateral
wall



5
uterine
fundus



3
Postranní



4
Středová

PLACENTA PRAEVIA

Anomalies of placenta

Anomalies of chorionic villi (1 : 100 pregnancies)

⇒ **mola hydatidosa**

⇒ **chorionepitheliom**

Anomalies in location:

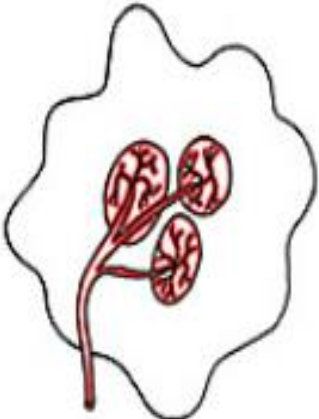
⇒ **placenta praevia** (causes bleeding in week 28)

⇒ **placenta accreta** (attached to myometrium)

⇒ **placenta increta** (grown into myometrium)

⇒ **placenta percreta** (grown through myometrium)

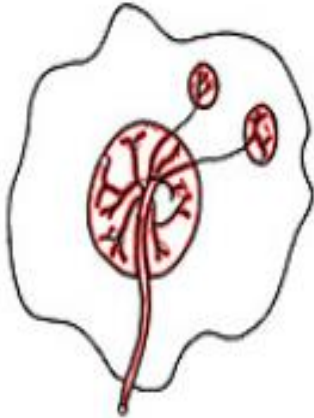
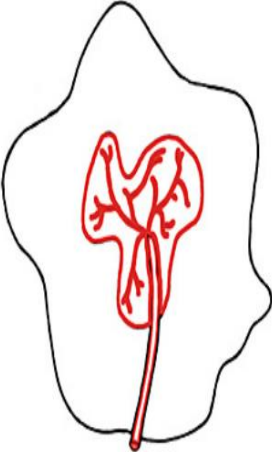
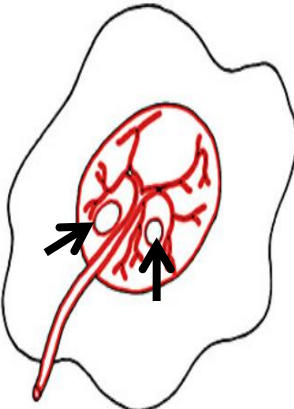
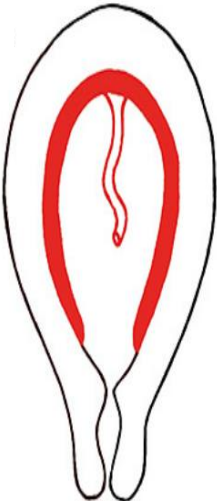
Anomalies of placenta



placenta duplex

placenta triplex

(several separate pieces)



placenta membranacea

placenta fenestrata

placenta tripartita

placenta succenturiata

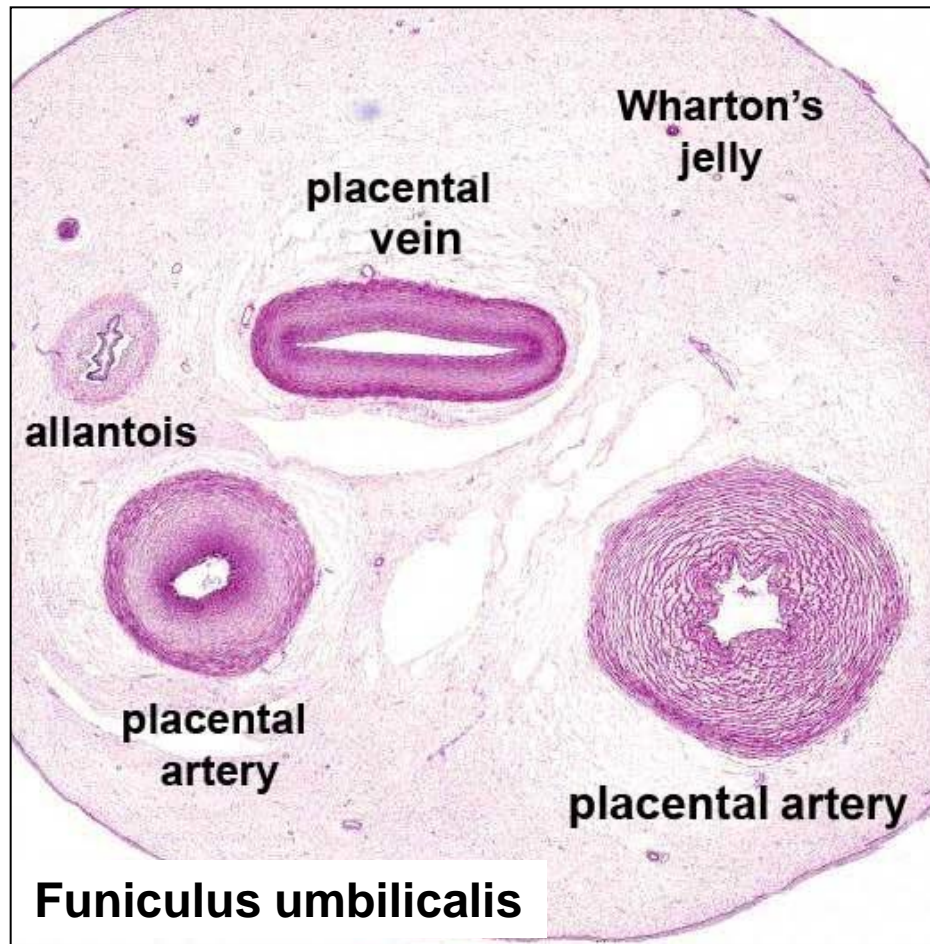
(large, thin)

(perforated)

(several portions)

(1 main + several accessory placentae)

- Umbilical cord of full-term fetus:
 - 50 – 60 cm long and 1,5 – 2 cm wide
 - ⇒ amniotic ectoderm on the surface
 - ⇒ jelly-like connective tissue with umbilical vessels:
 - v. umbilicalis (1) + aa.umbilicales (2)



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*)



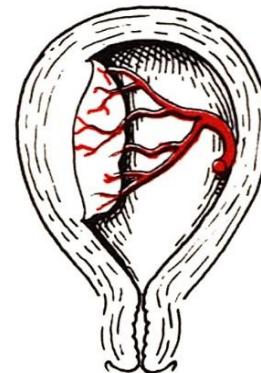
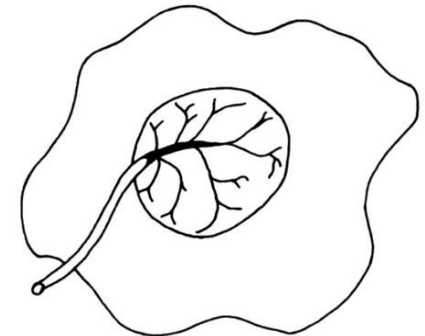
True knot



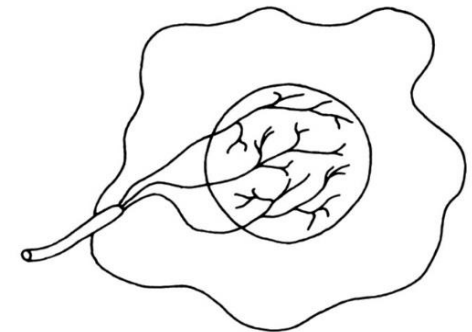
False knot

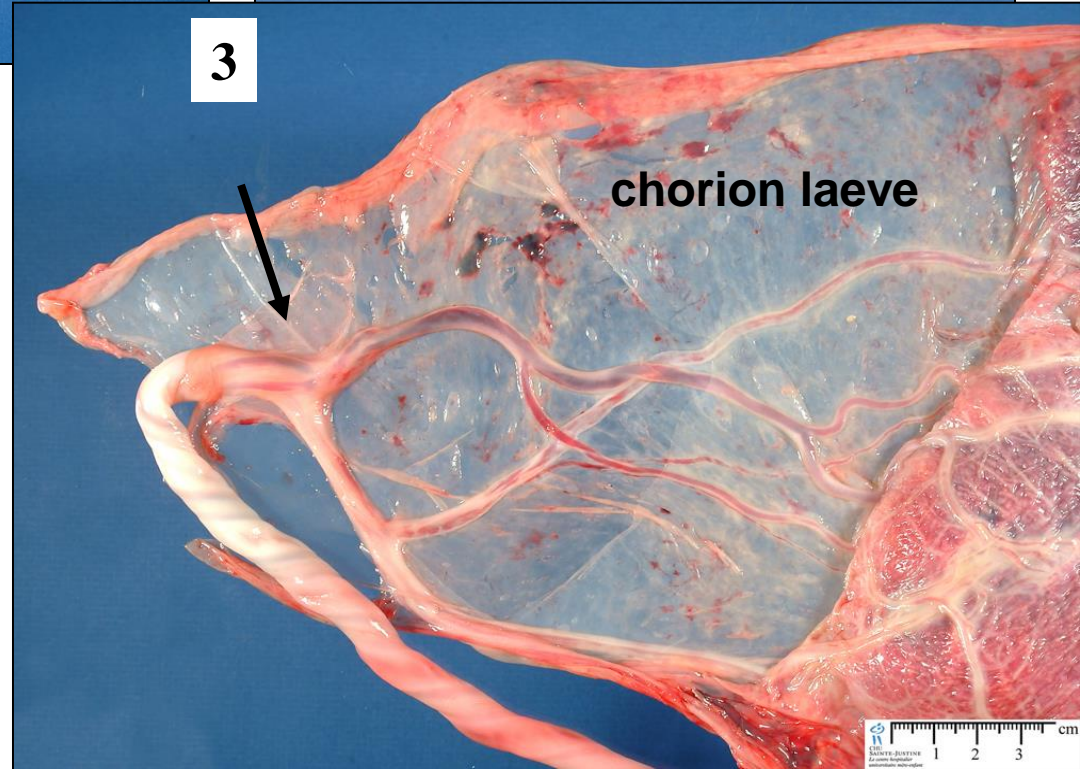
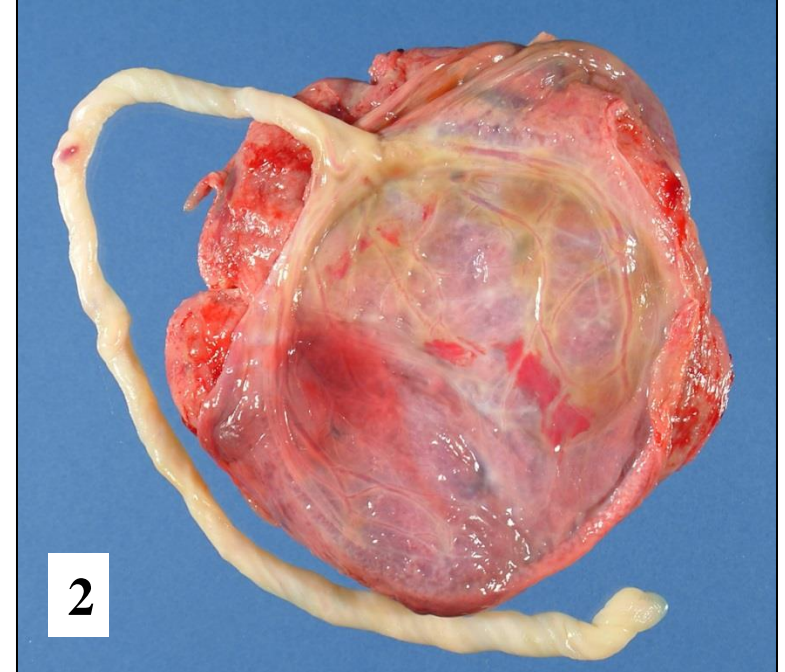
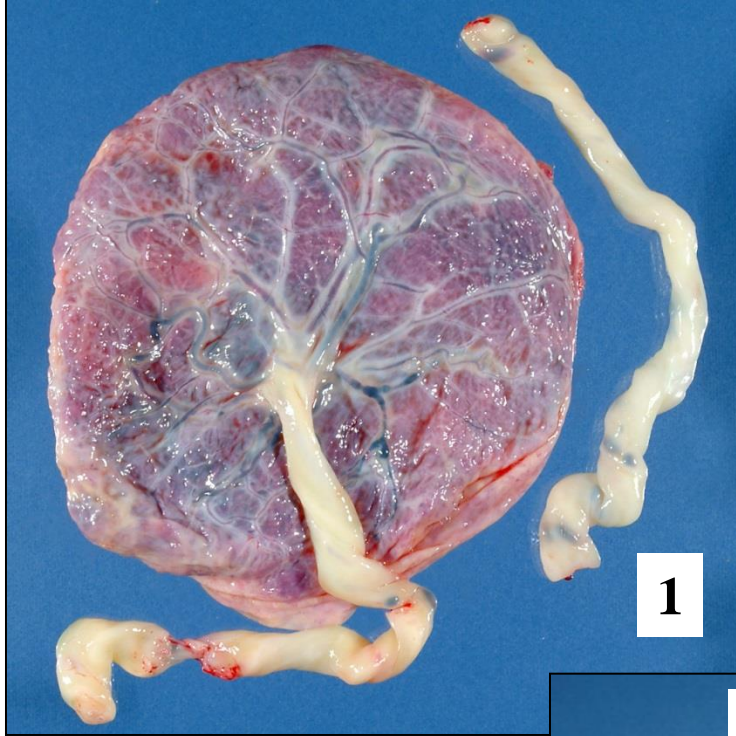


Insertio marginalis



Insertio velamentosa
(placenta velamentosa)





Umbilical cord - placenta insertion

1 – insertio centralis

2 – insertio marginalis

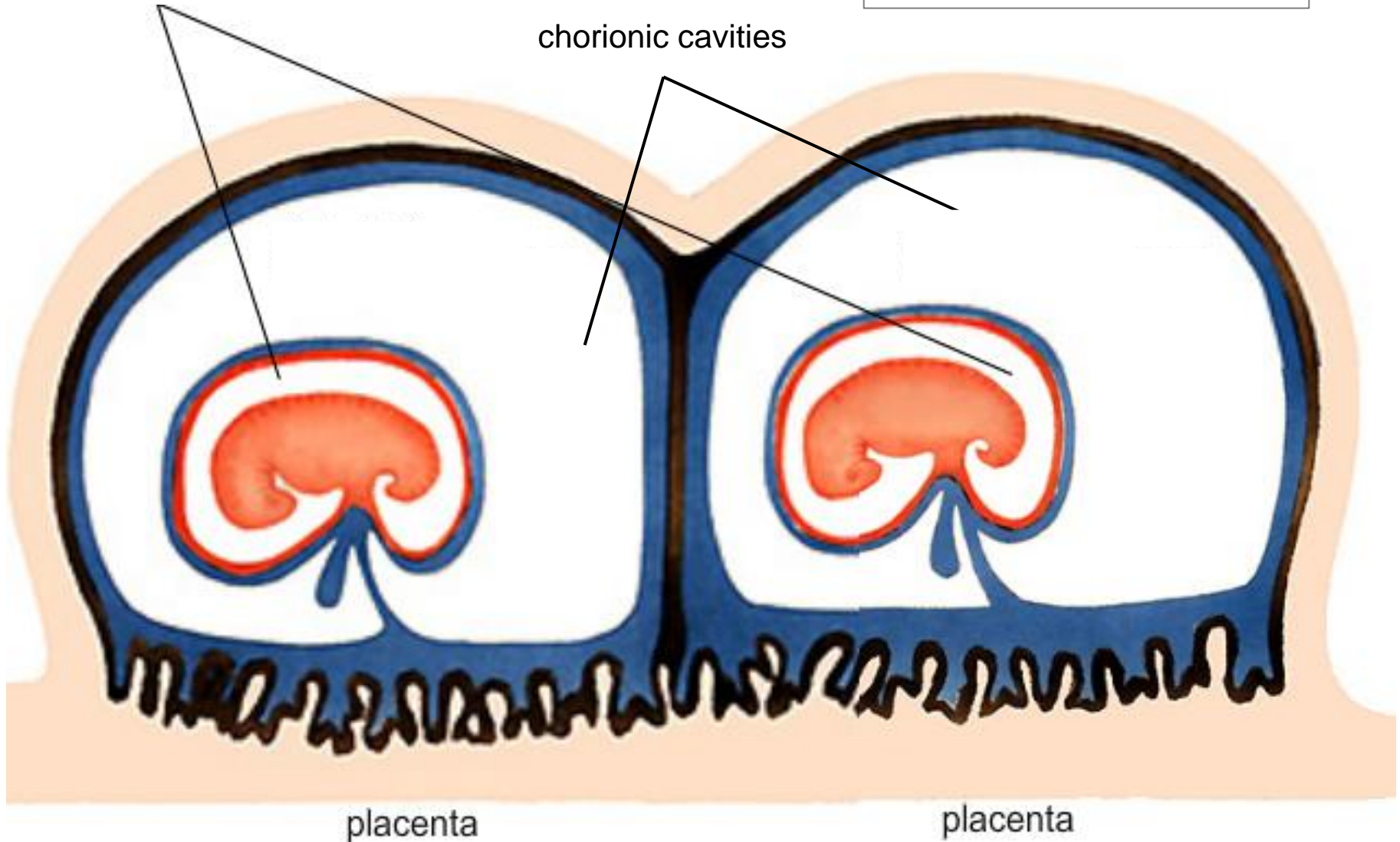
3 – insertio velamentosa

Multiple pregnancy

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

amniotic cavities

chorionic cavities

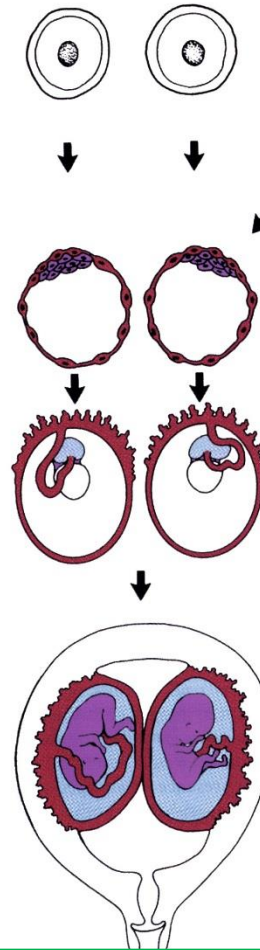


TWINS

DIZYGOTIC TWINS

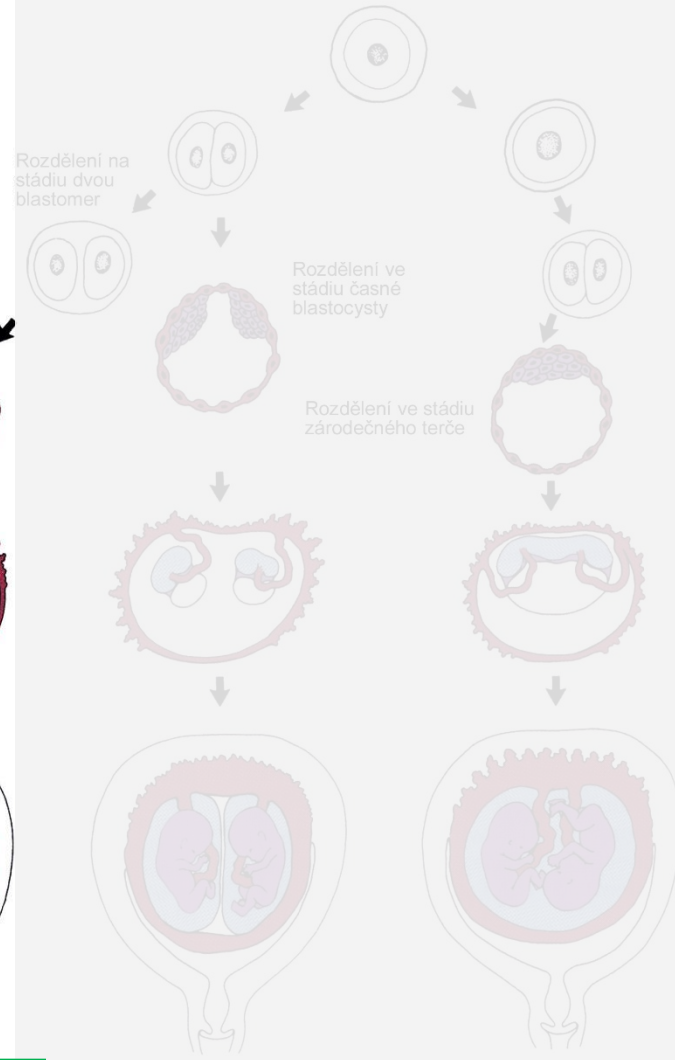
- 2 spermatozoa fertilize 2 oocytes
- each embryo develops separately (has its own amnion, chorion and placenta)
- twins can be of different sexes
- resemblance of twins is as between siblings of different age

Dizygotic



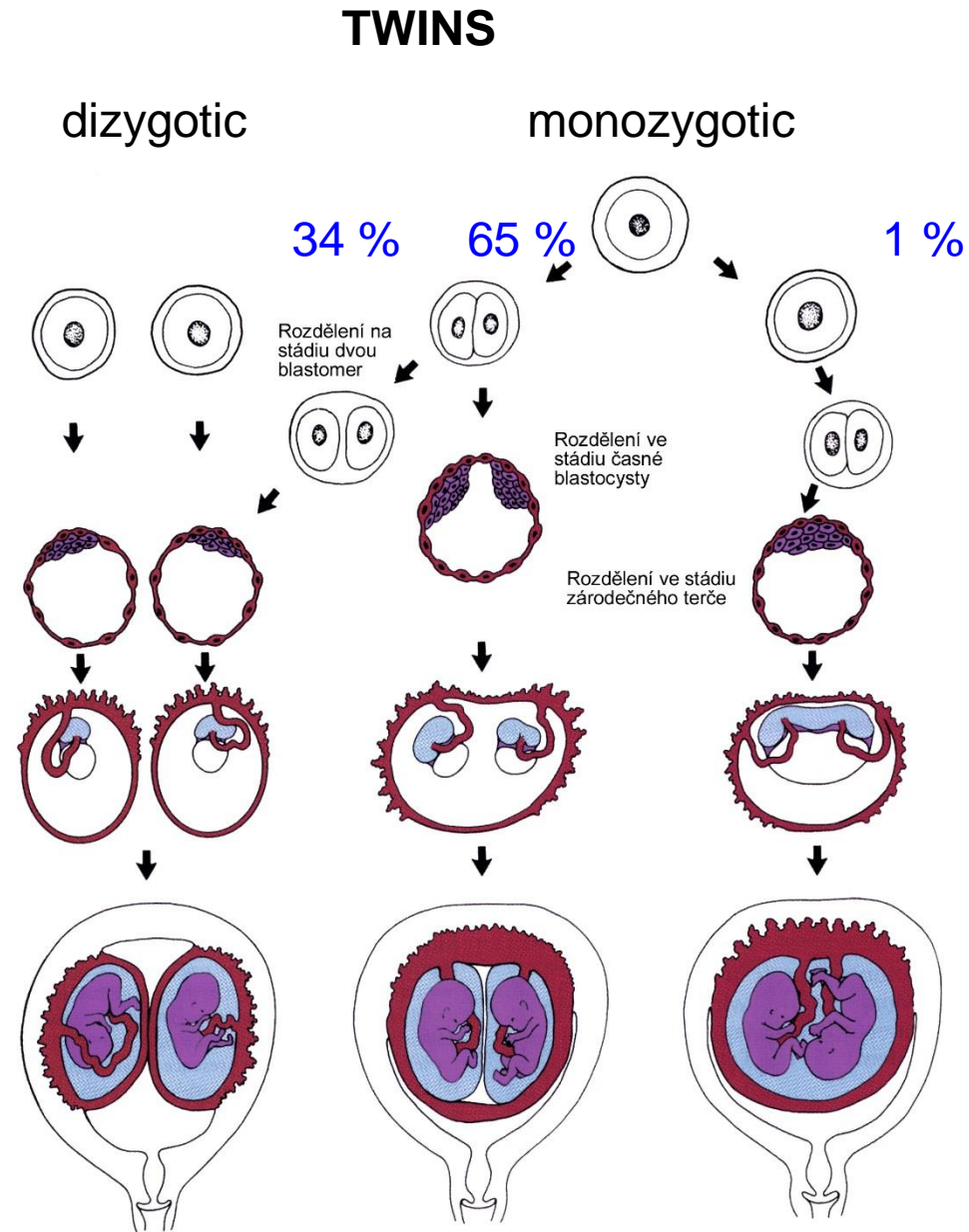
separate amnion,
chorion, placenta

JEDNOVAJEČNÁ



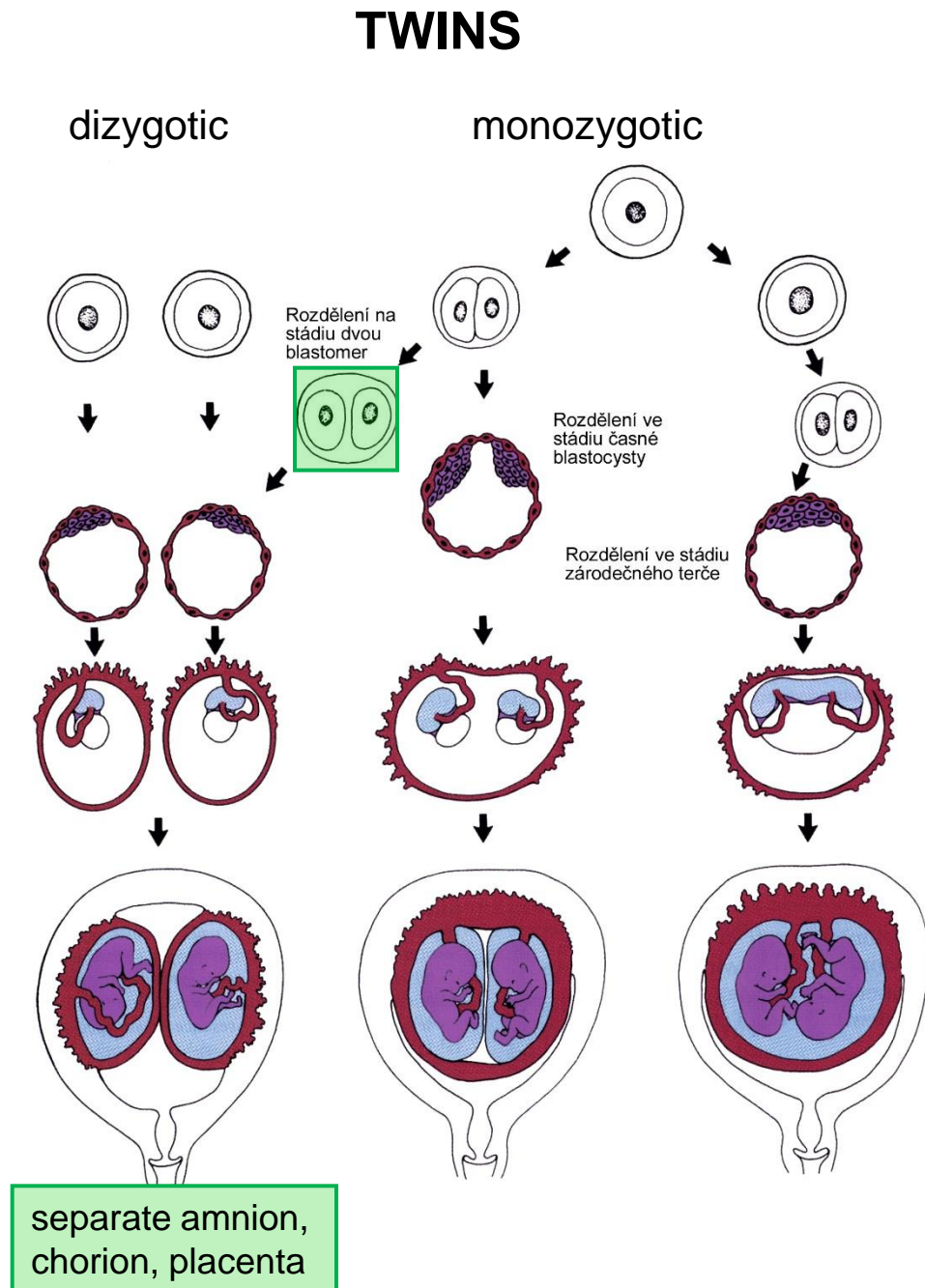
MONOZYGOTIC TWINS

- **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 same sexes**



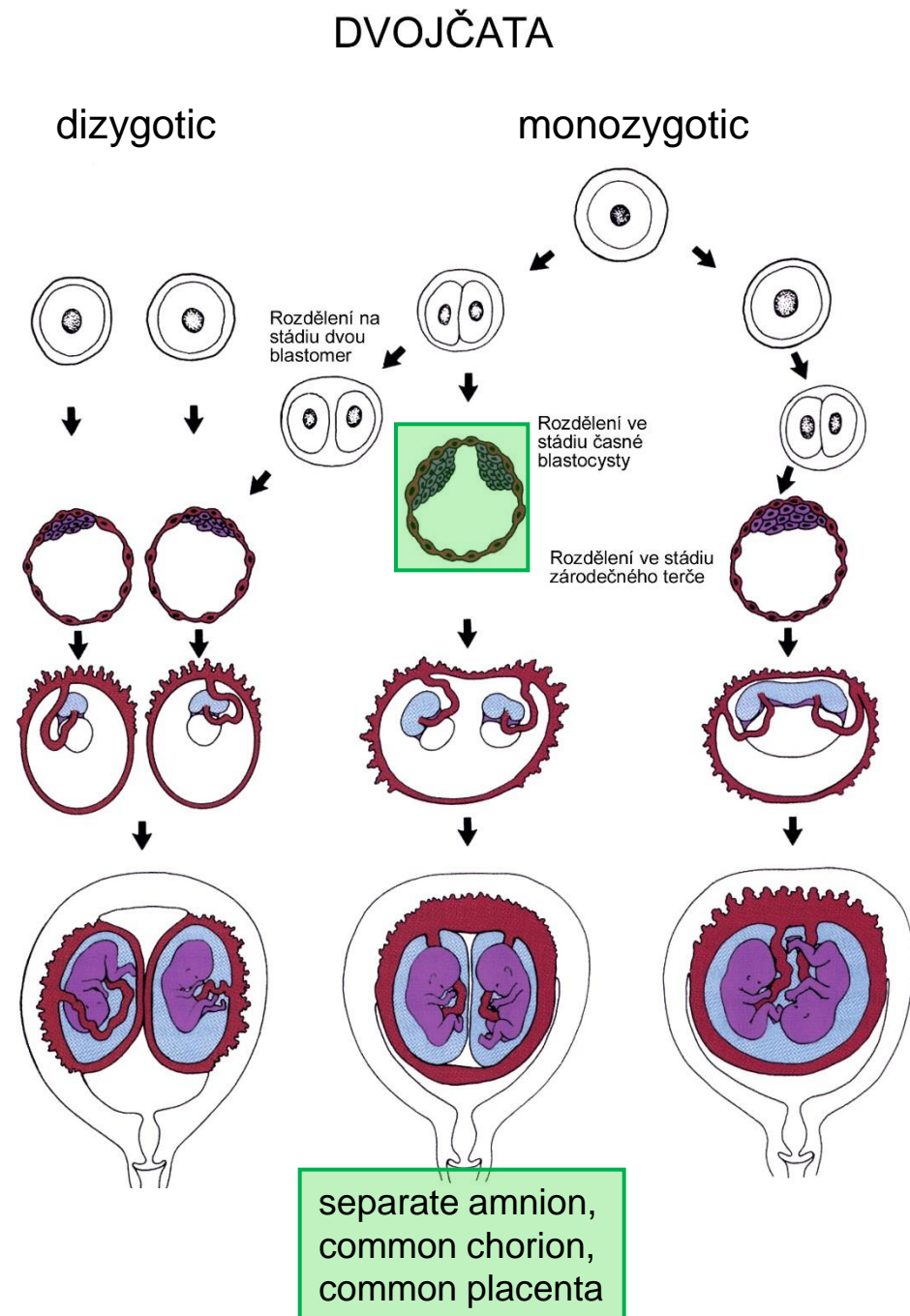
MONOZYGOTIC separated on stage of 2 blastomeres

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



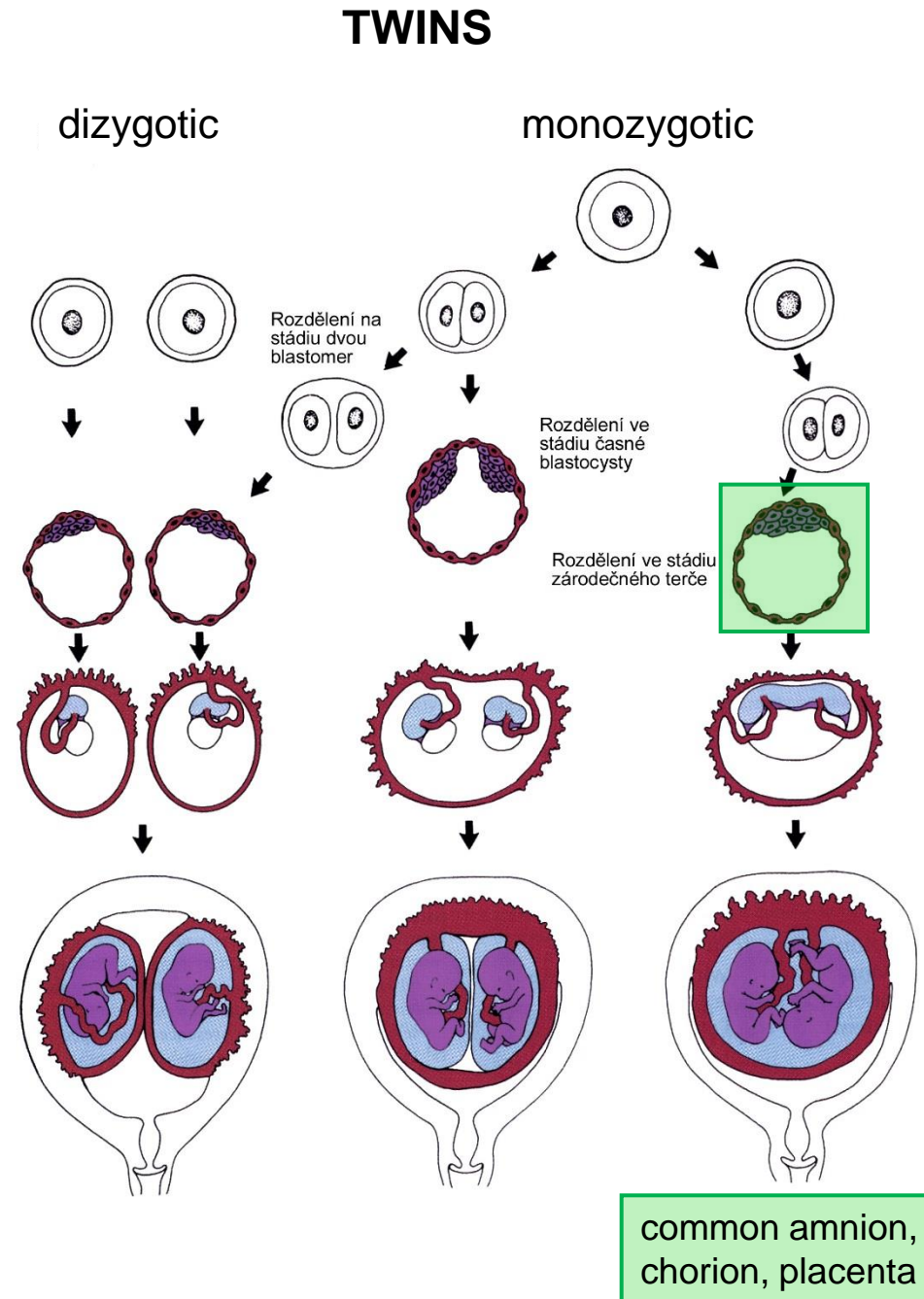
MONOZYGOTIC separated on stage of blastocyst

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

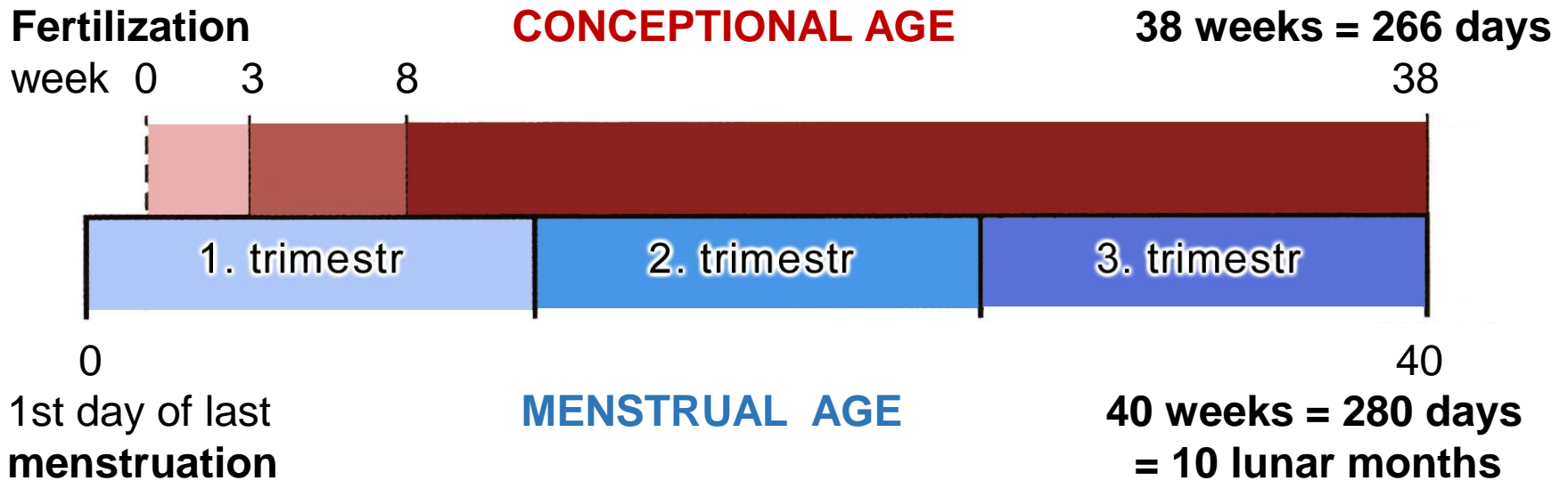


MONOZYGOTIC separated on stage of bilaminar germ disc

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



Length of pregnancy



preembryo embryo fetus

Calculation of the expected date of delivery:

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

Rule of Hasse

determine the age of fetus according its length

AGE (l.m.)*		CRL** (cm)
• 3.	3^2 <u>(the second power of l.m.)</u>	= 9 cm
• 4.	4^2	= 16 cm
• 5.	5^2	= 25 cm
• 6.	6×5 <u>(l.m. x 5)</u>	= 30 cm
• 7.		= 35 cm
• 8.		= 40 cm
• 9.		= 45 cm
• 10.		= 50 cm

*l.m. = lunar month

**CRL = crown-rump length

Fetal position in utero

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

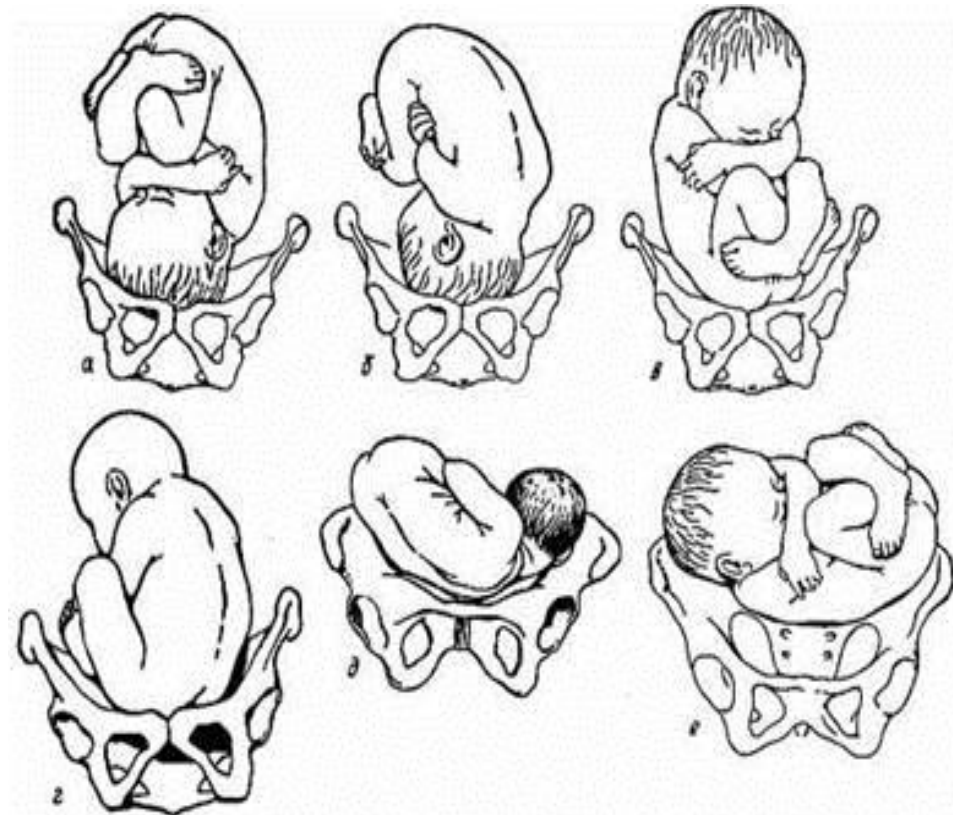
Four characters of fetus arrangement in uterus are followed up and determined before delivery:

- Situs
- Positio
- Habitus
- Presentatio

Situs

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

- Longitudinal situs (parallel axes) - 99%,
by head (kaudally) 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

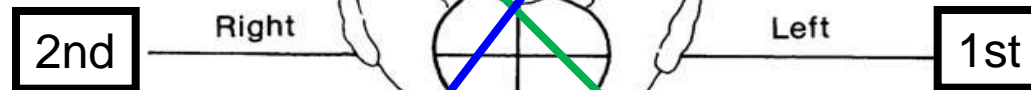


ROP

First less ordinary
to the left, dorsally



LOP

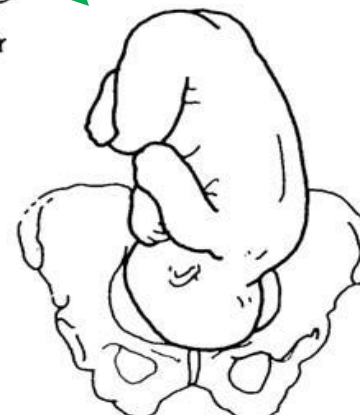


Second less ordinary
to the right, ventrally



ROA

First ordinary
to the left, ventrally



LOA

Habitus

relation: parts of fetal body to one another

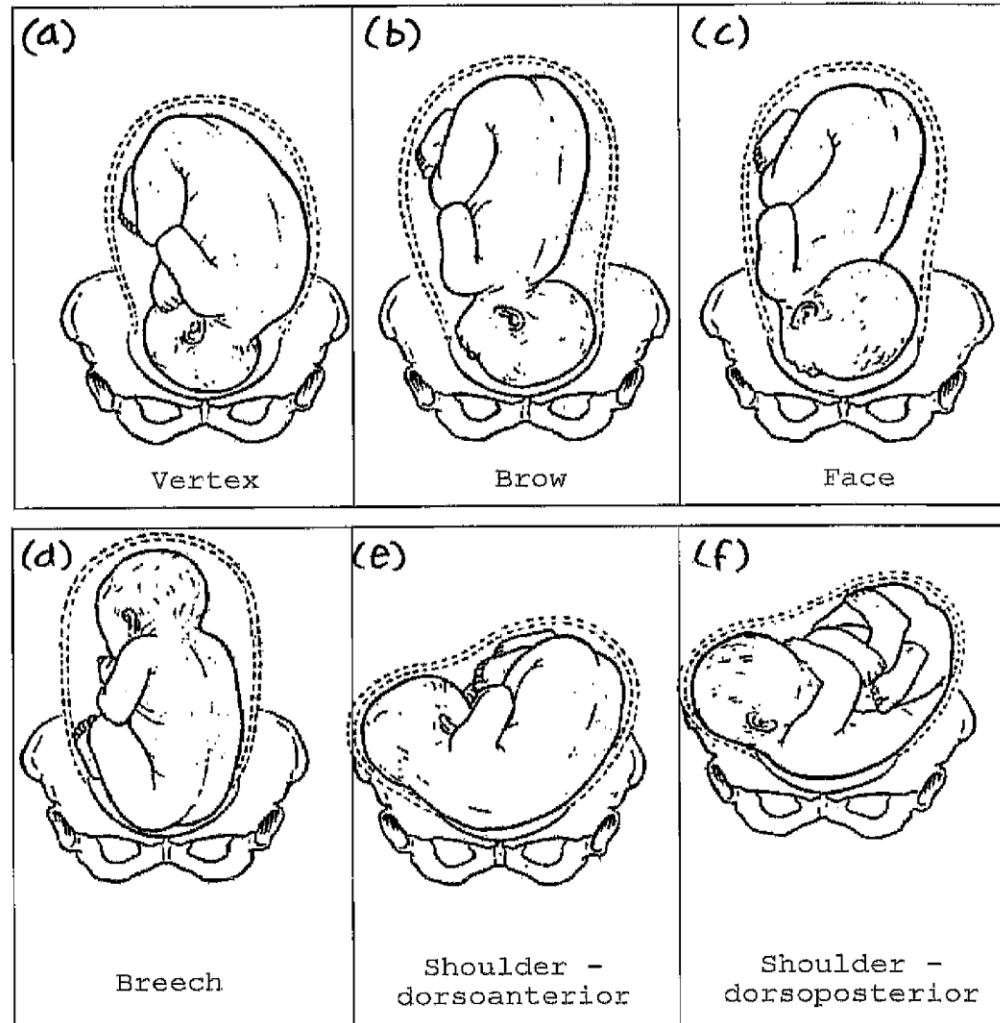
- **regular** = flexion of head, chin on chest, limbs flexed in all joints, upper limbs crossed in front the chest, lower limbs pressed to abdomen, fetus takes up the smallest possible volume
- **irregular** = each other



Praesentatio

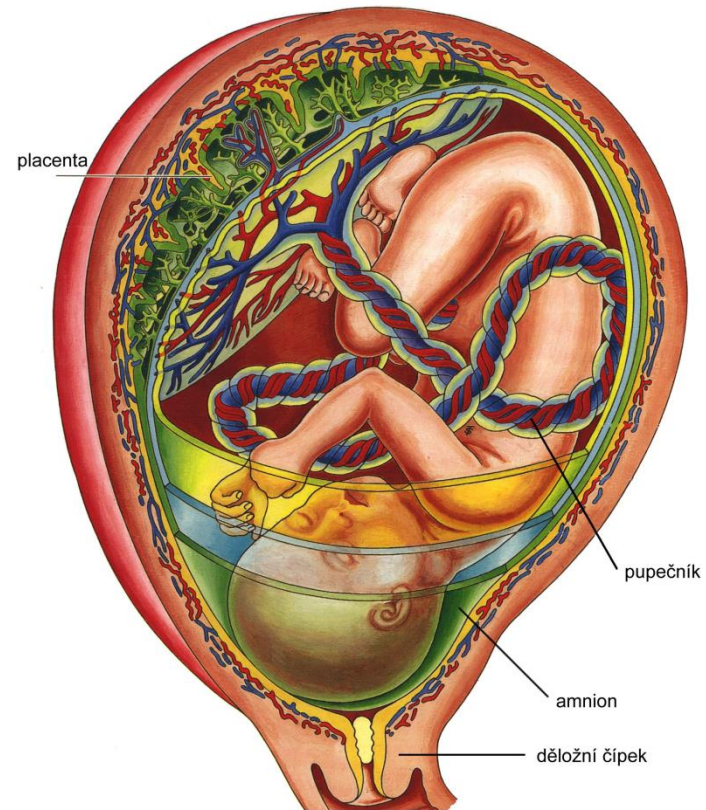
relation: part of fetal body – aditus pelvis

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



Physiological fetus position in uterus

- Longitudinal situs by head
- First ordinary position
- Regular habitus
- Presentatio by head (vertex)



Donošenost a zralost plodu

- **Full-term fetus** – relates to the length of pregnancy (menstrual age)
 - **preterm** (to 37th week)
 - **full-term** (38 – 40 week)
 - **after term**(more then 42 week)
 - **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**

Marks of full-term fetus

Main characters

- length (50-51 cm)
- weight (3,000-3,500 g)
- diameters of the head
- ♂ 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 bone are hard, major and minor fonticulus are palpable and separated from each other
- newborn cries and moves



EMBRYOLOGY

Set of embryological pictures II

