Ch28: Human Development

Explain the stages of development starting with fertilization and ending with the neonatal period.

Discuss the major events of the first, second, and third trimesters of development.

Review the changes occurring in some organs as the infant goes from life *in utero* to neonate.

week 10

Prenatal Development

Embryonic development

fertilization - 8 weeks

Fetal development

9 weeks - birth

time period from fertilization to birth = gestation

Postnatal Development

Oocyte at Ovulation

- 2º oocyte arrested in Metaphase II
- Completion of Meiosis only if fertilization occurs
- Follicular cells of corona radiata protect ovum as it breaks through ovary wall

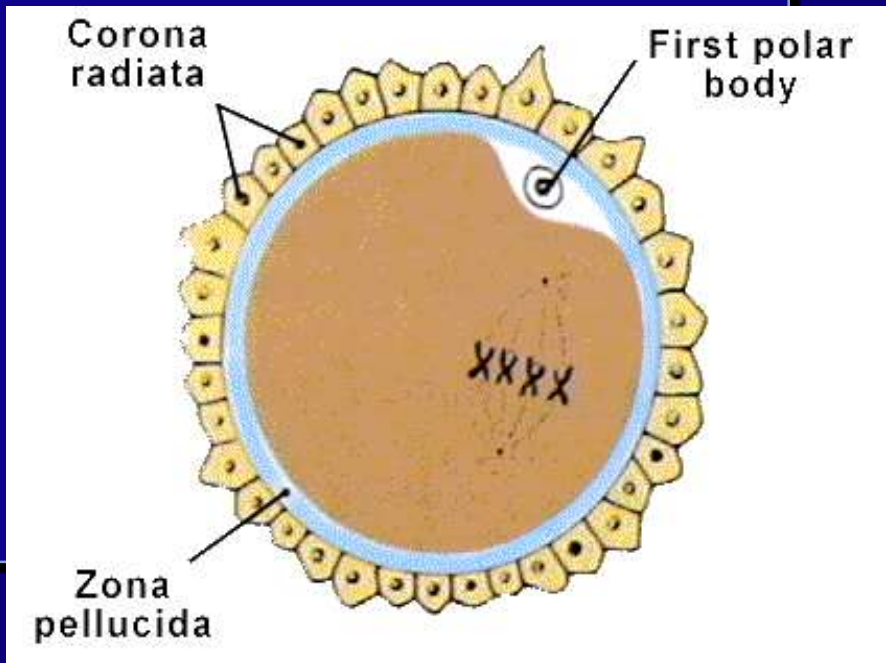
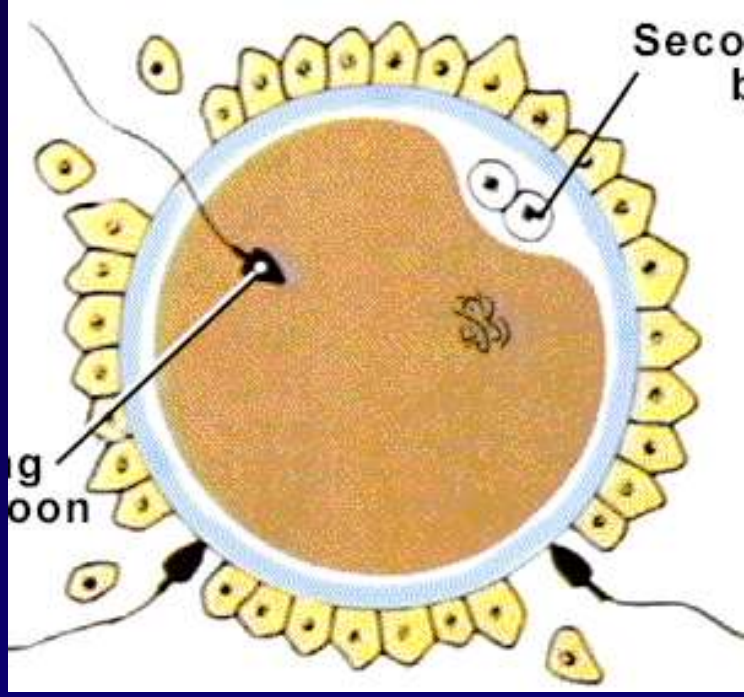


Fig 28-1

Fertilization

Taking place in ??



Viability of gametes:

- Oocyte 12-24 h
- Sperm 12-48 h

Acrosome contains hyaluronidase

⇒ acrosomal reaction breaks down intercellular cement between adjacent follicle cells

Single sperm fuses with oocyte

amphimixis - fusion of sperm and oocyte pronuclei

The first Trimester

weeks 1-12; fetus size ~ 3 in.; weight ~ 14 g

Cleavage

Implantation

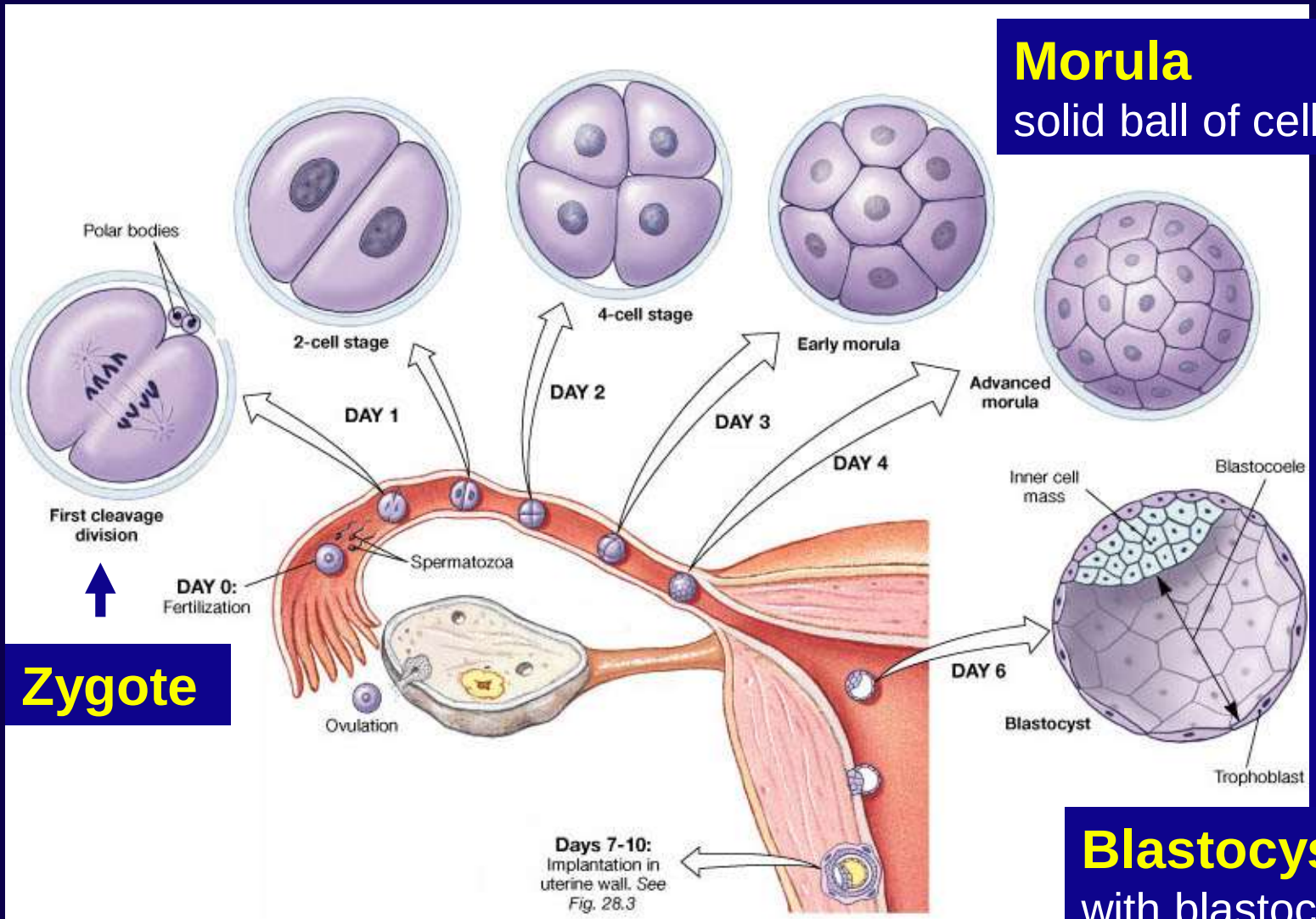
Placentation

Embryogenesis

Basic organ plan and tissues laid out – most susceptible to damage or disorganization at this time

Cleavage

Early division of zygote into multiple cells without increase in size, partitions contents

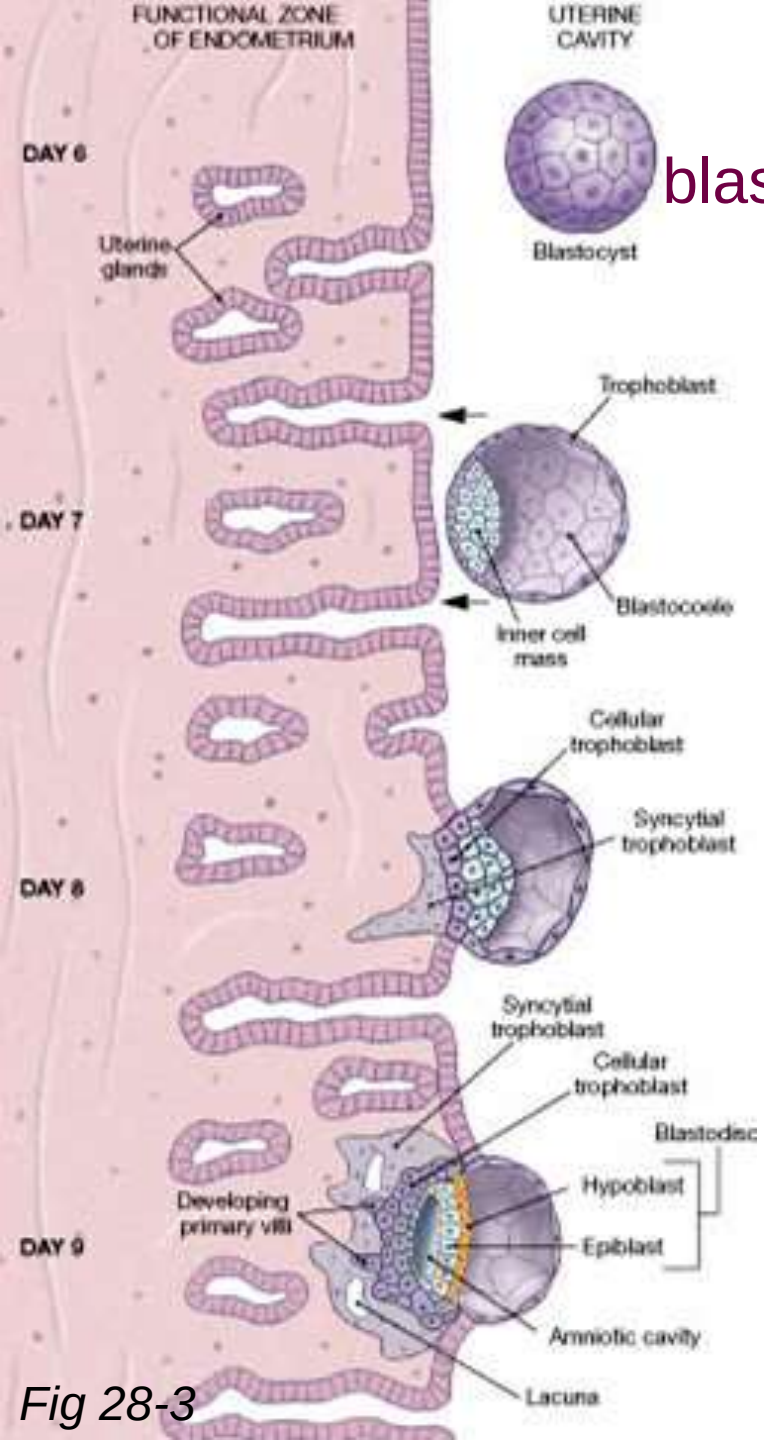


Morula
solid ball of cells

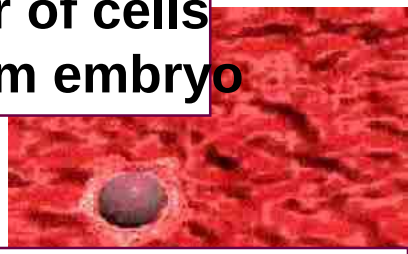
Zygote

Blastocyst
with blastocoele cavity

Implantation - embedding of blastocyst into uterine lining begins at day 7



Blastocyst - with blastocoele cavity
Trophoblast - outer layer of cells
Inner cell mass - will form embryo



Trophoblast forms syncytial trophoblast- erodes into endometrium
Cellular trophoblast - carries nutrients to inner cell mass

Lacunae and primary villi formed by trophoblast
All of these form placental tissues

Fig 28-3

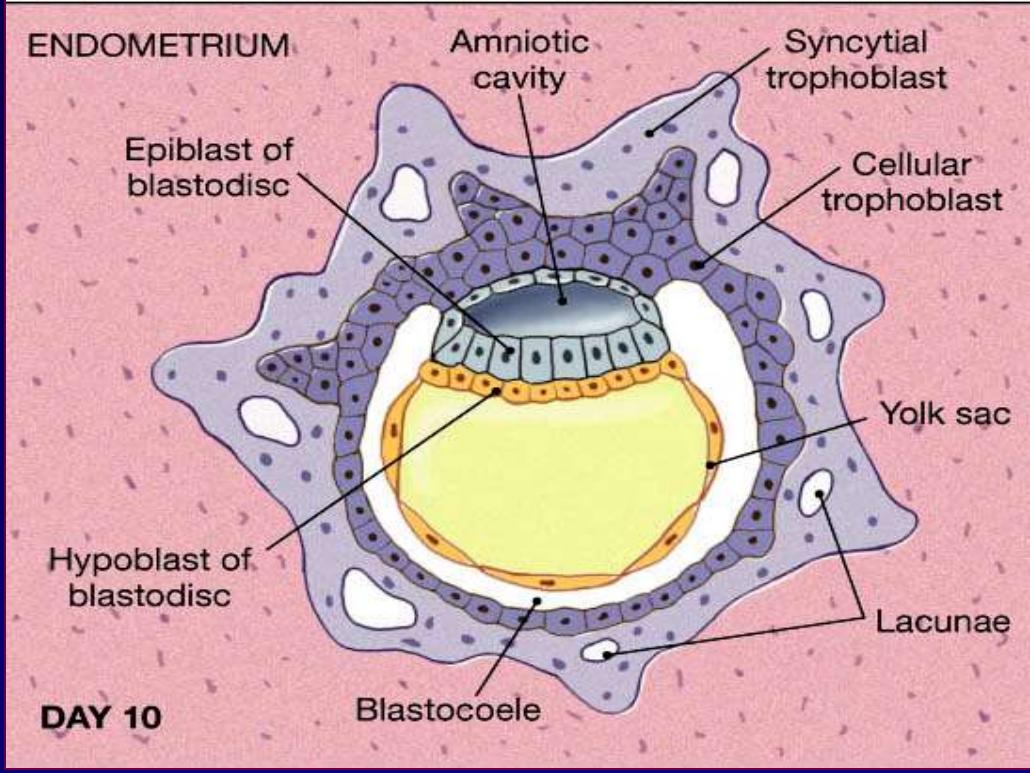
Day 10

Embryo completely embedded in endometrium

Amnion and yolksac visible

Blastodisc formation (2 cell layers)

- Epiblast
- Hypoblast



Gastrulation: 3 Germ Layers Formed

day 12:

Ectoderm (forms from epiblast)

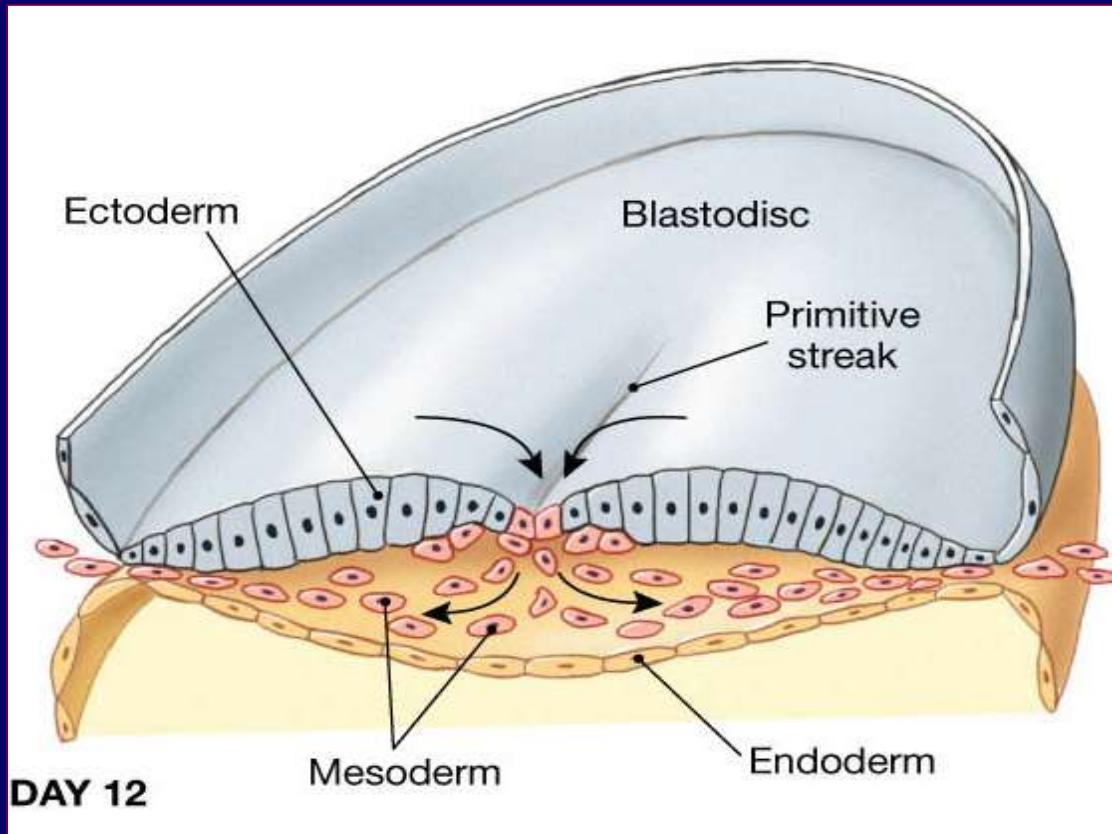
- Nervous system
- Epidermis

Endoderm (forms from hypoblast)

- Mucosae (eg: GI-tract
- Associated glands

Mesoderm

- Everything else



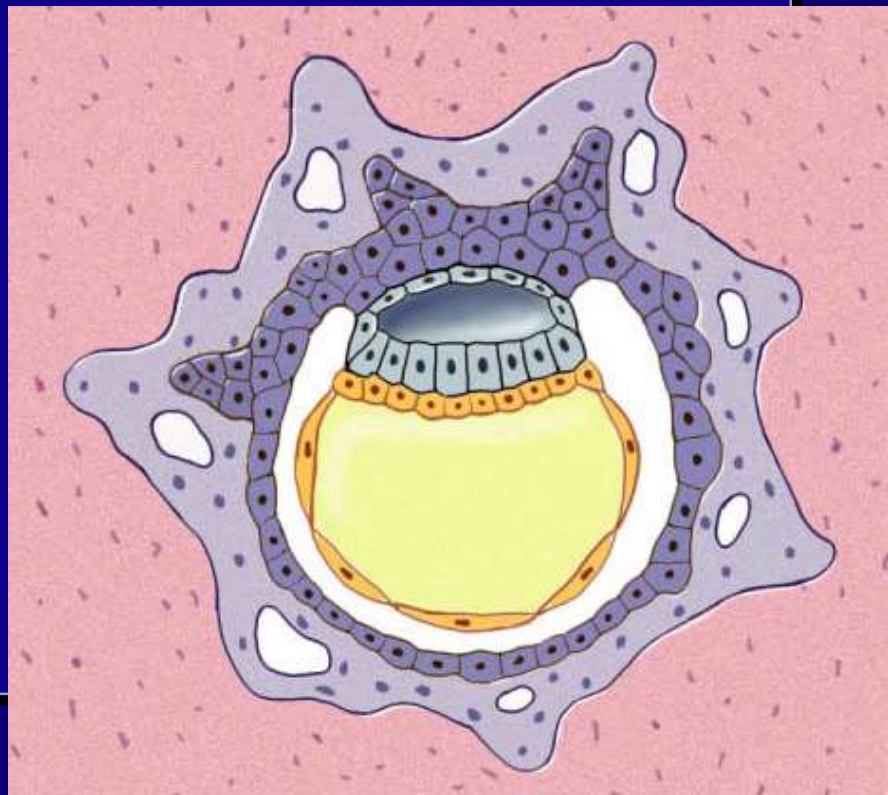
Formation of Extra-embryonic Membranes

visible after day 10:

Amnion – Protection of embryo/fetus

Yolk sac –

Early site of blood cell formation



Placentation

Fig 28-5

Development of placenta from edges of blastocyst

Placenta = organ that forms from the chorion and the endometrium and allow the embryo/fetus to exchange nutrients and waste.

Chorionic villi provide surface area for exchange

Nutrient and gas exchange happens without actual blood exchange

Umbilical cord - contains two umbilical arteries and one umbilical vein

Fig 28-6

Embryogenesis

Following gastrulation, formation of viable embryo

Head fold and tail fold develop

Critical period organogenes

Teratogens, Teratology = ?

- Rubella and syphilis
- X-rays
- FAS and smoking

Second and Third Trimester

- After the end of 8 weeks: **Fetal development**
- Week 12: **all organ systems laid out**
- **Most teratogens not lethal anymore – but produce major defects**
- **3rd trimester mostly for size increase and maturity.**

Fig. 28-7

Labor and Delivery

22 weeks of gestation absolute minimum (normal?)

Parturition: Expulsion of fetus and placenta due to fetal oxytocin ↑

Stages of labor

1. dilation stage - cervix stretches
2. expulsion stage - fetus delivered
3. placental stage - placenta expelled

Fig. 28-9/10

The End