CHAPTERS 28  PREGNANCY and DEVELOPMENT

Pregnancy and Development

• Embryology
  – 1 cell ➔ organism
  – process :
    • fertilization  fusion of gametes (nuclei)
    • mitosis  1 cell ➔ trillions
    • cell specialization  structure and function
    • cell destination  get to the right place

• gestation  =  pregnancy
  • 280 days  from last menstrual cycle

  getting together

• sperm : vagina ➔ cervix ➔ uterus ➔ fallopian tube
• ovum : ovary ➔ fimbriae ➔ fallopian tube

• 2 gametes ➔ 1 zygote

fertilization

• oocyte protected by outer corona radiata
  inner zona pellucida

• acrosome
  – enzymes dissolve zona pellucida  =  acrosomal reaction
• oocyte reaction
  – cortical reaction  blocks polyspermy
• completes meiosis II

• fertilization  =  fusion of nuclei
  \[23 + 23 = 46\]  (diploid)

  stages

• zygote  1\textsuperscript{st} cell
• pre-embryo  1\textsuperscript{st} 2 weeks
• embryo  week 3 – 8  (week 1 – 8)
• fetus  week 9 - birth

  pre-embryonic growth

• cleavage
  – mitotic divisions
  – morula  16 + cells in a ball  ~ day 3
    100 cells  ~ day 4-5
• enter uterus  ~ day 4

• blastocyst
  – hollows in center  =  blastocele
  – trophoblast  future chorion
  – inner cell mass  future embryonic disc
twins

- identical monozygotic twins
  - zygote (or morula) splits in two
  - adjacent or same placenta

- fraternal dizygotic twins
  - 2 ovum + 2 different sperm
  - 2 different placenta

implantation

- day 6 – 7; complete by day 14
- trophoblast fuses with endometrium
- trophoblast secretes hCG
  - maintains corpus luteum

endometrium

- decidua basalis
  - maternal part of placenta
- decidua capsularis
  - between embryo and uterine cavity

placenta

- Placenta = chorion + decidua basalis
- chorion part of trophoblast
  - chorionic villi
    - fetal blood vessels
- decidua basalis endometrium
  - lacunae blood filled spaces

- functional by end of 3rd month
- produces estrogen, progesterone

embryonic membranes

- from original zygote, but not part of embryo
- chorion from trophoblast

- amnion fluid filled sac
  - amniotic fluid protection
    - prevent adhesions
    - collects urine
  - surrounds fetus

- yolk sac under embryonic disc
  - future “gut”
  - produces early blood cells
tests

- hCG pregnancy test
- amniocentesis
  - amniotic fluid
  - fetal cells
  - 16 – 18 weeks
- Chorionic Villi sampling CVS
  - biopsy of chorionic villi
  - embryonic cells - not part of embryo
  - ~ 8 weeks
- ultrasound

gastrulation

- = formation of 3 primary germ layers
- primitive streak
- trilaminar embryonic disc
  - 3 primary germ layers
    » ectoderm outer
    » mesoderm middle
    » endoderm inner

organogenesis

- ectoderm nervous system, epidermis
- mesoderm connective tissues, solid organs
  - dermis
  - bone, ligaments, cartilage, muscles
  - kidney, adrenal cortex
  - blood, bone marrow, heart, blood vessel walls
  - lymph tissue
- endoderm linings, cavities
  - mucosa digestive, respiratory, urinary, reproductive
  - liver, gall bladder, pancreas, thymus
  - grow out of primitive digestive tube

ectoderm

- becomes CNS and epidermis
- neural tube brain and spinal cord
- neural crest cells cranial and spinal nerves
eye (retina), inner ear
adrenal medulla
- epidermis the rest of the ectoderm

endoderm

- forms future digestive tract = primitive gut
- outpocketings:
  - respiratory mucosa
  - thyroid, parathyroid, thymus
  - liver, pancreas
  - urinary bladder and tracts
- internal epithelial tissues
mesoderm

- notochord  first axial support of embryo
           future vertebral column
- somites  40 segments of tissue, each side
   - sclerotome  vertebra, ribs
   - dermatome  dermis
   - myotome  muscles (skeletal)
- connective tissues

end of embryonic stage

- ~ 1 inch
- all organs and tissues formed
- most are functioning
- heart beats since week 3 ½
- brain waves recorded since week 7
- vascular system complete
- limbs and digits present

How does this happen?

- toolkit genes  direct development
  produce proteins that affect adjacent cells
- induction  adjacent cells affect development
  - turn on/off specific genes for structure and function
  - turn on other developmental genes
- STEM CELLS  totipotent
           pluripotent
           multipotent

fetal development

- weeks 9 – 38
- cell specialization  detailed tissue
           organ development
- growth

- see table 4.2  pg 112

Parturition = birth

- ↓ progesterone  allows myometrium activity
  - Braxton-Hicks contractions  false labor
- oxytocin  stim myometrium contractions
- pain  stretch of cervix
         hypoxia of uterus  (vasospasm)
stages of labor

- stage 1  dilation
  - 1 cm to 10 cm
  - hours to day +
  - cervix effaces (thins)
  - amnion bursts

- stage 2  expulsion
  - ~ 50 min
  - crowning baby’s head at vulva

- stage 3  placental (afterbirth)
  - uterine contractions detach blood vessels / placenta
  - 15 – 20 min after baby

- neonatal  1st 4 weeks

- umbilical cord cut
  - ↑ CO₂ - stimulates respiration
  - inhalation - ↑ pulmonary circulation
  - ↑ L atrium pressure
  - closes foramen ovale and ductus arteriosus