Developmental Anatomy (Ch. 4)
Human Anatomy lecture

I. Overview: Table 4.1
A. Terminology
   - **gestation** - period from conception (fertilization) to **parturition**
     - *childbirth* ❖
   - **conceptus** = all the stages of development and products of fertilization
     - clinically gestation is divided into three 3-month intervals called **trimesters**
     - biologically, divided into 3 different stages:

   - **sketch**
     - ovarian cycle begins fertilization preembryonic embryonic fetal
     - sprout

B. Fertilization
   - occurs in uterine tube
     - sperm viable for 48 hours
     + oocyte viable for 24 hours
   - = 3 day “window” for fertilization
   - sperm + ovum = **zygote**

II. Preembryonic stage (zygote ➔ ~ day 16)
A. **cleavage** (mitosis of zygote) begins within 30 hours – **KNOW Fig 4.2**
   1. 2 cells ➔ 4 ➔ 8 ➔ 16
     - result is a solid ball of cells (each is a blastomere) called the **morula** by third day
     - sprout ➔ part
   2. peristalsis and ciliary action move morula through uterine tube into
      uterine cavity by day 4
   3. By 5th day, morula has become a hollow ball of cells, the blastocyst (Fig. 4.3a)
     - **embryoblast** (inner cell mass) - becomes embryo “bag” ➔
     - **trophoblast** – shell; becomes placenta & membranes
     - **blastocoel** – fluid-filled cavity

   - **sketch**
B. implantation – begins ~ 6th day (Fig. 4.3b & c)
- blastocyst attaches and embeds into uterine wall
  - trophoblast secretes enzymes that digest endometrium
- digested cells and endometrial glands provide nutrition until placenta
devlops
- takes about a week, endometrium completely covers conceptus

C. embryogenesis (Fig. 4.3 & 4.4)
- blastomeres multiply, rearrange, differentiate
  - gastrulation forms 3 primary germ layers ~ day 15 & 16
  -- Table 4.2 details fate of primary germ layers: NRF, but
  1. ectoderm - nervous tissue and epidermis
  2. mesoderm - muscle, connective tissue, blood
  3. endoderm - lining of GI, respiratory, urinary organs

III. Embryonic stage (day 17→ end of 8th week)
A. further cell movements & complex foldings begin shaping body (Fig. 4.5)
  - organs begin forming
  - by the end of the 8th week, most organs systems have been formed
  - embryo measures ~ 3cm; weighs 1g

B. Embryonic membranes -- KNOW FIG. 4.8b
  - protect/nourish the embryo/fetus
  - considered accessory organs
  1. amnion – “bag of waters”
    - thin transparent sac, surrounds embryo with a fluid-filled cavity
    amniotic fluid聧吸 absorbs shock, buoyant support
  2. yolk sac
    - small, rudimentary in humans
    - site of early blood cell formation, primitive germ cells
  3. allantois
    - small outpocketing of hindgut (originally from yolk sac)
    - site of early blood cell formation
    - contributes blood vessels to umbilical cord
  4. chorion
    - outermost membrane, surrounding others and embryo
    - derived from trophoblast
    - becomes placenta

C. Placenta and umbilical cord -- Fig. 4.8c
“flat cake”
  1. placenta is a combination of fetal & maternal tissue (Review fetal circ. notes)
    - chorionic villi - grow into endometrium
    - decidua - modified endometrium
      “falling off”
    - surrounding endometrial capillaries enlarge forming sinuses called
      intervillous spaces, collectively the placental sinus
* NO MIXING OF BLOOD*
  - exchange of nutrients/ wastes is by diffusion across capillary walls
  - multiple other functions (Table 4.3, NRF details)

2. Placentation takes 3 months to complete
   -- at end of embryonic period is responsible for ~50% of nutrition/waste removal (Fig. 4.9)
3. umbilical cord
   - 2 umbilical arteries and 1 umbilical vein and c.t.( stem cells)
   - transports blood to/ from placenta/ fetus

IV. Fetal stage (Table 4.4, NRF)
   A. organs continue to grow and develop: at 3 months, fetus is 9 cm; 45g
   B. by the end of the 7th month, enough surfactant is in the lungs to enhance survival of prematures
   C. most weight and size gain is in the last 2 months

V. Maternal anatomical changes
   A. Uterus
      - 10x - 15x increase in weight -- hyperplasia and hypertrophy
      - fills abdominopelvic cavity → striae = stretch marks

   RESULTS: Compression
      - bladder
      - inferior vena cava ↓ venous return → varicose veins
      - GI tract - heartburn and constipation
      - thoracic cavity – difficult breathing

   B. Other organs
      - vagina -- ↑2x
      - breasts --↑2x
      - increase skin pigmentation (hormonal)
        linea alba becomes linea nigra
      - average weight gain ~ 25-35 lbs

   C. puerperium - post-delivery recovery ~ 6 weeks
      - during puerperium, uterus undergoes involution → reduction to non-pregnant size
        900 g → 60 g
      - obstetrics - branch of medicine dealing with all of above
        "midwife"
VI. Mammary glands

A. General structure of the breast – KNOW Fig. 26.21a & c
   1. modified sweat glands surrounded by adipose & c.t. tissue within superficial fascia
   2. levels of organization
      
      mammary gland – secretory portion of breast, including ducts
      ↓
      lobe (15-20)
      ↓
      lobule (many)
      ↓
      acinus (many) = secretory unit ⇒ Fig. 26.21d
      ⇐ “berry”

   3. single nipple surrounded by pigmented areola ⇒ rough due to modified sebaceous glands
   4. suspensory ligaments - run between lobes from deep fascia to dermis for support

B. Path of milk flow
   - suckling stimulates contraction of myoepithelial cells within acinus
      
      acinus
      ↓
      ↓
      lactiferous duct (1 per lobe)
      ↓
      lactiferous sinus
      ↓
      opens to the surface
      at nipple
SKETCHES

I. A.

II. A. 3.

V. Maternal changes