II. Fertilization and Pregnancy

A. Process of Fertilization

1. Capacitation and arrival of sperm
    a. sperm's function enhanced in female tract from secretions (6 hrs.)
    b. Fertilization is only successful if many sperm reach the egg.
2. Migration through Follicle cells & Binding to Zona Pellucida
    a. ZP - a network of 3 glycoproteins, 1 is sperm receptor.
    b. first sperm to reach ZP binds to receptor
3. Acrosomal Reaction
    a. binding triggers acrosomal reaction
    b. sperm release enzymes in the acrosome by exocytosis
    c. this exposes protein on sperm membrane that will bind and fuse with egg membrane.
4. Fusion
    a. plasma membranes of egg and sperm fuze
    b. sperm nucleus enters the egg.
5. Cortical
    a. fusion causes cortical reaction
    b. cortical granules (small vesicles with enzymes) in cortex of egg release their contents by exocytosis.
    c. the enzymes harden the zona and make polyspermy impossible.
6. Meiosis II of secondary oocyte
7. Mitosis of eg and sperm nuclei, making 2 cells.

B. Role of HCG

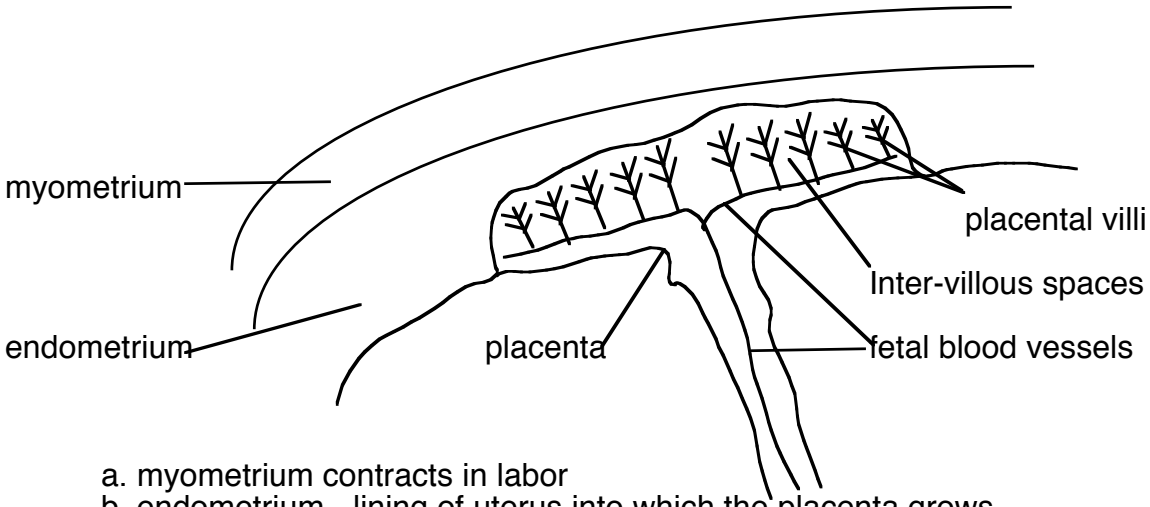
1. Non-pregnant woman
    a. FSH causes follicle and egg to mature, LH causes ovulation
    b. Burst follicle becomes Corpus Luteum
    c. CL secretes Progesterone
    d. progesterone maintains the endometrium
    e. no fertilization, no pregnancy
    f. about 14 days after ovulation the CL degenerates, no longer making progesterone
    g. the endometrium sloughs (menstruation) taking the egg with it.

2. Pregnant woman
    a. FSH causes follicle and egg to mature, LH causes ovulation
    b. Burst follicle becomes Corpus Luteum
    c. CL secretes Progesterone
    d. progesterone maintains the endometrium
    e. Fertilization occurs, blastocyst arrives, and implants itself in uterus.
    f. embryo starts making HCG
    g. HCG keeps the CL from degenerating
    h. thus the progesterone keeps being made, maintaining the endometrium and embryo

3. Other facts
    a. Human chorionic gonadotropin only made by embryo
    b. HCG shed in urine
    c. Pregnancy tests check for it in urine (or blood) (monoclonal antibody; dye attaches to HCG; appears as line)
    d. Thought to cause morning sickness (high for 2 months)
    e. By about half way through pregnancy, the CL degenerates, but by then the placenta is making progesterone.

C. The Placenta

1. Development
    a. tissues from developing embryo grow and mingle with the endometrium.
    b. initiated by progesterone, this forms the placenta
2. Structure
    a. disk-shaped, size of a plate, 2 cm thick by 18.5 cm.
    b. contains embryonic and maternal blood vessels
    c. blood does not mix.
3. Diagram - parts



    a. myometrium contracts in labor
    b. endometrium - lining of uterus into which the placenta grows
    c. placental villi increase surface area to facilitate exchange of materials
    d. inter-villous spaces - maternal blood flows through these spaces, brought by maternal blood vessels
    e. chorion - (fetal portion of placenta)
        i. on outer surface are the villi, forms the placental barrier,
        ii. cytoplasm secrete estrogen and progesterone into maternal blood
        iii. many mitochondria to provide ATP for active transport
4. Functions
    a. Diffusion between maternal & fetal blood (also active transport)
        i. To fetus: O_2, glucose, lipids, water, vitamins, minerals, hormones
        ii. To mother: CO_2, urea, water, hormones
        iii. Other: drugs and antibodies, etc.

    b. Hormones
        i. Progesterone - maintains uterine lining, suppresses FSH, LH release
        ii. Estrogen - stimulates further growth of endometrium, helps inhibit release of FSH