Pregnancy and Development

Embryology
- fertilization: fusion of gametes
- mitosis: 1 cell → trillions
- cell specialization: structure and function

Gestation = pregnancy ~ 280 days
- Hormonal changes
- Uterine changes
- Mammary gland development

Fertilization
- Acrosomal reaction: sperm enzymes dissolve zona pellucida
- Cortical reaction: ovum zonal inhibiting enzymes block attachment of other sperm

Fertilization = fusion of nuclei: sperm + ovum → 1 zygote

Implantation
- Day 6; complete by day 14
- Blastocyst (pre-embryo) fuses with endometrium
- Trophoblast secretes:
  - hCG: maintains corpus luteum
  - Enzymes: digests endometrium cells
  - Growth factors: stimulates endometrium growth

W/ fertilization
- hCG = human chorionic gonadotropin made by embryo (chorion) ~8d after fertilization
- In mother's blood ~ 14d after ovulation
- Stimulates corpus luteum to produce progesterone
- Progesterone maintains uterus growth of placenta

W/ pregnancy:
- Hypothalamus → Anterior pituitary
- Ovary
- Uterus
- GnRH → FSH → Follicle - meiosis: estrogen
- LH → Ovulation → Corpus luteum - Progesterone
- Development of: placenta, mammary glands
placenta = chorion + endometrium

chorion contains fetal blood vessels
endometrium contains maternal blood vessels

functional by end of 3rd month
placenta produces hormones

- estrogen
- progesterone
- hPL
- hCT

cross-placenta transport
diffusion from mother’s blood:
- glucose, lipids, electrolytes, oxygen
to mother’s blood:
- carbon dioxide, wastes
active transport
- amino acids, Ca
fetal hemoglobin

cell specialization

cell specialization = cell differentiation
- forming specific adult cells
- by turning on / off genes
- different active genes make different proteins; which make different cells

- toolkit genes
- genes that control development

- induction
- a cell affects the specialization of adjacent cells
- chemicals control genes, enzymes, of other cells

hormones control mother’s metabolism

hPL human placental lactogen
- stim mammary gland development
- increases blood glucose
- “gestational diabetes”
  possible effect of mother’s glucose levels on fetal insulin?
hCT human chorionic thyrotropin
- a fetal hormone that increases mother’s BMR
  like TSH

elevated PTH increases blood calcium

other hormones

- hCG increases progesterone
- estrogen + progesterone inhibit ovulation
- estrogen growth of placenta, mammary ducts
- progesterone growth of placenta, mammary glands
- inhibits myometrium contractions
- oxytocin stim uterus contractions

physiologic changes - mother

- morning sickness hi estrogen, progesterone
- hyperglycemia hPL
- polyuria due to glucosuria
- water retention due to hyperglycemia
- stress incontinence pressure on urinary bladder
- cardiovascular increase blood volume, BP, HR
- increased BMR hCT
- varicose veins decrease venous return from LE due to pressure on IVC
- respiration increased rate

parturition = birth

↑ estrogen develop oxytocin receptors
↓ progesterone allows myometrium activity
  Braxton-Hicks contractions (false labor)

- oxytocin rhythmic contractions of myometrium
  stretch of uterus → ↑ oxytocin (positive feedback)