

# Reproductive System

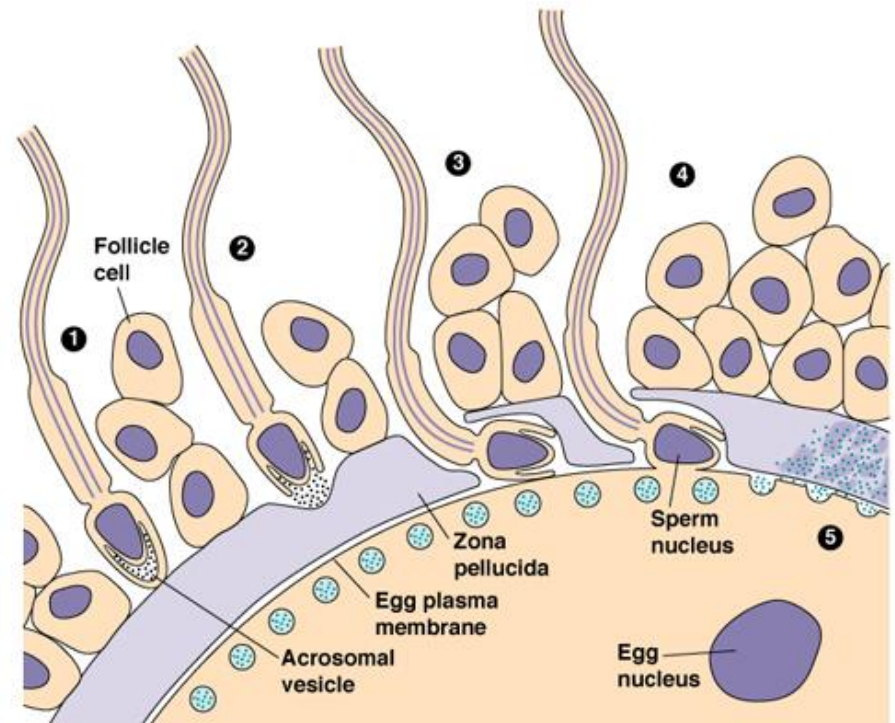


# Fertilization

- Male ejaculates due to contraction of muscle in the testicles, which forces sperm out of the body
  - 2 to 5 mL of fluid with 40 to 600 million sperm
- Sperm seek out egg (1 to 2 hours to reach the egg) and will fight to be the first to enter the egg
  - Egg is only viable for 24 hours
  - Sperm can't naturally fertilize an egg and must go through capacitation which involves weakening the cell membrane
- After one sperm has entered the egg, the outer layer of the egg becomes impenetrable to any other sperm

# Fertilization

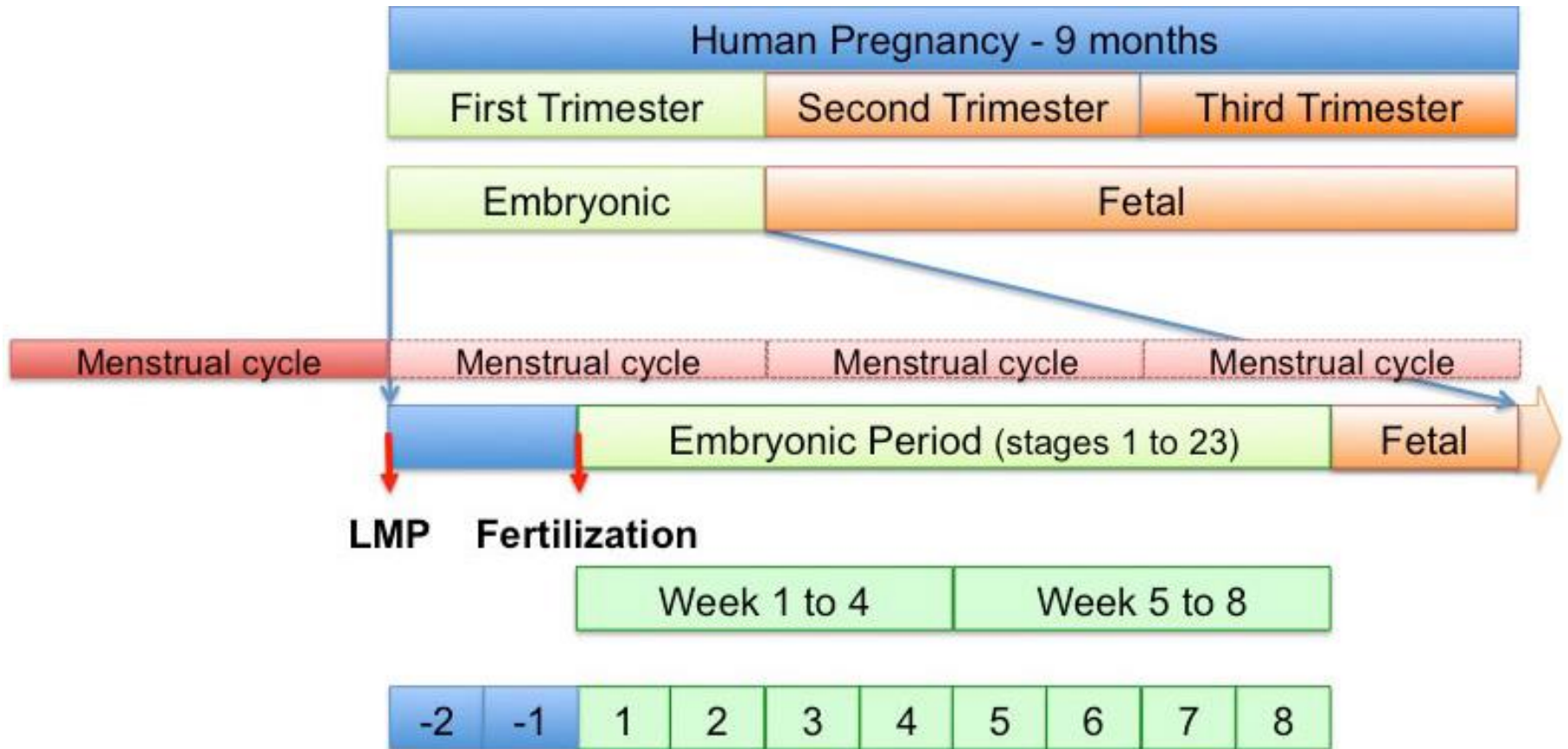
- Cell that forms is a **zygote** – everyone exists as a single cell for 24 hours before first division



# Pregnancy

- Gestation Calculation
  - First pregnancy: 274 days, just over 39 weeks
  - Subsequent pregnancies: 269 days, 38.4 weeks
- Trimesters
  - First Trimester - embryonic period (organogenesis)
  - Second and Third Trimester - fetal period (growth)

# Human Development Timeline



# Prenatal Period

- First: the zygote forms a blastula – hollow ball of cells
  - This occurs through rapid cell division called cleavage
- By day 7 (week 1): blastocyst has attached to endometrial lining – outer cells will form the amnion, chorion, umbilical cord, and placenta, while the inner cells will form the fetus

# Embryonic Stage

- About the time of implantation, the mass of cells begins the embryonic stage
- Cells surrounding the embryo form the placenta and the amnion
  - Organ that exchanges and filters nutrients, gases, and wastes between the maternal blood and embryo blood
- Germ layers form from inner cell mass at week 2:
  - Endoderm: digestive tract and mucous membranes
  - Mesoderm: bones, muscles, other organs
  - Ectoderm: skin, hair, nails, and nervous system

# Embryonic Stage

- The umbilical cord also forms with 2 other extra-embryonic membranes
  - Yolk sac = forms blood cells early in development and also later becomes sex cells
  - Allantois = also forms blood cells and becomes the arteries and veins of the umbilical cord in week 3



# Embryonic Stage

- Week 3: Chorion forms and maternal and embryonic blood vessels start to move closer together
- By the end of month 1 (week 4) the fetus has developed a neural tube, head with a jaw, arm and leg buds, and a heart beat
- All the major organs systems have begun development by the end of month 1
- Fetus is  $\frac{1}{4}$  of an inch long

# Embryonic Stage

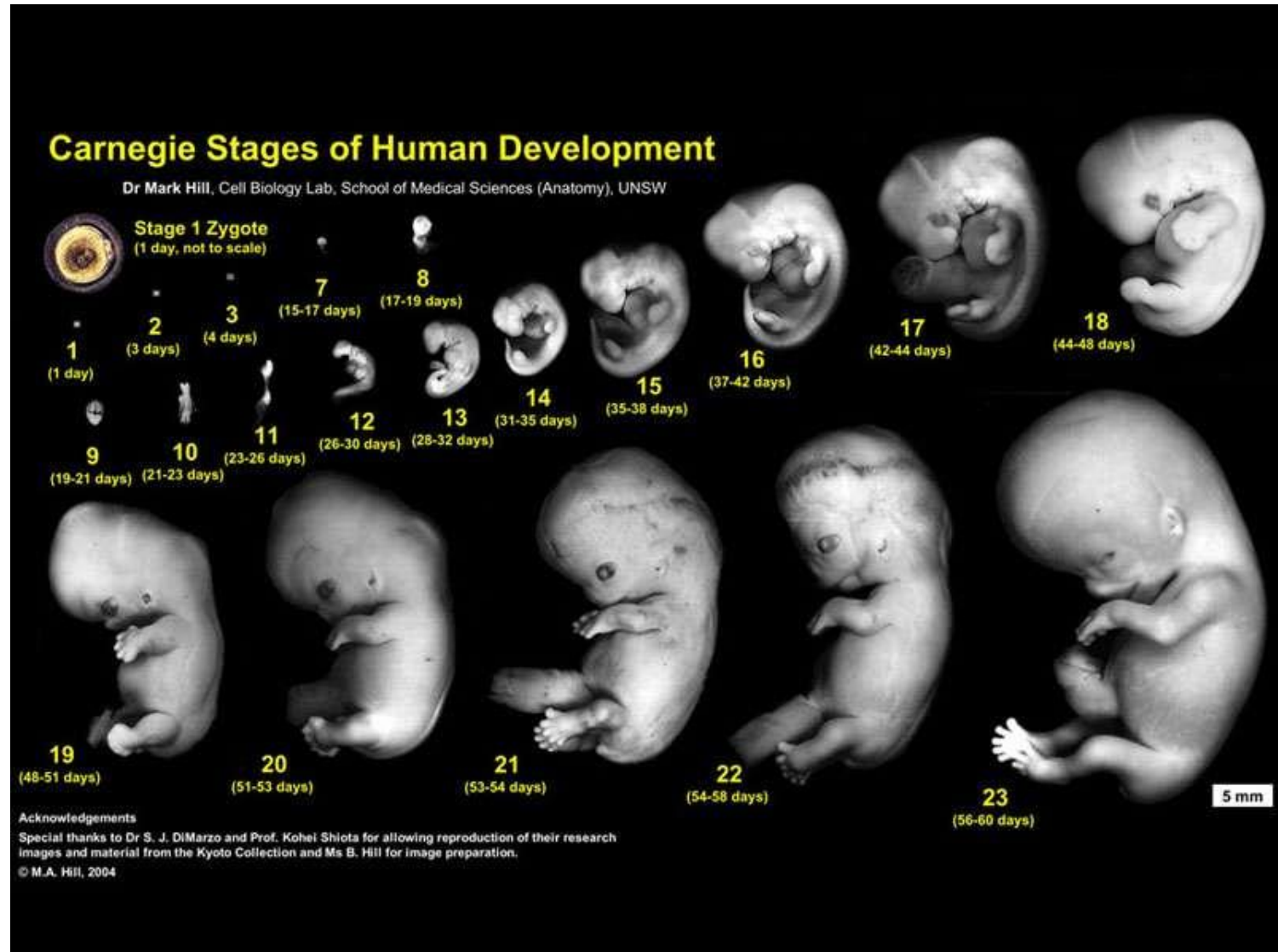
- Week 5-7: head grows rapidly, face develops, upper and lower limbs elongate, fingers and toes form
- The term embryo will continue until the end of week eight
  - Embryo will now be referred to as a fetus until birth and is about 1 ¼ inches long

# Fetal Stage

- Month 3: body lengthening accelerates as head growth slows, ossification centers begin in the bones
  - By week 12, external reproductive organs are distinguishable

- Month 4: body grows rapidly to amount 8 inches, skeleton continues to ossify, fetus can be startled, respond to loud noises and turn away from light shown on the pregnant women's belly

# First Trimester Development



# Fetal Stage

- Month 5: growth slows, limbs are full length, skeletal muscles contract and the mother can feel the fetus move, hair begins to grow on the head, secretions from the sebaceous glands cover the fetus
- Month 6: fetus gains weight, eyebrows and eyelashes develop, skin is thin and translucent

# Fetal Stage

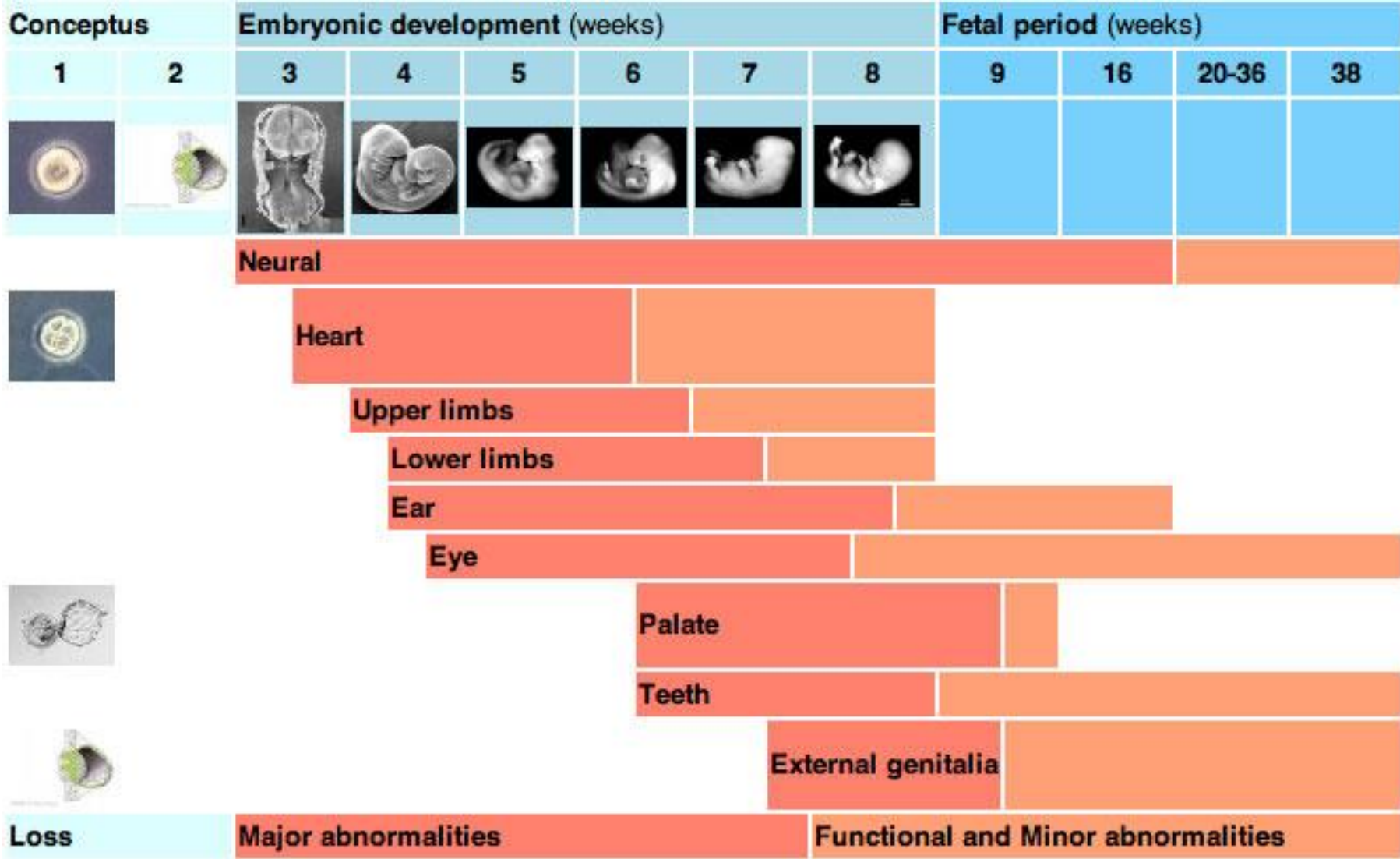
- Month 7: fat deposits in skin, eyelids (which fused in month 3) reopen, fetus is about 16 inches long
- Final trimester is month 8-10: brain cells rapidly form networks, testes descend into the scrotum, digestive and respiratory systems form last
- Full term: 19-20 inches and 6-8 pounds

# Fetal Stage

- Fetal circulation
  - Blood bypasses the lungs while sending a small amount to sustain the lung tissues
  - Half the blood enters the liver and the rest is bypassed
  - Blood in the heart can move through a hole in the atrial septum



# Human Critical Periods of Development



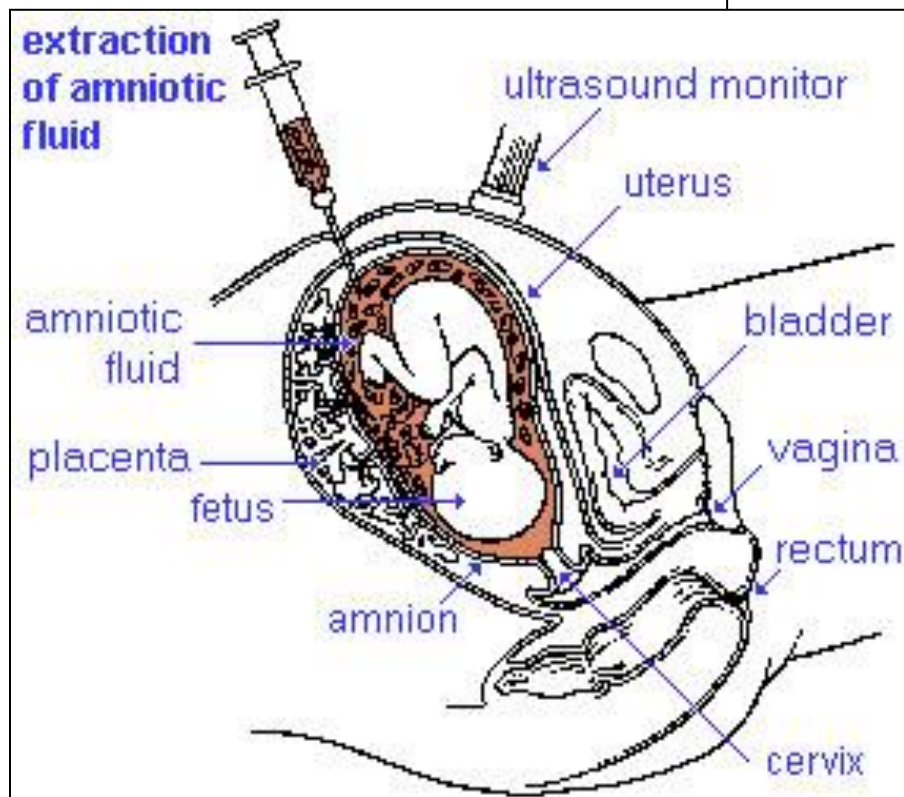
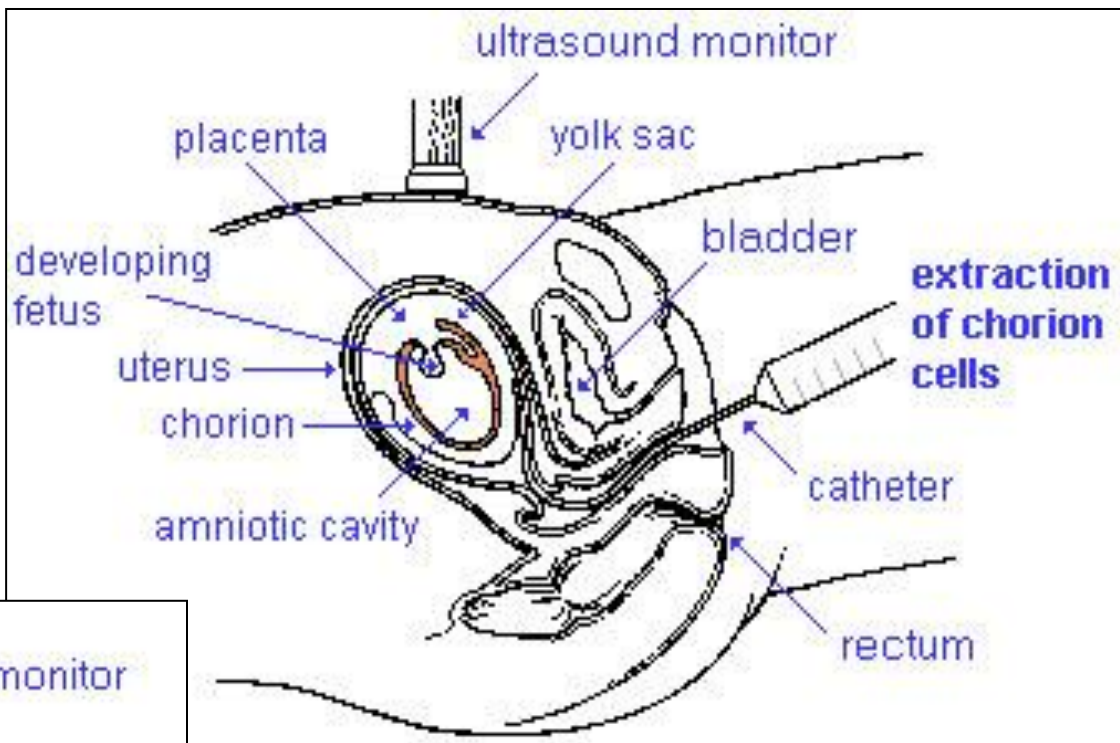
# Ectopic Pregnancy

- Condition in which the fetus develops anywhere other than the uterus
  - 1 in 50 pregnancies
- Locations:
  - Fallopian tubes (98%)
  - Ovaries, cervix, or abdominal cavity (2%)

- Risk factors:
  - Previous history
  - Previous surgery on fallopian tubes
  - Pelvic infections (possibly caused by STD's such as Chlamydia or Gonorrhea)
  - Endometriosis (formation of uterine tissue in a place other than the uterus) or fibroid tumors
  - Sometimes can happen without any risk factors
  - Cigarette smoking

# Detecting Chromosomal Defects

- Chorionic Villus Sampling
- Amniocentesis
- Preimplantation Genetic Diagnosis



# Twins

- Identical twins – division of the growing blastocyst
  - Can share a placenta, amnion, or chorion
- Fraternal twins – fertilization of two eggs

# Childbirth

- Occurs roughly 280 days after last menstrual period
- Stage 1: Dilation – cervix expands to 10cm to accommodate the babies head, water breaks – rupture of amnionic sac
- Stage 2: Expulsion – increase urge to push, contractions increase, baby is expelled from the body
- Stage 3: Placental Stage – “afterbirth” includes the removal of the placenta from the uterine wall

# Mammary Glands

- Gland:
  - Specialize in the secretion of milk following pregnancy
  - Contains 15-20 lobes
  - Glands in males don't develop at puberty
- Breast overlies the pectoralis muscles
- Nipple forms the tip and the areola surrounds each nipple



# Contraception

- Different methods can be used at different stages of baby development
  - Stopping the release of the sex cells: vasectomy and birth control pills or skin progestin implants
  - Prevent transport of sperm into the female: coitus interruptus (withdrawal method), rhythm method
    - Have a high failure rate
  - Mechanical barriers: male and female condoms, diaphragm, cervical cap

# Contraception

- Chemical barriers: creams, foams, and jellies with spermicidal properties
  - Have a high failure rate
- After egg fertilization: morning after pill, intrauterine devices (IUD)
- After implantation of the egg: Abortion – drugs and surgery
- 100% protection: abstinence

# Cancers

## Male

- Prostate
- Testicular
- Penile

## Female

- Breast
- Ovarian
- Uterine
- Cervical
- Vaginal
- Vulvar

# Fetal Alcohol Syndrome (FAS)

- In addition to lower birth weight, infants of mothers who consume large amounts of alcohol during pregnancy may exhibit a pattern of physical anomalies.
- Classification identifies an association between lower levels of drinking and less extensive fetal involvement. (between 2 and 3 per 100 births)
- CFAS features may not be specific to alcohol. Using drugs or not gaining enough weight (less than 5 pounds) may also cause the symptoms.

# Resources

- [http://php.med.unsw.edu.au/embryology/index.php?title=Foundations\\_Lecture\\_-\\_Introduction\\_to\\_Human\\_Development#Week\\_1\\_Development](http://php.med.unsw.edu.au/embryology/index.php?title=Foundations_Lecture_-_Introduction_to_Human_Development#Week_1_Development)