Today’s Topics

- Prenatal Development
- Influences on Prenatal Development
- Prenatal Diagnosis & Treatment

Stages of prenatal development

- Germinal period (0-2 weeks)
  - Zygote → Implantation
- Embryonic period (3-8 weeks)
  - Nervous, circulatory & respiratory systems formed
- Fetal period (9 weeks – birth)
  - Organs & systems are refined

Where it all happens

1. Germinal Period: The Beginning of Development
   - 1-celled Zygote
   - 4-cell
   - 8-cell
   - Morula (16 celled solid sphere)
   - Blastocyst
**Human Development -- Prenatal Development**

### Again: Where it all happens

1. **Zygote**
2. **Morula**
3. **Implantation**
4. **Cleavages**
5. **Blastocyst**
6. **Germ Disc**
7. **Trophoblast**
8. **Embryo**

#### Embryonic Period (3-8 weeks)

- **Germ disk** (center of blastocyst) → Embryo
- Trophoblast → placenta, amniotic fluid, umbilical cord

#### Embryonic period (3 weeks to 8 weeks)

- **Trophoblast becomes**
  - Amniotic Sac
  - Umbilical cord
  - Placenta
    - ½ trophoblast
    - ½ uterus lining

- **Blastocyst becomes 3 layers of cells**
  - Ectoderm (outer)
  - Mesoderm (middle)
  - Endoderm (inner)
Embryonic period (3 weeks to 8 weeks)

- Layers of cells
  - Ectoderm → nervous system, sensory receptors, outer skin, hair teeth and nails.
  - Mesoderm → muscles, the skeleton, the circulatory system, the excretory system, inner skin, and the reproductive system
  - Endoderm → digestive system and respiratory system (e.g., lungs)
- Numerous risks

Fetal period (8 weeks - birth)

- Period is characterized by rapid growth of bone & muscles
- All regions of the brain grow
- By month 3
  - 3.5 inches long, 1.25 ounces
  - Active
  - Visible facial features
  - Limbs distinguished
  - Genitals identifiable
**Fetal period (8 weeks - birth)**

- Months 4-6
  - Refining of reproductive system
  - Brain continues to develop
    - Takes on adult shape
    - Brain waves look like a newborn’s by month 6
  - Month 4-5: Mom can feel baby move (“quickening”)
  - By 5 months, fetus is about 12 inches long & 1 pound

**Fetal period (8 weeks to birth)**

- Months 6-9
  - Respiratory system matures (lungs are last)
  - Age of viability
    - Between 22 and 28 weeks (~7 months)

- Note:
  Gestational age is calculated from the woman’s last menstrual period (not from conception)

**Where it all happens**

- Germinal period (0-2 weeks)
  - Zygote → Implantation
- Embryonic period (2-8 weeks)
  - Nervous, circulatory & respiratory systems formed
- Fetal period (8 weeks – birth)
  - Organs & systems are refined

**Prenatal Period Review**
Effects of prenatal environment

• Teratogens
  – From the Greek word Tera (=Monster)
  – Any environmental agent that causes a birth defect
  – The severity of damage and type of defect depends on
    • Genetic susceptibility
    • Dose
    • Simultaneous presence of other negative factors
    • Time of exposure

Teratogens and the Timing of Their Effects

Effects of prenatal environment

• Maternal characteristics
  – Maternal age & nutrition
  – Emotional states and stress
  – Maternal diseases
    • Bacterial (e.g., Syphilis, Chlamydia & Gonorrhea)
    • Viral (e.g., Genital herpes & AIDS)
    • Parasites (e.g., Toxoplasmosis)

Effects of prenatal environment

• Drugs
  – Legal drugs
    • Alcohol
      – Large quantities
        » FAS
      – Moderate quantities
        » ARND (p. 77)
      – Limited quantities
        » Effects unknown

Normal baby brain  FAS baby brain
Effects of prenatal environment

• Drugs
  – Legal drugs
    • Alcohol
    • Nicotine

• Illegal drugs
  • Cocaine (neurological & cognitive deficits)
  • Heroin (behavioral problems & attention deficits)
  • Marijuana (deficits in memory & information processing)

Effects of prenatal environment

• Medication
  – Prescription drugs:
    • Examples:
      – Antibiotics
      – Antidepressants
      – Hormones
      – Thalidomide
      – Accutane

• Environmental toxins
  – Radiation
  – Mercury
  – Lead
  – Carbon monoxide
  – And many many more!
- Preventative Measures
  - Genetic counseling

- Preventative Measures
- Ultrasounds
  - Uses sound waves to generate a live video of the fetus (still, it’s very hard to see!)
    - Can be used at 4 or 5 weeks
    - At 20 weeks, can identify the child’s sex

- Preventative Measures
- Ultrasounds
- Testing for genetic abnormalities
  - Amniocentesis
    - Samples the amniotic fluid
    - Can be done 16 weeks after conception

- Preventative Measures
- Ultrasounds
- Testing for genetic abnormalities
  - Amniocentesis
    - Samples the amniotic fluid
    - Can be done 16 weeks after conception
  - Chorionic Villus sampling (CVS)
    - samples tissue from part of the placenta
    - can be done 10-12 weeks after conception
The Stages of Birth

- **First stage**
  - Contractions
  - Cervix dilates
- **Second stage**
  - Infant going through birth canal
- **Third stage**
  - Delivery of the placenta

The Birth Process

- **Cesarean Delivery**
  - Head too big
  - Breech position
  - Labor not progressing
- **Vaginal Birth Complications**
  - Anoxia
  - Fetal monitoring device

Assessing newborns

- **The Apgar Scale**

<table>
<thead>
<tr>
<th>Score</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate</td>
<td>Absent</td>
<td>Slow—less than 100 beats per minute</td>
<td>Fast—100 to 140 beats per minute</td>
</tr>
<tr>
<td>Respiratory effort</td>
<td>No breathing for more than one minute</td>
<td>Irregular and slow</td>
<td>Good breathing with normal crying</td>
</tr>
<tr>
<td>Muscle tone</td>
<td>Limp and flaccid</td>
<td>Weak, inactive, but some flexion of extremities</td>
<td>Strong, active motion</td>
</tr>
<tr>
<td>Body color</td>
<td>Blue and pale</td>
<td>Body pink, but extremities blue</td>
<td>Entire body pink</td>
</tr>
<tr>
<td>Reflex irritability</td>
<td>No response</td>
<td>Grimace</td>
<td>Coughing, sneezing, and crying</td>
</tr>
</tbody>
</table>

Infant Reflexes

- Reflexes: organized inborn behaviors that occur in response to particular stimulation
  - Grasping
  - Sucking
  - Rooting
  - Stepping
  - Moro

The surgeon reaches into the abdominal incision and lifts the baby’s head as an assistant pushes down on the upper uterus.
Prematurity & Low Birth Weight

Preterm baby vs. Small for gestational age baby (SGA)

• Low birth weight: under 5½ pounds
• Very low birth weight: Under 3 pounds
• Extremely low birth weight: Under 2 pounds

Potential causes and consequences of low birth weight
– Damage to nervous system
– Lung or liver diseases
– Learning disability
– Attention deficit hyperactivity disorder
– Breathing problems

Compensatory stimulation
– Mimicking sensations in the womb

Enrichment
– Paralleling normal newborns’ stimulation

Touch therapies
– Massage
– Kangaroo care