Normal Pregnancy

- **Pregnancy**
The course that the embryo and the fetus grow in the maternal body

- **Stages of pregnancy**
  1. Early pregnancy: ≤12 weeks
  2. Mid pregnancy: ≥13 weeks, ≤27 weeks
  3. Late pregnancy: ≥28 weeks
  4. Term pregnancy: ≥37 weeks, <42 weeks
Amniotic Fluid

Placenta Function

1. Metabolism
2. Exchange of O₂ and CO₂
3. Exchange of nutritive factors and waste
4. Defensive; Limited. IgG, virus, drug
Placenta Hormones

1. Human chorionic gonadotropin (hCG)
2. Human chorionic somatomammotropin (hCS; hPL)
3. Estrogens
4. Progesterone
5. Oxytocin
6. Immunity tolerance

Fetal membranes

- **Structure**
  chorion and amnion
- **Amnion**
  A double-layered translucent membrane
  Become distended with fluid
Umbilical Cord

- **Structure**
  - Amnion, yolk sac, one vein, two artery and Wharton jelly
- **Length**
  - 30-70 cm

Amniotic Fluid

- **Source**
  1. Exudation of fetal membranes (early pregnancy)
  2. Fetal urine
  3. Fetal lung
  4. Exudation of amnion and fetal skin
Amniotic Fluid, Cont’d

- **Absorption**
  1. Fetal membrane
  2. Umbilical cord
  3. Fetal skin
  4. Fetal drinking

- **Feature**
  1000-1500ml at 36\textsuperscript{th}-38\textsuperscript{th} week (peak), transparent, slightly turbid

Amniotic Fluid

- **Function**
  1. Protect fetal move freely
  2. Warm the fetal
  3. Protect mater prevent infection
Specimen Collection

1. It is obtained by needle aspiration into amniotic sac which is called **amniocentesis** after 14th week of gestation:
   - Transabdominal amniocentesis
   - Virginal amniocentesis

2. 30 mL maximal collection; first 2-3 mL can be contaminated

It is used to determine the health of an unborn baby
The chromosome analysis of the fluid can be performed to determine abnormalities
The fluid may be cultured and analyzed for enzymes, or for other materials that may indicate genetically transmitted diseases.
Other studies can be done directly on the amniotic fluid including measurement of \( \alpha \)-fetoprotein
Properties of Amniotic Fluid

1. Amniotic fluid is the fluid medium that the fetus is surrounded within the amniotic cavity
2. The volume ranges from 400-1,200 mL, depending on the week of pregnancy

Properties of Amniotic Fluid, Cont’d

3. Mainly composed of water
4. Composed of ions including sodium, chlorine, and calcium
5. Amniotic fluid contains urea, which comes from the fetus
Variations of Substances in Amniotic Fluid

Amniotic Fluid Volume Versus Gestation Period

1. Amniotic fluid increase rapidly from an average volume of 50 mL by 12 weeks of pregnancy to 400 mL at mid-pregnancy
2. The 24th week of pregnancy, the volume of amniotic fluid continues to increase
3. Maximum of about 1 liter of fluid at 36th to 38th weeks
Urinary Production Rate vs. Weeks Of Pregnancy

1. The urinary production rate increases with the weeks of pregnancy
2. The increase in urinary production can be a result of the growing fetus
3. During the latter half of pregnancy, fetal urine composes a major portion of the amniotic fluid

Normal Flows in/out of The Late Gestation Fetus and its Amniotic Fluid

1. There is a continuous exchange of fluids between the secretions of the kidneys, lungs and head of the fetus with the amniotic fluid
2. Any changes produced in these flows can lead to alterations in the amniotic fluid
   - A = transplacental
   - B = intramembranous
   - C = transmembranous
Abnormal Concentration of Fluid

Amniotic Fluid

1. Oligohydramnios: Depth of the amniotic fluid is < 5cm.
2. Polyhydramnios: Fluid levels are > 25 cm
3. Cerebral Palsy: Maternal infections involving the amniotic fluid, placenta and the urinary tract

Abnormal Concentration of Fluid, Cont’d

Blood

1. Rh Disease: Incompatibility between the blood of the mother and her fetus. When the fetus has Rh- positive blood, the mother’s antibodies will destroy fetal blood cells
2. Preeclampsia: Characterized by high blood pressure and protein in maternal urine
Fetal Maturity Tests

- Respiratory distress is the most frequent complication of early delivery
- Laboratory tests must be performed to determine the maturity of the fetal lungs
- Several laboratory tests are available to measure fetal maturity tests

Fetal Maturity Tests, Cont’d

- **Lecithin-Sphingomyelin (L/S) Ratio**
  1. Before 34th week, L and S is equal
  2. After 34th week, L increases; then L/S ratio increases to > 5 at term
  3. When ratio reaches 2 or more; delivery is usually considered to be relatively safe
Lecithin-Sphingomyelin (L/S) Ratio, Cont’d

Amniotic Fluid Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Normal Values at Term</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha-fetoprotein</td>
<td>≤225 µg/L</td>
<td>Hydrops fetalis of the newborn</td>
</tr>
<tr>
<td>Lecithin-sphingomyelin ratio</td>
<td>2/0</td>
<td>Neural tube disorder</td>
</tr>
<tr>
<td>Amniotic fluid lung maturity index</td>
<td>Positive</td>
<td>Fetal lung maturity</td>
</tr>
<tr>
<td>Amniotic fluid pH</td>
<td>&gt;7.2</td>
<td>Fetal lung maturity</td>
</tr>
<tr>
<td>Mucin viscosity</td>
<td>≥20 mg/L</td>
<td>Fetal lung maturity</td>
</tr>
<tr>
<td>Optical density 650 nm</td>
<td>≥20,150 mg/L</td>
<td>Fetal lung maturity</td>
</tr>
<tr>
<td>Listeriae body count</td>
<td>≥32,000/µL</td>
<td>Fetal lung maturity</td>
</tr>
</tbody>
</table>
Amniotic Fluid Tests, Cont’d

1. It is an α–globulin with MW 64 KD and containing 4% carbohydrates
2. It is present in fetal and maternal blood and amniotic fluid and formed chiefly in the fetal liver
α-Fetoprotein

3. Its concentration in infant serum diminishes steadily over two years reaching the low

4. Increases its concentration in amniotic fluid indicates that the fetus has neural tube defect or 45/XO chromosomal constitution

5. In plasma of pregnant women with diabetes or Rh immunization

THE END

Any questions?