



Biochemistry of biological fluids (BIOCH 472)

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Class 10:

Amniotic Fluid

Objectives for this lecture

- State the functions of amniotic fluid.
- Describe the formation and composition of amniotic fluid.
- Describe the analysis of amniotic fluid for the detection of neural tube disorders.

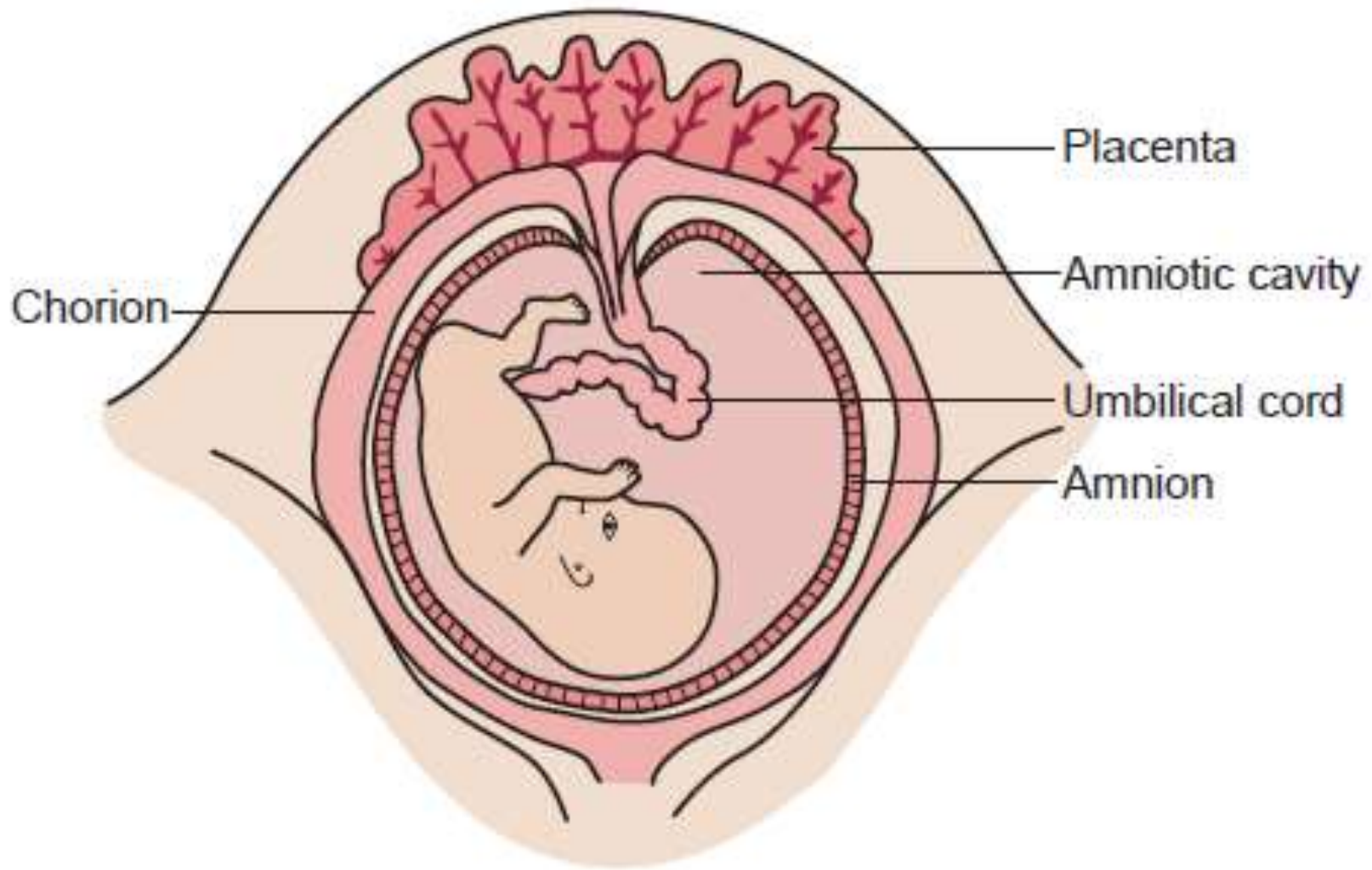


Figure 14-1 Fetus in amniotic sac.

Function of Amniotic Fluid

- Present in the *amnion*, membranous sac that surrounds the fetus.
- Provide a protective cushion for the fetus.
- Allow fetal movement.
- Protect the fetus from extreme temperature changes.
- Permit proper lung development.
- Exchanges of water and chemicals.

Amniotic Fluid Volume

- **Change in volume:**
 - During the first trimester = 35 mL.
 - Fluid increases reaching a peak of 1 L during the third trimester.
 - Gradually decreases prior to delivery.

Amniotic Fluid Volume

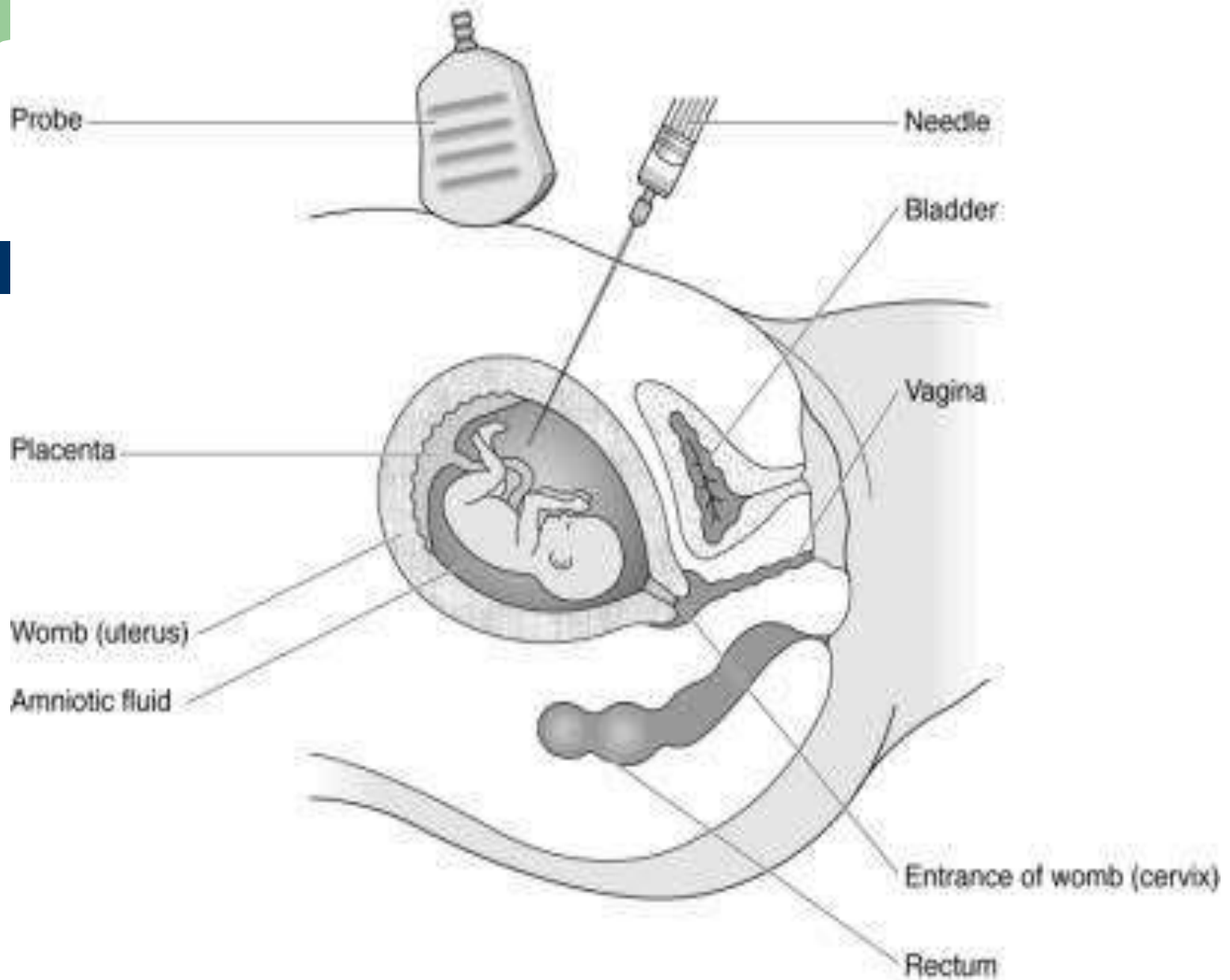
- Volume is regulated by:
 - ✓ first trimester, *fetal urine* contribute to volume.
 - ✓ *lung fluid* contribute to volume when fetal swallowing of the amniotic fluid begins.
 - ✓ *Intramembranous flow* by absorbing amniotic fluid components into the fetal vascular system.

Chemical Composition

- composition similar to the maternal plasma.
- contains a small amount of fetal cells from the skin, digestive system, and urinary tract.
- The fluid also contains:
 - Bilirubin
 - Creatinine
 - Nitrogenous compounds
 - Proteins
 - Enzymes
 - Urea
 - Electrolytes
 - Lipids
 - Glucose

Specimen Collection

- Abnormality on the ultrasound indicate potential fetal development problems and indicate the need for:
 - ✓ amniocentesis
 - ✓ laboratory measurements of fetal lung maturity.
- Fetal cells in amniotic examined for chromosome abnormalities by karyotyping test.



Specimen Collection

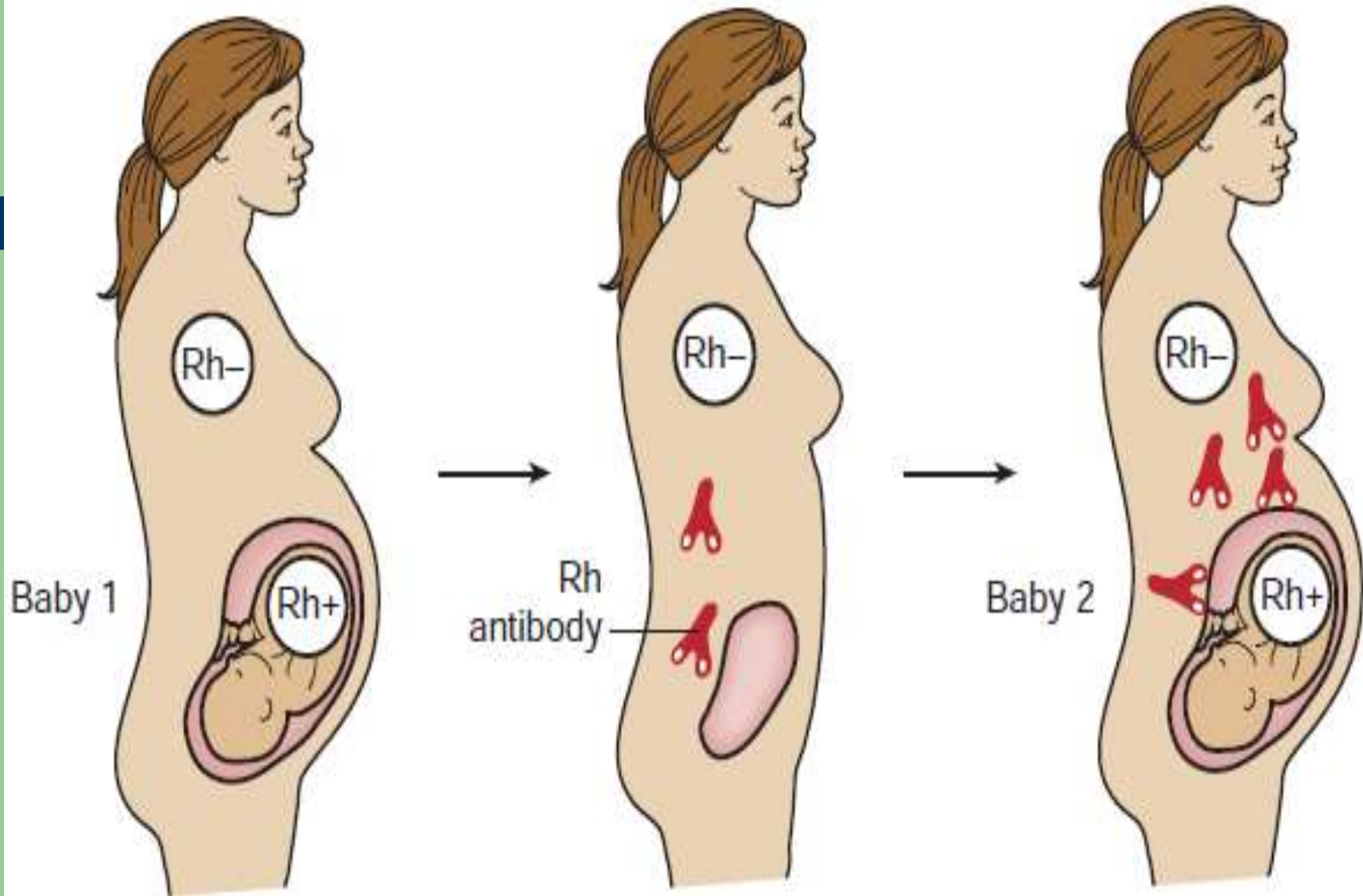
- 30 mL obtained by needle aspiration into the amniotic sac (***amniocentesis***).
- Vaginal amniocentesis may also be performed.
- Tests is frozen and tested within 72 hours.
- Fluid for chemical testing is separated from cellular elements by **centrifugation or filtration**.

Color and Appearance

- *Normal* amniotic fluid is colorless.
- may exhibit *turbidity* from cellular debris.
- *Blood-streaked* fluid is a result of a traumatic tap, abdominal trauma, or intra-amniotic hemorrhage.
- *yellow* color due to presence of bilirubin as an indicative of red blood cell hemolysis.
- *dark green* color from fetal intestinal secretions.
- *dark red-brown* fluid is associated with fetal death.

Tests for Fetal Distress

- ***Hemolytic Disease of the Newborn***
 - **anti-Rh antibody** production in postpartum mothers.
 - antibodies present in the maternal circulation cross the placenta and bind to the antigen on the fetal RBCs, the cells are destroyed.
 - Results is increasing in unconjugated bilirubin,



Tests for Fetal Distress... cont.

- ***Neural Tube Defects***
 - Increased levels of alpha-fetoprotein (AFP) (between 12 and 15 weeks)
 - When the skin fails to close over the neural tissue.
 - Causing anencephaly and spina bifida.

Tests for Fetal Maturity

- ***Fetal Lung Maturity***
 - complication of early delivery, lack of lung surfactant.
 - **lecithin** and **sphingomyelin** safe ratio is 2.0
 - Many laboratories have replaced the L/S ratio with **phosphatidyl glycerol** immunoassays, fluorescence polarization.

Tests for Fetal Maturity.... Cont.

- ***Foam Stability***

- Amniotic fluid is mixed with 95% ethanol, shaken for 15 seconds, and allowed to sit undisturbed for 15 minutes.
- surface of the fluid is observed for the presence of a continuous line of bubbles around the outside edge (phospholipid).