UNIT 6 part 5: Fetal Heart Circulation & Circulatory System Problems

Fetal Circulatory System
• Fetus is connected to the mother in the following pathway: umbilical cord, placenta, uterus

• \( O_2 \), nutrients, and wastes are exchanged at placenta (travel through umbilical cord)

• Oxygen rich blood from the placenta enters the fetus through the vein in the umbilical cord

• The vein brings the blood to the fetus’ inferior vena cava and the blood enters the right atrium

• The blood then flows through a special opening between the right and left atria called the foramen ovale

• Blood then passes into the left ventricle, and then the aorta

• About 1/3 of the blood entering the right atrium does not cross through the foramen ovale but flows into the pulmonary artery

• Because a large supply of blood is not needed in the lungs, most of the blood is shunted through a blood vessel bypass to the aorta called the ductus arteriosus

After Birth:
• Blood is sent to the lungs to pick up oxygen

• Increased oxygen levels & pressure in the ductus arteriosus cause the ductus arteriosus to close (within 4-10 days)

• The circulation in the lungs increases and more blood flows into the atrium of the heart. This increased pressure causes the foramen ovale to close and blood circulates normally

Problems in the Circulatory System:
• PFO (patent foramen ovale)
  – Foramen doesn’t close

• Heart Murmur
  – Leaking valve; sound: “hissing” or “swishing”

• Varicose Veins
  – Blood can flow backwards because veins are enlarged
  – Causes: 1) due to weakness in the walls of the vein & 2) valves that no longer work

• Angina Pectoris
  – Chest pain due to reduce flow of blood/oxygen to heart
• Myocardial Infarction (Heart Attack)  
  – Cellular death due to prolonged lack of blood/oxygen

• Atherosclerosis  
  – Arteries are narrowed by deposits

• Arteriosclerosis  
  – End stage of atherosclerosis where artery walls become calcified and hard

• Stroke  
  – Artery to the brain is blocked

• Bradycardia  
  – Resting heart rate that is slower than 60 beats/min

• Tachycardia  
  – Resting heart rate that is faster than 100 beats/min

• Hypertension: High Blood Pressure  
  – Sustained elevated arterial pressure of 140/90 or higher  
  – 90% of cases due to: diet, obesity, age, race, heredity, stress, smoking  
  – Asymptomatic for 10-20 years: “silent killer”

• Aneurysm: weakened arterial wall allows blood to pool

![Diagram of heart attack](image.jpg)  
![Diagram of blood flow](image.jpg)  
![Diagram of artery narrowing](image.jpg)  
![Diagram of aneurysm](image.jpg)

Image courtesy of W.L. Gore & Associates, Inc.