What is Portal Circulation?

Worksheet

Portal circulation is the route from gastrointestinal organs to the liver via the hepatic portal vein. It allows the liver to process absorbed nutrients and filter wastes before blood enters systemic circulation.

Questions

1. Which organ does NOT contribute blood to the hepatic portal vein?

A) Small intestine
B) Stomach
C) Spleen
D) Lungs

2. Why is portal circulation called a 'double capillary bed' system?

A) It has two livers
B) Blood passes through GI capillaries, then liver sinusoids before entering systemic circulation
C) It contains twice the blood volume
D) It uses two different oxygen sources

3. Flow rate through hepatic portal vein:

A) 0.5 L/min
B) 1.5 L/min
C) 5 L/min
D) 25 L/min

4. Portal circulation bypass example:

A) Increased cardiac output
B) Esophageal varices from portal hypertension
C) Increased arterial blood pressure
D) Pulmonary edema

5. After a meal, glucose absorbed from the small intestine enters the bloodstream via the portal vein. How does this differ from systemic circulation?

6. A patient takes an oral antibiotic. Why does the liver process it before it affects systemic infection?

7. Portal hypertension (high pressure in portal vein) causes esophageal varices. Why does blood back up into the esophagus?

8. Define: What is the hepatic portal vein?

9. Define: Why is portal blood oxygen-poor?

10. Define: Which vessels merge to form the hepatic portal vein?

Answer Key

1. D) Lungs - The lungs are part of pulmonary circulation. Portal blood comes from GI organs and spleen only.

2. B) Blood passes through GI capillaries, then liver sinusoids before entering systemic circulation - Portal blood flows through GI capillaries first, then through liver capillaries again.

3. B) 1.5 L/min - Portal blood flow is ~1.5 L/min.

4. B) Esophageal varices from portal hypertension - Portal hypertension causes blood to find alternative routes via portosystemic anastomoses.

5. Glucose-rich blood from intestine superior mesenteric vein hepatic portal vein liver sinusoids. Liver extracts ~50% for glycogen synthesis before releasing remainder to systemic circulation. In systemic circulation, glucose goes direct to tissues without hepatic first-pass.

6. Oral drug is absorbed in GI tract enters portal circulation travels to liver hepatocytes metabolize/detoxify it modified form enters systemic circulation reaches infected tissue. This is first-pass metabolism, unique to portal circulation.

7. Increased pressure in hepatic portal vein blocks normal outflow from spleen and GI tract alternative routes form (portosystemic anastomoses) blood shunts to esophageal veins varices form at lower pressure vessels.

8. The main vessel carrying nutrient-rich blood from GI organs and spleen directly to the liver (~1.5 L/min).

9. It drains the GI tract and spleen (which use oxygen) but has not yet passed through the lungs for re-oxygenation.

10. The superior mesenteric vein and splenic vein. The inferior mesenteric vein usually joins the splenic vein.