

## Hepatobiliary system

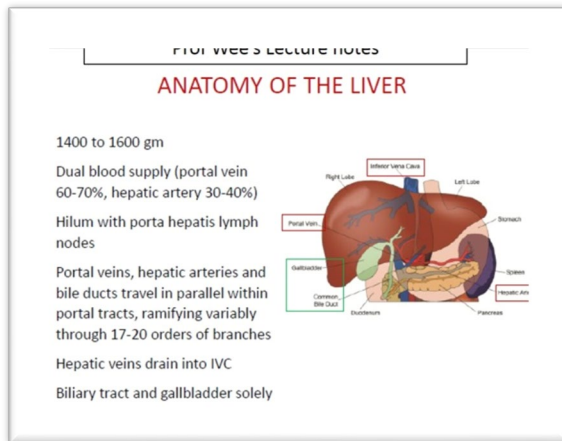
### Main structural components:

#### Gross:

- Liver, intra and extrahepatic bile ducts, common bile duct, gallbladder
- Portal and systemic vessels

#### Microscopic:

- Hepatocytes, bile duct cells (biliary tract epithelium), sinusoids
- Organisation : Lobules vs Acini



### Important pointers:

- Knowing the 2 main parenchymal cellular components helps make sense of the primary tumours that arise in the liver – hepatocellular or biliary epithelial (glandular) in origin.
- The liver is special because of dual blood supply:
  - o Portal vein (revise where it drains from!): main blood supply to liver
  - o Hepatic artery: supplies biliary tract; provides minor proportion of blood supply to liver

### Main functions of the liver

- **Metabolism**
  - Endogenous substances (lipids, carbohydrates, protein breakdown products)

- Exogenous substances (alcohol, drugs, toxins)
- **Synthesis of proteins**
  - Albumin, clotting factors. Note: think about how liver failure may present clinically if these synthetic functions are lost
- **Bile production**
  - Functions of bile – fat emulsification and hence absorption in gut; elimination of bilirubin and other waste products

Note: The biliary tract does NOT produce bile. Hepatocytes do. Biliary tract drains bile into the gut.

### Clinicopathologic correlates

1. Hepatic disease can have many clinical presentations:

- Systemic signs and symptoms – fever, jaundice, malnutrition with loss of weight, bleeding tendency, generalised oedema, malaise
- Localised signs and symptoms – pain, hepatomegaly

2. **4 main clinical manifestations** that are common symptom/signs complexes in liver disease. They have many causes, and can occur simultaneously.

1. **Hepatitis**
2. **Liver failure**
3. **Cirrhosis**
4. **Jaundice**

**Video mindmap** further explaining the **4 symptom complexes** in relation to **main liver functions**:

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/hepatobiliary-system/hepato-ii-clinicopathologic-correlates/>

3. **Blood investigations:** These include **liver function tests** and other tests for hepatic dysfunction.

Prof Wee's Lecture notes		
LABORATORY EVALUATION OF LIVER DISEASE		
Test category	Serum measurement	Tests
Hepatocyte integrity	Cytosolic hepatocellular enzymes <sup>^</sup>	Serum aspartate aminotransferase (AST) Serum alanine aminotransferase (ALT) Serum lactate dehydrogenase (LDH)
Biliary excretory function	Substances normally secreted in bile <sup>^</sup>	Serum bilirubin – Total, unconjugated (indirect) and conjugated (direct) Urine bilirubin Serum bile acids
	Plasma membrane enzyme (from damage to bile canaliculus) <sup>^</sup>	Serum alkaline phosphatase (ALP) Serum γ-glutamyl transpeptidase (GGT)
Hepatocyte synthetic function	Proteins secreted into the blood	Serum albumin <sup>*</sup> Coagulation factors: prothrombin (PT) and partial thromboplastin (PTT) times (fibrinogen, prothrombin, factors V, VII, IX, X)
Hepatocyte metabolism		Serum ammonia <sup>^</sup> Aminopyrine breath test (hepatic demethylation) <sup>*</sup>

<sup>^</sup> Increased in liver disease  
<sup>\*</sup> Decreased in liver disease

### Approach to main liver diseases

- **Aetiologic category**
  - Helps you to remember cause and pathogenesis (eg. Vascular; Infectious, Neoplastic etc)
- **Cellular/subcellular** and hence **functional** components affected (eg. hepatocytes; bile canaliculi; bile duct epithelium; central veins/sinusoids)
  - Helps to work out morphology (gross and micro)
  - Helps you work out clinical manifestations.
  - Eg. Alcoholic liver disease → abnormal lipid metabolism, free radicals, cytokines → steatosis, steatohepatitis → **necrosis of hepatocytes** → nodular regeneration of hepatocytes with fibrosis (Cirrhosis) → portal hypertension, eventual Liver failure

**Video mindmap** of liver diseases according to aetiology:

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/hepatobiliary-system/iii-main-diseases-approach/>

### Talking POTS

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/hepatobiliary-system/iv-liver-pots-approach/>

### Hepatobiliary system quiz

<https://medicine.nus.edu.sg/pathweb/pathology-demystified/hepatobiliary-system/hepatobiliary-system-quiz/>