

Liver Function Tests (LFT)

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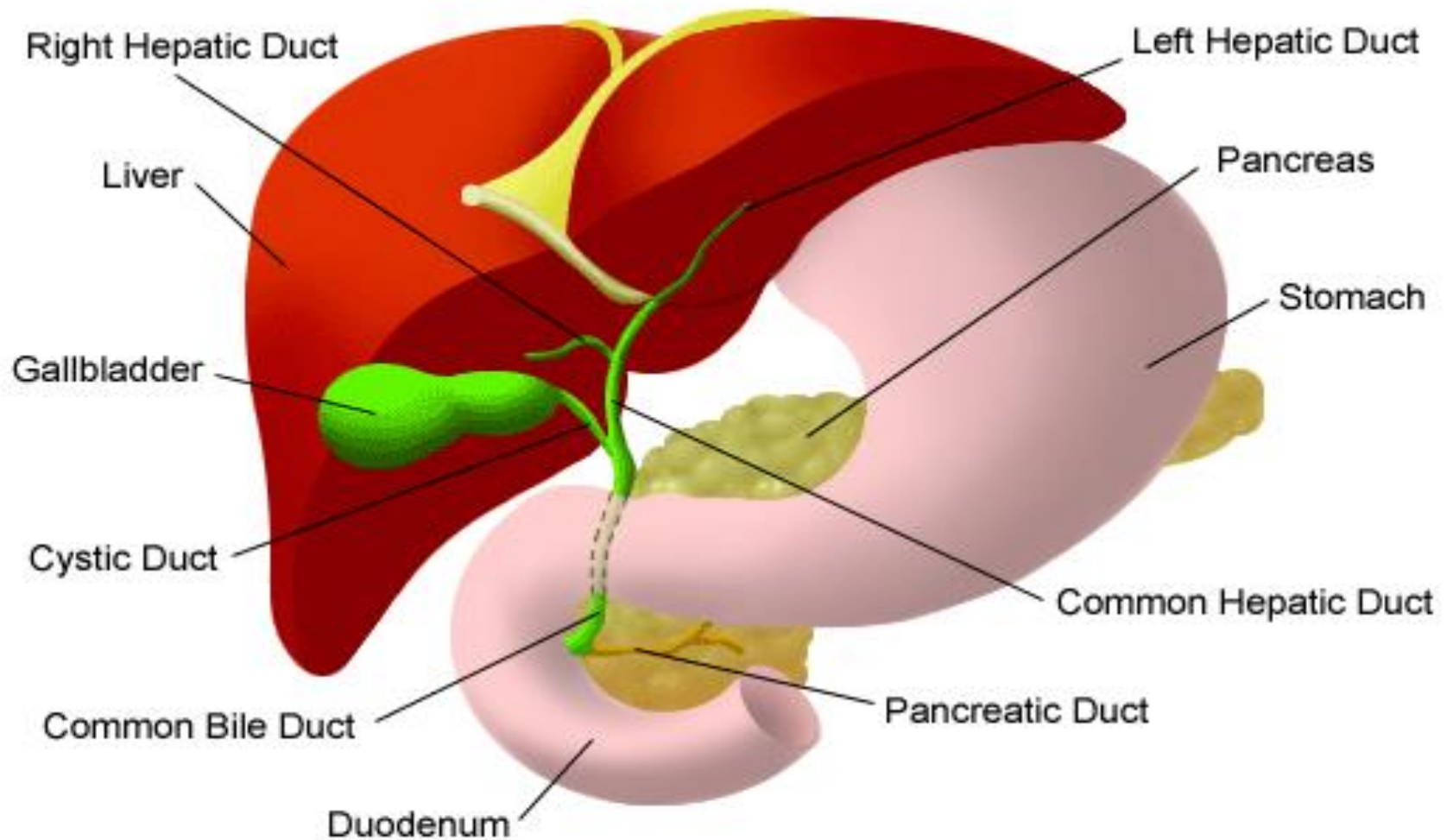
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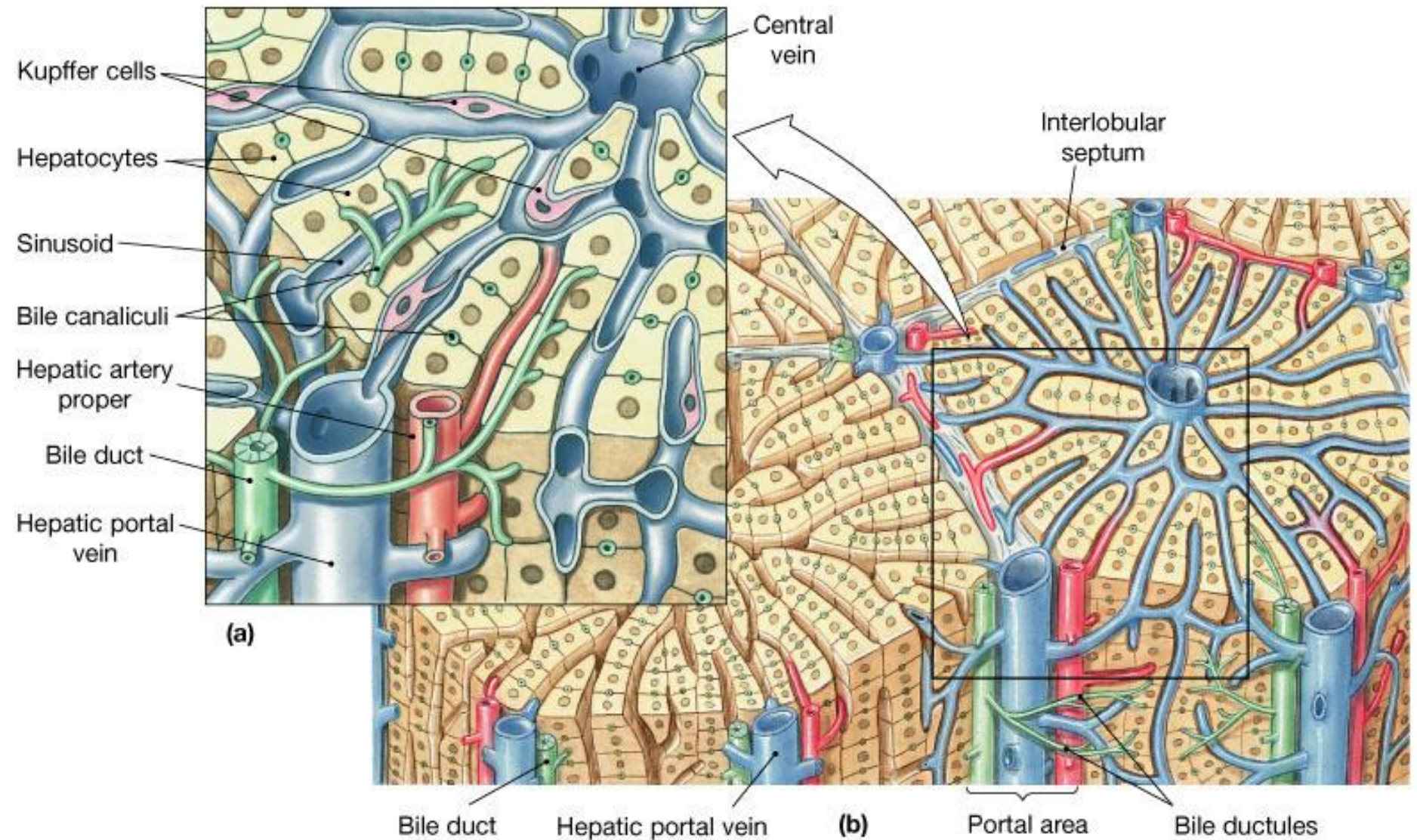
Liver Function Test

- Large functional reserve & Regenerative capacity.
- Weight : 1.2 to 1.5 kg. in adults.
- Consist of four lobes with gall bladder.
- Consists of two types of cells : Kuffer cells & Hepatocytes.
- Blood supply : Characterized by dual blood supply.

Biliary System



Liver Histology



Functions of the liver

- Metabolic function :
Carbohydrate, lipid, protein.
- Secretory & Excretory function.
- Synthetic function : Albumin,
Fibrinogen, Prothrombin.
- Detoxification & Protective function.
- Storage function : Vit. B 12 & Vit. A,
Glycogen.

LFT

- Functions of the liver often deranged in liver diseases. Several biochemical tests are routinely done in clinical laboratory to evaluate these functions which help in diagnosis & management of the liver diseases. These are referred to as **liver function tests**.

Indications :-

- To detect presence of liver diseases.
- To distinguish between different types of liver diseases.
- To evaluate the extent of liver damage.
- To follow the response to treatment.

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Classification of LFT' S

- Test based on excretory function
 1. Serum bilirubin – Total, conjugated & unconjugated.
 2. Urine bilirubin.
 3. Urine & faecal urobilinogen.
- Test based on Carbohydrate metabolism
 1. Galactose tolerance test.
 2. Fructose tolerance test.
- Test based on lipid metabolism.
 1. Total cholesterol.
 2. Free & Esterified cholesterol ratio.

➤ Test based on synthetic function

1. Total Protein & A / G Ratio.
2. Prothrombin time.

➤ Test based on detoxication function of liver

1. Hippuric acid test.

➤ Test based on foreign substances excretion

1. Bromosulphthlein test.
2. I^{131} Rose bengal test.

➤ Test based on serum enzymes derived from the liver.

1. Estimation of transaminases :
AST & ALT.
2. Estimation of Alkaline phosphatase.
3. Estimation of Gamma glutamyl transpeptidase (GGT).
4. Estimation of 5' Nucleotidase.
5. Estimation of Lactate Dehydrogenase.

Serum bilirubin :-

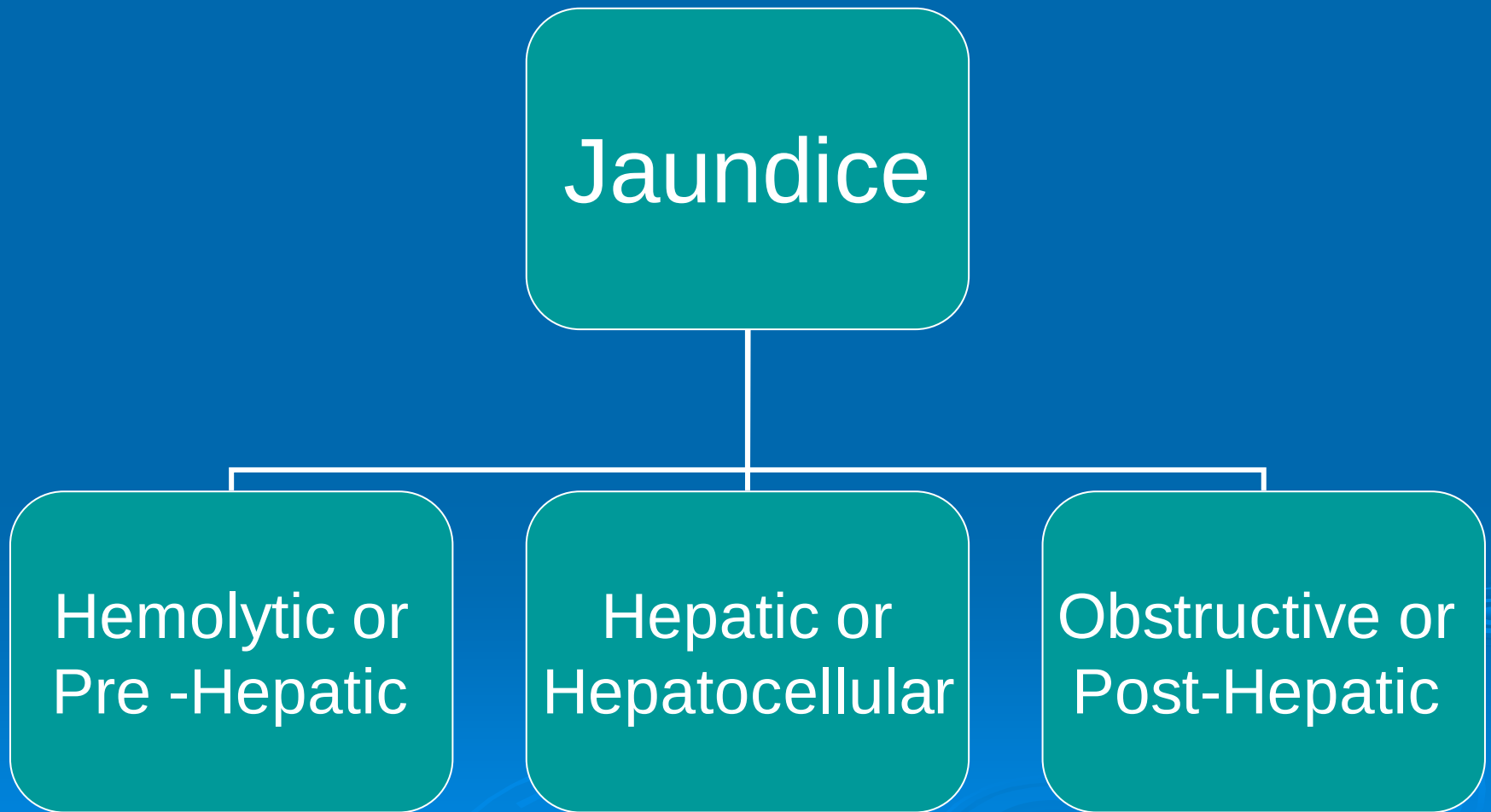
- Normal range – 0.2 – 1.0 mg %
- Estimated by **Van den Bergh** reaction.
- Principle :— Diazotized sulphanilic acid + Bilirubin → Azobilirubin $\Rightarrow$
- Help in diagnosis & prognosis of jaundice.
- To differentiate various types of jaundice.

- **Direct bilirubin** : reacted directly with reagent
- **Indirect bilirubin** : require addition of alcohol for color development
- Unconjugated bilirubin = indirect form
Conjugated bilirubin = bilirubin mono and di-glucoronides

Jaundice or Scleral Icterus



Types of jaundice :-



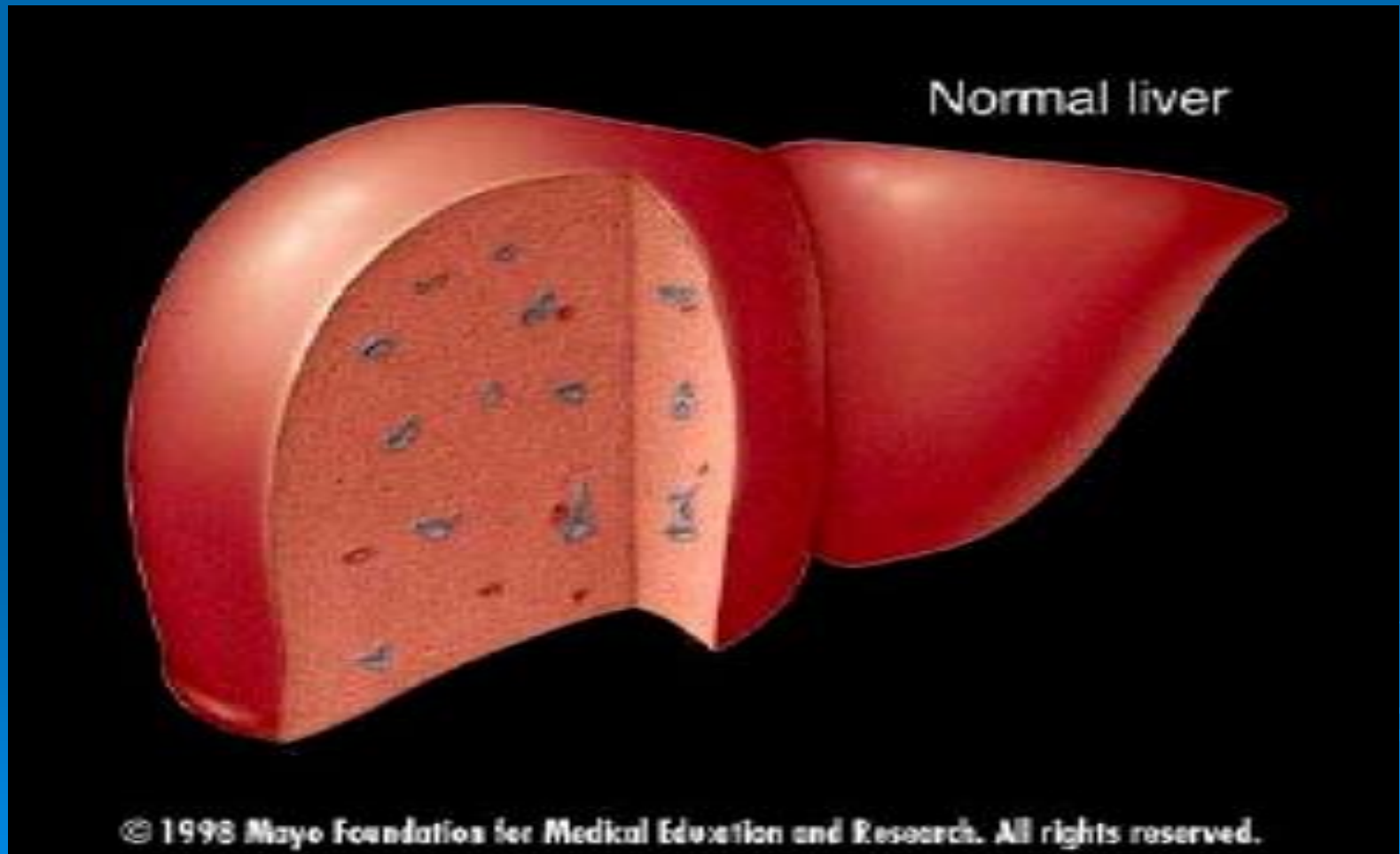
Hemolytic or Pre -Hepatic

- Due to excessive breakdown of the Hb.
- **Causes** :-Malaria, Incompatible blood transfusion, thalassemias, Hemolytic diseases of the new born.
- Liver cell unable to conjugate **excess unconjugated bilirubin. (Water insoluble)**
- Van den Bergh reaction is **Indirect positive**

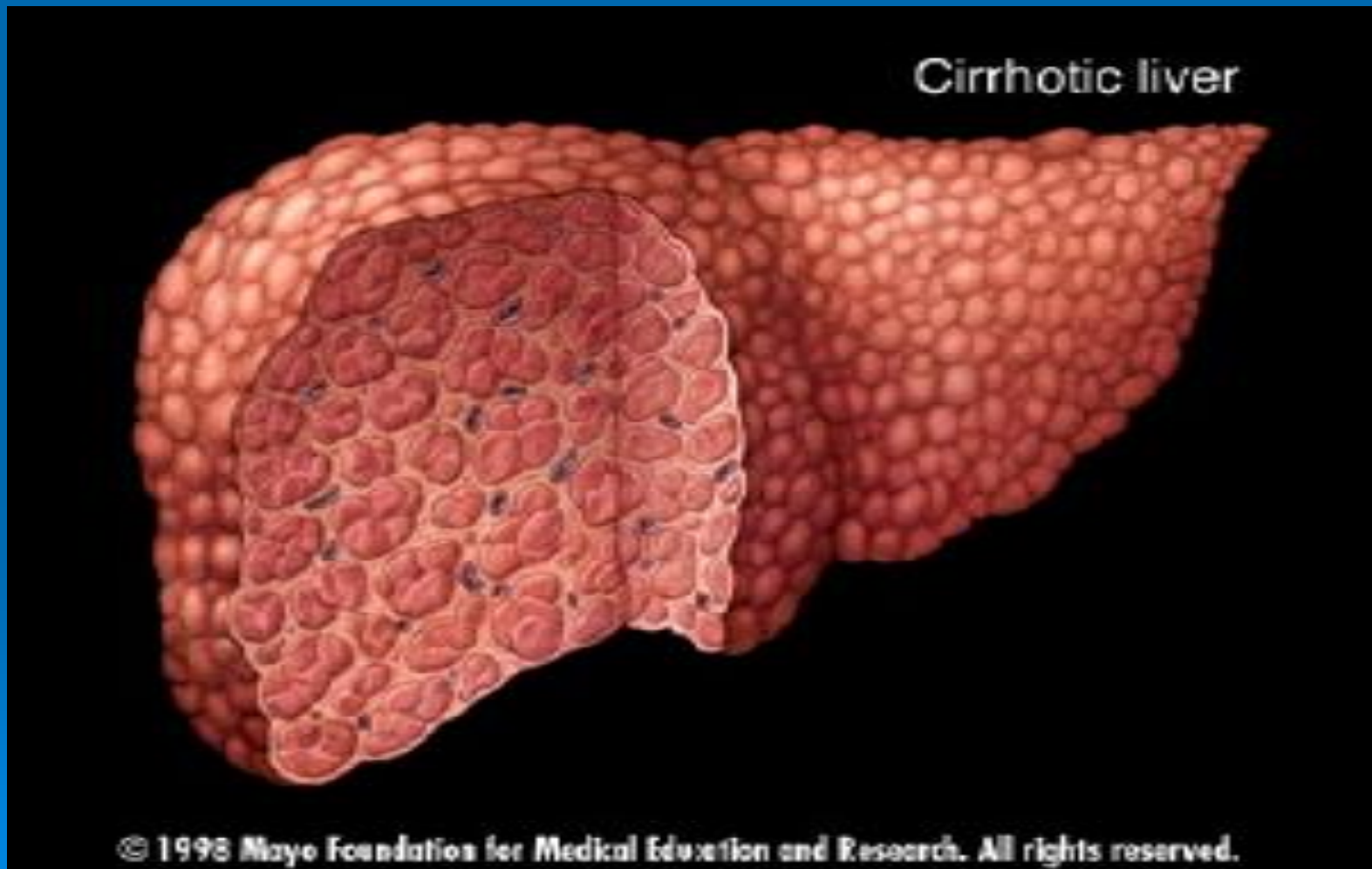
Hepatic or Hepatocellular

- Due to damage of parenchymal cell.
- **Causes** :- Viral & toxic hepatitis, liver cirrhosis,
- Uptake & Conjugation affects.
- **Increased level of conjugated as well as unconjugated bilirubin.**
- Van den Bergh reaction is **Biphasic**

Normal Liver



Cirrhotic Liver



Obstructive or Post-Hepatic

- Due to an obstruction in the bile duct.
- **Causes** :-Stones in gall bladder or bile duct, carcinoma of head of pancreas.
- Increased concentration of **conjugated bilirubin. (Water soluble)** in serum.
- Van den Bergh reaction is **direct positive**

Test based on serum enzymes derived from the liver

- **AST & ALT** :- present in cytoplasm, ↑ in liver damage.
- **ALP** :- Found in cell lining the bile canaliculi & normally excreted in bile. Large ↑ found in post hepatic jaundice.
- **GGT** :- Hepatic microsomal enzyme, advocated as screening test for alcohol abuse.
- **5'Nucleotidase** :- Microsomal & cell membrane localized enzyme. ↑ in hepatobiliary diseases.
- **LDH** :- Localised in cytoplasm of hepatic cell.
↑ activity of LD₅ in serum is an indicator of liver diseases.

Test based on synthetic function

- **Total protein & A/G ratio** :- Half life of albumin is about 15-20 days.
- Low serum albumin is indicative of chronic liver diseases.
- Liver cirrhosis causes **reversal of A/G ratio**.
- **Prothrombin time** :- Synthesised by the liver.
- Useful to assess acute as well as chronic liver diseases.

Test based on lipid metabolism

- **Serum cholesterol** :- Chronic diseases associated with parenchymal cell destruction may causes low values
- **Free & esterified ch.ratio** :-Intra hepatic diseases are characterised by increase in free cholesterol.

Test based on Carbohydrate metabolism

- **Galactose tolerance test** :- Exclusively metabolised by the liver.
- Liver function assessed by utilization of galactose
- Half life of galactose markedly elevated in hepatocellular damage, infective hepatitis, liver cirrhosis.

Test based on foreign substances excretion

- **BSP Test** :- Assess the excretory function of liver.
- Mild impairment of liver cell will cause an increase in BSP retention.

Test based on detoxification function of liver

- **Hippuric acid synthesis test** :-Assess the detoxification function of liver.
- Hippuric acid produced in the body when benzoic acid combines with glycine.
- A reduction in hippuric acid excretion $<3\text{g}$ indicates hepatic damage.

LFT's(Examples)

- T bili - 4.0
 - Direct - 0.5
 - Indirect - 3.5
- ALT - 26
- AST - 56
- T Protein - 6.2
 - Alb - 4.0
 - Glob - 2.2

Diagnosis ? - Haemolytic Jaundice

LFT's (Examples)

- T bili - 12.0
 - Direct - 9.5
 - Indirect - 2.5
- ALT - 2600
- AST - 1540
- T Protein - 6.2
 - Alb - 4.0
 - Glob - 2.2

Diagnosis ? - Ac Viral hepatitis



Thank You