Al-Mustansiriyah University

College of Medicine

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Lab No. 14

Serum Bilirubin

Billirubin (BR) is a yellow-orange pigment which gives the serum its characteristics yellow color. At the end of their life span red blood cells are broken down by the reticuloendothelial system, mainly in the spleen .The released hemoglobin is split into globin, which enters the general protein pool and haem, which is converted to billirubin after removal of iron. The iron is reutilized.

About 80 percent of billirubin is derived from the breakdown of haem within the reticuloendothelial system. Other sources include breakdown of immature red cells in the bone marrow and of compounds chemically related to hemoglobin, such as myoglobin and the cytochromes.

The resulting BR is insoluble in water but soluble in lipid and in the organic solvents, it is carried by albumin and circulates in blood to reach the liver where conjugated with **glucuronic acid**. **The conjugated billirubin** is soluble in water and is excreted in the bile but some of it regurgitates into circulation and if exceeds 0.4 mg/100ml then appears in urine.

Conjugated BR reacts with diazo reagent **(Diazotized sulphanlic acid)** to give a purple color and said to have direct Van Den Berg reaction.

Unconjugated BR, as it is insoluble in water, does not react with Diazo reagent but if methanol is added then it gives the reaction so is said to have **indirect Van Den Berg reaction.**

Normal Range: **Total serum billirubin = 0.3-1.1 mg/dl**

Direct billirubin = 0.1-0.4 mg/dl

Indirect billirubin = 0.2-0.7 mg/dl

Clinical Significance

Increased serum billirubin may result from:

1) Increased destruction of hemoglobin (hemolytic)
2) Decreased excretion (or retention) due to either hepatocellular or excretory duct disease of the liver.

Jaundice is manifested clinically when total serum billirubin exceeds 2 mg/dl.

It is classified into:

1.Pre-hepatic jaundice (hemolytic or choluric), is due to:

a- Overproduction of billirubin ,as in:

1- Hemolytic anemia.

2- Incompatible blood transfusion.

3- Hemolytic disease of the newborn due to Rh-incompatibility where total serum billirubin may exceed 20mg/dl and may cross blood brain barrier causing **kernicterus**. In most other hemolytic conditions with normal liver function the serum billirubin rarely exceed 5mg/dl.

b.Transport Defects

Either at the level of carrying capacity of the blood as in the case of neonates exposed to sulphonamides or the defect is at the level of uptake by the liver (Gilbert's Disease)or at the level of conjunction (Grigler-Najjar's syndrome).

1. **Hepato-cellular jaundice**

Disease of the parenchymal cells of the liver may impair conjugation and excretion of billirubin to various degrees:

a. Congenital: Grigler-Najjar's syndrome (**Impaired conjugation**)

Dubin-Johnson's syndrome (**Impaired excretion**).

b. Premature enzymatic system as in physiological jaundice of the newborn.

C. **Hepatitis:**

1. Due to toxic agents: paracetamol, alcohol.

2. Due to infective agents: viral hepatitis, Septicemia.

3. Post-hepatic (obstructive, cholestasis):

May be medical (**Intra-hepatic**) or surgical (**extra-hepatic**).

Intrahepatic cholestasis occurs in infectious hepatitis, cirrhosis, Intrahepatic carcinoma and on intake of drugs such as phenothiazines and methyl testosterone.

Extra-hepatic cholestasis is caused by mechanical obstruction of the biliary tree mostly due to gallstones or carcinoma of the head of pancreas.