

Liver Function Test (Bilirubin)



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“The liver is one of the major metabolic organs, which performs many essential biological functions such as removing toxins from the body and synthesizing proteins and biochemicals necessary for digestion and growth.”

—Liver

Major Metabolic Functions of the Liver

01

Synthetic Function

Plasma proteins (**albumin**,
globulins), **cholesterol**,
triglycerides and **lipoproteins**

02

Detoxification and Excretion

Ammonia to Urea (**Urea Cycle**),
bilirubin, Cholesterol, Drug metabolites.

03

Storage Function

Glycogen, Vitamins A, D, E,
K and B12

04

Production of bile salts

Helps in digestion

Liver Function Tests

Blood Tests are used to help **diagnose** and **monitor liver disease or damage**, the tests measure the levels of certain enzymes and proteins in your blood, some of these tests measure how well the liver is performing its normal functions of producing protein, and other liver function tests measure enzymes that liver cells release in response to damage or disease.

Abnormal liver function test results do not always indicate liver disease.

Why it is Done?

Liver function tests can be used to:

- Screen for liver infections, such as **hepatitis**.
- Monitor the progression of a disease, such as **viral or alcoholic hepatitis**, and determine how well a treatment is working.
- Measure the **severity of a disease**, particularly scarring of the liver (cirrhosis), Monitor possible side effects of medications.
- Liver function tests **check** the levels of **certain enzymes and proteins in the blood**, levels that are higher or lower than normal can indicate liver problems.

Some common liver function tests include



Bilirubin

Total Bilirubin Test



ALP

Alkaline Phosphatase



ALT

Alanine Transaminase



AST

Aspartate Transaminase

01



Total Bilirubin Test

Total Serum Bilirubin,
(TSB)

What is this test?

This is a blood test that measures the amount of a substance called **bilirubin**, this test is used to find out how well the liver is working, it is often part of a panel of tests that measure liver function, a small amount of bilirubin in your blood is normal, but a high level may be a sign of liver disease.

Types of Bilirubin

Direct (Conjugated) Bilirubin

This is bilirubin that has been processed by the liver and is water-soluble.

Indirect (Unconjugated) Bilirubin

This form has not yet been processed by the liver and is fat-soluble.

Total Bilirubin

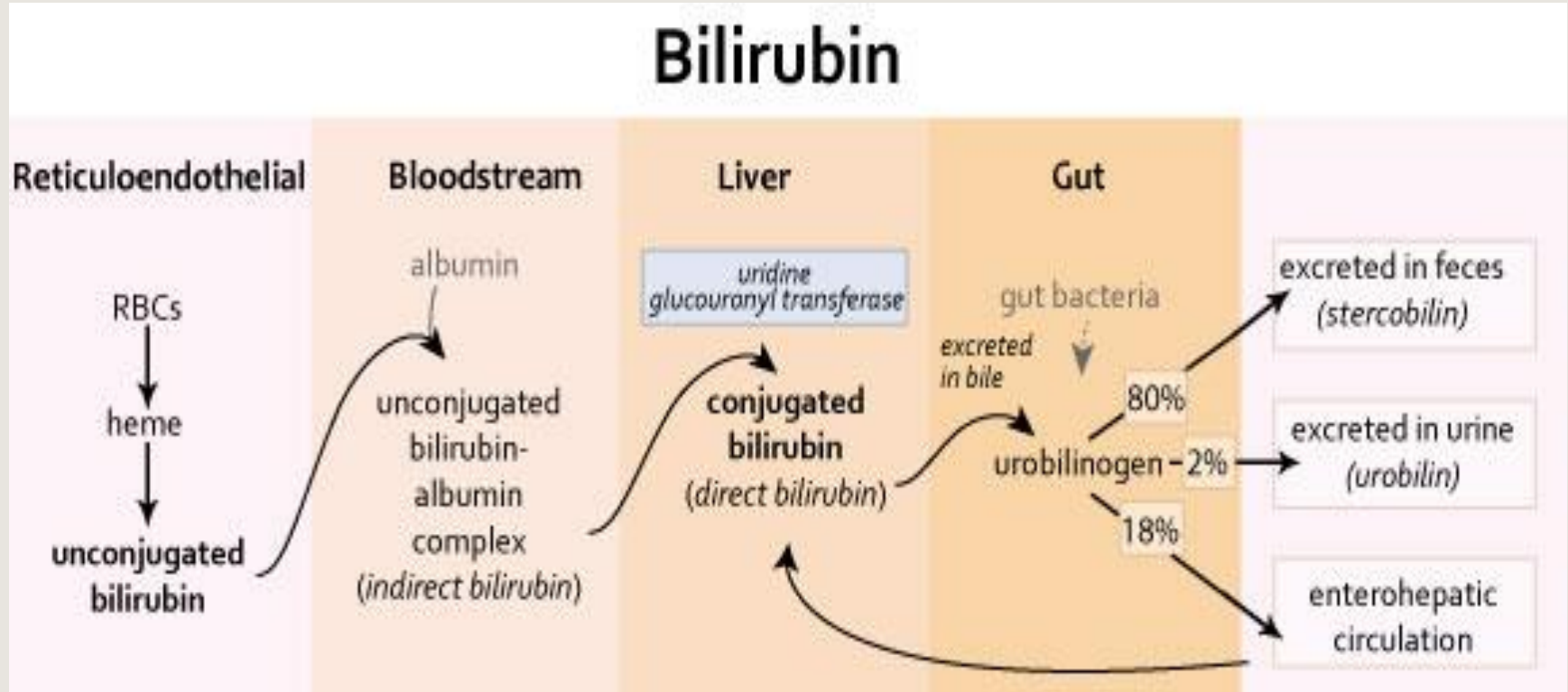
This is the sum of direct and indirect bilirubin.



Formation of Bilirubin

The liver makes bile to help you digest food, and bile contains bilirubin, most bilirubin comes from the body's normal process of breaking down old red blood cells, a healthy liver can normally get rid of bilirubin, but when you have liver problems, bilirubin can build up in your body to unhealthy levels, bilirubin is a reddish-yellow pigment made during the normal breakdown of red blood cells.

Excretion Pathway of Bilirubin

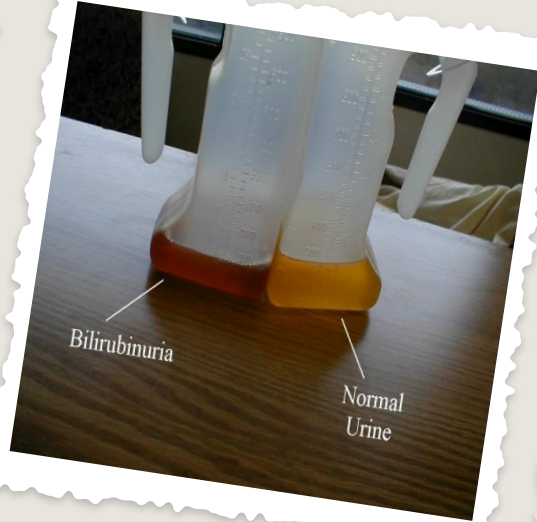


Symptoms of High Bilirubin Levels

Signs and symptoms of high bilirubin levels in adults vary with the underlying cause; however, symptoms usually include:



Yellowing of the skin and whites of the eyes (jaundice)



Dark urine



Fatigue and weakness

Symptoms of High Bilirubin Levels



Unintentional weight loss



Abdominal pain and swelling

Symptoms Serum and Urine.



Unconjugated Bilirubin and Conjugated Bilirubin

Unconjugated Bilirubin

- 1- Present normally in plasma.
- 2- Attached non-covalently to albumin.
- 3- Has a high molecular weight and can not be filtered through the kidney.
- 4- Nonpolar, insoluble in plasma and can cross the brain barrier in neonates causing brain damage.
- 5- Gives indirect van den Bergh reaction.

Conjugated Bilirubin

- 1- Present normally in bile.
- 2- Conjugate to glucuronic acid.
- 3- has a small molecular weight and can be filtered through the kidney if present in plasma.
- 4- polar, soluble in plasma and can not cross the brain barrier
- 5- Gives direct van den Bergh reaction.

Bilirubin

- High bilirubin levels in adults usually mean that there may be an underlying problem involving the red blood cells, liver, or gallbladder.
- Symptoms of high bilirubin levels in newborns are skin and/or scleral jaundice.
- High bilirubin levels in a newborn mean that the neonate is not processing red cell breakdown effectively or an underlying cause is responsible.
- a high bilirubin level may affect the brain, lead to deafness, and cause intellectual or developmental disabilities.

What Do Test Results Mean

Bilirubin results depend on age, gender, and health

Less Than 1 (mg/dL)

Normal bilirubin levels are generally less than 1 (mg/dL).

Greater Than 2.5 (mg/dL)

Adults with jaundice have typically bilirubin levels greater than 2.5 (mg/dL)

Greater Than 15 (mg/dL)

In an otherwise healthy newborn, bilirubin levels greater than 15 mg/dL may cause problems.

Bilirubin Form	Normal Value
Total (elderly/Adult)	0.2 — 0.8 mg/dl
Newborn	0.8 — 12 mg/dl
Critical Value(adult)	>12 mg/dl
Critical Value (Newborn)	>15 mg/dl
Fecal urobilinogen	40 – 280 mg/dl
Urine	0.0 – 0.02 mg/dl

How Do I Get Ready For This Test?

Follow instructions about not eating or drinking before the test, and ask the patients about all medicines, herbs, vitamins, and supplements are taking.

Causes of Abnormal Results

—liver diseases,
like hepatitis

—Cirrhosis,
which is scarring
of the liver

—Biliary Stricture

—Cancer of the
Gallbladder,
Pancreas or Liver

—Gallstones

Drug Toxicity

Jaundice in Newborn

“Jaundice in newborn babies is common and usually harmless, it causes yellowing of the skin and the whites of the eyes, the medical term for jaundice in babies is **neonatal jaundice**. ”



Procedure of Bilirubin Test

Procedure for total Bilirubin

	Reagent blank	Sample blank	Sample	standard
DW	100 u	-	-	-
Sample	-	100 u	100 u	
Standard	-	-	-	100 u
Reagent (AT)	-	1 ml	-	-
Working reagent	1 ml	-	1 ml	1ml

2. Mix thoroughly and let stand the tubes for 2 min at room temperature.
3. Read the absorbance of the sample blanks at 540 nm against DW
4. Read the absorbance of the sample and standard at 540 nm reagent blank.

Liver Function Test (Bilirubin) !

Do You Have Any Questions?



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