



AL-Mustaqbal University College

**Medical laboratory Techniques
Department**

Clinical Biochemistry

**Lecture (5)
(liver functions)**



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Liver is largest and most complex internal organ . All blood flow fm intestine and pancreas reaches liver via portal venous system. Liver is a multifunctional organ that is involved in diverse body functions.

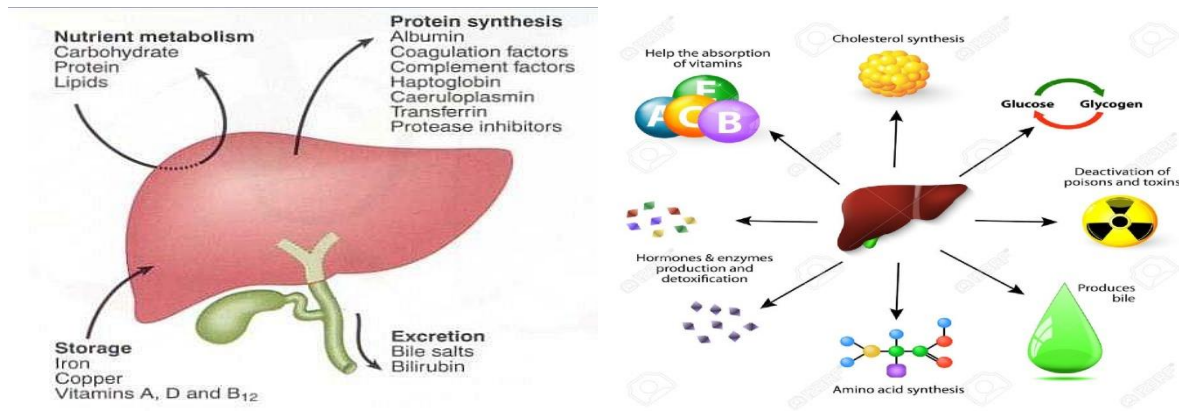


Figure 1. Liver functions

a. **Metabolic Functions** :-

Liver actively participates in carbohydrate metabolism, lipid, protein, mineral and vitamin metabolisms.

b. **Excretory Functions:-**

Bile pigments, bile salts and cholesterol are excreted in bile into intestine.

c. **Protective functions & detoxification:-**

Kupffer cells of liver perform phagocytosis to eliminate foreign compounds. For example ammonia is detoxified to urea and metabolism of xenobiotics (detoxification). Clearance of hormones such as insulin, parathyroid hormone, oestrogen, cortisol .

d. **Hematological and synthetic functions:-**

- Liver participates in formation of blood (particularly in fetus)

- Synthesis of plasma proteins (albumin and prothrombin), hormones e.g angiotensinogen, insulin-like growth factor and triiodothyronine.
- Destruction of erythrocytes (Bilirubin)

e. **Storage functions:-** Glycogen, vitamins A, D and B₁₂.

f. **Serum enzyme:-** Acting as markers of liver damage.

Liver Function Tests?

liver function tests are blood tests used to help diagnose and monitor liver disease or damage. The tests measure the levels of certain enzymes and proteins in the blood.

Some of these tests measure how the liver performs its normal functions of producing protein and getting rid of bilirubin, a product of blood waste. Other liver function tests measure enzymes that liver cells release in response to damage or disease.

Abnormal liver function test results don't always indicate liver disease.

Why is this being done?

Liver function tests may be used to:

1. Screening for liver diseases, such as hepatitis.
2. Monitoring the development of a disease, such as viral or alcoholic hepatitis, and determining the effectiveness of a treatment.

3. Evaluation of the severity of a disease, particularly scarring of the liver (cirrhosis).
4. Monitor possible side effects of medications.

Why do I need liver function testing?

You may need liver function testing if you have symptoms of liver disease. **These include:**

- Jaundice, a condition that causes your skin and eyes to turn yellow
- Nausea and vomiting
- Diarrhea
- Abdominal pain
- Dark-colored urine
- Light-colored stool
- Fatigue

liver function tests check levels of certain enzymes and proteins in the blood. Levels that are higher or lower than normal could indicate liver problems. **Some common liver function tests include:**

1. **ALT**. ALT is an enzyme found in the liver that helps convert proteins into energy for liver cells. When liver damage occurs, ALT is released into the bloodstream and levels rise.
2. **AST**. AST is an enzyme that helps metabolize amino acids. As with the ALT, AST is usually found in the blood at low levels. Increased AST levels may indicate liver damage, disease, or muscle damage.

3. The enzyme alkaline phosphatase (ALP).(ALP) is an enzyme found in the liver and bones that is important for the breakdown of proteins. Higher than normal levels of the enzyme alkaline phosphatase (ALP) may indicate liver damage or disease, such as a blocked bile duct or some bone disease.
4. **Albumin and total protein.** Albumin is one of several proteins that are produced in the liver. Your body needs these proteins to fight infection and perform other functions. Lower than normal levels of albumin and total protein may indicate liver damage or disease.
5. **Bilirubin.** Bilirubin is a substance produced during the normal breakdown of red blood cells. Bilirubin passes through the liver and is excreted in the stool. High levels of bilirubin (jaundice) may indicate liver damage, a disease, or certain types of anemia.
6. **Gamma-glutamyltransferase(GGT).** (GGT) is an enzyme found in the blood. Levels higher than normal may indicate damage to the liver or bile duct.
7. **LD.** LD is an enzyme found in the liver. High levels may indicate liver damage, but these levels may be elevated as a result of many other disorders.
8. **Prothrombin time (PT).** (PT) is the time it takes your blood to clot. An increased prothrombin time (PT) may indicate liver damage, but the time may also increase if you are taking certain blood-thinning medications, such as warfarin.

Normal blood test results for typical liver function tests include:

- ✓ ALT. 7 to 55 (units / liter)
- ✓ AST. From 8 to 48 (units / liter)
- ✓ (ALP). 40 to 129 (units / liter)
- ✓ Albumin. 3.5 to 5.0 (g / dL)

- ✓ Total protein. 6.3 to 7.9 (g / dl)
- ✓ Bilirubin. 0.1 to 1.2 (mg / dL)
- ✓ (GGT). From 8 to 61 (units / liter)
- ✓ LD. From 122 to 222 (units / liter)
- ✓ Prothrombin time (PT). 9.4 to 12.5 seconds

These results are typical for adult men. Normal results vary from laboratory to laboratory and may be slightly different for women and children.

What do the results mean?

If one or more of the liver function test results were not normal, it may mean the liver is damaged or not working properly. Liver damage can be caused by a number of different conditions, including:

1. Hepatitis A
2. Hepatitis B
3. Hepatitis C
4. Alcohol use disorder, which includes alcoholism.
5. Liver cancer
6. Diabetes

Metabolism of Bilirubin:-

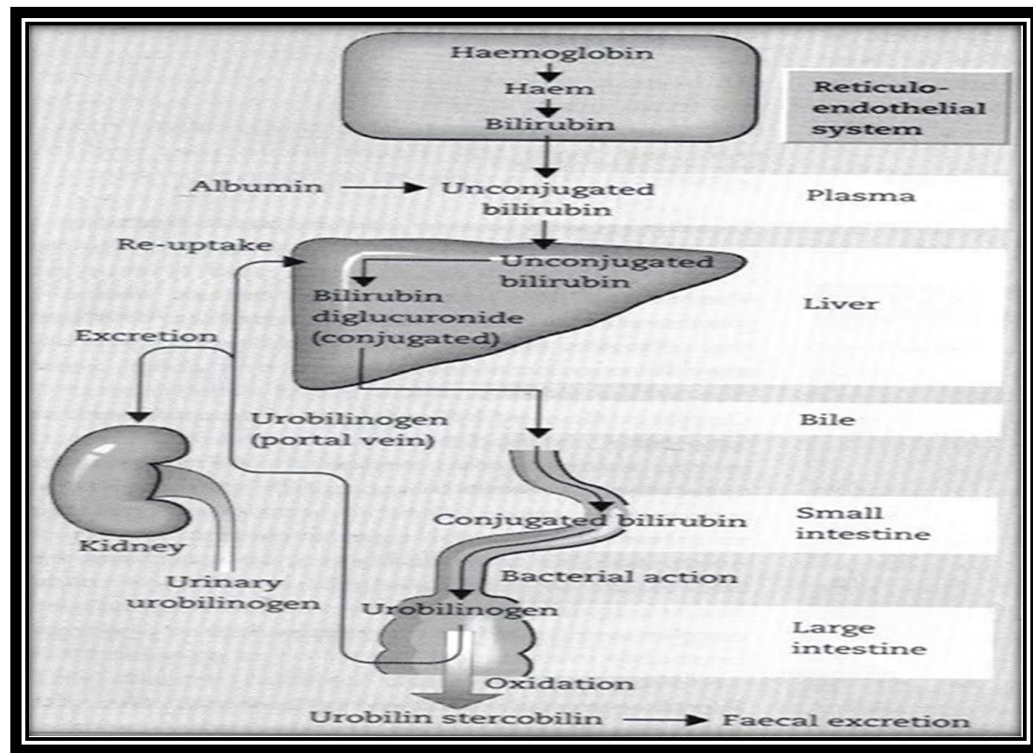


Figure 2. Metabolism of Bilirubin.

References

- Lippincott's Illustrated Reviews Biochemistry: 6th edition, Unit IV, Chapter 21, Pages 282 - 285.
- Lecture notes: Clinical Biochemistry: 9th edition, Chapter 13, Pages 174 - 187.
- Clinical Chemistry - Techniques, Principales and Correlations: 6th edition, Chapter 24, Pages 520 -521.