

## Unit 12

# ORGAN FUNCTION TESTS

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### ORGAN FUNCTION TESTS

Organ function tests are essential diagnostic tools used by healthcare professionals to assess the health and functionality of various organs and systems within the human body.

#### TYPES OF ORGAN FUNCTION TEST

##### 1. Kidney Function Tests

Include tests like serum creatinine, blood urea nitrogen (BUN), estimated glomerular filtration rate (eGFR), and urinalysis to assess kidney function, filtration rate, and electrolyte balance.

##### 2. Liver Function Tests (LFTs)

Assess the function of the liver by measuring levels of enzymes (such as ALT, AST, ALP), bilirubin, albumin, and other markers in the blood.

##### 3. Thyroid Function Tests

Measure levels of thyroid hormones (T3, T4) and thyroid-stimulating hormone (TSH) to evaluate thyroid gland function and diagnose thyroid disorders like hypothyroidism and hyperthyroidism.

##### 4. Pancreatic Function Tests

Evaluate pancreatic health by measuring levels of enzymes such as amylase and lipase in the blood, as well as glucose levels to assess insulin secretion.

##### 5. Pulmonary Function Tests (PFTs)

Measure lung function, capacity, and gas exchange through tests like spirometry, lung volume measurement, diffusion capacity, and arterial blood gas analysis.

##### 6. Gastrointestinal Function Tests

Evaluate digestive system function using tests such as gastric emptying studies, fecal occult blood tests, stool analysis, and imaging studies like endoscopy or colonoscopy.

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## 7. Neurological Function Tests

Include neurological examinations, imaging studies (e.g., MRI, CT scan), electromyography (EMG), and nerve conduction studies to assess nerve function, brain activity, and muscle function.

## KIDNEY FUNCTION TESTS

The kidneys play a crucial role in maintaining overall health by filtering waste products and excess fluids from the blood, regulating electrolyte balance, controlling blood pressure, and producing hormones essential for red blood cell production and bone health.

## FUNCTIONS OF THE KIDNEYS

1. **Filtration:** The kidneys filter waste products, toxins, and excess substances from the bloodstream, excreting them as urine.
2. **Fluid Balance:** They regulate the body's fluid balance by adjusting urine production according to hydration status and fluid intake.
3. **Electrolyte Balance:** The kidneys maintain proper levels of electrolytes such as sodium, potassium, calcium, and phosphate in the bloodstream.
4. **Blood Pressure Regulation:** They help regulate blood pressure by controlling the volume of blood and releasing hormones like renin, which regulates blood pressure and volume.
5. **Acid-Base Balance:** The kidneys regulate the body's acid-base balance by excreting hydrogen ions and reabsorbing bicarbonate ions.
6. **Hormone Production:** They produce hormones like erythropoietin, which stimulates red blood cell production, and calcitriol, the active form of vitamin D, which regulates calcium absorption and bone health.

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## TESTS TO ASSESS KIDNEY FUNCTION

### Serum Creatinine

Creatinine is the waste product of creatine, which the muscles use to make energy. Typically, creatinine travels in the blood to the kidneys, where it leaves the body in the urine. High levels in the blood might indicate that the kidneys are not working correctly, while low levels can occur with low muscle mass.

Normal Level

- Male : 0.7–1.2 milligrams per deciliter (mg/dL)
- Female : 0.5–1.0 milligrams per deciliter (mg/dL)

### Causes high creatinine levels

#### 1. Chronic kidney disease

When kidneys are damaged, they have trouble removing creatinine from the blood, and levels rise.

#### 2. Kidney obstruction

A blockage in urine flow, such as an enlarged prostate or kidney stone, could cause kidney obstruction.

This blockage can create a backup of urine into the kidney and impair the kidney's ability to function correctly. The medical term for this condition is hydronephrosis.

#### 3. Increased consumption of protein

What a person eats can affect creatinine levels.

For example, proteins and cooked meat contain creatinine, so eating more than the recommended amount of meat or other proteins for a person's activity levels can cause Trusted Source high creatinine levels after eating.

#### 4. Intense exercise

Creatinine is present in the muscles and helps them produce energy. Both dehydration and muscle breakdown from exercise may cause an increase Trusted Source in blood creatinine levels.

#### 5. Certain medications

Antibiotics, such as trimethoprim, and H2 blockers, such as cimetidine, can cause a temporary increase in measured serum creatinine levels.

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## Blood Urea Nitrogen (BUN)

- BUN measures the amount of nitrogen in the blood that comes from urea, a byproduct of protein metabolism. Elevated BUN levels can indicate impaired kidney function or dehydration.
- **Normal range:** In general, around 6 to 24 mg/dL (2.1 to 8.5 mmol/L).

### CAUSES OF HIGH BUN

#### 1. Kidney Disease or Dysfunction

- If the kidneys are not functioning properly, they may not adequately filter urea nitrogen, leading to elevated BUN levels.
- Chronic kidney disease, acute kidney injury, or conditions that reduce blood flow to the kidneys (such as dehydration or heart failure) can all result in high BUN levels.

#### 2. Dehydration

- When the body is dehydrated, there is less fluid available to dilute urea nitrogen in the blood, leading to higher BUN levels.
- Dehydration can be caused by various factors, including insufficient fluid intake, excessive sweating, vomiting, diarrhea, or certain medications.

#### 3. Heart Failure

- Heart failure can cause reduced blood flow to the kidneys, leading to decreased kidney function and elevated BUN levels.
- Additionally, heart failure can result in fluid retention, which can also contribute to elevated BUN levels due to dilutional effects.

#### 4. Gastrointestinal Bleeding

Conditions that cause gastrointestinal bleeding, such as ulcers, gastritis, or inflammatory bowel disease, can lead to increased absorption of nitrogen from the gastrointestinal tract, subsequently raising BUN levels.

#### 5. High Protein Diet or Increased Protein Breakdown

Consuming a diet high in protein or conditions that result in increased breakdown of protein (such as severe burns, trauma, or certain infections) can lead to elevated BUN levels due to increased production of urea nitrogen.

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## 6. Obstruction of Urinary Tract

Any obstruction in the urinary tract, such as kidney stones or tumors, can impair kidney function and lead to elevated BUN levels.

### OTHER TEST FOR KIDNEY FUNCTION

1. Estimated Glomerular Filtration Rate (eGFR): eGFR estimates the kidneys' filtration rate based on serum creatinine levels, age, gender, and other factors. A lower eGFR indicates decreased kidney function.
2. Urinalysis: Examination of urine for abnormalities such as proteinuria (presence of protein), hematuria (presence of blood), leukocytes (indicative of infection), and specific gravity (reflects urine concentration).
3. Urine Albumin-to-Creatinine Ratio (ACR): ACR measures the amount of albumin (protein) in the urine relative to creatinine. Elevated levels indicate kidney damage, especially in diabetic patients.

### LIVER FUNCTION TEST

Liver function tests (LFTs) are a group of blood tests commonly performed to assess the health and function of the liver. These tests help in diagnosing liver diseases, monitoring the progression of liver conditions, and evaluating the effectiveness of treatment.

### WHY IT IS PERFORMED

1. Screening for infections: LFTs can help screen for liver infections, such as hepatitis.
2. Monitoring diseases: LFTs can help monitor diseases, such as viral or alcoholic hepatitis, and determine how well a treatment is working.
3. detecting serious disease: LFTs can help look for signs of serious disease, particularly scarring of the liver, called cirrhosis.
4. detecting alcohol ingestion: LFTs can be used to detect alcohol ingestion.

### COMMON TEST FOR LFT

#### Liver Enzyme Tests

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**Alanine Transaminase (ALT)** is an enzyme mainly found in your liver. The ALT test measures the level of ALT in your blood. Consistently high levels of ALT in your blood can be a sign of liver damage.

**Aspartate Transaminase (AST)** is an enzyme found in large amounts in your liver and other parts of your body. The AST test measures the level of AST in your blood. High levels of AST can be a sign of liver damage.

## **Alkaline Phosphatase (ALP)**

It is an enzyme found in large amounts in your liver, bile ducts, and other parts of your body. The ALP test measures the level of ALP in your blood. High levels of ALP can be a sign of liver or bile duct damage.

## **Gamma-glutamyl transpeptidase (GGT)**

It is an enzyme found in large amounts in your liver, bile ducts, and pancreas. The GGT test measures the level of GGT in your blood. High levels of GGT can be a sign of liver or bile duct damage.

## **Liver Protein Tests**

- Total Protein measures the amount of protein in your blood. The two main proteins found in the blood are **globulins and albumin**.
- Globulin is a protein made in your liver and helps the immune system fight infections.
- Low globulin levels can be a sign of liver damage or other conditions.
- Albumin is another protein made in your liver. An albumin test measures how well your liver is making the proteins that your body needs.
- Low albumin levels can be a sign of liver damage. Prothrombin is a protein made in your liver and helps with clotting blood.
- A prothrombin time test measures how much time it takes for your blood to clot. A high prothrombin time can be a sign of liver damage.

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## Bilirubin Tests

- Bilirubin is a yellow fluid made in your body when red blood cells break down.
- A bilirubin test measures the level of bilirubin in your blood. If your liver is damaged, bilirubin can leak out of your liver into your blood and can cause jaundice (yellowing of skin and eyes).
- It also can come out in the urine making it look very dark.

Liver Function Test	Reference Range
Alanine Transaminase (ALT)	7-56 units per liter (U/L)
Aspartate Transaminase (AST)	10-40 U/L
Alkaline Phosphatase (ALP)	20-140 U/L
Total Bilirubin	0.1-1.2 milligrams per deciliter (mg/dL)
Albumin	3.5-5.0 grams per deciliter (g/dL)
Total Protein	6.0-8.3 g/dL
Gamma-Glutamyl Transferase (GGT)	9-48 U/L

Meat