

Kidney Function Tests

Clinical biochemistry in nephrology is mainly used to diagnose and monitor renal dysfunction or damage.

The most important functions of kidney are ...

- 1-Excretion of urine
- 2- Excretes the waste products of protein metabolism
- 3-Regulates fluid, electrolyte, and acid-base balance
- 4-The kidney also has a biosynthetic role, and is involved in the production of renin,erythropoietin, prostaglandins, and vitamin D3
- 5-kidney is able to perform gluconeogenesis under conditions of starvation
- 6-It is an important site for degradation of some peptide hormones.

Urine is produced by the ultra-filtration of blood from the glomerulus and subsequent modification of the filtrate in the renal tubule. Filtration is aided by the hydrostatic pressure in the capillaries, created by the difference in diameter of the afferent and efferent arterioles. In the normal kidney, large plasma proteins and blood cells are retained within the glomerular capillaries, but other plasma constituents pass into the capsular space and then into the tubule lumen. Most filtered substances are reabsorbed either passively or by active transport across the tubular membrane back into the blood, while other substances are secreted into the tubular fluid. The modified filtrate passes from the tubule to the collecting duct where it emerges as urine.

Kidney Function Tests

- 1- Urine specific gravity and the effect of water deprivation.
- 2- Estimation of non-protein nitrogen level in the blood.
- 3- Studies of the ability of the kidney to excrete certain dyes.
- 4- Tests based on the clearance concept.
- 5- Other blood chemistry determinations, such as electrolytes, blood pH, cholesterol and serum proteins

1-Specific gravity:

Specific gravity of urine is a measurement of the relative amount of solids in solution and is an indication of the degree of tubular reabsorption or concentration by the kidney

2-Estimation of non-protein nitrogen level in the blood

The term non-protein nitrogen is used to identify nitrogen containing components of serum or plasma that are not associated with protein which represent products of intermediary metabolism of both tissues and ingested protein and included urea,creatinin,creatin,uric acid,ammonia,ammonia acid,and undetermined nitrogen

Urea nitrogen ...

Urea is formed in the liver and represents the principal end product of protein catabolism and is excreted by the kidney. It has no useful function in the body other than a possible mild diuretic action.

Interpretation of results ...

- 1- it increases with dietary increase in protein (increase meat food)
- 2- catabolic breakdown of tissues as in fever, trauma, infection, toxemia,
- 3- hemorrhage in GIT tract
- 4- Administration of cortisone and thyroid drugs & tetracyclines
- 5- Anything that causes a decrease in glomerular filtration rate will cause an increase in UN
- 6- decrease plasma water
- 7- decrease rate of excretion of urea nitrogen (Azotemia)

Acute Renal Failure

Acute renal failure (ARF) describes a sudden reduction in renal function associated with a

sudden decrease in the glomerular filtration rate (GFR), and the rapid development of azotemia and uremia.

Intra-renal causes of ARF include:

- **Acute tubular necrosis** (nephrosis) resulting from injury due to nephrotoxins or ischemia.
- **Acute nephritis**, which may be associated with infections such as *Leptospira canicola* or other bacterial or viral agents
- **Acute trauma**

Clinical Signs

- **Lethargy** and **depression**
- **Anorexia**
- **Nausea** and **vomiting**
- **Dehydration**
- **Kidney pain** in some cases
- **Oliguria** (< 7 ml urine/kg bodyweight/day)
- Occasionally, **anuria** (< 2 ml urine/kg bodyweight/day) or **polyuria**

If untreated, renal failure may progress and result in severe systemic disease.

Signs may include:

- **Shock**
- **Disseminated intravascular coagulation (DIC)**
- **Respiratory distress**
- **Neurologic disturbances**
- **Coma** and **death**

Laboratory findings

Hematology

- Regenerative anemia associated with blood loss
- Thrombocytopenia
- Stress or inflammatory leukogram
- Raised packed cell volume (PCV) if dehydrated

Biochemistry

- Raised blood urea nitrogen (BUN), which may be influenced by dietary protein intake, dehydration, or gastrointestinal hemorrhage
- Raised plasma creatinine
- Hyperkalemia
- Hyperphosphatemia
- Hypercalcemia in some cases; low or normal serum calcium in others

Urinalysis and Urine Culture

- Specific urine gravity:
 - 1.008 - 1.012 (isotheruria) in primary renal failure
 - 1.030 in pre-renal azotemia
- Osmolality:
 - < 350 mOsm/l (dilute) in primary renal failure
 - > 500 mOsm/l (concentrated) in pre-renal azotemia
- Urinary sediments: protein, blood, crystals, tubular casts, cells, depending on etiology
- Positive urine culture with pyelonephritis