

AGRICULTURE FORUM FOR TECHNICAL EDUCATION OF FARMING SOCIETY

Kota, Rajasthan



TESTS FOR ASSESSMENT OF KIDNEY FUNCTION IN ANIMALS

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Leaflet History

Received : 18.04.2026

Revised : 23.04.2026

Accepted : 28.04.2026

INTRODUCTION

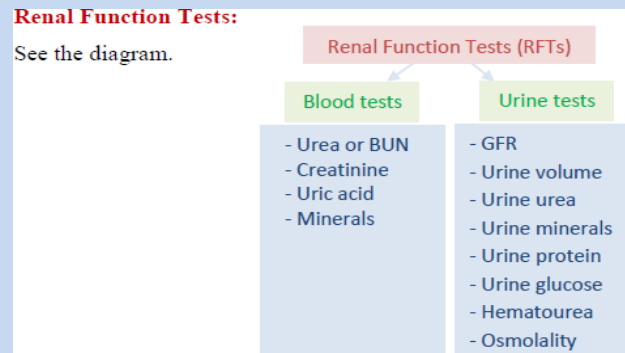
Kidney is important organ in body. It has many vital functions as:

- Blood filtration is a major function.
- Eliminates products of metabolism such as creatinine, uric acid and urea.
- Regulates the balance of water, Na⁺, K⁺, Cl⁻, Ca²⁺ etc.
- Maintains blood volume, pressure and pH (acidity/alkalinity)

Many factors can affect on kidney function leads to kidneys damage. It occurs in stages. Diabetes and high blood pressure are the most common causes of kidneys damage. Kidney fuction tests are used to asses the condition like Acute & Chronic renal failure, Nephrotic syndromes These are based on elimination kinetics of markers of glomerular filtration,blood flow,or tubular reabsorption/ secretion and are based on clearance concept

Renal Function Tests:

See the diagram.



Indirect tests of Glomerular function

1. Creatinine
2. Blood Urea/ Blood Urea Nitrogen
3. Carbamylated Haemoglobin

Direct Test of Glomerular Function

1. Determination of Glomerular Filtration rate using urinary clearance of Inulin
2. Physically Examining Urine
3. Determining Concentrating Ability of tubules by specific gravity of urine
4. Proteinuria
5. Hematuria

High blood urea can indicates:

- Renal insufficiency due to obstruction or cancer.
- Blockage of the urinary tract (by a kidney stone or tumor).
- Low blood flow to the kidneys caused by dehydration or heart failure.
- High-protein diet.

Low blood urea may be due to:

- Very low protein diet as in malnutrition.
- Severe liver damage inhibits urea cycle, decrease urea formation and increase free ammonia leads to hepatic comma

Note: BUN= 50% urea

Serum creatinine:

- In renal failure, the level of creatinine is elevated in blood and decreased in urine because kidney unable to excrete creatinine in urine.

Elevated blood creatinine is a more sensitive indication of impaired kidney function than the BUN because:

- Its level only effected by muscle mass which is usually constant.
- Creatinine level is very little affected by liver function.

The BUN/Creatinine ratio:

BUN-creatinine ratios increase with renal disease. Other factors such as liver function, muscle mass, and dietary protein can effect on this ratio.

- **High BUN-to-creatinine ratio occurs in:**
 - Sudden (acute) kidney failure.
 - Urinary tract blockage (as a kidney stone).
- **Very high BUN-to-creatinine ratio** may be caused by
 - Bleeding in the digestive tract or respiratory tract.

- A low BUN-to-creatinine ratio may be caused by:
 - Low protein diet,
 - Severe muscle injury.

Creatinine clearance:

- **Definition:** Creatinine clearance is the removal of creatinine from the body by kidney. More accurately, it is the volume of blood plasma that is cleared from creatinine per unit time.
- **Clinical important:** creatinine clearance is a useful measure for estimating the glomerular filtration rate (GFR) of the kidney. It is usually expressed in ml/min.

Cystatin C:

- It is a ubiquitous protein secreted by most cells in the body and small amounts excreted in the urine.
- It may be used as an alternative to creatinine and creatinine clearance for monitoring kidney dysfunction.
- It is a better marker of the GFR. A reduction in GFR causes a rise in the concentration of cystatin C.