

KIDNEY FUNCTION TEST

The main function of the kidney is excretion of water soluble waste products from our body. The kidney has various filtration, excretion and secretory functions. Derangement of any of these function would result in either decreased excretion of waste products and hence their accumulation in the body or loss of some vital nutrient from the body.

Functions of Kidney

1. Excretion of nitrogenous wastes (e.g., BUN, creatinine)
2. Regulation of body water and solute content of urine
3. Regulation of Acid–base balance
4. Regulation blood pressure
5. Production of Hormones (Erythropoietin)

URINE EXAMINATION

Before we do a quantitative examination of urine a qualitative examination is necessary as it can provide excellent clues to the nature and location of the lesion in the renal system. This examination consists of a physical examination where the colour, odour, quantity, specific gravity etc of the urine is noted. Microscopic examination of urine is done to rule out any pus cells, Rbc, casts, Crystals.

BLOOD UREA NITROGEN (BUN)

- a. Small quantities of urea are ingested and absorbed from the large intestine.
- b. The majority of urea in plasma is synthesized by the liver. Specifically, the hepatic urea cycle synthesizes urea from ammonia that is a waste product of protein catabolism.
- c. Urea is not found in feces because it is either absorbed or converted to ammonia by urease containing bacteria.
- d. The kidney is the most important route of urea excretion.
- e. Urea is completely filtered by the glomeruli, and about 40% of the filtered amount is reabsorbed in the renal tubules depending on the person's state of hydration(dehydration).
- f. Saliva, gastrointestinal tract, and sweat are other routes of urea excretion. Excretion of urea by these routes increases when the BUN concentration increases.
- h. In ruminants, urea that is excreted into the rumen (or ingested in the diet) is degraded by

the microflora to ammonia. The ammonia subsequently is then used to synthesize amino acids for protein production.

Increase urea nitrogen causes:

1. Urea nitrogen level are increased with a dietary increase in protein
2. Catabolic breakdown of the tissues as a consequence of fever, trauma, infection, or toxemia.
3. Hemorrhage into the gastrointestinal tract.
4. Severe dehydration
5. Decrease rate excretion of urea nitrogen.

Causes of decreased BUN concentration

- a. Low BUN values may be seen in hepatic insufficiency
- b. Low protein diets
- c. Young animals may have low BUN values from increased fluid intake, and increased urine output

SERUM CREATININE LEVEL

- a. Small quantities of creatinine may be absorbed when diets contain muscle. Intra-individual variations in serum creatinine concentrations are partially due to diet (i.e., amount of meat consumed)
- b. Most creatinine originates endogenously from nonenzymatic conversion of creatine that stores energy in muscle as phosphocreatine.
- c. It is simply used as a marker of renal function.
- d. Serum creatinine is a better indicator of renal function and more specifically glomerular function than urea. Increased serum creatinine:
 1. Impaired renal function
 2. Very high protein diet
 3. Vary large muscle mass: body building, giants, acromegaly patients
 4. Athletes
 5. Drugs: Cimetidine, Trimethoprim

Causes of decreased serum Creatinine level

1. Pregnancy
2. Increasing age (reduction in muscle mass)

Protein

Urine that is voided from the body does not contain detectable protein. Most protein that passes the glomerular filter is reabsorbed in the tubules. Consequently normal urine when tested for protein is negative. The presence of protein in urine is always considered pathologic except at the time of parturition, following exercise, or during estrus. Protein in urine is noticeably increased in renal disease of any etiology, except obstruction, and is therefore a very sensitive, general screening test for renal disease. The Roberts reagent method, reagent strip and spectrophotometer used for detection protein in urine.

Causes of proteinuria:

1. Renal disease as nephritis.
2. Nephrosis .
3. Cystitis.
4. Vaginitis.
5. Urolithiasis.

Glucose

Glucose normally absent from urine, glucosuria in case of:-

1. Diabetes mellitus.
2. Shock.
3. Enterotoxaemia.
4. Ingestion of excessive carbohydrates.

KetoneBodies:

Ketone bodies include acetoacetic acid, acetone, and beta hydroxybutric acid. These are the results of lipid breakdown and accumulation of acetyl coenzyme A that is not utilized for lipogenesis or in the citric acid cycle and that becomes converted to ketone bodies. The Ross test has been widely utilized for detection of ketone bodies.

Causes of ketone urea:

1. Ketosis in cattle.
2. Pregnancy toxemia in sheep and goats.
3. Starvation and fasting.

Bilirubin urea

Causes of bilirubin urea:

1. Biliary obstruction.
2. Hepatic diseases.
3. Hemolytic jaundice.

Acid-alkaline reaction (pH):

Normal values of the pH reaction of urine from any species of animal must be carefully considered as the diet and state of metabolism. In general bovine, ovine and caprine have alkaline urine, while canine and feline have acid urine. The hydrogen ion concentration can be determined by reagent strips and pH meter.

1. Increased acidity of the urine may result from starvation, fever and acidosis.
2. Alkaline urine occur in cystitis, ingestion of salts such as sodium lactate, sodium bicarbonate, sodium citrate and nitrate.



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