

Al-Rasheed University College
Department of Dentistry
2st Stage



PRACTICAL BIOCHEMISTRY

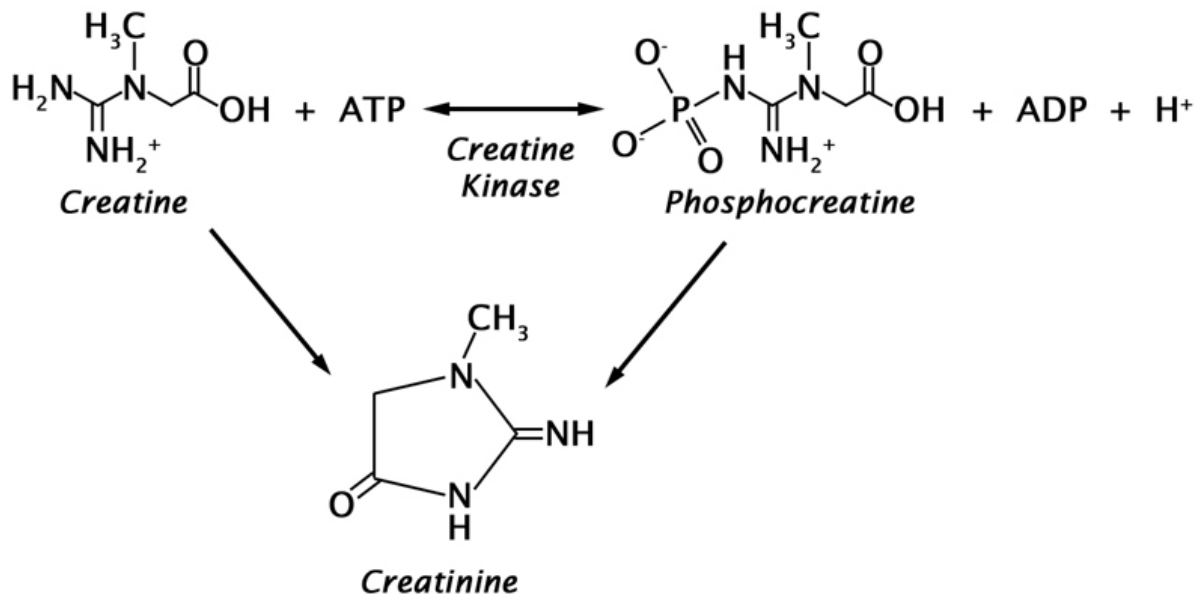
lab 11 Serum Creatinine



Serum Creatinine

Creatinine is the internal anhydride of creatine; creatine is present in muscle to mediate energy transfer during muscle contraction. Through interconversion of creatine and phosphocreatine about 2% of muscle creatine is spontaneously converted into creatinine daily which appears in urine as a waste product.

Creatinine is a breakdown product of creatine phosphate in muscle.



Serum creatinine (is a biochemical test) is an important indicator of renal health because it is an easily measured byproduct of muscle metabolism that is excreted unchanged by the kidneys. Creatinine itself is produced via a biological system involving creatine, phosphocreatine, and adenosine triphosphate (ATP, the body's immediate energy supply).

Normal Range:

✚ Normal Range of S.Creatinine: (0.1-1.2)mg/dl

The kidneys maintain the blood creatinine in a normal range. Creatinine has been found to be a fairly reliable indicator of kidney function. Elevated creatinine level signifies impaired kidney function or kidney disease.



Physiological and other factors that affect serum creatinine level:

1. ***Sex and Age***; because of the amount of endogenous creatinine produced is proportional to muscle mass the production varies with age and sex. It's lower in children.
2. ***Daily excretion*** of creatinine can be 10-30% greater as a result of dietary make of creatinine in meats especially cooked roast meat. On the whole however, dietary floatations of creatinine intake cause only minor variation in daily creatinine excretion of the same individual
3. ***Certain drugs*** (e.g salicylates) increase plasma creatinine by inhibiting tubular secretion of creatinine
4. ***Analytical factors*** some endogenous substances (e.g acetoacetate) and exogenous substances(e.g drugs) may affect the analytical method.

❖ Other Factors that affect serum creatinine

Increases with:

- a. low GFR
- b. increased muscle mass
- c. skeletal muscle damage
- d. high meat or creatine uptake
- e. drugs such as cimetidine, trimethoprim, triamterene, and amiloride

Decreases with:

- a. high GFR
- b. decrease muscle mass
- c. advanced age

Clinical significance:

Constancy of endogenous production of creatinine and the less effect diet protein catabolism and hydration status on its plasma level make creatinine a useful indicator of glomerular filtration rate (GFR).

An increase in serum creatinine can be due to:

1. Any disease in which there is impaired (e.g reduced blood pressure, fluid depletion, congestive cardiac failure)
2. Most disease in which there is food of functioning nephrons (e.g:acute and chronic glomerulonephritis).
3. Diseases in which pressure is increased on the tubular side of the nephron (e.g:urinary tract obstruction due to prostatic enlargement)

Is blood urea or serum creatinine preferred in assessing renal function?

Blood urea is a less accurate measure of GFR because the production of urea is much more variable than the production of creatinine and because renal tubular reabsorption of urea is more variable than is the secretion of creatinine.

Thus in a patient with an increase in blood urea that is relatively greater than the increase in serum creatinine (normal ratio 20:1) the presence of one of the pre-renal cause of uremia may be suspected.

Serum creatinine ,disproportionately elevated to blood urea , suggests an inadequate protein intake , water diuresis or advanced liver disease. Also drug interaction and analytical factors as causes of elevated serum creatinine must be remembered.

Creatinine clearance test

A more precise measure of the kidney function can be estimated by calculating how much creatinine is cleared from the body by the kidneys. This is referred to as creatinine clearance and it estimates the rate of filtration by kidneys (glomerular filtration rate, or GFR). The creatinine clearance can be calculated (estimated) by a formula using serum (blood) creatinine level, patient's weight, and age.

A test that helps determine whether the kidneys are functioning normally. It helps provide information about how well the kidneys are working (gauges the rate at which a waste, creatinine, is "cleared" from the blood by the kidneys) .



The test compares the creatinine level in urine with the creatinine level in blood.

If the kidneys are not removing enough creatinine, the level of creatinine in the urine will fall. And consequently the level of creatinine in the blood will rise.

When the kidneys fail to clear enough creatinine and other wastes from the blood, the wastes build up in the bloodstream. Symptoms of kidney disease -- including swelling (edema), nausea, and high blood pressure -- may develop.

Creatinine is freely filtered by glomeruli and not reabsorbed or metabolized by renal tubules. However, approximately 15% of excreted urine creatinine is derived from proximal tubular secretion. Because of the tubular secretion of creatinine, the creatinine clearance typically overestimates the true GFR by 10% to 15%.

Advantages of creatinine clearance:

1. It is a normal metabolite of the body.
2. It does not require I.V. administration.
3. Estimation of creatinine is simple.
4. In early stages it has got advantage over S.Creatinine.

$$\text{CrCl (mL/min)} = \frac{(140 - \text{age}) \times \text{Lean Body Weight (kg)}}{\text{Serum Creatinine (mg/dL)} \times 72} \quad (\times 0.85 \text{ if female})$$