

المادة/ الكيمياء السريرية النظري

قسم تقنيات المختبرات الطبية / المرحلة الثانية

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المحاضرة العاشرة / وظائف الكلية

### Lec. 10 (function of kidney tests)

-**kidneys** are the most important organs for the excretion of the waste products metabolism.

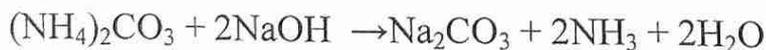
-renal functions are evaluated by determination the quantity of urea ,creatinine and uric acid in the serum.

**Urea (H<sub>2</sub>NCONH<sub>2</sub>)** : It consists about 50 % of non-protein nitrogen compounds (urea,creatine ,creatinine, NH<sub>3</sub>,amino acids and uric acid) .

N.V of urea = 14 -40 mg / 100 ml of serum.

During pregnancy is commonly between 15 – 20 mg/100 ml up to 500 mg/100 ml are found in conditions associated with some disease.

**Estimation of urea** : urea is estimated by conversion to NH<sub>3</sub> then to ammonium carbonate by the presence of urease enzyme.



Nessler's reagent                      **yellow to orange complex**

## Clinical significance of urea

1-hyper uremia : associated with.

A-acute or chronic nephritis ,B-tubule necrosis ,C-nephro sclerosis D-obstruction of urinary tract.

2-hypo uremia .

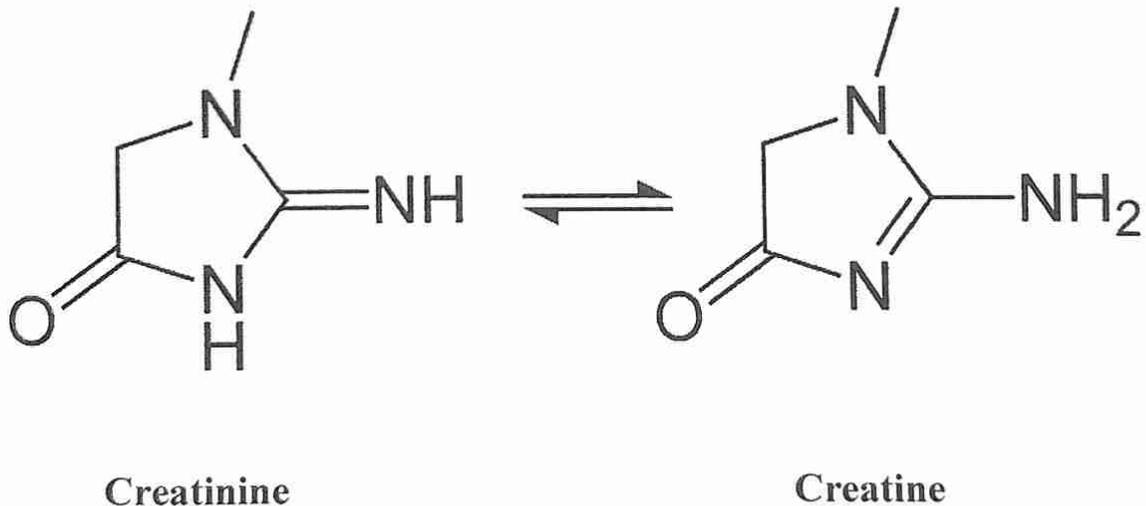
A-Liver Failure ,B-Pregnancy

## Plasma creatinine and creatine

-**creatine** : is synthesized in the liver and pancreas from A.A (Arg,Gly,Meth) and stored in the muscle as creatine and creatine phosphate.

-value of creatine and creatine phosphate together is about 400 mg/100ml of fresh muscle.

2% of creatine and creatine phosphate are change to creatinine daily .



Creatinine excreted by kidney in glomerular filtration without any reabsorption.

N.V of creatinine = 0.1 – 1.4 mg /100ml of serum.

N.V of creatine = 0.5 –0.9 mg /100ml of serum.

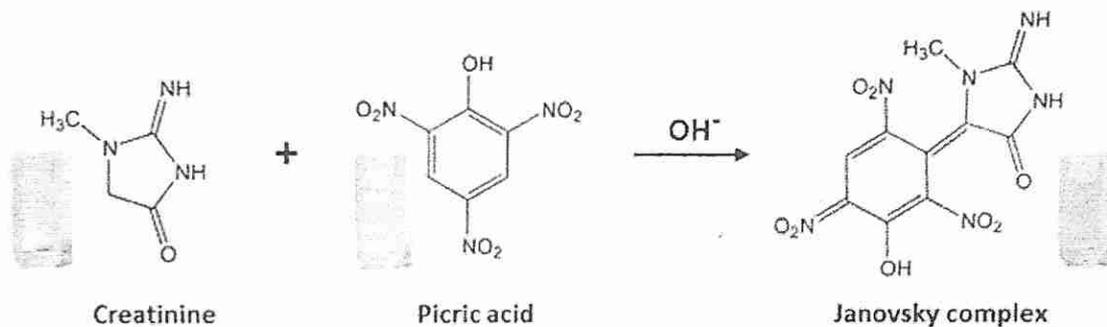
## Clinical significance

1-high level of creatinine in the blood is noticed with urinary obstruction .

2- high level of creatine in serum is noticed with muscle diseases such as muscle destruction .

-there is no relation between kidney diseases and creatine level in serum.

**Estimation of creatinine by Gaffa reaction** : creatinine reacts with sodium picrate to form creatinine picrate (red solution).



**Creatinine clearance(CrCl)** / is the volume of blood plasma cleared of **creatinine** per unit time. It is a rapid and cost-effective method for the measurement of renal function. Both CrCl and GFR can be measured using the comparative values of **creatinine** in blood and urine and the creatinine clearance is a good estimation of the glomerular filtration rate.

**Uric acid** : belongs to non-protein nitrogen compounds.

-it is the end product of purine metabolism is present in each of DNA and RNA.

-it is synthesized in the liver by two major pathway:

1-endogeneous pathway: from the metabolism inside the body.

2- exogenous pathway: from the metabolism of pyrine taken the food (mainly meat).

N.V = 2 -7 mg/100ml

### Clinical significance of uric acid

1-hyper uricaemia : occurs due to.

A-Increase in purine formation.

B-after intake of food rich in nucleoprotein (liver ,kidney ) .

-Determination of uric acid is helpful for diagnosis of **Gout** in serum (6.5 – 10 mg/100ml).

Estimation of uric acid :uric acid is regarded as reducing agent which can be oxidized by using phosphotungstic acid.

The product of this reaction is tungsten (blue color) at 700 nm.

Uric acid + phosphotungstic acid +O<sub>2</sub> → Allantion +CO<sub>2</sub> + phosphotungstons.

**(blue)**