

ESTIMATION OF BLOOD UREA

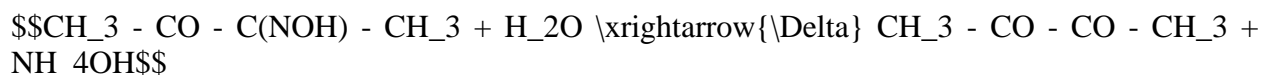
BLOOD UREA :

- Urea is the major end product of protein catabolism.¹
 - Amino acids on deamination yields ammonia which is neurotoxic.²
 - In the liver ammonia detoxified into urea by urea cycle.³
 - Urea is highly water soluble therefore excreted through urine.⁴
 - Being end product of protein, urea concentration varies with dietary intake of proteins even under normal healthy conditions.⁵
 - Abnormally increased blood urea level observed in diseased kidney, glomerulonephritis: nephrosis etc.⁶
 - Similarly in perirenal conditions such as enhanced protein catabolism.
 - Dehydration, diarrhoea, vomiting and post renal conditions that obstruct the lower urinary tract e.g. enlarged prostate glands, strictures of urethra or stone in ureter etc.
 - Decreased blood urea observed in hepatic disease such as hepatocellular Jaundice or cirrhosis due to impairment in ureagenic function of liver.
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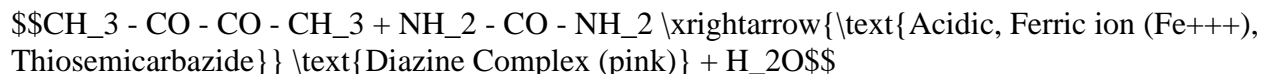
PRINCIPLE :

At higher temperature, diacetyl monoxime (on heating) form diacetyl. Urea reacts with diacetyl under strong acidic condition in presence of ferric ion and thiosemicarbazide to give a pink coloured diazine complex.⁷ The intensity of the pink colour is compared with a standard solution of urea treated similarly.

REACTION :



(Diacetyl Monoxime (DAM) \rightarrow Diacetyl)



(Diacetyl + Urea \rightarrow Diazine Complex)

Reagents :

- Mixed Colour Reagent - DAM, TSC⁸
- Mixed acid reagent - H_2SO_4 , FeCl_3 , Phosphotungstic acid
- Serum
- Std urea : 100 mg%

Procedure :

Label three test tubes as S (Standard), T (Test) & B (Blank) make addition as follows to dilute the sample and standard.

Step	Reagent	T (Test)	S (Standard)	B (Blank)
1	Diluted Serum	1 ml	--	--
2	Distilled Standard	--	1 ml	--
3	Dist. Water	1 ml	1 ml	1 ml
4	Mixed colour reagent	2 ml	2 ml	2 ml

mix it well then add

Step	Reagent	T (Test)	S (Standard)	B (Blank)
5	Mixed acid reagent	2 ml	2 ml	2 ml

- Again mix thoroughly.
- Then keep in boiling water bath for 20 minutes.
- Cool and measure O.D. of the coloured solutions, using 520 nm green filter.
- Colour is stable for 24 hrs. at room temp, if kept in the dark.

Observation :

- Filter used 520 mm green.
- Optical Density Absorbance of T =
- Absorbance of S =
- Conc. of Std = 100mg%

Calculations :

$$\text{Blood urea in mg\%} = \frac{T - B}{S - B} \times 100$$

Reference range :

- 15 - 45 mg% (mg/dl)

Result :

The concentration of urea in blood is mg%

Blood urea :

Urea contains two atoms of nitrogen and its molecular weight is 60, of which 28 is due to nitrogen. Hence, the relationship of total blood urea to urea nitrogen is given by the ratio:

$$\frac{60}{28} = 2.14$$

- Therefore $\text{Blood urea nitrogen (mg/dl)} = \frac{\text{Blood urea (mg/dl)}}{2.14}$
- i.e. $\text{Blood urea (mg/dl)} = \text{Blood urea nitrogen (mg/dl)} \times 2.14$

Reference range :

On ordinary diet, the reference range for blood urea nitrogen is 10 - 18 mg/dl and that of blood urea is 15-40 mg/dl.

Interpretation :

Urea is the main end product of protein catabolism. Its blood level depends on dietary intake of protein.⁹ It is synthesized in liver and constitutes a major nonprotein nitrogenous (NPN) substance.¹⁰ The condition, in which blood urea is increased, is called as uremia.¹² This can be of three types.

a. Pre-renal uremia:

- Decrease in blood volume: In dehydration due to prolonged diarrhoea, vomiting, burns, etc.
- The reduced plasma volume leads to low blood pressure, which decreases effective filtration rate in glomeruli and reduces filtration of urea.
- Increased tissue protein breakdown : In diabetes and in different types of fevers.¹³
- Hematemesis i.e. bleeding within the gastrointestinal tract.
- Cardiac failure and circulatory collapse due to other causes.

b. Renal uremia :

- In this, increase in blood urea is due to improper functioning of the kidney.¹⁴
- Nephritis¹⁵
- Acute glomerulonephritis
- Renal tuberculosis¹⁶
- Mercurial poisoning.

c. Post renal uremia :

- It is due to obstruction in the pathway of urinary excretion.¹⁷
- Important causes of post-renal uremia are: Enlarged prostate, Stone in the urinary tract, Stricture of the urethra, Tumors of the bladder affecting the ureteric junction.

Use of blood urea estimation in the assessment of renal function :

Since route of urea excretion is through kidneys, blood urea level is estimated to assess renal function.¹⁸ As blood urea level is affected by dietary protein and other pre-renal factors, serum creatinine estimation should also be done simultaneously.^{19,20}

Results :^{21,22}

- Blood urea nitrogen = mg/dl^{23,24}
- Blood urea = mg/dl²⁵