

Tikrit University

College of Nursing

Basic Nursing Sciences



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Bio Chemistry

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Blood Urea

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Urea

Belongs to the class of non-protein nitrogenous compounds (NPN) in addition to creatine, creatinine, uric acid, ammonia, and amino acids. The liver produces urea from ammonia generated by amino acid deamination. One-half of the total urine solids come from protein catabolism. And that the amount of excreted depends on the amount of protein consumed, and that the urea concentration test is one of the most important tests that can measure the efficiency of the kidneys to perform their functions, and its concentration is always measured with the concentration of creatinine, as these two tests help to diagnose renal impairment.

The kidneys excrete around 85 percent of urea, with the remaining 15 percent excreted through the gastrointestinal (GI) tract and the skin. As a result of impaired renal clearance (acute and chronic renal failure/impairment), serum urea levels increase in certain scenarios. It is also possible for urea levels to rise in non-renal circumstances, such as upper gastrointestinal bleeding, dehydration, catabolic states, and a high-protein diet to increase. It is possible for urine levels to be lowered as a result of malnutrition, a low-protein diet, or a severe liver condition. Urea, on the other hand, is high in the early stages of renal disease.

Clinical Information

Urea is the final degradation product of protein and amino acid metabolism. In protein catabolism the proteins are broken down to amino acids. The ammonia formed in this process is synthesized to urea in the liver. This is the most important catabolic pathway for eliminating excess nitrogen in the human body.

Increased blood urea may be due to (cardiac decompensation, water depletion due to decreased intake and excessive loss, increased protein catabolism, and high protein diet).

Renal causes :

(acute glomerulonephritis, chronic nephritis, polycystic kidney disease, nephrosclerosis, and tubular necrosis) and postrenal causes (eg, all types of obstruction of the urinary tract, such as stones, enlarged prostate gland, tumors).

Normal Level of Urea

Results of the blood urea test are measured in milligrams per deciliter (mg/dL) in the United States and in millimoles per liter (mmol/L) internationally. In general, 7 to 20 mg/dL (2.5 to 7.1 mmol/L) is considered normal. Urea levels tend to increase with age.

High urea counts could be caused by the following health conditions:

- Urinary tract obstruction
- Congestive heart failure or recent heart attack
- Gastrointestinal bleeding
- Dehydration, resulting from not drinking enough fluids or for other reasons
- Shock
- Severe burns
- Certain medications, such as corticosteroids and some antibiotics
- A high protein diet

Low urea counts can be caused by :

Liver failure

- Malnutrition
- Anabolic steroid use
- Overhydration, Which can result from prolonged intravenous fluids
- Pregnancy (due to increased plasma volume)

- Impaired nutrient absorption
- Syndrome of inappropriate anti-diuretic secretion

Because urea is synthesized by the liver, severe liver failure causes a reduction of urea in the blood. Just as dehydration may cause an elevated BUN, overhydration causes a decreased BUN. When a person has "syndrome of inappropriate anti-diuretic secretion" (SIADH), the anti-diuretic hormone responsible for stimulating the kidney to conserve water causes excess water to be retained in the bloodstream rather than being excreted into the urine. SIADH can cause the BUN level, along with other important substances, to decrease because the fluid volume of the bloodstream may significantly increase.

Physiological

Increase: The blood urea rises in normal people on increasing the protein content of the diet.

Decrease:

- 1-The blood urea concentration is lower in the growing infant than in the adult.
- 2- During normal pregnancy
- 3- Normal person on low protein, high carbohydrate diet. This the basis of conservative treatment of anuria.

Pathological

Increase:

1- Excessive formation: excessive body protein catabolism

2- renal disease

3- Gastrointestinal hemorrhage

Decrease:

Very low urea levels may be found following transfusion of glucose solution. The effects are mixture of simple dilution of body fluids, protein catabolism reduction.

Some medicine can cause blood urea to be higher than normal

Determination of urea level in serum

Principle

The salicylate and hypochlorite ions in the reagent react with the ammonium ions to form a complex that is green in color (2,2-dicarboxylindophenol).

CAL. Standard is 8.33 mmol/L (50 mg/dL).

Procedure

Wavelength is 600 nanometer (Hg 578 - Hg 623 nanometer), Cuvette is 1 cm light path

Temperature is 25°C and 37°C are the temperatures. Measurement comparison to the reagent blank. Table 3.5 depicted in test urea.

Test urea

Reagent	Blank	Stander	Sample
Standard	-	10.0 µL	-
Sample	-	-	10.0 µL
Working reagent (R1)	1000.0µL	1000.0 µL	1000.0 µL
Mix. Incubate for 3 minutes at 37°C or 5 minutes at 20-25°C.			
Sodium Hypochlorite (R2)	200.0 µL	200.0 µL	200.0 µL

Mix. Incubate for 5-10 minutes at 37°C. Within 2 hours, compare the absorbance of the standard (A_{standard}) and the sample (A_{sample}) to a reagent blank.

The calculation is illustration in Equation (3.3) and Equation (3.4).

$$\text{Urea concentration} = \frac{A_{\text{sample}} \times 8.33 \text{ (mmol/L)}}{A_{\text{standard}}}$$

$$\text{Urea concentration} = \frac{A_{\text{sample}} \times 50 \text{ (mg/dL)}}{A_{\text{standard}}}$$