SODIUM & POTASSIUM

(Colorimetric Method)

DIATEK

Diagnostic reagent for quantitative in vitro determination of Sodium & Potassium in serum on Photometric systems

Presentation

Pack size	Sodium Reagent (R1)	Sodium Colour Reagent (R2)	Potassium Reagent (R3)	Sodium Standard (S1)	Potassium Standard (S2)
2 x 20T	1 x 50ml	1 x 65ml	1 x 60ml	1 x 5ml	1 x 5ml

Summary

Sodium is the major extracellular cation of the body. Sodium regulates the osmotic pressure in the cells & fluids & guard against an excessive loss of water from the tissues. Very low values are found in acute Addison's disease. Conditions in which extracellular fluid is lost (e.g vomiting & diarrhoea). Increased sodium levels are found in the following conditions: hyperadrenalism, severe dehydration, diabetic comma after insulin therapy.Unlike sodium, potassium is the major intracellular cation in the body. Potassium in conjunction with sodium and chloride, aids in the regulation of osmotic pressure & acid-base balance. A proper balance of potassium, calcium & magnesium is necessary for the normal function of the heart & muscle tissues. Potassium is also known to play a significant role in the conduction of nerve impulses. Elevated potassium levels (hyperkaliemia) are often associated with renal failure, dehydration shock or adrenal insufficiency. Low values are found in muscular disorders (paralysis) & in diabetic coma.

Method

Colorimetric method.

Principle

A. Sodium

Sodium is precipitated as the triple salt, sodium magnesium Uranyl acetate, with the excess uranium then reacting with ferrocyanide, produces a chromophore whose absorbance varies inversely as the concentration of sodium present in the test sample.

Uranyl ions + Mg ions+Na^+ ------► Uranyl MgNa Precipitate

Free Uranyl ions + $K_4Fe(CN)_6$ ---► Brown colored complex

B. Potassium

Potassium is determined by using sodium tetraphenyl boron in a specifically prepared mixture to produce colloidal Suspension. The turbidity of which is proportional to potassium concentration.

Tetraphenyl Boron + K^+ ---------- White turbidity

Reagent Composition

A. Sodium

Sodium Reagent (R1)

Uranyl acetate	–	2.1 mmol/L
Magnesium acetate	–	20 mmol/L

Sodium Colour Reagent (R2)

Potassium ferrocyanide	
Sodium Standard	150 mmol/L

B. Potassium

Potassium Reagent (R3)

Sodium tetraphenylboron	⩾ 50 mmol/L
Sodium hydroxide	⩾ 30 mmol/L
Potassium Standard	5 mmol/L

Storage Instructions and Reagent stability

The reagents are stable upto the end of the indicated month of expiry, if stored at 2-8°C and contamination is avoided. Do not freeze the reagents.

Waste Management

Please refer to local legal requirements.

Reagent Preparation

Reagents are ready to use

Specimen

Freshly drawn serum is recommended; Plasma from non-sodium & non-potassium containing anticoagulants is an acceptable alternative.

Stability of sodium & potassium in serum:

24 hours	at	R.T
2 weeks	at	2-8°C

Specimens should be free from hemolysis. Discard contaminated specimens.

Assay Procedure

A. Sodium

Wavelength	:	530nm
Optical path	:	1 cm
Temperature	:	R.T
Measurement	:	Against reagent blank

Step 1: Precipitation of Sodium

Pipette into 2 clean dry centrifuge tubes labeled standard (S) & Test (T)

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	Standard (S)	Test (T)
Sodium Reagent (R1)	1000 µl	1000 µl
Sodium Standard (S1)	10 µl	-
Sample	-	10 µl
Mix vigorously & incubate for 5 min., at R.T. Then centrifuge at 2000-3000 rpm for 2 min. to obtain a clear supernatant		

Step 2: Colour development

Pipette into clean, dry test tubes labeled as Blank (B), Standard (S) & Test (T)

	Blank (B)	Standard(S)	Test (T)
Sodium Colour Reagent (R2)	1000 µl	1000 µl	1000 µl
Supernatant from step 1	-	20 µl	20 µl
Sodium Reagent (R1)	20 µl	-	-
Mix well allow it to stand at R.T for 5 min. Then measure the absorbances of all tubes within 10 min.			

Calculation

$$\text{Sodium (mmol/L)} = \frac{\text{Abs of blank} - \text{Abs of test}}{\text{Abs of Blank} - \text{Abs of standard}} \times \text{Conc. of Std. (150mmol/L)}$$

B. Potassium

Wavelength : 620nm

Optical path : 1 cm

Temperature : R.T

Measurement : Against reagent blank

Pipette into clean, dry test tubes labeled as Blank (B), standard (S) & Test(T)

	Blank (B)	Standard(S)	Test (T)
Potassium Reagent (R3)	1000 µl	1000 µl	1000 µl
Potassium Standard (S2)	-	50 µl	-
Sample	-	-	50 µl
Mix well allow it to stand at R.T for 5 min. Then measure the absorbances of all tubes.			

Δ A = (Abs. Test or Standard) – (Abs. Blank)

Calculation

$$\text{Potassium (mmol/L)} = \frac{\Delta \text{ A test}}{\Delta \text{ A standard}} \times \text{Conc. of Std. (5 mmol/L)}$$

Linearity

Sodium is linear upto 200mmol/L.
Potassium is linear upto 8 mmol/L

Reference Range

Sodium - 135 –155 mmol/L
Potassium - 3.4 – 5.3 mmol/L
It is recommended that each laboratory should establish its own normal range representing its patient population.

Quality Control

To ensure adequate quality control each run should include assayed normal & abnormal controls.

Precautions & Notes

1. All glassware & cuvettes should be washed with quality distilled water before use.
2. Sodium assay has a decreasing slope, hence the blank is higher than the standard & test.
3. Pipetting of sodium reagent (in step1) & transfer of supernatant (in step 2) should be done quickly to avoid error due to low density of liquid.
4. Turbid & ecteric samples produce falsely elevated results. In case of potassium bilirubin above 40 mg/dl & Urea nitrogen above 80 mg/dl will produce elevated results.

Literature

1. Henry RF et al. Clinical chemistry Principles and technics, 2nd Ed., Harper and Rox, Hagerstown, M.D (1974)
2. Tietz NW. Fundamentals of Clinical Chemistry WB, Saunders Co., Phila, PA, P.874

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