

### Intended Use

For the turbidimetric determination of potassium in serum or plasma.

### Method History

Potassium can be determined by a wide range of different techniques. Among the more common are the direct measurement using flame photometry and colorimetric procedures. Recently the use of ion specific electrodes has become important.

In 1958, Sunderman and Sunderman<sup>1</sup> described the photometric measurement of potassium ions in a protein-free filtrate which was combined with sodium tetraphenylboron. The addition of formaldehyde and EDTA in the reaction negated the interference of ammonia and certain cations.<sup>2,3</sup>

In this method, the amount of potassium is determined using sodium tetraphenylboron in a specially prepared matrix to produce a colloidal suspension, the turbidity of which is proportional to potassium concentration in the range 2 to 6.5mEq/L. The agreement with flame methods is excellent.

### Clinical Significance

Elevated potassium levels (hyperkalemia) are often associated with renal failure, dehydration, shock and adrenal insufficiency (Addison's Disease).<sup>4</sup> Decreased potassium levels are often associated with malnutrition, negative nitrogen balance, gastrointestinal fluid losses and hyper-activity of the adrenal cortex (Cushing's Syndrome).

### Reagents

1. Potassium Reagent: 6.0% sodium tetraphenylboron in a solution containing preservatives and thickening agents. **WARNING! CORROSIVE!** (See "Precautions" section).
2. Activator.
3. Potassium Calibrator.

### Precautions

1. This reagent is for *in vitro* diagnostic use only.
2. Reagent is corrosive. **DO NOT PIPETTE BY MOUTH.** Avoid contact with skin and clothing. Flush with copious amounts of water if contact occurs.

### Reagent Preparation

To prepare Potassium Working Reagent, add one drop of Activator for every 1ml of Potassium Reagent required. Mix well. Potassium Working Reagent is stable for 8 hours. Example: 10ml of working reagent requires the mixing of 10ml of Potassium Reagent with 10 drops of Activator.

### Reagent Storage

The reagents are stable through the expiration date on the label when stored below 28°C (82°F).

**DO NOT FREEZE! PROTECT FROM LIGHT!**

After reconstitution, the Potassium calibrator is stable for 2 weeks when stored at 2-8°C.

### Reagent Deterioration

If the Potassium Reagent becomes cloudy, it should no longer be used.

### Specimen Collection and Storage

Specimens for serum potassium analysis should be free from hemolysis, since the high concentration of potassium released from red cells significantly increases the serum levels and thus invalidates the test results. Blood specimens should also be separated from the red cells shortly after

collection to prevent any leakage of potassium from the intracellular into the extracellular fluid. Plasma from anticoagulants not containing potassium is also suitable. Potassium in serum is stable for at least 2 weeks at room temperature.

### Materials Required but not Provided

1. Accurate pipetting devices – 50ul (0.05ml) and 2.0ml.
2. Test tubes/rack
3. Timer
4. Spectrophotometer or colorimeter. For determining accurate results for all photometric procedures, the capabilities of the instrument should be known prior to its use. The instrument should be calibrated and monitored routinely.
5. Vortex mixer.

### Procedure (Manual)

Read entire procedure before starting the test. Allow all reagents and specimens to come to room temperature before proceeding.

1. Prepare Potassium Working Reagent according to instructions.
2. Label test tubes: Standard, Control, Patient, etc.
3. Add 2.0ml of Potassium Working Reagent to all tubes.
4. Pipette 0.05ml of standard, control or patient into the respective tubes.
5. Mix well and let incubate at room temperature for 3 minutes.
6. After incubation, zero the spectrophotometer with distilled water. Read and record the absorbances of all test tubes at 630nm (600-650nm).

### Quality Control

The establishment of a good quality control program including the use of reliable control sera is recommended. It is important to note that this method may not produce accurate results when used with control sera or potassium standards other than these provided by Pointe Scientific. Other products contain preservatives that interfere with this procedure and tend to produce falsely elevated results.

### Calculation

A = Absorbance

$$\text{mEq/L potassium Patient's serum} = \frac{A (\text{Patient})}{A (\text{Standard})} \times \text{Conc. Of Std. (mEq/L)}$$

### Precision

The interassay variability was found to be 1.8% CV (1sd).

### Limitations

This method has been found to be linear between 2 and 6.5mEq/L. It is important to note that this method may not produce accurate results when used with control sera or potassium standards other than these provided by the manufacturer. Other products contain preservatives that interfere with this procedure and tend to produce falsely elevated results. Turbid or icteric samples produce falsely elevated results. Bilirubin above 4.0 mg/dl and Urea Nitrogen above 80 mg/dl will produce elevated results. Hemolyzed sera produce elevated results. Sera containing high levels of ammonia should be avoided.

### Expected Values<sup>5</sup>

Serum 3.4-5.3 mEq/L. Because differences in laboratory techniques, instrumentation and regional populations can affect assay results, it is recommended that each laboratory establish its own range of expected values.

## References

1. Sunderman, F.W., Jr. and Sunderman, F.W.: "Am. J. Clin. Path. 29:95 (1959).
2. Terri, A.E. and Sesin, P.G.: "Am. J. Clin. Path." 29:86 (1958).
3. Hillman, G. and Beyer, G.: "Z. Klin. Chem. U Klin. Biochem." 5:93 (1967).
4. Harper, H.A.: "Review of Physiological Chemistry", 11<sup>th</sup> ed., Lange Medical Publications, Los Altos, CA (1967).
5. Henry, R.J., Cannon, D.C. and Winkelman, J.W., Editors: "Clinical Chemistry Principles and Technics", 2<sup>nd</sup> Ed., Harper & Row, Hagerstown, MD (1974).

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