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Specific Gravity of Urine (Multistix 10 SG) - Royal Oak

Document Type: Procedure

I. PURPOSE AND OBJECTIVE:

A. Specific gravity is the ratio of the mass of a solution compared to the mass of an equal volume of water. Therefore, it is measure of the total solute concentrations of urine when compared to water (1.000). Hyposthenuria (low specific gravity) may indicate the loss of the kidney's ability to concentrate urine, as can occur with renal diseases such as pyelonephritis, glomerulonephritis, and diabetes insipidus. Hypersthenuria may occur with congestive heart failure, Addison's disease, cirrhosis, and forms of dehydration (vomiting, diarrhea, fever, heavy exercise).

B. The Multistix test is based on the pKa change of pretreated polyelectrolyte reagent in relation to ionic concentrations. The higher the concentration of electrolytes in the urine, the greater the release of H^+ from the reagent, and the lower the pKa of the polyelectrolyte in the reagent. This causes a color change of bromthymol blue pH indicator from dark blue to yellow, measuring specific gravity from ≤1.005 to ≥1.030 in increments of 0.005.

C. This document describes the steps for this procedure to assist technologists.

II. SPECIMEN COLLECTION AND HANDLING:

Fresh, well-mixed, uncentrifuged urine. It is recommended that testing be done within one hour after voiding. Otherwise immediately refrigerate the specimen and return to room temperature before testing.

III. REAGENTS/SUPPLIES:

A. Siemens Multistix 10SG (#2161)

B. 2.8% weight for weight (w/w) bromthymol blue

C. 68.8% w/w polyelectrolyte (methyl vinyl ether/maleic anhydride)

D. 28.4% w/w sodium hydroxide

IV. QUALITY CONTROL (QC):

A. Both Normal and Abnormal Kova–Trols are run and results are recorded:

1. at the beginning of each shift
2. whenever a new lot number of reagent strips is opened
3. whenever a new shipment of reagent strips is received
4. whenever troubleshooting warrants it

V. PROCEDURE:

A. Briefly dip the test area of the strip in fresh, **well-mixed** uncentrifuged urine

B. While removing the strip, run the edge against the rim of the urine container to remove excess urine. Hold the strip in a horizontal position to prevent mixing of chemicals from adjacent reagent areas and/or contaminating the hands with urine.

C. If reading instrumentally, follow directions given in the Clinitek Advantus procedure.

D. Use the Refractometer under the following circumstances:

1. Clinitek Advantus result of s.g. ≤1.005 or s.g ≥1.030 is obtained
2. Urine is highly colored so as to interfere with dipstick reading
3. Physician requests specific gravity by meter
4. Clinitek Advantus is inoperable

E. Use visual read only if both Clinitek Advantus and Refractometer are inoperable:

1. To read visually, compare the **SPECIFIC GRAVITY** reagent area to the corresponding Color Chart on the bottle label at **45 seconds**. Hold strip close to color blocks and match carefully.

VI. REPORTABLE RANGE:

The Clinitek reports specific gravity from ≤1.005 to ≥1.030 in increments of 0.005. For the Corewell Health East report, values less than 1.005 or greater than 1.030 are retested by Refractometer and edited to the Refractometer value obtained. Any Refractometer value ≥1.035 is diluted with H_2O and repeated.

VII. REFERENCE RANGE:

A. 1.005 – 1.030

B. Random urine specimens can vary in specific gravity from 1.003 to 1.040+. Normal adults with normal diets and normal fluid intake will produce urine of specific gravity 1.016 – 1.022 during a 24 hour. period. If a random urine has a specific gravity of ≥1.023, concentrating ability can

be considered normal.

VIII. LIMITATIONS/INTERFERING SUBSTANCES:

A. Highly buffered alkaline urines may cause low readings relative to other methods. The Clinitek automatically adjusts strips read instrumentally for pH.

B. Moderate quantities of protein (100-750 mg/dL) may elevate specific gravity readings.

C. Neither glucose nor radiocontrast dyes interfere with this method.

D. **Notes**: When x-ray crystals are suspected from microscopic examination of urinary sediment, the urine specific gravity should be retested by refractometry of the uncentrifuged urine. A specific gravity of ≥1.035 correlates with the presence of x-ray crystals.

IX. REFERENCES:

1. Multistix 10 SG. Miles, Inc. Diagnostics Division, Elkhart, IN 46515, rev. 04/99
2. Henry, J.B., Clinical Diagnosis and Management by Laboratory Methods, 20th editions, Philadelphia, W.B. Saunders Co., 2001 pp. 371-372.
3. Hundley, J.M. and Fleming, J.K., Urine Analysis American Society of Clinical Pathologists Workshop, Dearborn, MI., 1991.

Approval Signatures

Step Description	Approver	Date
Medical Director	Ann Marie Blenc: System Med Dir, Hematopath	4/17/2023
Policy and Forms Steering Committee Approval (if needed)	Gail Juleff: Project Mgr Policy	4/11/2023
Policy and Forms Steering Committee Approval (if needed)	Colette Kessler: Mgr, Division Laboratory	4/10/2023
Lab Chemistry Best Practice Committee	Caitlin Schein: Staff Physician	4/10/2023
Lab Chemistry Best Practice Committee	Qian Sun: Tech Dir, Clin Chemistry, Path	4/5/2023
	Colette Kessler: Mgr, Division Laboratory	4/5/2023