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Applicability	Taylor + Trenton + Wayne

Urine Specific Gravity by Refractometry

Document Type: Procedure

I. PURPOSE AND OBJECTIVE:

The refractive index and the specific gravity of a urine specimen are both related functions of the quantity and types of dissolved substances in a urine specimen. The Digital Refractometer is a temperature compensated meter that measures the refractive index. The meter's scales show this value as specific gravity.

II. SPECIMEN COLLECTION AND HANDLING:

1.0 ml of fresh urine collected in a clean container. Urine preservatives should not be used.

III. REAGENTS:

A. Isopropyl Alcohol
B. Distilled Water

IV. EQUIPMENT:

A. Fisherbrand™ Handheld Analog Clinical Refractometer - Corewell Trenton
B. Fisherbrand™ HDR-P5 Digital Refractometer - Corewell Taylor, Wayne and Canton

V. SUPPLIES:

A. Disposable plastic pipette

B. Lint free cloth

C. Distilled water

VI. CALIBRATION:

Calibration will be performed at least annually or as needed for troubleshooting purposes.

A. Fisherbrand™ Handheld Analog Clinical Refractometer

1. For accurate measurement, the room temperature must be 20º C (68ºF) when calibrated.
2. Lift the Daylight Plate and place 3 drops of distilled water to cover the prism. The area should be free of any air bubbles or dry spots.
3. Gently and slowly lower the plate down to prevent splash.
4. Allow the sample to rest on the prism for approximately 30 seconds before continuing to step 5. This allows the sample to adjust to the ambient temperature of the refractometer.
5. Hold the refractometer to the eye and the Daylight Plate in the direction of a light source.
6. While looking through the eyepiece, turn the Calibration Screw with a flathead instrument until the boundary between the upper blue field and the lower white field meet exactly on the 1.000 Specific Gravity line.

B. Fisherbrand™ HDR-P5 Digital Refractometer

1. Be sure that the measuring surface and well are clean as outlined in Cleaning section.
2. Allow time for the distilled water sample to temperature equilibrate to that of the instrument.
3. Apply 0.2-0.3 mL distilled water to the measurement surface and close the cover
4. Press and hold the 'ZERO' button for 2 seconds until CAL is displayed.
5. Press the 'ZERO' button for 2-3 seconds until you see 'CAL' flashing.
6. Press the 'ZERO' button once again while 'CAL' is flashing to start to calibrate.
7. When the calibration is completed, the display will show "-End"
8. If the calibration fails, the display area will give an error code above the 'CAL"

VII. MAINTENANCE:

A. Fisherbrand™ Handheld Analog Clinical Refractometer

1. Clean the instrument between each measurement with distilled water, wiping the prism with a soft, dry or damp cloth.

B. Fisherbrand™ HDR-P5 Digital Refractometer

1. Cleaning of the measurement surface and well should be performed immediately

after each sample reading. NEVER immerse the instrument in any liquid. When the measurement surface and well have been completely cleaned, no residue should be present

2. Clean the sample well with a distilled water rinse
3. Dry thoroughly using a Lint free cloth

VIII. QUALITY CONTROL:

A. Kovatrol I and Kovatrol III are run daily.

1. Controls are prepared weekly by reconstituting with clinical laboratory reagent water (deionized water) using a graduated cylinder. See package insert for more details based on the bottle size.
2. Gently rotate the bottle until completely dissolved (approximately 15 minutes).
3. Allow controls to reach room temperature prior to testing.
4. Apply urine control to refractometer using the same method as that for patient testing
5. Record results in Biorad Unity or document on QC log as appropriate.
    a. If control fails, repeat the test
    b. If the repeat control fails, perform calibration
    c. Patient results are not reported until acceptable QC is obtained.

IX. PROCEDURE:

A. Fisherbrand™ Handheld Analog Clinical Refractometer

1. Lift the Daylight Plate of the refractometer and place a small amount (2 to 3 drops) of urine to cover the entire prism.
2. Gently and slowly lower the plate down to prevent splash.
3. Allow the sample to rest on the prism for approximately 30 seconds before going to step 4. This allows the sample to adjust to the ambient temperature of the refractometer.
4. Hold the refractometer to the eye with the Daylight Plate in the direction of a light source. A circular field/scale with graduations down the center will be visible. Focus if necessary. The upper portion of the field should be blue and the lower portion white.
5. Take the reading where the boundary line of blue and white cross the graduated scale.
6. Lift the Daylight Plate and flush the plate with distilled water. Wipe the sample from the prism with a soft, dry or damp cloth. Do not immerse in water.

B. Fisherbrand™ HDR-P5 Digital Refractometer

1. Turn on the refractometer by pressing the READ button. '----' will be displayed.

2. Before testing a patient specimen, make sure the refractometer is clean and dry.
3. Allow the sample time to reach the same temperature as the instrument. Failure to do so will result in inaccurate measurement.
4. Using a plastic pipette, place 1 or 2 drops of urine in the sample well covering it completely. Minimum sample size is 0.2 to 0.3 mL.
5. Close the cover.
6. Press the “READ” button to measure the Specific Gravity of the sample and note the displayed value. If you press the READ key for 2 seconds, the instrument will take 15 measurements (remaining measurements will countdown on the screen) and then the average result will be displayed.
7. Clean off the sample from the measuring chamber using a Lint free cloth and clinical laboratory reagent water (deionized).
8. Patient results should be recorded on the Patient Log.
9. Instrument will automatically turn off after 1 minute of inactivity.

X. RESULT REPORTING:

A. Report results to the thousandth (e.g. 1.0XX)

B. Fisherbrand™ Handheld Analog Clinical Refractometer -results from the Clinitek >1.030 will be reported up to 1.~~050~~045. Results >1.~~050~~045 will be reported as >1.~~050~~045.

C. Fisherbrand™ HDR-P5 Digital Refractometer - results from the Clinitek >1.030 will be reported up to 1.~~050~~045. Results >1.~~050~~045 will be reported as >1.~~050~~045.

D. Results from the ~~Velocity~~Sysmex UN Clinitek Novus >1.~~060~~045 will be reported ~~up to > 1.050 from the refractometer. Results~~as >1.~~050 from the refractometer will be reported as >1~~045.~~050.~~

E. Enter the specific gravity results obtained from the refractometer into the Laboratory Information System (LIS) if the greater than (>) result is not confirmed.

XI. TROUBLESHOOTING:

A. Fisherbrand™ Handheld Analog Clinical Refractometer

1. If the instrument becomes foggy, water has entered the body. Contact Customer Service.
2. Failure to clean the prism on a regular basis will lead to inaccurate results and damage the prism's coating.

B. Fisherbrand™ HDR-P5 Digital Refractometer

1. Error Codes:
    a. A01- Beyond the scope of calibration temperature (0.0^{O}C-40.0^{O}C)
    b. A02- During calibration, no solution or solution wrong
    c. A03- This instrument has a hardware failure.

d. LLL- Below measuring range

e. HHH- Above measuring range

2. Battery Condition: (1 AAA batteries) Replace when no lines appear in battery icon on screen.

XII. REFERENCES:

A. Burtis, Carl A., Ashwood, Edward R. Tietz Textbook of Clinical Chemistry. W. B. Saunders Co.; Philadelphia, 1994 pp. 1556-1557.

B. Fisherbrand™ HDR-P5 Digital Thermometer Operational Manual, 201803MP01

C. Fisherbrand™ Analog Clinical Refractometer User Manual RH-DOC-2031974

Attachments

Urinalysis Manual Result Worksheet.pdf

Approval Signatures

Step Description	Approver	Date
Medical Director	Muhammad Arshad: Chief, Pathology	6/24/2024
Policy and Forms Steering Committee Approval (if needed)	Tanya Williams: Medical Technologist Lead	6/19/2024
	Christopher Ferguson: Dir, Lab Operations B	6/19/2024
	Ashley Beesley: Mgr, Laboratory	6/19/2024
	Kristen DiCicco: Mgr, Laboratory	6/18/2024
	Katherine Persinger: Mgr, Laboratory	6/18/2024
	Tanya Williams: Medical Technologist Lead	6/18/2024

Applicability

Taylor, Trenton, Wayne