

OREGON HEALTH & SCIENCE UNIVERSITY  
Hospitals and Clinics  
Point of Care

**Specific Gravity, Urine  
by American Optical Refractometer**

Principle

The refractive index and the specific gravity of a urine specimen are both related functions of the quantity and type of dissolved substances in the specimen. Each substance contributes differently to the refractive index and to the specific gravity. Because various urine specimens are likely to contain similar types and proportions of dissolved substances, the refractive index and the specific gravity may be correlated. Urine specific gravity by an optical refractometer is used as a screening test. Increased amounts of abnormal substances such as protein, glucose or radiographic contrast medium in urine may give high specific gravity results that are not necessarily indicative of normal renal function. With decreased renal function, specific gravity is  $<1.020$ . As renal impairment is more severe, specific gravity approaches 1.010.

The instrument most commonly used to measure specific gravity is the TS (total solids) Meter by American Optical. This is a hand refractometer with two temperature-compensated scales (between  $15.5^{\circ}\text{C}$  and  $37.8^{\circ}\text{C}$ ), which allow direct determination of total solids of serum or the specific gravity of urine.

Specimen Requirements

1. 0.5 mL of fresh urine.
2. Samples are stable up to 4 hours when stored at  $2-8^{\circ}\text{C}$ .

Interferences

Excretion of radiographic contrast medium will cause a marked increase in specific gravity results in urine.

Linearity

1.000-1.035

Reference Range

- |           |                   |             |
|-----------|-------------------|-------------|
| 1. Urine: | 24 hr collection  | 1.015-1.025 |
|           | Random, adult     | 1.002-1.030 |
|           | Fluid restriction | $>1.025$    |

## Alert Values

None

## Quality Control

1. Perform Quantimetrix Dropper Plus Urine Levels 1 and 2 control solution tests every 24 hours of patient testing. Allow QC material to come to room temperature prior to performing testing.
2. Record the liquid control results in the Quality Control (QC) logbook. Include the date, your initials, and the reagent lot numbers and expiration dates.
3. If the liquid control fails, repeat the test. If the repeat fails, perform calibration and repeat control test.
4. If the second repeat fails, do not use the refractometer. Send urine samples to the Core Laboratory for testing. Notify the POCT Coordinator at 4-5497. Document all action taken on the QC logsheet.

## Procedure

1. Turn on the light by pressing the button on the back of the refractometer stand.
2. Place 1-2 drops of quality control or patient sample between the prism and the cover plate and allow the liquid to be drawn into the space between the two by capillary action.
3. Press the plastic cover gently but firmly to spread the small volume of sample in a thin, even layer over the prisms.
4. Read the specific gravity where the sharp boundary between the light and dark fields cross the left hand scale. If necessary, rotate the eyepiece to focus.
5. Lift the plastic cover plate up and wipe the sample from the prism and cover plate with a lint free tissue.
6. Turn the light off.

## Calculations

N/A

## Reporting Results

1. Results are reported out to three decimal places, i.e., 1.0XX.
2. Results outside of the device's linearity are reported as <1.000 or >1.035.

## Calibration- By POCT

1. Perform calibration once every 6 months using sterile bottled distilled water and 5% Saline.
2. To perform calibration:
  - a. Turn on the light by pressing the button on the back of the refractometer stand.
  - b. Place 1 - 2 drops of sterile water between the prism and the cover plate and allow the liquid to be drawn into the space between the two by capillary action.
  - c. Press the plastic cover gently but firmly to spread the small volume of liquid in a thin, even layer over the prisms.
  - d. Read the specific gravity where the sharp boundary between the light and the dark fields cross the left-hand scale. If necessary, rotate the eyepiece to focus.
  - e. Lift the plastic cover plate up and wipe the sample from the prism and cover plate with a lint free tissue.
  - f. Repeat process b through e with 5% Saline.
  - g. Turn the light off.
3. Sterile water should read  $1.000 \pm 0.002$  to be acceptable. 5% Saline should read  $1.023 \pm 0.002$  to be acceptable.
4. Record the calibration results on the QC logsheet. Include date and your initials.
5. If the result is outside the acceptable limits, contact the Point of Care Coordinator at 4-5497.

## Reagents

1. Quantimetrix Urine Dipstick Control Kit, Dropper Plus, Levels 1 and 2.
  - a. Allow the controls to sit at room temperature for fifteen minutes.
  - b. Vials are stable at room temperature for one month or refrigerated until the expiration date on the vial.
2. 5% Saline. Stable at room temperature for 1 year. Contact Point of Care at 4-5497:

## References

1. Tietz, Norbert W. Textbook of Clinical Chemistry. W.B. Saunders Co.: Philadelphia, 1986, pp. 1301-1302.
2. Wallach, Jacques. Interpretation of Diagnostic Tests. Little, Brown and Co.: Boston, 1978, p. 93.