

Urinalysis Dipstick Screen

Body function, both normal and abnormal, will be reflected in the appearance and chemical composition of urine. A urinalysis is performed to screen for renal, urinary tract, metabolic or systemic disease. The dip and read techniques are easy to perform. However, as with all laboratory procedures, the test requires care in its performance. The directions must be followed exactly. Accurate timing of the glucose and nitrite tests is essential to provide reliable results. The reagent strips must be kept in the bottle with the cap tightly closed (as specified on the cap) to maintain proper reagent reactivity. Also of great importance, any test result is not better than the specimen on which it is performed. Therefore, to obtain optimum results, it is necessary to use FRESH, well-mixed, uncentrifuged urine.



Universal Safety Procedures are required for all laboratory testing.

PREPARATION AND LABELING:

The manufacturer labels reagents.

All laboratory supplies must be labeled with both the received and open dates.

STORAGE AND STABILITY:

- All unused strips must remain in the original bottle.
- Transfer to any other container may cause reagent strips to deteriorate and become unreactive.
- Do not store bottle in direct sunlight.
- Lid must be closed tightly to keep out moisture
- Do not remove desiccant from bottle.
- Store at temperatures between 15°-30°C (59°-85°F).
- Test strips and controls are good through manufacturer's expiration date.

CRITERIA FOR SPECIMEN ACCEPTABILITY:

- a. Patient Preparation: None
- b. Method of Collection: The specimen container must be thoroughly clean and free from any detergent and disinfectant. The containers, if possible, should be capable of being sealed. Containers for bacteriologic determinations should also be sterile.
- c. Quality: Specimen may be rejected due to insufficient volume or contamination
- d. Type of Specimen: Urine, preferable first morning urine; clean-catch urine when testing for bacteriologic determinations.
- e. Volume Required: 10-15mL
- f. Timing of Collection: First morning specimen whenever possible. Avoid collection, if possible, at the time of menstruation and for 2-3 days after. *Blood may affect the readability of the reagent pads.*

Substances that cause abnormal urine color may affect the readability of test pads of urinalysis reagent strips.

These substances include:

- visible levels of blood or bilirubin and drugs containing dyes (e.g., Pyridium, Azo Gantrisin, Azo Gantanol),
- nitrofurantoin (Macrochantin, Furadantin), or
- riboflavin

Levels of ascorbic acid normally found in urine does not interfere with this test.

LABORATORY TEST LOG/PATIENT'S CHART:

Date, patient's name, test, test result, person performing the test and any other Pertinent information needed to assure specimen integrity and identity.

The patient's chart must contain a unique identifier that is assigned by PHOCIS. This unique identifier is located on the patient demographic profile sheet.

MATERIALS NEEDED:

- Disposable Gloves
- Prepackaged Wipes
- Urine Collection Containers
- MultiStix Reagent Strips

SPECIMEN COLLECTION:

Approximately 15mL of urine

Collection Procedure for Clean Catch Specimens:

The female patient should thoroughly cleanse skin and collect a midstream specimen in the following manner:

1. Wash hands with soap and water.
2. Rinse hands and dry with a paper towel or hand dryer.
3. Tear open the towelette packages so that the towels can be easily removed with one hand, as they are needed.
4. Tear open the towelette packages so that the towels can be easily removed with one hand, as they are needed.
5. Open the urine container. Do not touch any of the inside surfaces or the lid.
6. Remove undergarments and sit on the toilet with legs spread apart.
7. With one hand, spread the labia apart to expose the vulva. Keep this hand in place during washing and urinating procedure.
8. Use the towelette to wash the vulva, passing the towelette only from front to back. Repeat this procedure using the second towelette.
9. Begin urinating into the toilet bowl then, without stopping the flow of urine, insert the container into the stream of urine. Do not allow the container to touch the legs, vulva, or clothing. Fill the container about half full.
10. Replace the lid on container.
11. The urine specimen should be returned to the laboratory area where the completed patient label is applied to the cup.

Once the urine specimen is split at the point of collection, the urine remaining in the sterile plastic screw top container may be used for dipstick testing.

A first morning is preferred but random collections are acceptable.

Urine should be examined soon after collection. If there is a delay in testing, the urine should be stored in the refrigerator and examined as soon as possible.

QUALITY CONTROL:

One Chex-Stix Positive Strip and one Negative Control Strips should be performed **monthly**. Record strip lot number, expiration date, and values, (as indicated in the Expected Results table) on Control Log. Store the Chek-Stix Control Strips in the original tightly capped bottle at temperatures between 15°-30°C. Do not store the bottle in direct sunlight. Do not remove the desiccant from bottle. The control strips are stable until manufacturer's expiration date.

QUALITY CONTROL PROCEDURE:

MATERIALS NEEDED:

- Disposable Gloves
- Graduated Plastic Tubes (provided)
- Distilled Water
- Chex-Stix Combo Pak Controls



1. Label one tube Positive and one tube Negative. Place 12mL of distilled or deionized water in each appropriately labeled tube. **DO NOT USE TAP WATER.**
2. Remove a CHEK-STIX Control Strip from the bottle and replace the cap immediately and tightly.
3. Place the strip into the tube. Cap tightly.
4. Repeat Steps 1-3 for other control
5. Gently invert the tube(s) back and forth for 2 minutes
6. Allow the tube(s) to stand for 30 minutes at room temperature.

Invert one more time, then remove; read and discard the strip(s) according to laboratory procedures.

7. Rinse control tubes and invert to dry.
8. Expected Results: Test result names may be abbreviated as shown below. You must include units (when applicable) Use + according to color chart on the bottle of Multistix when reporting out QC results. Negative results use negative not neg.

TEST	POSITIVE CONTROL	NEGAVTIVE CONTROL
Gluc	100mg/dL-250mg/dL	Negative
Ket	≥ Trace	Negative
Bio	Moderate-Large	Negative
pH	≥ 8.0	6.0-7.0
Prot	Trace-100mg/dL	Negative
Nit	Positive	Negative
Leu	Trace-Moderate	Negative

HANDLING PRECAUTIONS FOR DIPSTICKS:

All unused strips must remain in the original bottle. Transfer of reagent strips to any other container may cause reagent strips to deteriorate and become unreactive.

Do not remove desiccants from bottle.

Replace cap immediately and close tightly after removing reagent strip.

Do not touch test areas of the reagent strip.

Keep reagent test areas away from detergents that may be found in specimen containers and other contaminating substances found in working area.

Dip the test areas in urine completely, but briefly to avoid dissolving out reagent.

Read test results carefully at the times specified, in a good light and with the test area held near the appropriate color chart.

Protection against ambient moisture, light, and heat is essential to guard against altered reagent activity. Discoloration or darkening of reagent areas may indicate deterioration

PROTEIN:

- The test is based on the protein-error-of-indicators principle at a constant pH, the development of any green color is due to the presence of protein.
- Colors range from:
 - yellow for Negative through yellow-green and
 - green to green-blue for Positive
- **Expected values:**
 - In normal urine, less than 150 mg of total protein is excreted per day (24 hour period) (<15mg/dL).
 - Clinical proteinuria is indicated at greater than 500 mg of protein per day (strip result of \geq 30mg/dL).
- **Performance characteristics:** the protein pad is not specific for a particular protein and proteins other than albumin can cause a positive response.
- **Limitations:** Visibly bloody urine may cause falsely elevated results.
- **Sensitivity:** 15-30mg/dL albumin

BLOOD:

- The test is based on the peroxidase-like activity of hemoglobin, which catalyzes the reaction of diisopropylbenzene dihydroperoxide and 3,3',5,5'-tetramethylbenzidine.
- Colors range from:
 - orange through green; very high levels of blood may cause the color development to continue through blue.
- **Expected values:**
 - Normally, hemoglobin is not detectable in urine.
 - Occult blood occurs in urine as intact erythrocytes and hemoglobin, which can occur during urological, nephrological, and bleeding disorders.
 - Small amounts of blood are sufficiently abnormal.
 - The significance of the Trace reaction may vary among patients and clinical judgment is required for assessment in an individual case.
- **Performance characteristics:**
 - presence of green spots on the reacted test pad indicates the presence of intact erythrocytes,
 - green color across the entire pad indicates free hemoglobin.
- **Limitations:** Capoten may reduce the sensitivity.
- **Sensitivity:** 0.015-0.062 mg/dL hemoglobin

LEUKOCYTES:

- Granulocytic leukocytes contain esterases that catalyze the hydrolysis of the derivatized pyrrole amino acid ester to liberate 3-hydroxy-5-phenyl pyrrole. Pyrrole then reacts with diazonium salt to produce a purple product.
- **Expected values:**
 - Normal urine specimens generally void negative results.
 - An increase in leukocytes (≥ 10 leukocytes/ μ L) is an indication of pyuria and is found in nearly all diseases of the kidney and urinary tract.
 - A strip result of Small or greater is a useful indicator of infection.
- **Performance characteristics:**
 - Leukocyte esterase is a reliable indicator of leukocytes in urine.
 - A positive reaction at less than the two (2) minute reading time may be as a positive indication of leukocytes in urine.
- **Limitations:**
 - Elevated glucose concentrations (≥ 3 g/dL) may cause decreased test results.
 - The presence of cephalexin (Keflex) or cephalothin (Keflin) or high concentrations of oxalic acid may also cause decreased test results.
 - Tetracycline may cause decreased reactivity and high levels of the drug may cause a false negative reaction.
 - Positive results may occasionally be due to contamination of the specimen by vaginal discharge.

Sensitivity: 5-15 white blood cells/hpf in clinical urine

NITRITE:

- This test depends on the conversion of nitrate (derived from the diet) to nitrite by the action of Gram negative bacteria in the urine.
- At the acid pH of the reagent area, nitrite in the urine reacts with p-arsanilic acid to form a diazonium compound.
- This diazonium compound couples with 1,2,3,4-tetrahydrobenzo(h)quinolin-3-ol to produce a pink color.
- **Expected values:**
 - Normally no nitrite is detectable in urine.
 - Many enteric gram-negative organisms give positive results when their number is greater than 0.075mg/dL nitrite ion or greater.
- **Performance characteristics:**
 - The test is specific for nitrite and will not react with any other substance normally excreted in urine.
 - Nitrite concentration during infection increases with the length of time the urine specimen is retained in the bladder prior to collection.
- **Limitations:**
 - Pink spots or pink edges should not be interpreted as a positive result.
 - A negative result does not rule out significant bacteria.
 - False negative results may occur with shortened bladder incubation of the urine, absence of dietary nitrate, or the presence of pathological microbes.
- **Sensitivity:** 0.06-0.1 mg/dL nitrite ion

GLUCOSE:

- Based on the double sequential enzyme reaction.
- One enzyme, glucose oxidase, catalyzes the formation of gluconic acid and hydrogen peroxide from the oxidation of glucose.
- A second enzyme, peroxidase, catalyzes with the reaction of hydrogen peroxide with a potassium iodide chromagen to oxidize the chromagen to colors ranging from green to brown.
- **Expected values:**
 - Small amounts of glucose (≤ 3 mg/dL) are normally excreted by the kidney.
 - These amounts are usually below the sensitivity level of this test but on occasion may produce a result between Negative and 100 mg/dL that is interpreted as a positive result.
- **Performance characteristics:**
 - The test is specific for glucose; no substance excreted in urine other than glucose is known to give a positive result.
 - The test may be used to determine whether the reducing substance found in urine is glucose.

- If the color appears somewhat mottled at the higher concentrations, match the darkest color to the color blocks.
- **Limitations:**
 - Ketone bodies reduce the sensitivity of the test; moderately high ketone levels (40mg/dL) may cause false negatives for specimens containing small amounts of glucose (75-125 mg/dL).
 - The combination of such ketone and low glucose levels is metabolically improbable in screening.
- **Sensitivity:** 75-125mg/dL glucose

KETONE:

- Test based on the development of colors ranging from buff-pink, for a negative reading, to maroon when acetoacetic acid reacts with nitroprusside.
- **Expected values:**
 - Normally, ketone is not detected in urine.
 - In ketoacidosis, starvation or with other abnormalities of carbohydrates or lipid metabolism, ketones may appear in urine at levels of 10mg/dL or higher before ketone levels are elevated.
 - Clinical judgment is needed to determine the significance of Trace results, which may occur during physiological stress conditions such as fasting, pregnancy and frequent strenuous exercise.
- **Performance characteristics:**
 - The test reacts with acetoacetic acid in urine.
 - It does not react with acetone or β -hydroxybutyric acid.
- **Limitations:**
 - False Trace results may occur with highly pigmented urine specimens.
 - Compounds that contain sulfhydryl groups may cause false positive results.
- **Sensitivity:** 5-10mg/dL acetoacetic acid

pH:

- Test based on double indicator principle that a broad range of colors covering the entire urinary pH range.
- Colors range from orange through yellow and green to blue.
- **Expected values:**
 - Normal pH of urine can range from 4.6-8.0.
 - Certain dietary conditions can produce acid or alkaline urines.
- **Performance characteristics:**
 - pH test area measures pH values from 5-8.5 visually.
 - pH readings are not affected by variations in the urinary buffer concentration.
- **Limitations:**

- Bacterial growth by certain organisms in a specimen may cause a marked alkaline shift (>8.0) usually because of urea conversion to ammonia.

SPECIFIC GRAVITY:

- Test based on the pKa change of certain pretreated polyelectrolytes in relation to ionic concentration. In the presence of an indicator
- **Expected values:**
 - Normal specific gravity of urine ranges from 1.001-1.035.
- **Performance characteristics:**
 - This test permits determination of urine specific gravity between 1.000 and 1.030.
 - It correlates within 0.005 with values obtained with the refractive index method.
- **Limitations:**
 - This test is dependent on ions in urine and results may differ from those obtained with other specific gravity methods when certain nonionic urine constituents, such as glucose are present.
 - Highly buffered alkaline urines may cause low readings, while the presence of moderate quantities of protein (100-750mg/dL) may cause elevated readings.

BILIRUBIN:

- **Expected values:**
 - Normal adult urine contains about 0.02mg/dL of bilirubin which is not detectable by the most sensitive methods.
- **Performance characteristics:**
 - The test is specific for bilirubin and will not react with any other substance normally excreted in the urine.
- **Limitations:**
 - Indican (indoxyl sulfate) may produce a yellow-orange to red color response that may interfere with interpretation. Metabolites of Iodine (etodolac) may cause false positive or atypical results.
- **Sensitivity:** 0.4-0.8mg/dL bilirubin

UROBILINOGEN:

- **Expected values:**
 - Normally present in the urine at concentrations up to 1.0mg/dL.
 - A result of 2.0mg/dL represents the transition from normal to abnormal.
- **Performance characteristics:**
 - Urobilinogen is detectable in concentrations as low as 0.2mg/dL in urine.

- **Limitations:**
 - The test pad may react with interfering substances known to react with Ehrlich's reagent, such as *p*-aminobenzoic acid.
 - False negative results may be obtained if formalin is present.

Appendix:

UA Log F-12

