KAISER PERMANENTE®
COLORADO LABORATORY

CLINITEK ADVANTUS PROCEDURE

PRINCIPLE

Urinalysis screens for abnormalities of urine which may reflect renal disease, urinary tract infection, or neoplasm, or systemic disease and disease adjacent to the urinary tract.

Urinalysis includes the examination of physical characteristics, such as color and appearance, chemical characteristics such as pH, protein, glucose, bilirubin, nitrite, specific gravity, blood, ketones, and leukocytes. When indicated, microscopic examination is performed for the detection of casts, RBCs, crystals, bacteria, epithelial cells, WBCs, yeast and other cellular components.

The Clinitek Advantus Analyzer is a semi-automated, benchtop instrument designed to read Siemens Medical Solutions Diagnostics Reagent Strips for Urinalysis. The analyzer is a reflectance spectrophotometer that analyzes the color and intensity of the light reflected from the reagent area and reports the results in clinically meaningful units. No calculations are by the operator.

Chemical Principles of the Reagent Strips

Test Name	*Chemical Principle*
Protein	At a constant pH, the development of any green color is due to the presence of protein (Protein error-of-indicators principle). Colors range from yellow for "Negative" through yellow-green and green to green-blue for "positive" reactions.
Blood	Hemoglobin 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 to blue.
Leukocytes	Esterases in granulocytic leukocytes catalyze the hydrolysis of the derivatized pyrrole amino acid ester to liberate 3-hydroxy-5-phenyl pyrrole. This pyrrole then reacts with a diazonium salt to produce a purple product.
Nitrite	Nitrate (derived from the diet) is converted 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 ρ-arsanilic acid to form a diazonium compound. This diazonium compound couples with 1,2,3,4-tetrahydroben-zo(h)quinolin-3-ol to produce a pink color.
Glucose	Glucose oxidase catalyzes the formation of gluconic acid and hydrogen peroxide from the oxidation of glucose. Peroxidase catalyzes the reaction of hydrogen peroxide with a potassium iodide chromogen to oxidize the chromogen to colors ranging from green to brown.
Ketone	Acetoacetic acid reacts with nitroprusside. Colors range from buff-pink, for a negative reading, to maroon.
pH	The double indicator principle gives a broad range of colors covering the entire urinary pH range. Colors range from orange through yellow and green to blue.
Specific Gravity	pKa changes occur for certain pretreated polyelectrolytes in relation to ionic concentration. In the presence of an indicator, colors range from deep blue-green in urine of low ionic concentration through green and yellow-green in urines of increasing ionic concentration.
Bilirubin	Bilirubin couples with diazotized dichloroaniline in a strongly acid medium. The color ranges

through various shades of tan.

SPECIMEN

A random, freshly voided urine sample is recommended. Collection procedures for both males and females are posted in all laboratory restrooms. The specimen must be collected in a clean, dry container and examined within one hour to avoid changes or deterioration in the urine. If the specimen must be kept for more than one hour before examination, it should be refrigerated at 2°- 8°C or transferred into a Urine vacuum preservative tube for no longer than 24 hours. Allow specimen to return to room temperature if refrigerated before testing. STAT testing must be performed within one hour and routine testing must be performed within 24 hours.

SPECIMEN STORAGE

Urine specimens will be kept a minimum of four hours prior to disposal, with the exception of specimens collected after 2 pm. For those locations that close at 6 pm, specimens collected after 2 pm will be disposed of just before closing. For After Hours, specimens collected after 6 pm will be held until closing and then discarded.

SPECIMEN REJECTION CRITERIA:

1. Specimen container without two forms of identification (Full name, DOB, MRN) or an LIS Label.
2. Unlabeled specimen container
3. Specimens collected >1 hour and not refrigerated or poured into a preservative tube.
4. Volume is <0.5 ml.

SPECIMEN FOR URINE CULTURE

Urine Culture will be ordered by the provider or automatically reflexed by the LIS based on the Urinalysis test protocol below. Time limit for setting up urine cultures from specimens stored at room temperature is described below. To provide a consistent process, use the following guidelines:

1. When a urine culture is ordered by the provider at the same time as a urinalysis, the culture needs to be set up immediately upon receipt of the specimen.

2. When a urine culture reflexes as a result of the dipstick analysis, the culture needs to be set up as soon as the label prints.

3. When a provider calls to add on a urine culture to a specimen received earlier in the day, the culture must be set up within 1 hour of collection. E. coli can double its bacterial count within 17 minutes. To prevent erroneous results affecting patient diagnosis and treatment, minimize replication of bacteria by plating the specimen as quickly as possible after collection. Requests for culture to a specimen greater than 1 hour after collection must be rejected.

4. After the culture has been set up, review the plate to ensure that it has been inoculated, then initial the label on the plate as an indicator that this step has been completed.

5. As the culture plate is being prepared for transport, check the plate to ensure that it has been inoculated. If the plate has been inoculated, initial the plate and scan the ACCN onto the Transfer List. If the plate has not been inoculated, proceed with the following steps:

    a. Take the plate to the person working the UA bench.
    b. Have that person check the collection time to determine if the specimen is too old to plate. Urine cultures must be plated within one hour of collection.
    c. If not, inoculate the plate and initial the plate.
    d. If the specimen is too old, cancel the culture, notify the provider and fill out a variance.

SUPPLIES

1. Siemens Clinitek Advantus Urine Analyzer.

2. Siemens Multistix 10SG.
    - KPID = 0000 3529 (Reagent Multistix Strip 10SG 100 / pkg)
    - Protect reagent strips against exposure to light, heat, and ambient moisture to guard against altered reagent reactivity.
    - Store the unused strips in the original bottle. Transferring unused reagent strips to other containers may cause the strips to deteriorate and become un-reactive.
    - Store the reagent strips at room temperature, 15° – 30°C
    - Do not store the bottle in direct sunlight.
    - Do not remove the desiccant from the bottle.
    - Do not use reagent strips beyond the expiration date.
    - Initial and date the reagent bottle when you first open it and document on the maintenance log.
    - Do not remove the strip from the bottle until immediately before it is to be used for testing. Replace the cap immediately and tightly after removing the reagent strip.
    - Do not touch the test pads of the reagent strip.

3. Thermal paper
    - KPID = 0006 3529 (Paper thermal roll 2 ¼ “ x 85’, 3 rolls / pkg)

4. Siemens Clinitek Advantus disposal waste bin liner
    - Fisher, cat no AM6472, 5/pk

MAINTENANCE

See separate maintenance protocol

CALIBRATION

Calibration is performed at each read head immediately before each reagent strip is read. The fixed platform contains two white calibration bars, positioned directly under each read head. As a strip comes into position under a read head, the analyzer reads the calibration bar and calibrates for that scanning cycle. The analyzer then scans the reagent strip and stores the data in memory. Calibration confirmation is performed daily when patient samples are tested and documented on the maintenance log. See Maintenance log and maintenance protocol.

QUALITY CONTROL

- BIO-RAD qUAntify Control System, Negative urine control, Level 1
- BIO-RAD qUAntify Control System, Positive urine control, Level 2, (product # 975)

- The unopened urine controls are stable at 2 °- 8° C. (35° - 46°F) up to the expiration date printed on the label.
- After opening, the controls are stable for 31 days at the following temperature: 2°C to 25°C. (40° - 80° F)

- Immediately upon opening a new set of controls:
    1. Write the “date opened” on each bottle
    2. Determine the expiration date, (31 days from “date opened”), and write the new “expiration date” on each bottle
    3. Open controls will be retained at room temperature for the duration of the vial's use
    4. Attach a small accession number aliquot label to the appropriate vial – see below
- Do not freeze
- Run both levels of controls daily when patient samples are tested and when opening a new bottle of reagent strips.
- Quality Control Lots are sequestered for all medical office laboratories. Information is entered into the LIS where all QC values are transmitted and stored. The supervisor or designee is responsible for reviewing QC values in the LIS on at least a monthly basis.
- Control values should fall within the assigned values listed on the control manufacturer's package insert.
- When tolerance limits are exceeded, perform the following steps:
    1. If the urine control is out the first time, rerun the control
    2. If the control is out a second time, open a new set of strips. If the control is OK, discard the first vial of strips and continue with the newly opened vial of dipsticks.
    3. If the control is still out with the new strips, clean the Clinitek per the manufacturer's recommendations and repeat controls using the original strips.
    4. If the control is out this time, open a new vial of control. Opening a new vial of control should be considered the last resort. All of the steps above should be performed prior to opening a new vial of control.

Testing QC Samples

1. At the Ready/Run screen, select Menu.
2. Select ID
3. Scan the accession number label on each QC vial. Each medical office laboratory has been assigned an accession number to use so that QC values are transmitted to and verified in the LIS.

Clinitek Advantus QC Accession numbers for MOL

Location	Level 1	Level 2
Arapahoe	**0-QC-083001**	**0-QC-083002**
Aurora Centrepoint	**0-QC-323001**	**0-QC-323002**
Baseline	**0-QC-343001**	**0-QC-343002**
Brighton	**0-QC-563001**	**0-QC-563002**
Castle Rock	**0-QC-403001**	**0-QC-403002**
East Denver	**0-QC-063001**	**0-QC-063002**
Englewood	**0-QC-143001**	**0-QC-143002**
Evergreen	**0-QC-513001**	**0-QC-513002**
Franklin	**0-QC-023001**	**0-QC-023002**
Hidden Lake	**0-QC-263001**	**0-QC-263002**
Highlands Ranch	**0-QC-443001**	**0-QC-443002**
Ken Caryl	**0-QC-453001**	**0-QC-453002**
Lakewood	**0-QC-033001**	**0-QC-033002**
Longmont	**0-QC-193001**	**0-QC-193002**
Parker	**0-QC-503001**	**0-QC-503002**
Pueblo North	**0-QC-673001**	**0-QC-673002**
Rock Creek	**0-QC-423001**	**0-QC-423002**
Smoky Hill	**0-QC-123001**	**0-QC-123002**
Southwest	**0-QC-093001**	**0-QC-093002**
Westminster	**0-QC-073001**	**0-QC-073002**
Wheatridge	**0-QC-103001**	**0-QC-103002**

5. Obtain a Multistix 10SG reagent from the bottle
6. Squeeze the QC material on each pad on the Multistix 10SG reagent strip
   CAUTION: Do not blot the edge of the strip. This could affect results.
7. Place the reagent strip onto the supports of the strip loading station, with reagent pads facing up.
8. Place the strip to the right and parallel to the push bar. Ensure that the end of the strip is against the back wall of the platform and that it is not touching the bottom of the strip loading station.
   CAUTION: Improper placement may cause the analyzer to jam or the strip to incorrectly align under the read heads.

9. Repeat steps 3 through 8 for each additional control.
10. The strip automatically advances along the strip loading station, under the read heads, and into the waste bin.
11. The results are printed and stored in memory.
12. Verify all results in the “ARE” application of the LIS by using the accession numbers above. Document all action taken in the LIS for controls that were out of limits.

URINALYSIS TEST PROTOCOL

TEST STRIP		ACTION
Specific Gravity		**Report**
PH		**Report**
Leukocyte Esterase	**If Positive**	**Do microscopic and culture**
Nitrite	**If Positive**	**Do microscopic and culture**
Protein	**If Positive**	**Do microscopic** **Do culture if > 5 WBC/hpf**
Glucose		**Report**
Ketone		**Report**
Urobilinogen		**Do NOT Report**
Bilirubin	**If Positive**	**Ictotest no longer necessary**
Blood	**If Positive**	**Do microscopic** **Do culture if >5 WBCs/hpf**

PROCEDURE – Patient Testing on the Clinitek Advantus with Identification

NOTE: The dipstick portion of specimen testing can be completed and verified by a CLA. The CLA must make sure that if (Blood, Leukocytes (WBC’s), Nitrite (Bacteria) and/or Protein is positive that the sample is spun down for a microscopic examination performed by a technologist. If the technologist is not available pour the sample into properly labeled preservative tubes for later UA microscopic and culture if necessary.

1. Perform physical and chemical analysis on un-centrifuged urine
2. At the Read/Run screen, select ID.
3. Enter the ID number for the specimen you are about to test by scanning the barcode label on the specimen cup (Not the lid). The ID can also be typed in using the numeric keypad in the event barcode labels are not available or the scanner is not functional.

4. When this information is correctly entered press <ENTER>
5. Completely immerse all of the reagent pads on a Siemens Reagent Strip in fresh, well-mixed, un-centrifuged urine.
6. Immediately remove the reagent strip from the urine sample
7. While removing the strip, run the edge against the side of the container. This removes excess liquid.
   CAUTION: Do not blot the edge of the strip. This could affect results.

8. Place the reagent strip onto supports of the strip loading station, with the reagent pads facing up.

9. Place the strip to the right and parallel to the push bar. Ensure that the end of the strip is against the back wall of the platform and that it is not touching the bottom of the strip loading station.
   CAUTION: Improper placement may cause the analyzer to jam or the strip to incorrectly align under the read heads.
10. Repeat steps 2 through 9 for each specimen.
11. When the push bar is to the far left of the platform, you can place a new strip on the loading station until the previous strip placed enters the waste bin. When the final strip moves to the waste bin, the run ends, and end of run reports are processed.

To delete an accession number that was entered in error:

1. If you entered an accession number in error, press on the ID button at the main screen which shows the incorrect ID.
2. Press on the up arrow button until the ID you want to delete is displayed
3. Press on the delete button
4. Press on the “Delete Only ID: XXXX option

To resend a patient result (or multiple patient results) to the LIS:

1. At the main screen press MENU
2. Press MEMORY
3. Select LAST BATCH OF PATIENT RESULTS button
   or SEND ONLY THIS RESULTS button
   or SEND A GROUP button

4. Click on the re-transmit button →

Procedure Notes - Mechanical problems are evident when the analyzer shows an error code message. A chemistry problem may display a data flag, or may become evident with an unexpected result. If you obtain an unexpected result on any chemistry, refer to *The Limitations and Performance Characteristics* sections of the *Multistix 10SG Urine Test Strip package insert*.

Dark orange color and extremely bloody urine samples

Note: CLA's are not to dip or report any parameter from a "strangely" colored or "bloody" urine. If the technologist is not available to follow up, call the provider to inform them of the delay. Pour this sample into preservative (UA and culture) tubes for follow up.

Dark orange color may be produced in the urine due to the presence of drugs containing azo dyes. This abnormal color will affect the dipstick results from the Clinitek Advantus. Follow the steps below in the LIS for reporting of such urine specimen.

1. Report the color as "Orange"
2. Report the appropriate appearance
3. Click on Perform
4. All of the dipstick results will be reported as ** and a comment of: "Cannot read dipstick due to color interference" will be attached.
5. Centrifuge an aliquot of the urine sample and examine microscopically and report findings.

Extremely bloody urines also give erroneous results on the dipstick result from the Clinitek Advantus. Follow the steps below in the LIS for reporting of such urine specimen.

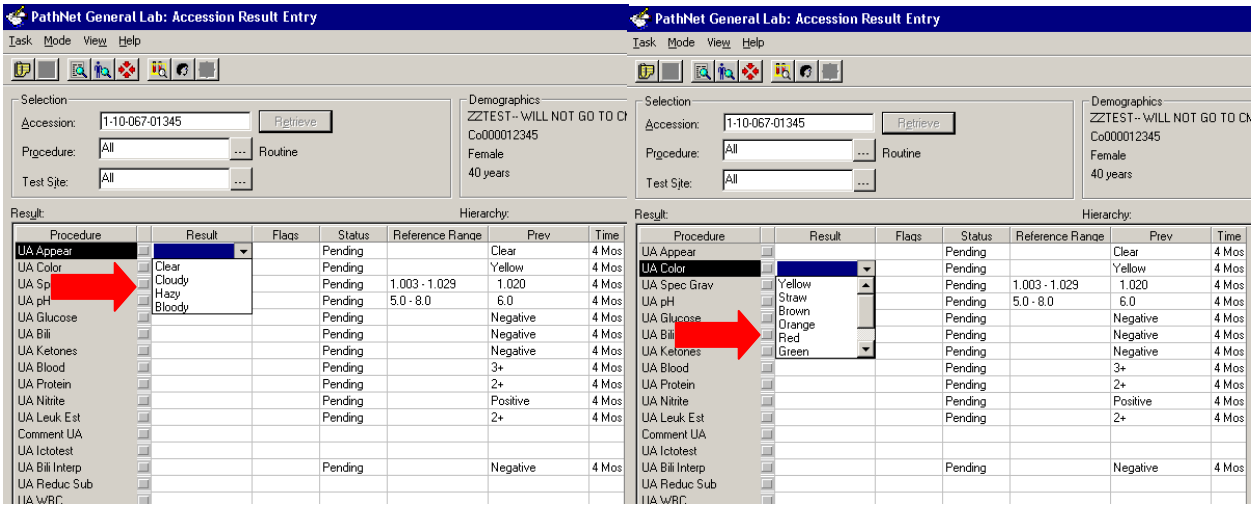
1. Report the color as "Orange"
2. Report the appropriate appearance
3. Click on Perform
4. All of the dipstick results will be reported as ** and a comment of: "Cannot read dipstick due to color interference" will be attached.
5. Centrifuge an aliquot of the urine sample and examine the sediment microscopically and report the findings.
6. Prior to verifying the results, change the color to "Red"
7. Do not perform a dipstick analysis on the supernatant of bloody urine samples.

REPORTING RESULTS

Dipstick Examination:

Examine the urine analyzer printout for errors, and confirm specimen identification. Transfer results to the Cerner computer, verifying patient identification and result values. Enter the color and clarity of the specimen.

CLA's will **verify** dipstick portion of results in Cerner. They will be required to spin samples for microscopic review if urine is positive for Blood, Leukocytes, Nitrite and/or protein.



Positive glucose results on pediatric patients (< 1 year old) will reflex a comment that Clinitest is no longer being performed on positive glucose dipstick results.

Positive bilirubin results will require you to click on the UA Bili interp box so that a “positive” result auto populates this field. If the Bili interp box is not clicked, the urinalysis is not complete and will appear on pending logs.

PROCEDURE – MICROSCOPIC EXAMINATION

Perform microscopic examination if required by Urinalysis Test Protocol above, or if specifically requested by the provider.

1. Centrifuge 10-12 ml of urine in a centrifuge tube at 2000 rpm for 5 minutes.
2. Discard supernatant by inverting tube completely.
3. Mix sediment.
4. Place one drop on a glass slide, coverslip, and examine under the microscope. Only one specimen per slide.
5. Examine under low power for casts.
6. Examine under high power for WBC's, RBC's, crystals and other elements.
7. Examine at least 10 fields.

Microscopic Examination:

1. **Yeast, epithelial cells, mucus, crystals, and trichomonas** report as "trace" to "4+", using the criteria:

trace =	0-2/hpf
1+ =	3-5/hpf
2+ =	6-9/hpf
3+ =	10-50/hpf

4+ =	over 50/hpf

2. **Crystals -** Report type per high power field.

- If a crystal is hexagonal, it is either cystine or uric acid. Add 1 drop of HCL to sediment and examine: cystine is soluble in HCL, uric acid is insoluble.
- Report leucine, tyrosine, sulfa, ampicillin or X-ray dye crystals if able to identify.
- Refer to A Handbook of Routine Urinalysis for help in crystal identification

3. **Bacteria and Amorphous** – Report using the following criteria:

trace =	<¼ full field
1+ =	¼ full field
2+ =	½ full field
3+ =	¾ full field
4+ =	full field

4. **WBCs and RBCs:** Report as the average number of cells/hpf, using the following criteria:

WBC	RBC
0-4/hpf	0-3/hpf
5-10/hpf	4-10/hpf
11-20/hpf	11-20/hpf
21-50/hpf	21-50/hpf
51-100/hpf	51-100/hpf
Report >100/hpf as "full field	Report >100/hpf as "full field

Note: A drop of 2% acetic acid may be added to the sediment which will lyse the RBCs. This also defines the WBC nuclei and epithelial cells to aid in their identification.

5. **Casts:** Report casts as to classification, and casts and cylindroids as to average number per low power field.

6. **Sperm:** Report as spermatozoa as "present."

7. If after examining the sediment, you find nothing to report, enter "microscopic exam is negative for formed elements" as a microscopic comment.

8. Report other appropriate comments in the microscopic field.

9. Review and correlate microscopic findings with dipstick results before accepting results.

- See limitations of the procedure section and chart below

Positive Macroscopic Result	**Expected Microscopic Findings**	**Interpretive Notes**
Leukocyte	WBC	Increased granulocytes are seen in UTI, Pyelonephritis, LE and other collagen diseases, and in infections of the prostate, cervix and vagina. Monocytes are seen in renal transplant rejection. Eosinophils are seen in drug-induced acute interstitial nephritis, cholesterol embolism and shistosomiasis.
Blood	RBC	Indicative of acute or chronic renal or urogenital disease. Seen in hypertension, glomerular nephritis, cystitis, excessive exercise, and tumors of the bladder or kidney. The presence of dismorphic RBC's suggests a glomerular disease such as glomerular nephritis. RBC's are distorted when passing through the abnormal glomerular structure.
Protein	Casts / Mucus / Epithelial cells	Hyaline / Granular casts = frequently found in normal persons who have been stressed. Can also be found in patients with intrinsic renal disease. Granular casts form from degenerated cellular casts. WBC casts – Appear in the urine in a wide variety of disease states. Most consistently seen in infections of the kidney such as pyelonephritis. RBC casts – Diagnostic of glomerular disease or renal parenchymal bleeding. Most common disease states are acute glomerular nephritis, lupus nephritis, and immune complex disorders. Epithelial casts – Seen in acute tubular necrosis and glomerular nephritis. Waxy casts – Form from degenerated granular casts. The presence of many broad waxy casts is indicative of severe nephron degeneration / chronic renal failure. Epithelial (Squamous) – Have little if any clinical significance. Improperly collected specimen. Mucus – Large amount seen with chronic inflammation of urethra or bladder.
Nitrite	Bacteria	Presence of bacteria may be due to contamination, prolonged storage before examination, cystitis, or pyelonephritis.

PROCEDURAL NOTES

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- Always pour off urine samples into preservative tubes if they cannot be dipped immediately or if the technologist is not available to perform a microscopic examination within 15 minutes.

- It is extremely important to check UA printouts to confirm that a sample needs a microscopic exam and that that exam is done. Once verified (top part) the microscopic does not show up in Cerner as pending.

- Urobilinogen results from the urine analyzer are not reported.

- Do not report renal or clue cells.

- Microscopic examination done on a urine specimen of less than 10 ml. should have the total volume of the urine specimen entered into the computer in the comment field.

- Microscopic examination done on a urine specimen of less than 1.0 ml may have the examination done on an unspun sample. Note this event as a microscopic comment by adding the comment DROP. If on the microscopic examination, any bacteria or white blood cells are observed culture the specimen.

- Patient urine samples can be discarded down the sink. Specimen containers are discarded in regular trash receptacles. Ensure that there are no patient identification on the containers by "blacking off" the name and ID with a marker or putting blank labels on top of the LIS label.

Expected Characteristics:

Physical: Color – Yellow
Appearance – Clear

Chemical: Specific Gravity – 1.003-1.029
pH – 5-8
Leukocytes – Negative
Nitrite – Negative
Protein – Negative
Glucose – Negative
Ketones – Negative
Bilirubin – Negative
Blood – Negative
Reducing Substances – Negative

Microscopic: WBC – 0-4/hpf
RBC – 0-3/hpf
Mucus – None
Casts – None
Epithelial Cells – None, if clean catch specimen
Crystals – amorphous urates, uric aced ammonium biurate, calcium

carbonate, calcium oxalate, amorphous phosphates, triple phosphate, calcium phosphate.

Sperm None

ALERT VALUES

- The presence of ketones and/or sugars in the newborn (up to 1 month of age)
- Glucose values in patients < 18 years of age: 2+ (250 mg/dl) or higher
- The provider or appropriate nursing personnel must be contacted immediately per the Alert Value Calling Protocol in the Quality Control Manual, section 8

LIMITATIONS OF THE PROCEDURE

Specimens that are visibly contaminated with fecal matter should not be tested. Bacteria that are part of the normal flora in feces can cause false positive nitrites and lead to a false diagnosis of urinary tract infection.

- **Specific Gravity**: The chemical principle of the test may cause slightly different results compared with other specific gravity methods when elevated amounts of certain constituents are present. Glucose and urea concentrations greater that 1% may cause a low specific gravity reading relative to other methods. In the presence of moderate amounts of protein (100-500 mg/dl) or ketoacidosis, reading may be elevated.
- **Leukocyte Esterase**: This test is not affected by erythrocytes in concentrations up to 10,000/ul or by bacteria common in urine. Do not collect specimens in containers that have been cleaned with strong oxidizing agents. The drugs cephalexin and gentamycin have been found to interfere with this test. Nitrofurantoin colors the urine and thus causes interference with visual interpretation of the test trip. High levels of albumin (<500 mg/dl) in the urine may interfere with the test results.
- **Nitrite**: Large amounts of ascorbic acid (see under glucose) decrease the sensitivity of the test. False positive readings may be produced by medication that colors the urine red or that turns red in an acid medium (e.g., phenazopyridine).
- **Protein**: False-positive results may be found:
  1. In strongly alkaline urine (pH of 9 or higher).
  2. During therapy with phenazopyridine.
  3. When infusions of polyvinylpyrrolidone (blood substitutes) are administered.
  4. Then residues of disinfectants containing quaternary ammonium groups or chlorohexidine are present in the urine container.
- **Glucose**: The effect of ascorbic acid (vitamin C) retained in the urine due to ingestion of vitamin tablets, antibiotics or fruit juices has been eliminated at glucose concentrations of 100 mg/dl and above so that false-negative readings rarely occur, even at high concentrations of ascorbic acid. False-positive readings may be produced by strongly oxidizing cleaning agents in the urine container.
- **Ketone**: Red-orange to red color shades, which are readily distinguished from the colors obtained with ketone bodies, can be produced by phenylketone or phthalein compounds administered for liver and kidney function tests. 2-mercaptoethane sulphonate sodium (MENSA) or other sulfhydryl-containing compounds may cause false positive results.

- **Bilirubin**: Large amounts of ascorbic acid present in the urine following the ingestion of medication containing vitamin C or fruit juices lower the sensitivity of the test. In case of doubt, repeat test on urine voided at least ten hours after the last administration of vitamin C. Elevated concentrations of nitrite, as in urinary infections, may result in lower bilirubin values. Large amounts of urobilinogen in the urine affect the color change of the bilirubin test, but not enough to give a positive result. False positive results may be produced by medication that color the urine red or turn red in an acid medium (e.g., phenazopyridine).

- **Blood**: False-negative readings are obtained when formalin is used to preserve the urine. Nitrite in excess of 10 mg/dl the urine (which is rare in urinary tract infections) delays the reaction.

  False-positive results can be produced by residues of strongly oxidizing cleaning agents in the urine container. Urine from menstruating females occasionally yields a positive result. This test has not been found to be affected by the ingestion of reasonable quantities of ascorbic acid.

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