Specimen Collection Guidelines

The accuracy of any test result depends on the quality of the specimen submitted. Following the collection, preparation and transport instructions will help to ensure the most accurate test results.

Specimen Collection Preparation

Prior to collecting the specimen, review the specimen requirements listed in the test listing section of this manual. Note the proper specimen type to be collected, amount of sample necessary for testing and special storage and/or transport instructions.

Each specimen container should be properly identified with the patient's full name, date, time of collection and specimen type. Each specimen must be accompanied by a properly completed test requisition.

Specimen Collection Tubes (listed in recommended order of draw)

Red Top: Does not contain an anticoagulant. This tube is used for collecting serum or clotted whole blood specimens. This tube should be used for all drug levels.

Serum Separator Tube (SST) (Tiger Top): Does not contain an anticoagulant but contains a clot activator and serum separator gel. This tube is used for collecting serum.

Light Blue: Contains the anticoagulant sodium citrate. This tube is used for preparing citrated plasma for coagulation studies. Tube should be inverted 8-10 times immediately after collection to prevent clotting. It is also important to completely fill the tube to the appropriate level since the ratio of blood to anticoagulant is critical for coagulation tests.

Green (Sodium or Lithium Heparin): Contains the anticoagulant sodium heparin or lithium heparin. This tube is used for preparing heparinized plasma, whole blood, or bone marrow specimens. Tube should be inverted 8-10 times after collection to prevent clotting.

Lavender (EDTA): Contains the anticoagulant EDTA. This tube is used for preparing EDTA plasma, whole blood, or bone marrow specimens. Tube should be inverted 8-10 times after collection to prevent clotting.

Royal Blue: May contain either the anticoagulant EDTA or no anticoagulant. The tube containing anticoagulant is used for preparing whole blood or plasma trace element studies and the tube without anticoagulant is used for preparing serum trace element studies.

Yellow: Contains the anticoagulant acid citrate dextrose (ACD). This tube is used for preparing whole blood specimens used for special studies.

Gray: Contains the preservative sodium fluoride and the anticoagulant potassium oxalate. This tube is used for preparing whole blood and plasma specimens such as glucose testing or blood alcohol testing.

Specimen Preparation Procedures

Serum: Collect whole blood in an amount 2 ½ times the required volume of serum so that a sufficient amount of serum can be obtained. To obtain serum, whole blood should be collected into either an SST or plain red top tube. After collection, allow the tube to sit in an upright position at room temperature for 30-45 minutes. After the clot has formed, centrifuge the tube for 10 minutes at 3400 rpm. Remove the tube and transfer the serum to a transport tube and store specimen as required.

Whole Blood: Collect whole blood in the collection tube specified for the test. To avoid clotting, invert tube 8-10 times to mix the blood with the anticoagulant. Never freeze whole blood unless specifically instructed in the specimen requirements.

Plasma: Collect blood in the collection tube specified for the test. Invert tube 8-10 times to ensure proper distribution of anticoagulant. Specimens collected in additive tubes for plasma may be centrifuged immediately. Centrifuge the tube for 10 minutes at 3400 rpm. Remove the tube carefully without disturbing the contents. Using a pipette, carefully transfer the plasma to a plastic tube taking care not to transfer any cellular material. Store the specimen as required.

Coagulation/Hemostasis: To produce valid results for coagulation tests and factor assays, specimen integrity is crucial and must be maintained. All specimens sent for testing must be collected in the following manner:

- Obtain venous blood by clean venipuncture. Avoid slow flowing draws and/or traumatic venipunctures as either of these may result in an activated or clotted specimen. Do not use needles smaller than 23 gauge. Do not leave the tourniquet on for an extended length of time before drawing the sample.
- Draw a discard tube (plain red top), as a recommended procedure, before drawing coagulation specimens in light blue-top vacuum tubes (3.2% buffered sodium citrate). Discard the red top tube.

Note: Reference intervals have been established using 3.2% buffered sodium citrate.

- Fill light blue-top tubes as far as vacuum will allow and mix by gentle inversion. Exact ratio of nine parts blood to one part anticoagulant must be maintained. Inadequate filling of the sample tube will alter this ratio and may lead to inaccurate results.

All coagulation specimens with time sensitive shipping requirements or delayed shipping must be processed in the following manner:

- Centrifuge the specimen at 3400 rpm for 10 minutes. Hemolyzed specimens will be rejected.
- Immediately remove only the top two-thirds of the platelet-poor plasma from the specimen using a plastic transfer pipet (use of glass transfer pipets may result in activation and/or clotting of the plasma). Place the plasma in a properly labeled transport tube and clearly mark the vial contents as PLASMA. Glass vials will be rejected.
- Immediately freeze the plasma. Specimens must remain frozen during storage and shipment. A separate tube should be submitted for each assay requested.

Urine, Random: The normal composition of urine varies considerably during a 24-hour period. Most reference values are based on analysis of the first morning voided urine. The random urine specimen is preferred because it has a more uniform volume, concentration, and its lower pH helps preserve the formed elements. To reduce contamination, the specimen submitted for urinalysis should be a clean catch “midstream” sample. The sample should be collected in a sterile container.

Urine, 24-hour: Because proper collection and preservation of 24-hour urine specimens are essential for accurate test results, patients should be carefully instructed in the correct procedure. The patient should collect the 24-hour urine in a container provided by the laboratory. Please follow the following instructions:

- Unless the physician indicates otherwise, instruct the patient to maintain the usual amount of liquid intake but to consume no alcoholic beverages.
- Keep the 24-hour urine refrigerated during the entire collection period.
- Have the patient empty his/her bladder upon arising in the morning into the toilet. Record the time voided. This will be the START time of the collection. The first urine will not be included in the 24-hour urine collection.
- All urines collected after this start time should be placed into the container.
- At the same time the following morning as the START time, collect a urine sample and add it to the 24-hour collection. This will complete the 24-hour urine collection.
- Submit entire 24-hour collection to the laboratory.

Common Causes of Unacceptable Specimens

There are many reasons a specimen may be considered unacceptable. A specimen will be rejected if the sample submitted will cause inaccurate results. The client will be notified by our client services department if a specimen is received unsuitable for testing.

Hemolysis: Hemolysis is when red blood cells rupture and their hemoglobin content and other intracellular components "spill" into the serum or plasma. Normal serum or plasma is straw in color, but hemolyzed serum or plasma may vary from light pink to dark red. Hemolysis can have adverse effects by falsely increasing or decreasing certain test results or by interfering with testing methodologies.

Lipemia (Turbidity): Cloudy, milky, or turbid serum or plasma may be caused by bacterial contamination or the increased presence of fatty substances (lipids) in the blood. Lipemia can usually be avoided by collecting a fasting specimen. Moderate or gross lipemia may have adverse effects by interfering with test methodologies.

Hyperbilirubinemia (Icteric): Icteric serum or plasma may vary in color from dark to bright yellow which may interfere with the measurement of test results.

Incorrect Specimen Type: Accurate test performance and established reference intervals are based on specific specimen types. Each test ordered requires a specific specimen type. Please refer to test requirements regarding acceptable tube types, transport temperatures and specimen volumes.

Age of Specimen: Each analyte is only stable for a specific length of time. These times vary according to analyte and storage temperature. Please review the stability times listed for each test if specimen stability is in question.

Quantity Not Sufficient (QNS): QNS means that the specimen volume received for testing was not enough to meet the minimum volume required to perform the test at least once. The minimum specimen volume is the amount required to perform the test only once. Please refer to the test requirements for specimen volumes.

Plasma Specimen Errors: Plasma contains fibrinogen and other clotting factors when separated from the red blood cells. The most common errors in the preparation of plasma include:

- Failure to collect specimen in correct anticoagulant
- Failure to mix specimen with anticoagulant immediately after collection
- Incomplete filling of the tube, thereby creating a dilution factor excessive for total specimen volume
- Improper centrifugation – Because platelets interfere with most coagulation tests, we must ensure that the plasma submitted for testing is platelet poor plasma.

Urine Specimen Errors: Laboratory urine tests may require a random, 24-hour, or other timed collection. Please refer to the test information for type of sample and any special instructions that may need to be given to the patient.