

SPECIMEN COLLECTION AND PROCESSING

The quality of test results reported by any laboratory is directly related to proper collection and handling of the specimens submitted. Patient and specimen identification, correct specimens for the test requested, specimen collection, preparation, and storage at the correct temperature are all essential to producing an accurate test result. Please make sure that at least the quantity specified for the test is submitted. Under no circumstances should specimens in Sharps equipment, such as body fluid in a syringe, be submitted. If you are uncertain about a specimen type or requirement, please contact our Client Services Department for assistance.

Please be aware that IML is unable to accept, process or test any radioactive specimens.

FASTING SPECIMENS

Certain tests require a fasting specimen. It is recommended that the patient fasts 8-12 hours. Patients should not eat anything during the 8-12 hours before these tests but are encouraged to stay hydrated during this period by drinking an adequate amount of water. However, no other beverages, including black coffee, tea or juice should be consumed. Patients should be advised to avoid chewing gum, smoking and excessive exercise during the fast period.

SPECIMEN LABELING

Patient identification and specimen labeling is vital to accurate test results. All specimens must be labeled with the patient's first and last name, as well as date of birth or other unique patient identification number. The date and time of collection should also be indicated. All labeling should be done using a permanent, waterproof writing instrument, such as a permanent marker. Unlabeled specimens may be refused for testing. All containers should be tightly sealed for storage and transport.

BLOOD COLLECTION

Blood may be collected by a vacuum tube and needle assembly or by syringe. Blood should be collected into tubes with the appropriate additive. The color of the tube top indicates which additive, if any, is in the tube.

When tubes of varying colors are to be drawn, they must be drawn in the following order: Blood Culture Tubes, Light Blue Top Tubes, Plain Red Top Tubes, SST (Serum Separator) Tubes, Green Top (Heparin) Tubes, Lavender Top (EDTA) Tubes and Grey Top Tubes

Whole Blood:

If the blood collected in a tube is not separated into plasma or serum by centrifugation, it is referred to as "whole blood".

Serum:

When Whole Blood is collected in an SST, Plain Red Top Tube or other tube without anti-

coagulant and is centrifuged, the yellowish fluid in the top half of the tube is “serum.”

Plasma

When Whole Blood is collected in a tube with an anti-coagulant and is centrifuged, the yellowish fluid in the top half of the tube is “plasma.” The type of anti-coagulant in the tube determines the type of plasma produced, i.e. heparinized plasma is produced by collecting whole blood in a green top tube containing Lithium or Sodium Heparin and centrifuging it. The top portion of the specimen in the green top tube is then heparinized plasma.

Platelet Poor plasma is obtained by centrifuging Whole Blood and pipetting the plasma into a Plastic Transport Tube. The Transport Tube is centrifuged again and the resulting platelet-poor plasma pipetted into a new Transport Tube.

Specimen Quantities

For the benefit of the patient, please do not collect extra specimens. Minimize the amount of blood collected by reviewing the specimen requirements for each test and adding up the number of mLs of each specimen type required. For example, the serum of one SST tube is adequate for a Comprehensive Metabolic Panel, Lipid Panel and TSH. When calculating how many tubes are needed, estimate that you must draw 2.5 times the volume of whole blood for the serum or plasma needed. For example, to get 4 mL of plasma or serum, 10 mL of whole blood must be drawn.

Phlebotomy Basics

The following guidelines should be observed for proper blood collection. These guidelines are designed to serve as reminders of some important steps in blood collection and are not intended to be comprehensive or replace phlebotomist training¹:

1. Identify patient and review order.
2. Position patient. Seated patients should be comfortably seated with arm in straight line from shoulder to wrist.
3. Prepare equipment and proper collection devices prior to venipuncture.
4. Wash hands and apply personal protective equipment.
5. Apply tourniquet midway between elbow and shoulder. Do not use arm on side where patient has had a mastectomy or above an infusion site. Do not leave tourniquet on longer than one minute.
6. Select vein. Cephalic, basilic or median cubital should be used. Vein should be palpable but not pulsating. Pulsating indicates site is artery not vein.
7. Cleanse site using appropriate cleanser such as alcohol. Wipe in outward-moving concentric circles. Do not blow site dry.
8. Insert needle into vein at approximately 15° angle in direct line with vein. Tube should be below site to prevent backflow. Bevel should be facing upward.
9. Release tourniquet prior to removing needle.

¹Pendergraph, Garland E., Pendergraph, Cynthia Barfield. Handbook of Phlebotomy and Patient Service Techniques. Williams & Wilkins. 1998.

10. Once needle is removed, apply pressure to site with clean gauze.
11. Dispose of needle in sharps container. Remove and dispose of gloves appropriately. Wash hands.
12. Label all tubes.
13. For serum, allow the blood to clot for at least 20 minutes and separate from the cells by centrifuging for 10 minutes. For plasma or whole blood collections, thoroughly mix the blood with the additive by inverting the tube 5 to 10 times. Centrifuge and separate from the cells if appropriate.

Common Problems in Collection

Hemolysis: Occurs when red blood cells rupture releasing their contents into the serum. Even a slight degree of hemolysis will invalidate many test results and, in particular, elevate potassium and LDH. Hemolysis may be caused by difficult phlebotomy, small gauge needle (less than 18 ga.), placing red top tubes in the refrigerator before clotting is completed at room temperature, vigorous shaking of anti-coagulant specimens or storing in a refrigerator that is too cold

Lipemia: Cloudy specimen due to presence of excessive amounts of fat. Occurs often if blood is drawn after meal. Will invalidate many test results. Therefore, fasting specimen is preferred.

QNS: Quantity Not Sufficient. This indicates there is not enough specimen to perform the test requested. We are aware that often this is the only specimen obtainable from the patient. However, sometimes "a little is just not enough."

Tube Types

Red Top Tube: Contains no anti-coagulant. Used for serum or clotted whole blood. After drawing, gently invert 8 times. Allow blood to clot at room temperature, out of direct sunlight, for 30 minutes. Centrifuge and transfer the serum portion into a properly labeled plastic transfer vial. Prolonged exposure of the serum to the clot may invalidate some test results.

SST Tube: Serum separator tube contains no anti-coagulant. Includes a gel to separate serum from cells after centrifugation. After drawing, invert tube gently invert 8 times. Allow blood to clot at room temperature, out of direct sunlight, for 30 minutes. Do not centrifuge before completely clotted. Centrifuge at 3400-3500 rpm for 10-15 minutes. Send the centrifuged and labeled SST tube with its top on to the laboratory. This tube type is not preferred for use in toxicology or Therapeutic Drug Monitoring (TDM) testing.

Note: Some studies have demonstrated increased Potassium levels as a result of excessively vigorous inverting of tubes. Handle tubes with utmost care.

Lavender Top Tube: Contains EDTA anticoagulant. Tube must be filled completely and gently inverted 8 times in order to prevent clotting.

Gray Top Tube: Contains Potassium Oxalate as anti-coagulant and Sodium Fluoride as glucose preservative. After drawing, invert gently 8 times to prevent clotting.

Light Blue Top Tube: Contains solution of 3.2% Citrate as anti-coagulant. Used specifically for PT, PTT, and other coagulation tests. It is essential that the tube be properly filled to the "fill" line on the tube. After drawing, invert 4 times to prevent clotting. Partially filled or over-filled tubes invalidate coagulation. If collecting a Light Blue Top Tube using a Winged Infusion (Butterfly) Device, you will need to use an SST as a starter tube. Begin filling the SST to draw the blood through the tubing. Once the SST has begun to fill, discard it and fill the Light Blue Top Tube. This will enable you to completely fill the Light Blue Top Tube. A starter tube is not required for routine venipunctures using a conventional vacutainer or syringe.

Over filled or under filled Light Blue Top Tubes invalidate test results because of the altered ratio of blood to anti-coagulant and cannot be tested.

Green Top Tube: Contains Lithium or Sodium Heparin as anti-coagulant. After drawing, invert 8 times in order to prevent clotting. Use this tube when preparing Heparinized Plasma specimens.

Dark Blue Top (Trace Metal Tube): Tube contains no heavy metals. Available for Serum or with EDTA. Used for Heavy Metal testing. Invert 8 times after collection.

Yellow Top Tube: Contains ACD as anti-coagulant. After drawing, invert 8 times to prevent clotting.

Pearl (PST) Tube: Contains EDTA as anti-coagulant. This Plasma Separator Tube (PST) contains a gel barrier that separates the Plasma from the Cells after centrifugation.

Frozen Specimens

Frozen Serum: Draw Red Top Tube or SST, invert 8 times and allow specimen to clot at room temperature, out of direct sunlight, for 30 minutes. Centrifuge for

15 minutes to ensure good separation. Transfer Serum into plastic container and freeze. Label tube with patient's name, date and "serum." Place "frozen submitted separately" sticker on specimen bag of any other specimens, if specimens of another temperature are being submitted.

Frozen Plasma: Draw in tube with appropriate anti-coagulant, invert tube 8 times and centrifuge 15 minutes. Transfer plasma to plastic tube and freeze. Label tube with patient's name, date and with type of anti-coagulant used (i.e. Heparin, EDTA, Citrate). Place "frozen submitted separately" sticker on specimen bag of any other specimens, if specimens of another temperature are being submitted.

URINE COLLECTION

The following collection devices are used for urine specimens. All containers should be labeled with the patient's complete name and date on the cup or tube not the lid. All containers should be tightly sealed to avoid specimen leakage and then placed in a Bio-Hazard Specimen Transport bag.

Sterile Urine Cups: Used for urine culture and clean catch urinalysis.

Clean Catch Urine Specimen Collection Instructions for Females:

Instruct patient to wash hands, unscrew cap of urine container and remove cleansing towelette from packaging. Separating the folds of the urinary opening, the patient should cleanse the area thoroughly with down ward strokes, using a different part of the towelette for each downward stroke. Patient should begin urinating into the toilet and then move the urine container into the stream of urine (midstream collection). Specimen container should be tightly sealed, labeled and returned to the lab for testing.

Clean Catch Urine Specimen Collection Instructions for Males:

Instruct patient to wash hands, unscrew cap of urine container and remove towelette from packaging. Patient should cleanse the head of the penis using the towelette. If uncircumcised, the foreskin should be pulled back during cleaning procedure. Patient should begin urinating into the toilet, pulling foreskin back if present, and then move the urine container into the stream of urine (midstream collection). Specimen container should be tightly sealed, labeled and returned to the lab for testing.

For Patient Clean Catch Urine Collection Instruction Sheets, please call Client Services at (800) 288-1465.

24 Hour Urine Container: Used for 24 hour urine testing. Should be labeled with collection date, as well as start and completion times. If any preservative has been added to the sample, please note this on the container.

Collection Instructions:

Have patient avoid alcoholic beverages, vitamins and other medications (if possible) for at least 24 hours before beginning and during the course of specimen collection. Inform the patient if the specimen container contains any preservative, warning them not to discard the preservative and to keep the container away from children. Patients should not exceed their normal intake of liquids during the day before or day of the collection unless otherwise directed to do so by their physician. Instruct patient to begin collection period when they wake in the morning, voiding but not collecting their first morning urine. The 24 hour urine container should be labeled with the date and time of this uncollected specimen. All urine for the next 24 hours should be collected. The final collection should be made the next morning, approximately 24 hours from the start of collection. Keep the specimen in a cool place, preferably refrigerated, in a brown paper bag. Return the specimen to the laboratory as soon possible after the end of collection. For Patient 24 Hour Urine Collection Instruction Sheets, please call Client Services at (800) 288-1465.

SPECIMEN STORAGE AND TRANSPORT

Proper collection, storage and transport are vital to producing quality lab results. To help us provide the most accurate results, please ensure that specimens are properly packed for transport and stored at the appropriate temperatures. All specimen containers should be labeled and tightly sealed. Each patient's specimen should be placed in an individual Bio-hazard Specimen Bag, which should also be sealed. The patient's lab request form should be folded and placed in the outside pocket of the Specimen Bag. Specimens should be stored at the temperature specified for the test in the Test Listing, while awaiting courier pick-up. Specimens will be transported from your office by IML courier in accordance with federal, state and local bio-hazardous transport regulations.