SPECIMEN COLLECTION AND SUBMISSION GUIDELINES

The accuracy of any result/interpretation depends upon the quality of the specimen. Following the collection, preparation and transport instructions suggested in this directory helps to ensure the best possible test results. More detailed, test-specific specimen collection information, including volume requirements and appropriate collection container(s), is provided in the Test List section of this directory. In all settings in which specimens are collected and prepared for testing, use Standard Precautions and follow guidelines for the disposal of biological material and contaminated specimen collection supplies.

In addition to proper collection and handling, it is essential that specimens be submitted to the laboratory with pertinent collection and clinical information such as the patient's diagnosis, relevant history, and specimen source information. Failure to provide this necessary information or other relevant data can lead to inadequate or improper test performance and/or interpretation. The following caveats are simple but essential safeguards that must be followed to eliminate erroneous laboratory test results and interpretations.

Identify the Patient
Identify the patient prior to specimen collection. Ask the patient to state his/her full name and date of birth. Compare this information to that on the computer, computerized log and labels. In addition, the patient medical record number on the labels/requisitions must match that on the patient ID band.

Use Correct Blood Collection Containers
Collection (Vacutainer) tubes come in a variety of sizes, contain various types of additives and are easily identified by the color of the tube's stopper. Table 1 outlines the various tube types and their additives.

Vacutainer tubes fill by means of negative pressure and will automatically fill to the correct volume of blood and then stop. To ensure the correct ratio of blood to additive, it is critical to allow tubes containing additives to fill completely. Gently invert the tube(s) to mix the specimen and additive. Use the proper container and do not transfer the specimen from one type of vacutainer to another. Using the wrong container can lead to erroneous results. See Blood Collection Containers (Table 1).

* See special mixing directions for Quantiferon TB Gold collection tubes.
<table>
<thead>
<tr>
<th>STOPPER COLOR</th>
<th>ADDITIVE</th>
<th>COMMON USAGE</th>
<th>IMPROPER USAGE</th>
<th>DIRECTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Glass</td>
<td>No additive (for collection of serum)</td>
<td>Tests in Serology, some tests in Clinical Chemistry, Microbiology and HLA Antibody Screens.</td>
<td></td>
<td>Do not mix.</td>
</tr>
<tr>
<td>Red Plastic</td>
<td>Clot activator</td>
<td>Tests in Serology, some Clinical Chemistry and Microbiology tests.</td>
<td></td>
<td>Immediately after drawing each tube, the blood and additive in the tube must be mixed <em>gently</em> by inverting 5-10 times.</td>
</tr>
<tr>
<td>Blue</td>
<td>Sodium Citrate, 0.105M (3.2%)</td>
<td>Most coagulation tests</td>
<td></td>
<td>Immediately after drawing each tube, the blood and additive in the tube must be mixed <em>gently</em> by inverting 3-4 times.</td>
</tr>
<tr>
<td>Gold or Red/Gray (Serum Separator) SST</td>
<td>Contains an inert barrier material and a clot activator</td>
<td>Most Clinical Chemistry, and Serology tests.</td>
<td>Blood Bank, Drug levels, HLA, or Special Diagnostic Hematology specimens</td>
<td>Immediately after drawing each tube, the blood and clot activator should be mixed <em>gently</em> by inverting 5-10 times.</td>
</tr>
<tr>
<td>Green</td>
<td>Heparin</td>
<td>Specialized tests</td>
<td></td>
<td>Immediately after drawing each tube, the blood and additive in the tube must be mixed <em>gently</em> by inverting 8-10 times.</td>
</tr>
<tr>
<td>Mint Green (Plasma Separator)</td>
<td>Lithium heparin and gel</td>
<td>Mostly Clinical Chemistry</td>
<td>Hematology, Blood Bank, Serology, HLA</td>
<td>Immediately after drawing each tube, the blood and additive in the tube must be mixed gently by inverting 8-10 times.</td>
</tr>
<tr>
<td>Lavender</td>
<td>EDTA</td>
<td>All Blood Bank tests. Most tests in Hematology, Flow Cytometry, Specialized Chemistries, PCR and DNA-HLA typing.</td>
<td></td>
<td>Immediately after drawing each tube, the blood and additive in the tube must be mixed <em>gently</em> by inverting 8-10 times.</td>
</tr>
<tr>
<td>Yellow</td>
<td>Acid Citrate Dextrose</td>
<td>Used for most PCR testing and HLA Typing - must be glass tube</td>
<td></td>
<td>Immediately after drawing each tube, the blood and additive in the tube must be mixed <em>gently</em> by inverting 5-10 times.</td>
</tr>
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<td>STOPPER COLOR</td>
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</tr>
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<td>---------------</td>
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<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Gray</td>
<td>Heparin</td>
<td>QFT Nil Control</td>
<td>Any test other than QFT</td>
<td>If tubes have been stored in the refrigerator, allow them to equilibrate to room temperature before use.</td>
</tr>
<tr>
<td>Red</td>
<td>TB Antigen &amp; Heparin</td>
<td>QFT TB Antigen</td>
<td></td>
<td>Collect 1 mL of blood directly into each of the QFT blood collection tubes in the order Nil, TB-Antigen and Mitogen.</td>
</tr>
<tr>
<td>Purple</td>
<td>T cell Mitogen &amp; Heparin</td>
<td>QFT Mitogen Control</td>
<td></td>
<td>Mix by vigorously shaking the tubes up and down for 5 seconds (10 times). Proper shaking will lead to frothing of the blood.</td>
</tr>
<tr>
<td>Royal (Dark)</td>
<td>EDTA (Na₂)</td>
<td>Used for heavy metals analyses</td>
<td></td>
<td>Immediately after drawing each tube, the blood and additive in the tube must be mixed gently by inverting 5-10 times.</td>
</tr>
<tr>
<td>Blue</td>
<td>White EDTA and inert barrier material</td>
<td>HIV viral load and Hepatitis C viral load testing</td>
<td></td>
<td>Immediately after drawing each tube, the blood and additive in the tube must be mixed gently by inverting 8-10 times.</td>
</tr>
<tr>
<td>Brown Glass</td>
<td>Sodium heparin – lead free</td>
<td>Lead levels</td>
<td></td>
<td>Immediately after drawing each tube, the blood and additive in the tube must be mixed gently by inverting 8-10 times.</td>
</tr>
<tr>
<td>Brown Plastic</td>
<td>Brown Plastic EDTA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gray</td>
<td>Potassium Oxalate and Sodium Fluoride</td>
<td>Used for some glucose determinations</td>
<td></td>
<td>Immediately after drawing each tube, the blood and additive in the tube must be mixed gently by inverting 8-10 times.</td>
</tr>
<tr>
<td>Syringe</td>
<td>Heparin</td>
<td>Used for blood gas analysis</td>
<td></td>
<td>Immediately after drawing, gently mix the blood and additive by rolling the syringe between both hands.</td>
</tr>
<tr>
<td>Syringe</td>
<td>No additive</td>
<td>Used to collect specimens from patients that have poor venous access.</td>
<td></td>
<td>The specimen must be transferred from the syringe to the appropriate vacutainer tube. Allow the vacutainer to fill by vacuum - do not force by pressing the syringe plunger.</td>
</tr>
</tbody>
</table>
Use the Correct Order of Draw
The order for filling Vacutainer tubes is also important for successful specimen collection. If blood cultures are ordered, they must always be obtained first. In instances when several different tubes must be drawn from one patient, the tubes are filled in the following order:

1. Blood Cultures  
2. Blue top tube(s)  
3. Red top tube(s)  
4. Gold top tube(s)  
5. Green top tube(s)  
6. Brown top tube(s)  
7. Lavender top tube(s)  
8. Royal blue top (EDTA Na₂) tube(s)  
9. White top tube(s)  
10. Yellow top (ACD) tube(s)  
11. Gray top (oxalate/fluoride) tube(s)  
12. Followed by any others.

Label the Specimen
Compare the information on the computer screen with the labels and requisition (when applicable) prior to performing blood collection. All specimens must be labeled in the presence of the patient and immediately after completing the collection procedure. To maintain patient safety the label must contain, at a minimum, the following information:

- First and last name
- Date of birth
- Date and time of collection
- Initials of the person drawing the specimen (or tech code)
- Medical Record number on all inpatients and when available on outpatients

The Blood Bank will reject any specimens with labels not containing the minimum requirements.

Avoid Specimen Hemolysis
Red blood cells contain some analytes in concentrations many times higher than in serum or plasma. When red blood cells are hemolyzed, there is a release of these analytes resulting in falsely elevated levels. In addition, the hemoglobin may interfere with the testing method. Receipt of hemolyzed specimens is one of the most common reasons for specimen rejection by the laboratory. When collecting and handling blood specimens, hemolysis can be minimized by following these simple steps:

a. Allow the alcohol on the skin to dry completely.

b. Do not place the tourniquet too tightly or do not leave it on longer than one minute.

c. Whenever possible, use a 21 gauge.

d. Allow vacutainers to automatically fill when transferring blood from a syringe.

e. Do not squeeze a puncture site in order to obtain more blood.

f. Gently mix instead of vigorously shaking syringes or tubes with additives.

g. Transport the specimen to the laboratory promptly.

Prompt Specimen Transport or Processing
Valid measurement of analytes in serum or plasma requires prompt separation from the blood cells and analysis in the laboratory. When left unseparated, analytes shift between the cells and the plasma/serum and glucose is consumed. In addition, some analytes are unstable at room
temperature. Microbiology specimens require specific preservation methods depending on suspected organisms and/or specimen source. See the Test List section of this directory for test-specific details.

**Patient Preparation**

It is important to gain the patient's understanding and cooperation in obtaining an acceptable specimen. Some tests require that the patient be fasting or follow a special diet. There are other tests that require the patient to sign an informed consent or attestation prior to specimen collection. See the Test List section of this directory for test-specific requirements.

**Fasting** – The patient should not eat for 12-14 hours prior to specimen collection. If a fasting specimen is required, ask when the patient last ate or drank before collecting the specimen. If the patient has eaten recently and the physician wants the test to be performed anyway, indicate “nonfasting” on the laboratory requisition.

**Timed Specimens** – Timed specimens may be drawn at specific times or the test may require multiple blood specimens to be collected several times.

- Examples of single timed specimens: postprandial glucose, blood glucose, blood cultures and therapeutic drug monitoring.
- Examples of multiple timed specimens: glucose tolerance test and tests which measure the effect of certain medication.

**Serial Testing** – Diagnosis of many endocrine diseases requires sequential sampling of blood and/or urine. Cardiac markers may be drawn in series for diagnosis and monitoring.

**Informed Consent** – New York State regulations mandate that informed consents be obtained from the patient prior to performing specimen collection for the tests listed below. The authorized provider presenting the information to the patient must obtain a signed informed consent from the patient for the specific test requested. Place the signed consent in the patient's medical record. The provider must sign the attestation of prior consent and prognostic use on the laboratory requisition for all test listed below except oncofetal antigen testing. For oncofetal antigen testing, send the laboratory a copy of the signed informed consent or the physician's attestation.

- HIV Diagnostic Testing
- Factor V Leiden
- Prothrombin Gene Mutation Testing
- Cytogenetic/Chromosome Analysis for Inherited Disorders
- Oncofetal Antigen Testing
- Quantitative Hemoglobin Electrophoresis
- Genetic Testing