Specimen Collection – Other Types of Specimen Collections

I. Collecting and Processing of Specimens

A. Other types of specimen collections

1. Urine

Tests ordered -
- urinalysis
- chemical and physical properties

Types of specimens:
1. Random specimen
2. First morning voided – best for seeing all kinds of sediment, more conclusive
3. CCMS (Clean Catch Mid-Stream) – cultures

Cleaning procedure:
Female – remove contaminating bacteria from vulva vulva urethral meatus and related perianal areas. Front to back wipe. Expel first few drops, then “catch” in sterile container. Discard rest.
Male – wipe tip to base. Expel first few drops, then “catch” in sterile container. Discard rest.

4. Timed specimens:
24 hour collection:
Discard first specimen, then collect for 24 hours exactly.
Include last specimen from exactly 24 hrs. post.
Keep refrigerated or chilled during collection.

Containers
wide-mouth jug - 3 liters

Preservatives use to preserve integrity of urine
pre-measured - aliquot (or tablet, etc.)
Acetic acid, HCl, NaCl, boric acid, toluene

Volume of Urine Specimen – measured and recorded

2. Body Fluids
Transported by phlebotomist - collected by Dr. or Nurse

- gastric secretions
- pericardial fluid
- cerebrospinal fluid
- amniotic fluid
- synovial fluid
- seminal fluid*
- pleural fluid

*sometimes collected as OP, so phleb may give instructions
3. Stool/Fecal
   Frozen Samples
   24-hour collection
   Pinworm prep
   Cultures
   Occult Blood

   Swabs, cultures – transported by phlebotomist
   throat - phlebotomist may collect this on OP
   eye
   sputum      ear
   sinus       skin
   wound       feces

Donor
   Depending upon where he/she chooses to work, the phlebotomist may end up
   screening or drawing donors, after proper training.

B. Specimen Transporting and Processing

   Proper handling throughout the collection process, including transportation and
   processing, is important for maintaining specimen integrity, as well as protecting the
   phlebotomist and others from accidental exposure to potentially infectious substances.
   Improper handling can render the most skillfully obtained specimen useless.

   All specimens should be handled according to the Universal Precautions guidelines
   written by the Centers for Disease Control and Prevention and enforced by the
   Occupational Safety and Health Administration.

   General Guidelines

   Proper handling of specimens begins with the initial test request and includes patient
   preparation, equipment selection, and "order of draw."

   Transporting Specimens

   Blood specimen tubes should be transported carefully so as not to break them
   or cause the blood to hemolyze.

   Tubes should be transported with the stopper up, which aids in clot formation
   of serum tubes, reduces agitation which can cause hemolysis, and prevents
   contact of the blood with the tube stopper.
Blood in contact with tube stoppers contributes to aerosol (a fine mist of the specimen) formation during stopper removal.

Non-blood specimens should be transported in leak-proof containers with adequately secured lids.

Specimens arriving in the lab from off-site locations should be transported in sealed Zipper-type plastic biohazard bags to contain spills.

Special care should be taken to protect specimens from the effects of extreme heat or cold, light (when required).

Pneumatic tube systems are used in hospitals, but some specimens are unacceptable to be transported via the tube system such as:
- Transfusion products
- Pathology/tissue specimens
- Fecal specimens
- Body fluids (CSF, synovial, pleural, etc.)
- Glass

Specimens Requiring Special Handling

a. Specimens Requiring Protection from Light

Some test components are broken down in the presence of light, causing falsely decreased values. The most common of these is BILIRUBIN.

Other tests sensitive to light include vitamin B<sub>12</sub>, carotene, serum and RBC folate, and urine specimens for porphyrins.

Specimens can be easily protected from light by wrapping them in aluminum foil, or other dark paper.

Light-Inhibiting, amber-colored microcollection containers are available for collecting bilirubin specimens from infants.

b. Specimens That Need to Be Chilled

Certain metabolic processes continue even after a specimen is drawn.

Chilling the specimen slows down this process.

Specimens requiring chilling should be completely immersed in a slurry of crushed ice and water.

Large cubes of ice without water added prevent adequate cooling of the entire specimen, and may cause partial freezing which causes hemolysis.
Specimens requiring chilling are:

- Blood Gases - CLSI does not recommend this
- Ammonia
- Lactic Acid
- Renin
- Protime - only if there is a delay in testing over 4 hours
- Partial Thromboplastin Time - only if there is a delay in testing over 4 hours

c. Specimens That Need to Be Kept Warm

Some specimens need to be transported at or near body temperature of 37°C. Two examples are:

- Cold Agglutinins
- Cryofibrinogen

These specimens should be transported in a 37°C heat block or held tightly in the phlebotomist hand.

Some tests such as the activated clotting time (ACT) require that the tube for the test be kept pre-warmed prior to drawing the blood for the test, and kept in a 37°C heat block during test.

d. Time Constraints for Specimen Delivery

All specimens should be transported to the lab promptly. Ideally, routine blood specimens should arrive at the lab within 45 minutes of collection and be centrifuged within 1 hour. (2 hour maximum before centrifuged)

Specimens that cannot reach their destination within the allotted time period should be allowed to clot (if applicable), should be centrifuged, and the serum or plasma separated and transferred to a suitable container for transport.

If the specimens are drawn in serum separator tubes (SST), they need only be centrifuged once they have clotted. If drawn in a plasma separator tubes (PST), they can be centrifuged immediately (advantage for STATs). Once centrifuged, the separator gel separates the serum from the RBCs, thereby preventing glycolysis (utilization of glucose by RBCs) for up to 24 hours.

Applicable temperature requirements should be maintained until the specimens reach the laboratory.

e. Exceptions to the Preceding Guidelines
Specimens for glucose that are drawn in sodium fluoride tubes are stable for 24 hours at room temperature and up to 48 hours when refrigerated at 2-8°C.

Hematology tests drawn in lavender stopper (EDTA) tubes are performed on whole blood specimens and should never be centrifuged. EDTA specimens are stable for 24 hours.

However, it is important to make smears from EDTA blood within 1 hour of collection to preserve the integrity of the blood cells and prevent artifact formation, due to prolonged contact with the anticoagulant. "STAT" or "medical emergency" specimens take priority over all other specimens and should be transported and processed immediately.

**Specimen Processing**

**OSHA Regulations** –
OSHA regulations require the wearing of protective equipment when processing specimens. Protective equipment includes gloves, fully buttoned lab coats or aprons, and protective face gear such as masks and goggles with side shields or chin-length face shields.

a. **Plasma Specimens**
Specimens for tests performed on plasma are collected in tubes containing anticoagulants and may be centrifuged immediately.

b. **Serum Specimens**
Specimens for test performed on serum must be completely clotted prior to centrifugation. If clotting is not complete when the specimen is centrifuged, the resultant serum may clot and interfere with the performance of the test. Plastic tubes require a clot activator to initiate the clotting process.

Serum separator tubes and other tubes containing clot activating glass particles, usually clot within 15 minutes.

- Plastic tubes must have a clot activator to facilitate clotting.
- Proper mixing of clot activator tubes will ensure proper clotting.

Complete clotting normally takes around 30-45 minutes at room temperature.

Specimens from patients on anticoagulant medication, such as heparin or dicumarol, as well as specimens from patients with high white blood cell counts may take longer to clot.
Chilled specimen may take longer to clot.

Thrombin tubes normally clot in 5 minutes.

c. **Special Precautions for Handling Specimens**
Stoppers should remain on tubes awaiting centrifugation.
   Removing the stopper can cause loss of CO$_2$ and an increase in pH, leading to inaccurate results for tests such as pH, CO$_2$, and acid phosphatase.

Leaving tubes un-stoppered also exposes the specimen to possible contamination and evaporation.
   Evaporation lead to inaccurate results due to concentration of analytes.

Sources of contamination can also be:
   A drop of sweat, which interferes with electrolytes results.
   Powder from gloves, which may interfere with calcium determinations (some powder contains calcium).

d. **Centrifuging Specimens**
Tube levels and sizes must match.

Rules of operations:

1. Balancing centrifuge a must! If not balanced, the centrifuged will be thrown off balance and tubes can break, creating hazardous aerosol. Place tubes of equal size and fluid level across from each other. Always check again before closing lid.

2. Firmly fasten top until latched. These usually lock automatically so that they cannot be opened until completely stopped.

3. Do not walk away from centrifuge until it has reached maximum speed, to make sure there is no vibration (= unbalanced tubes).

4. If tube breaks in centrifuge:
   Immediately stop centrifuge (may need to unplug).
   Use puncture resistant gloves.
   Use lots of wet paper towels initially to pick up all the glass that has been ground along the outer wall.
   After all the glass has been removed, the centrifuge and baskets will need to be disinfected and washed.

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Some specimens may need special speeds and times. Refer to that department’s procedure manual.

e. **Proper Patient Instruction for Collection of:**
Patients will need to be given instructions for the collection of some specimens.
- routine urinalysis
- clean catch mid-stream urine samples * - ccms
- urine culture samples *
- 24-hr urine collections
- feces for occult blood and O&P

* require special towelettes for cleansing of genitalia (front to back). CCMS require initial voiding into toilet, then collecting the mid-sample into the sterile container, then finish last voiding into the toilet, as previously explained.

f. **Criteria for Specimen Rejection**
Specimens received by the lab may be rejected for analysis for the following reasons:

1. Inadequate, inaccurate, or missing specimen identification.
   eg: Urine specimen that is not labeled.

2. Additive tubes containing an inadequate volume of blood.
   eg: A partially filled coagulation tube.

3. Hemolysis
   eg: A hemolyzed specimen intended for potassium or bilirubin determination.

4. Wrong tube
   eg: A CBC collected in a red top tube

5. Outdated tube
   eg: A CBC collected in a tube that expired the week before.

6. Improper handling
   eg: A lavender top drawn for a CBC which has clots in it due to improper mixing.

7. Contaminated specimen
   eg: A urine for culture and sensitivity in an unsterile container.
8. Insufficient specimen, referred to as "quantity not sufficient" (QNS) for the test ordered.
   eg: A specimen for an erythrocyte sedimentation rate submitted in a microtainer.

g. **Time Constraints**

<table>
<thead>
<tr>
<th>Tube Color</th>
<th>Time Limit</th>
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<tbody>
<tr>
<td>Red Top</td>
<td>2 hrs RT</td>
</tr>
<tr>
<td>Green Top</td>
<td>2 hrs RT</td>
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</table>
| Lavender Top (Microtainer) | 6 hrs at RT  
                        | Stable for 24 hrs refrigerated  
                        | Smears made with in 1 hour (4 hrs) |
| Light Blue Top      | 4 hrs at RT  
                        | 24 hrs, refrigerated           |
| Red/Black (gold)    | 2 hrs  
                        | 24 hrs or more refrigerated (spun down and separated - after clotting) |
| Gray Top            | Stable for 24 hrs at RT and up to 48 hrs refrigerated                     |

**Processing specimens for reference laboratory**

Handling according to universal/standard precautions.

Shipping may require special handling, aliquoting, handling, preserving, processing. Always refer to the Reference Lab manual.