

Specimen Collection and Preparation

Accuracy of laboratory testing depends on the quality of the specimen submitted. Proper specimen collection, identification, and transport determine the accuracy and utility of the test results. Please consult the alphabetical test listings for information about collection and handling of specimens. If there are any questions, please call Rutland Regional Medical Center Laboratory at 802-747-1771 to clarify the specimen requirements. For a limited number of tests, handling requirements dictate collection of the specimen only at the hospital or only during limited hours.

Blood Collection

Plasma and Whole Blood: Draw a sufficient amount of whole blood into a tube containing the proper anticoagulant. Immediately invert the tube gently several times to mix. Unless whole blood is required, separate the plasma from the cells by centrifugation within 30 minutes. Examples of anticoagulant collection tubes include the following: green-top (lithium or sodium heparin), lavender-top (EDTA), and light blue-top (sodium citrate).

Note: If test requires whole blood, do not use a plasma gel tube. Some drug levels performed on plasma cannot be performed on plasma from a plasma gel tube.

Serum: Draw a sufficient amount of whole blood into a plain, red-top tube or a gold-top (serum gel) tube. If using a gold-top (serum gel) tube, gently invert the tube several times to activate clotting. Allow blood to clot at ambient temperature for 30 minutes. Centrifuge for 10 minutes to separate serum from clot. If using a plain, red-top tube, transfer the serum to a screw-capped, plastic vial within 1 hour of drawing the specimen if required. If a specimen is to be centrifuged, do not stop the centrifuge once started; interrupting the process may degrade specimen integrity.

Note: There are some tests requiring serum for which gold-top (serum gel) tubes should not be used. These are identified in the individual test listings. If you are not sure if a gold-top (serum gel) tube is acceptable, a plain, red-top tube is almost always acceptable for serum.

Blood Specimen Collection Tubes

The following is a list of tubes referred to in our specimen requirements:

- **Dark Green-Top (1-4 mL Sodium Heparin) Tube:** This tube contains sodium heparin as an anticoagulant and is used for the collection of heparinized plasma or whole blood for special tests.

Note: Immediately after draw, invert tube 5 times to prevent clotting.

- **Green-Top (4 mL Lithium Heparin) Tube:** This tube contains lithium heparin as an anticoagulant with no gel barrier. Most whole blood tests drawn in this tube need to be tested immediately. Plasma from these tubes should be tested or removed from tube within 4 hours of draw, depending on the analyte.

- **Gold-Top (Serum Gel [Gel and Clot Activator]) Tube:** This tube contains a clot activator with a gel barrier and is used for various tests.

Note: Immediately after draw, invert tube 5 times to activate clotting; let stand for 30 minutes before centrifuging for 10 minutes at 3,000 rpm. If frozen serum is required, pour off serum into plastic vial and freeze. Do not freeze VACUTAINER(S)®.

- **Grey-Top (Potassium Oxalate/Sodium Fluoride) Tube:** This tube contains potassium oxalate as an anticoagulant and sodium fluoride as a preservative. It is used to preserve glucose in whole blood and for some special chemistry tests.

Note: Immediately after draw, invert tube 5 times to prevent clotting.

- **Lavender-Top (EDTA) Tube:** This tube contains EDTA as an anticoagulant and is used for most hematological tests as whole blood, although plasma can be used for other tests.

Note: Immediately after draw, invert tube 5 times to prevent clotting.

- **Light Blue-Top (Buffered Sodium Citrate) Tube:** This tube contains 3.2% buffered sodium citrate as an anticoagulant and is used for coagulation studies.

Note: It is imperative that the tube be completely filled. The ratio of blood to anticoagulant is critical for valid results. Immediately after draw, invert tube 5 times to prevent clotting.

- **Light Green-Top (1.5-4.5 mL Lithium Heparin, Plasma Gel) Tube:** This tube contains lithium heparin as an anticoagulant with a gel barrier for separation and is used for the collection of heparinized plasma.

Note: Immediately after draw, invert tube 5 times to prevent clotting. Centrifuge for 10 minutes at 3,000 rpm.

- **Red-Top (Plastic) Tube:** This tube contains no anticoagulants and is used for selected chemistry tests requiring serum and for selected immunohematology tests requiring clotted blood.

Note: Let stand for 30 minutes before centrifuging for 10 minutes at 3,000 rpm.

- Royal Blue-Top (K₂ EDTA [Lavender Label]) Tube:
This tube contains EDTA anticoagulant and is used for trace metals analysis.
Note: Immediately after draw, invert tube 5 times to prevent clotting.
- Royal Blue-Top (Red Label) Tube: This tube contains no anticoagulant and is used for trace metals analysis.
Note: Refer to the individual metals tests in the alphabetic test listing to determine the tube type necessary.
- Yellow-Top (ACD B) Tube: These tubes contain acid citrate dextrose (ACD) and are used for special tests.
Note: Immediately after draw, invert tube 8 to 10 times to prevent clotting.
- Pink-Top (K₂ EDTA Tube: These tubes contain EDTA and are used for Blood Bank testing only.
Note: Immediately after draw, invert tube 5 times to prevent clotting.
- Special Collection Tubes: Some tests require specific tubes for proper analysis. Please call Rutland Regional Medical Center Sendout Department at 802-747-1794 prior to venipuncture to obtain the correct tubes for metals analysis or other tests as identified in the alphabetic test listings.

- STAT
- Time study
- Routine

When an inpatient test is requested STAT, call the pager 452-8344. For outpatient stats, call Rutland Regional Medical Center Laboratory at 802-747-1771.

Definition of Priorities:

- ST (STAT): Daily 24 hours
- TS (Time study): Scheduled as requested
- RT (Routine): Collection list times are as follows: 3:45, 4:45, 7:15, 9:00, 11:00, 13:00, 15:00, 17:00, 19:45, 22:15

Result Turnaround Time For:

STAT

- STAT tests have a turnaround time of <1 hour for most determinations
- Collection: Immediately if on STAT list
- Inpatient results: Available upon completion in HIS
- Outpatient results: Called or faxed

Time Study

- To be used for collection of a test at a specific time. The collection is made at requested time; the results will follow routinely. (If results are needed immediately, use STAT priority). TS priorities generate an immediate request in the laboratory. The phlebotomy team schedules the collection requested. Include collection specifics (eg, time of last drug dose).

Routine Collection

- Between 7 a.m. and 10:15 p.m. daily
- Performance: Next routine run of procedure following receipt of specimen
- Inpatient results: Available upon completion in HIS
- Outpatient results: Delivered to physician mailbox in physician lounge, by daily courier, via EMR interface or faxed.

Recommended Order of Blood Draw

- Light blue top tubes for coagulation
- Gold top serum gel tube or Royal Blue top trace metal no additive tube with red stripe
- Plain Red-top serum tube
- Royal Blue trace metal whole blood tube with EDTA and lavender stripe.
- Green-top (lithium or sodium heparin) or plasma gel tube
- Lavender-top (EDTA) tube
- Grey-top (potassium oxalate/sodium fluoride) tube
- Yellow-top (ACD B) tube

Gold-top (serum gel) tubes and VACUTAINER® PLUS serum tubes contain particulate clot activators and are considered additive tubes. Therefore, VACUTAINER® PLUS serum tubes are not to be used as discard tubes before drawing blue-top citrate tubes for coagulation studies.

Blood Collection Information

When ordering laboratory work, indicate the priority (urgency):

The laboratory staff draws blood specimens for laboratory testing. The information below is provided to assist other personnel in drawing blood specimens.

Blood Collection from the Operating Room:

Blood specimens are drawn by the anesthesiologist or anesthesiologist and witnessed by a nurse.

Blood Bank Testing:

- A Blood Bank identification band (Typenex® or Securline®) will need to be placed on the patient at the time of specimen collection. The band needs to contain patient's full name, medical record number or date of birth (a unique patient identifier), date of draw, and initials of collector.
- The label from the Typenex® bracelet is placed on the tube of blood. The labeled tube and red stickers from the Blood Bank band need to be delivered to the Blood Bank together.

Other Testing:

- Blood specimens are drawn by the anesthesiologist or anesthesiologist and placed in appropriate tubes. Call Rutland Regional Medical Center Phlebotomy at 802-747-1771 for assistance.
- Specimens must be labeled with the patient's name, identification number or date of birth, date and time of collection, and initials of the person collecting the specimen.
- Specimens are submitted to the laboratory through specimen reception.

Blood Collection from Unidentified ED Patient:

Refer to Emergency Department Trauma Banding Policy.

If a patient in critical condition in the ED requires phlebotomy, the following procedure will be used:

- The R.N., phlebotomist, or technologist drawing the specimen will place a Blood Bank wrist identification band on the patient before the blood is drawn.
- The specimen(s) will be drawn, and identification numbers will be used to identify specimen(s), requisitions, and the patient until definite identification is accomplished.
- Under no circumstances will results of laboratory determinations be released without patient identification. The patient is assigned a medical record number in the ED by the Registrar, which will remain with the patient

after admission to assist in identification and reporting of results.

Specimen Transport Requirements for Specimens Drawn Outside the Hospital

Required Information:

- Two unique identifiers must be on the tube
 - Patient's full name, clearly printed and correctly spelled
 - Patient's medical record number or date of birth
- Also required
 - Initials of phlebotomist
 - Date specimen was collected

Coagulation Testing (Light Blue-Top Tube Containing Sodium Citrate for Prothrombin Time [INR], Partial Thromboplastin Time, Fibrinogen, and D-dimer):

The above specimens may be assayed up to the following hours after collection if transported refrigerated.

- PT (INR): 24 hours
- PTT: 4 hours
- Fibrinogen: 4 hours
- D-dimer: 4 hours

Tubes must be completely filled and well mixed. For tests other than those listed above, see "Specimen Requirement" under individual test listing.

Hematology Testing (Lavender-Top Tubes Containing EDTA for Hemoglobin/Hematocrit, CBC, etc.):

Specimens may be assayed up to 36 hours after draw, if refrigerated. Tubes must be well mixed immediately after draw. The 4-mL lavender-top (EDTA) tubes must be at least half full with 2 mL of whole blood; the 2-mL pediatric lavender-top (EDTA) tubes must contain a minimum of 1 mL of whole blood.

Chemistry Testing (Light Green-Top Tubes Containing Heparin):

Optimally, specimens that have not been centrifuged with plasma separation, should be received in the laboratory within 2 hours. If stored refrigerated, analysis may still be performed and a result comment added referring to possible analyte interference.

Venipuncture During Intravenous (IV) Therapy

Specimens should not be drawn from veins receiving infusion (blood, salt, glucose solution, etc.). Use another vein for specimen collection. Ankle venipuncture is used only as default and permission has been obtained from the physician or nurse. If both arm veins are used and leg veins are not available, or in the opinion of the phlebotomist or nurse the veins available are inadequate, the physician is requested to do a femoral vein puncture. If requested by the attending physician, the specimen may be drawn from the arm with the IV line. This may be done provided:

- The IV is temporarily interrupted (60-90 seconds) before drawing, and the first 5-mL of blood is discarded.
- The requisition slip is marked "Drawn from above/below an IV infusion site."

Venipuncture During Blood Transfusion

Specimens may be drawn during the transfusion of blood or blood components unless request is for analysis of hemoglobin for which you must wait 30 minutes post transfusion. The restrictions listed above apply.

Laboratory personnel do not draw specimens through PICC line, central line, PORT-A-CATH® line, IV line, or IV ports.

Blood Collection from Venous, Arterial, or Other Lines

Specimen labeling must meet laboratory requirements, including patient's name and identification number, date and time of collection, and initials of person collecting the specimen. If requested by the attending physician, the IV Certified Intensive Care nursing staff may obtain a blood specimen through:

- An arterial line
- A distal port of the Swan-Ganz catheter
- Central venous access routes

No blood will be drawn through a TPN line; see TPN procedure, "Nursing Policy Manual." A blood specimen may also be drawn by an IV-certified nurse or his/her designee through:

- Hickman catheter, see "Nursing Policy Manual"
- PORT-A-CATH®
- Heparin/saline lock

Arterial lines may be used for blood draw providing the attending physician is contacted. This may be done provided:

- The IV is temporarily interrupted (2 minutes) during the drawing.
- The requisition slip is marked "Drawn from above/below an IV infusion site."

When blood is drawn through an indwelling line, the line should be flushed with saline and the first 5-mL of blood discarded (including blood cultures). It is not recommended that coagulation studies be drawn from any type of line.

Instructions For Ordering Tests

Requests For Testing:

Requests for laboratory testing must be authorized by physicians who are understood to be confined to persons with a bona fide M.D. or D.O. degree or its equivalent academic degree, such as M.B. and Ch.B. in the British Commonwealth, Nurse Practitioners and Physician Assistants, according to the Medical Staff Standard 1 based on the Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) Accreditation Manual for Hospitals.

Tests are listed in alphabetical order. If you are unable to find the requested test, please call Rutland Regional Medical Center Laboratory at 802-747-1771.

Terms and Definitions:

Test Name—Blood specimen tests are listed alphabetically.

Performing Laboratory— Not all tests are analyzed in the RRMCLab. To decrease costs associated with lower volume tests, some tests are referred to other laboratories.

Specimen Requirements—Type and minimum volume of specimen needed.

Specimen Transport Temperature— Indicates the temperature at which the specimen must be transported to the RRMCLab.

Room temperature = 15°C - 25°C (59°F - 77°F)

Refrigerated = 2°C - 10°C (35°F - 50°F)

Frozen < -5°C (< -23°F)

Critical Values— When applicable, results that have values requiring immediate attention are provided. Some of these are age and sex dependent, and will be listed as such.

Container—Try to fill the tube(s) indicated for each test. Light blue-top tubes must always be full, or the specimen is unsatisfactory. For tubes other than light blue, if you are unable to collect a full tube, call Rutland Regional Medical Center Laboratory at 802-747-1771 to confirm acceptability.

Days Performed—If a test is performed at Regional Medical Center Laboratory, availability states the day or days test is performed. If performed at a reference laboratory, there is an additional day or two for transportation. For some tests, the specimen must reach the reference laboratory by 9 a.m. to be reported the same day.

Methodology— Indicates the type of method used to perform the analysis.

Reference Range—Expected range of values found in a reference healthy population. May be age and sex specific. Measurement may be abbreviated as: g = gram, mg = milligram, µg = microgram, ng = nanogram, pg = picogram.

Urine Collection—Mayo Medical Laboratories

24-Hour Urine Collections—Mayo Medical Laboratories provides 24-hour urine collection containers.

Use the following procedure for correct specimen collection and preparation.

- Warn patient of presence of potentially hazardous preservatives in collection container.
- Instruct patient to discard **first-morning** specimen and to record time of voiding.
- Patient should collect all subsequent voided urine for remainder of the day and night.
- Collect **first-morning** specimen on day 2 at same time as noted on day 1.
- Please mix well before aliquoting and provide total volume of 24-hour urine collection.

See “Urine Preservatives” in “Special Instructions” for multiple collections.

Random Collections—For routine analysis and microscopic evaluation, have patient void into a clean container. Specimen

should be capped, labeled, and refrigerated until courier pickup time. A “clean-catch” or midstream specimen is preferred. Patient should first void a small amount of urine which is discarded. Some of the urine should then be collected in a clean container before voiding is completed.

If delays are anticipated in sending specimen to the laboratory, a portion of the specimen should be aliquoted into a grey urine culture transport tube (boric acid) should any culture work also be desired or indicated.