

Laboratory testing and results play an essential role in caring for our patients. More than 70% of diagnoses, treatment regimens and monitoring assessments are based off of laboratory results. The validity of these results is a direct reflection of the integrity of the specimen provided for analysis.

Please consult the alphabetical test listings for specific specimen collection, handling and transport requirements. If there are any questions, please call Kalispell Regional Medical Center (KRMC) Laboratory at 406-752-1737.

Blood Specimen Collections

Specimen Integrity can be defined as an uncompromised specimen representative of in vivo conditions.

- ❖ This means that the specimen we collect represents what is actually happening with in the patient's body and not any damage that may have been incurred during the collection process
- ❖ As a phlebotomist or medical professional that collects blood specimens, specimen integrity should be one of our primary concerns. A compromised specimen yields erroneous results and delays patient care. By protecting the integrity of the specimen we ensure that the providers will receive accurate results from which they will diagnose and treat our patients
- Factors affecting specimen integrity
 - Hemolysis – the breaking open of red blood cells and the releasing of its contents into the surrounding fluid
 - Directly affects protein analyte composition of serum and plasma causing erroneous results
 - For example can cause a dramatic increase in potassium (K^+), magnesium (Mg), iron (Fe) and enzyme levels
 - Hematoma and Ecchymosis – Residual clotted and/or damaged cells and tissues contaminate the specimen
 - Alters the composition of the specimen
 - Can cause a marked elevation of potassium (K^+) levels
 - Can affect coagulation and/or anticoagulation processes
 - Hemoconcentration – an increase in the concentration, pooling, of the red blood cells at the venipuncture site with a decrease in plasma volume
 - Fluid contamination – the introduction of intravenous and/or tissue fluids into a blood sample
 - Directly affects the composition of the blood sample
 - For example can cause an increase in electrolytes causing erroneous results
 - Improper additive to specimen ratio – too much or too little blood sample in relation to the amount of additive in the collection tube
 - Some anticoagulants require a specific ratio of blood sample to additive in order to function within its required parameters of the instruments

- Too little blood sample results in too much anticoagulant causing a diluted specimen
 - Too much blood sample results in not enough anticoagulant to prevent clotting
- Causes of compromised specimen integrity
 - Prolong tourniquet placement
 - Causes hemoconcentration
 - Tourniquets should be released within **1 minute** to minimize effects
 - Improperly tied tourniquet
 - Tourniquets tied too tightly or too close to the intended venipuncture site can cause the vein to blow (tear open on needle insertion), hemoconcentration, damage to the cells and/or tissues, prevent blood flow and cause considerable discomfort to the patient
 - Difficult specimen collection
 - Probing, digging or fishing for a vein can cause damage to the cells and surrounding tissues resulting in contaminated and/or hemolyzed specimens and is extremely painful for the patient
 - Probing is **NEVER** acceptable
 - Collapsed veins can cause damage to the cells and considerable discomfort to the patient
 - Improper use of a syringe – Pulling too hard on the plunger, causing excessive pressure can damage the red blood cells
 - Improper gauge needle – Too small a needle can cause the red blood cells to shred as they pass through the shaft of the needle
 - Poor or inappropriate site selection

Order of Draw

Standard blood specimen collection tubes are evacuated tubes. Evacuated tubes have a predetermined amount of vacuum for the indicated maximum tube volume. Blood collection tubes should be filled following the proper, approved, Order of Draw. The order of draw was established to prevent carryover or cross contamination of the additive from one tube into subsequent tubes resulting in adverse effects.

***Note:** The order of draw was established by and for the KRMC Laboratory for the collection of blood samples from current research and recommendations of governing institutions and may differ, in slight, from other laboratory facilities.*

The following charts include standard and pediatric specimen collection tubes, the order in which they are collected, as well as additive information and examples of common tests performed on each tube.

- ❖ The four most common tubes are known collectively as a “**Rainbow**”
- ❖ Hint: The tubes of the Rainbow are collected in alphabetical order
Blue → **Gold** → **Green** → **Lavender**

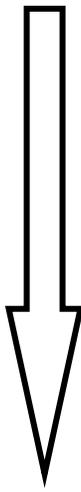
Standard Collection Tubes

Standard Tubes should be filled in the order indicated below regardless of the method of collection

Tube Type / Stopper Color	Additive	Action of Additive	Common Uses
Blood Cultures  Anaerobic (Orange cap)  Aerobic (Green cap) <hr/>  Yellow (Glass)	1. Growth Media 2. Activated Charcoal / Resin <hr/> SPS (Sodium polyanethol sulfonate)	1. Food for bacteria – promotes growth 2. Binds residual antibiotics <hr/> Anticoagulant that reduces the destruction of bacteria/fungi	Bacterial studies <hr/> Bacterial studies / Fungal studies
 Light <i>Blue</i>	Sodium Citrate	Anticoagulant	Coagulation studies
 Red	Silica Clot Activator	Promotes clotting	General Chemistry
 <i>Gold (SST)</i> (SST = Serum Separator Tube)	1. Silica Clot Activator 2. Gel Separator	1. Promotes clotting 2. Separates serum from cells	General Chemistry studies
 Light <i>Green (PST)</i> (PST = Plasma Separator Tube)	1. Lithium Heparin 2. Gel Separator <hr/> Sodium Heparin	1. Anticoagulant 2. Separates plasma from cells <hr/> Anticoagulant	Cardiac enzymes, General Chemistry <hr/> Specialty Chemistry
 <i>Lavender</i>  Purple  Pink	EDTA	Anticoagulant	Lavender / Purple – Hematology studies Pink – Blood Bank
 Grey	1. Sodium Fluoride 2. Potassium Oxalate	1. Glycolytic inhibitor 2. Anticoagulant	Metabolic Studies, Glucose studies
 Yellow	ACD (Acid, Citrate Dextrose - citric acid, trisodium citrate, dextrose)	Anticoagulant which preserves whole blood for several weeks	Histocompatibility, Flow cytometry, HLA studies
Tubes with additives not listed in the above table are drawn according to specific testing requirements. Please check the test catalog for specific instructions or call Lab for assistance.			

Microtainer Collection Tubes

- Often referred to as Pedi tubes, Micro-collection containers or Bullets
- When to use them and how to fill them
 - These tubes can be used for pediatric patients as well as extremely difficult draws
 - Never waste sample when it is difficult to obtain
 - Lavender tubes
 - The ideal specimen level is between the minimum (250µL) and maximum (500µL) fill lines
 - These tubes have a specific amount of additive. The tube cannot be over or under filled as this can cause erroneous results due to clotting or dilution, respectively.
 - Light Green tubes
 - Have a minimum (400µL) and a maximum (600µL) fill line specific to the amount of additive
 - Amber tubes need to clot before centrifugation
 - The ideal specimen level is to fill the shaded region of the microtainer



Tube Type / Stopper Color	Additive	Action of Additive	Common Uses
Blood Culture  Yellow cap (anaerobic & aerobic)	1. Growth Media 2. Activated Charcoal	1. Food for bacteria – promotes growth 2. Binds residual antibiotics	Bacterial studies
 Lavender	EDTA	Anticoagulant	Hematology studies
 Light Green	1. Lithium Heparin 2. Gel Separator	1. Anticoagulant 2. Separates plasma from cells	Cardiac enzymes, General chemistry
 Amber (SST)	1. Silica Clot Activator 2. Gel Separator	1. Promotes clotting 2. Separates serum from cells	General chemistry

The microtainer order of draw is in accordance with the recommendations of Becton, Dickinson (NCCLS-recommended Standards, according to NCCLS Document H4-A4) in order to minimize the chances of clotting

Specimen Volumes

When possible, blood specimen collection tubes should be filled to the maximum volume to ensure proper additive to specimen ratio and quantity of specimen for requested tests. Standard blood specimen collection tubes with additives should be filled with a minimum volume of 1mL of specimen.

Exception: *Sodium Citrate (blue top) tubes must always be filled to the maximum volume in order to comply with the 9:1 ratio of blood to additive testing requirement.*

Individual tests have specific volume requirements. Refer to the specific test for current volume requirements.

Note: Specimen volumes listed in the lab test catalog refer to the specific type of specimen that will be tested; *whole blood, serum, plasma*.

Whole blood: Unspun, anticoagulated blood.

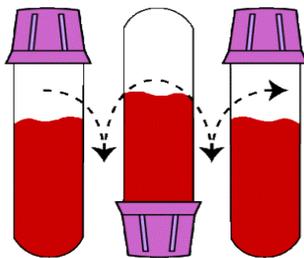
Serum: Whole blood is allowed to thoroughly clot before centrifugation.

Plasma: Anticoagulated whole blood is centrifuged.

Rocking

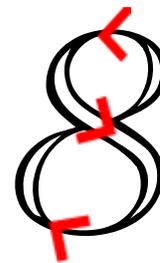
Blood specimen collection tubes with additives should be gently inverted or rocked following collection to ensure distribution of additive throughout the specimen. Tubes should be inverted or rocked 8-10 times unless otherwise indicated by specific test requirements.

Inversion



Equals 1 rock

Figure 8 Motion



Equals 1 rock

Centrifugation

Tests requiring serum or plasma specimens must be centrifuged. Specimens should be centrifuged within 1 hour of collection unless otherwise indicated by specific test requirements.

Note: Ratio of whole blood to serum or plasma: 2.5mL:1mL (2.5mL of whole blood will yield approximately 1mL of serum or plasma after centrifugation).

Centrifuge specimens for **15 minutes** at **3500 rpm** unless otherwise directed by laboratory personnel.

Blood specimen collection tubes not containing the gel separator need to be aliquot after centrifugation.

Test Stability

Refer to the individual test listings for specific transportation and testing stability requirements.

Urine Specimen Collections

Instructions for Clean-Catch, Midstream Urine Specimens

Males

1. Remove cup and towelettes from bag, if not already done.
2. Remove lid of cup. **To avoid contamination**, be careful not to touch the inside of the cup or the straw on the underside of the lid. Place lid, straw side up, on flat surface.
Caution: Do not remove label from lid. Sharp transfer needle located under lid label.
3. Cleanse with towelettes as follows:
 - a. **With one towelette, wipe head of penis in a single motion.** If not circumcised, retract foreskin back before cleansing.
 - b. Throw towelette into trash can, do not flush.
 - c. **Repeat above with second towelette.**
4. Void a small amount into the toilet. If not circumcised, hold foreskin retracted while voiding.
5. Place cup under stream and continue to void into the specimen cup. Fill specimen cup.
6. If necessary, finish voiding into the toilet.
7. Replace lid on cup and tighten securely.
8. Return specimen to lab or place in specimen cabinet as directed by lab personnel.

Females

1. Remove cup and towelettes from bag, if not already done.
2. Remove lid of cup. **To avoid contamination**, be careful not to touch the inside of the cup or the straw on the underside of the lid. Place lid, straw side up, on flat surface.
Caution: Do not remove label from lid. Sharp transfer needle located under lid label.
3. Cleanse with towelettes as follows:
 - a. **Separate the labia. With one towelette, wipe the inner labial folds front to back.**
 - b. Throw towelette into trash can, do not flush.
 - c. **With second towelette, wipe center of labial folds front to back.**
 - d. Throw towelette into trash can, do not flush.
4. While keeping labia separated void a small amount into the toilet.
5. Place cup under stream and continue to void into the specimen cup. Fill specimen cup.
6. If necessary, finish voiding into the toilet.
7. Replace lid on cup and tighten securely.
8. Return specimen to lab or place in specimen cabinet as directed by lab personnel.

Instructions for Collection of 24 Hour Urine Specimen

Your physician has ordered a test that requires the collection of a 24 hour urine specimen. To ensure accurate test results, please read these instructions completely prior to starting your collection.

Note: Some 24 hour urine tests require the patient to follow a specific diet or have dietary restrictions. Refer to the KRMC Lab Test Catalog for specific test requirements.

Follow the instructions carefully.

1. Decide upon a time in which the collection will be made, for example, 8:00 AM of day one to 8:00 AM of day two.
2. At the hour you choose to start the collection period, urinate into a toilet and flush as usual. The first urine is flushed away in order to mark the start of the 24 hour collection with an empty bladder.
3. Record the starting time and date in the space provided on the label of the collection container.
4. For the next 24 hours, collect **ALL** your urine in the container. Keep the urine cool during the entire collection. A small cooler containing ice works well.
Note: *Some tests require the addition of an acid or base preservative, which will be indicated by a red and white CAUTION label on the container. Please be very careful when adding urine to the container. Keep the lid tightly closed when storing.*
Females: A urine hat will be provided. Urinate into the hat and carefully transfer to the 24 hour jug.
Males: If no additive is required, males may urinate directly into the 24 hour urine jug. If an additive is required, a urinal will be provided. Urinate into the urinal and carefully transfer to the 24 hour urine jug.
5. At the end of the 24 hour collection period void the remaining contents of your bladder and include in the 24 hour urine jug. An attempt to void should be made even if you do not have the need to urinate. This will mark the end of the specimen collection.
6. Record the ending time and date in the space provided on the label. The ending time should be 24 hours after the start time.
7. Label the urine container with the patient's legal name (first and last) and date of birth.
8. Promptly bring the container back to the laboratory.

If multiple tests were ordered the laboratory may provide you with a special container that has a urine splitting device attached. Additional instructions will be provided. Please read these prior to starting your collection.

Stool Specimen Collections

Specific instructions will be distributed with the stool collection kits. Refer to individual test listings for specific specimen collection, handling or transport requirements.

All Other Specimen Collections

Refer to individual test listings for specific specimen collection, handling or transport requirements.