**TriHealth Laboratories**

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# Specimen Handling

Reference the below chart for general guidelines for processing blood specimens.

| Specimen Type | Additive | Tube top colors | Primary Testing | Processing Requirements |
|---|---|---|---|---|
| Serum ***with*** separator | No anticoagulants- specimen will clot |  Yellow | Chemistries | Improper handling can cause falsely elevated potassium as well as other analytes.<br>• Immediately following venipuncture- gently invert at least 5 times<br>• Place tube in a vertical position for a minimum of 30 minutes and a maximum of 2 hours<br>• Centrifuge for 15 minutes in a fixed rotor (slant) or 10 minutes in a horizontal centrifuge.<br>• Allow the specimen to remain at room temp until the courier arrives<br>NOTE: Once the gel barrier has formed, NEVER recentrifuged. |
| Serum ***with*** separator | No anticoagulants- specimen will clot |  Speckled Red | Chemistries | Improper handling can cause falsely elevated potassium as well as other analytes.<br>• Immediately following venipuncture- gently invert at least 5 times<br>• Place tube in a vertical position for a minimum of 30 minutes and a maximum of 2 hours<br>• Centrifuge for 15 minutes in a fixed rotor (slant) or 10 minutes in a horizontal centrifuge.<br>• Allow the specimen to remain at room temp until the courier arrives<br>NOTE: Once the gel barrier has formed, NEVER recentrifuged |
| Serum without separator | No anticoagulants- specimen will clot |  Red | Special testing requiring no serum separator | Improper handling can cause falsely elevated potassium as well as other analytes.<br>• Immediately following venipuncture- gently invert at least 5 times<br>• Place tube in a vertical position for a minimum of 30 minutes and a maximum of 2 hours<br>• Centrifuge for 15 minutes in a fixed rotor (slant) or 10 minutes in a horizontal centrifuge.<br>• Allow the specimen to remain at room temp until the courier arrives |

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| | | | | |
|---|---|---|---|---|
| Plasma with separator (anticoagulant additives to prevent clotting) | Lithium Heparin with gel |  Light Green | Chemistries | • Gently invert 8 times to mix specimen immediately after drawing<br><br>NOTE: Improper inversion/mixing can result in a clotted specimen which is unacceptable for testing. |
| Plasma (anticoagulant additives to prevent clotting) | Sodium Citrate |  Blue | Coagulation | • Gently invert 3-4 times to mix specimen immediately after drawing<br><br>NOTE: Improper inversion/mixing can result in a clotted specimen which is unacceptable for testing. |
| Plasma (anticoagulant additives to prevent clotting) | Lithium Heparin |  Green | Plasma Chemistries | • Gently invert 8 times to mix specimen immediately after drawing<br><br>NOTE: Improper inversion/mixing can result in a clotted specimen which is unacceptable for testing. |
| Whole Blood (anticoagulant additives to prevent clotting) | Sodium Heparin |  Green | BCA and T-Spot | • Gently invert 8 times to mix specimen immediately after drawing |
| Whole Blood (anticoagulant additives to prevent clotting) | EDTA |  Lavender | Hematology | • Gently invert 8 times to mix specimen immediately after drawing<br><br>NOTE: Improper inversion/mixing can result in a clotted specimen which is unacceptable for testing. |
| Whole Blood (anticoagulant additives to prevent clotting) | EDTA |  Pink | Blood Bank (Transfusion) | • Gently invert 8 times to mix specimen immediately after drawing<br><br>NOTE: Improper inversion/mixing can result in a clotted specimen which is unacceptable for testing. |

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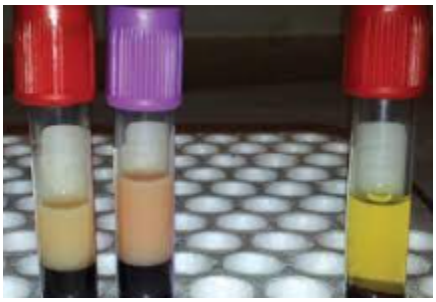
## LIPEMIA

Lipemia is an excess of fat or lipid in the blood. Lipemic serum is characterized by a milky appearance and, like hemolysis, can interfere with testing and lead to erroneous results. It may be avoided, in most cases, by obtaining fasting specimens. If possible, tests on hemolyzed or lipemic specimens will be performed. The condition of the specimen will be noted on the report for the physician's consideration in the interpretation of the results.

Lipemic specimens are on the left and the non-lipemic specimen is on the right.



## HEMOLYSIS

Hemolysis is a condition that may affect the results of various laboratory tests. Hemolysis is the release of hemoglobin from the red cells and is indicated by a pink, orange, or reddish tint of the serum. The chart below shows the various levels of hemolysis with #1 being no hemolysis and #4 being sever hemolysis.


General causes of hemolysis:

- Various disorders related to metabolism, infection, or exposure to chemical or physical agents.
- There are many external factors that can also lead to hemolysis, including poor venipuncture techniques, excessive pressure exerted on the blood during collection, or shaking a specimen.

Effects of Hemolysis on laboratory results:

- Hemolysis should be avoided since it can interfere with testing and may lead to erroneous results, especially in potassium measurement as well as liver enzymes and other metabolites.

See the chart below for various factors that contribute to hemolysis, possible consequences, and corrective actions to avoid hemolysis.

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# Specimen Handling

| Factors | Possible Consequences | Corrective Actions |
|---|---|---|
| **Collection** | | |
| Venipuncture | Hand veins are fragile and easily traumatized. | Veins in the antecubital area of the arm are the veins of choice. If blood is drawn below this area, a 22g or 23g needle used with a partial draw tube is suggested. A partial draw tube has reduced vacuum and causes less trauma. Make sure this partial draw tube has enough volume to maintain proper blood-to-additive ratio. |
| Prolonged tourniquet time | Hemoconcentration can affect water balance of cells causing rupture of the red blood cells. | Release the tourniquet as soon as blood flow is established in the first tube, if possible. |
| Cleansing procedure with isopropyl alcohol | If venipuncture is performed before alcohol is allowed to dry, red cells will rupture. | Allow alcohol to dry thoroughly. |
| Needle placement | Vein trauma may result when needle placement is not accurate. | The needle should be parallel to the vein. Enter at a 30° angle or less. Reposition the needle forward or backward vertically. Avoid probing. |
| Needle occlusion | Needle occlusion may cause blood to flow slowly and initiate RBC shearing. | Needle bevel may be positioned against the vein wall. Pull back slightly on the needle. Avoid rotating or changing the angle of the needle. |
| Tube choice | Tube vacuum might cause blood to enter the tube forcefully and may cause cell rupture. | If a partial draw tube is not acceptable for the test (e.g., protime), there may be smaller tubes available. |
| Hematoma | Specimens collected by penetrating through a hematoma may cause erroneous results. | Select another site. If another site is not available, collect distally to the hematoma. |

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# Specimen Handling

| Factors | Possible Consequences | Corrective Actions |
|---|---|---|
| **Processing, Handling, and Transport** | | |
| Vigorous mixing of tubes | Vigorous mixing may cause the red blood cells to rupture. | Use gentle inversion only. |
| Centrifuging specimens before 30 minutes after collection | If the clot is not completely formed, serum separation from the red blood cells is incomplete. | Allow the specimen tube to remain vertical in a rack for a minimum of 30 minutes. |
| Prolonged contact of serum/plasma with cells | Hemoglobin released from hemolyzed cells will contaminate serum or plasma. | Centrifuge the specimen after clotted, but within 2 hours after collection. |
| Temperatures - elevated or decreased | RBC membrane may rupture. | Do not centrifuge specimens longer than 20 minutes. The heat generated in the centrifuge may cause red cells to lyse.<br><br>Do not place the tubes or centrifuge on a counter exposed to extreme temperature variations (e.g. next to autoclave).<br><br>Never refrigerate the specimen before it is centrifuged.<br><br>When placing specimen boxes on outside of building, place in an area that is not exposed to extreme hot and cold temperatures. If the weather is hot, place an ice pack in box, being careful that specimens are not directly touching it. |