Reducing Hemolysis in Specimen Collection and Processing

This presentation was prepared by the ACL Specimen Collection, Processing, and Exception Handling Technical Advisory Team

Last reviewed 8/12/2022 SJP/SDV

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Objectives:

This presentation applies to new and experienced phlebotomists, laboratory assistants, and all team members involved in collection or processing of blood specimens.

- Improve patient safety by reducing specimen rejection due to hemolysis to ensure accurate results
- Define hemolysis and its causes
- Tips for prevention and reduction of hemolysis
- Tips for specimen processing
- Best practices when using butterfly/wing-set collection devices

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What is Hemolysis?

- Hemolysis is the rupture of red blood cells and the release of intracellular contents
- Hemolysis is mainly caused by:
  - Improper specimen collection
  - Improper specimen handling
- Minor causes of hemolysis:
  - Hemolytic anemia and certain disease states in patient
- If serum/plasma is a pink/red color it is typically an indication of hemolysis

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Possible Outcomes if Best Practices Are Not Followed

- Patient safety is compromised
- Testing delay
- Delay in treatment / diagnosis / discharge
- Redraws / additional patient sticks
- Rework
- Patient Dissatisfaction
- Physician Dissatisfaction

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Venipuncture Best Practices

- Recommended needle size is 21 gauge. Smaller gauges may be used in difficult or pediatric venipuncture situations, but have higher chance of hemolysis.
- Cleanse site with alcohol and allow site to air dry
- Never leave tourniquet on for more than 60 seconds
- Patient should be asked to close their hand without clenching or pumping
- Instruct patient to open hand once blood starts flowing into vacutainer tube(s)
- Avoid slow draws/poor blood flow from improperly positioned needles
- In the event a syringe needs to be used for the collection, the plunger must be pulled back slowly and gently to prevent hemolysis

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Venipuncture Best Practices (continued)

- Tubes must be collected via venipuncture in the correct order of draw to avoid contamination from preceding tube:

- Blood Cultures
- Blue top tubes (sodium citrate)
- Gold top tubes (serum tube with or without gel)
- Red top tubes (serum tube without gel)
- Green tubes (heparin gel)
- Green tubes (heparin no gel)
- Lavender top tubes (EDTA)
- Pink top tubes (EDTA)
- Gray top tubes (glycolytic inhibitor)
- Royal blue top tubes(with or without additive)

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Venipuncture Best Practices (continued)

- Any additional tubes, for example (ACD Yellow, Quantiferon Kit, etc..)
- Note: If a winged butterfly set is used and a coagulation tube needs to be drawn and a blood culture sample is not required, use a no-additive or sodium citrate discard tube first.
- Note: If a capillary collection is completed, the order of draw is: EDTA > Lithium Heparin (no gel) > Lithium Heparin (with gel) > Sodium Fluoride > Clot Activator and gel for serum separation > No Additive.

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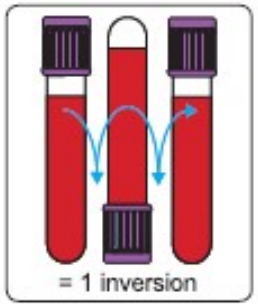
Venipuncture Best Practices (continued)

- Immediately after each tube is filled, invert tubes **gently** the appropriate # of times to ensure thorough mixing:
  - Blue 3-4 times each
  - Gold/Red 5 times each
  - All other tube types 8 times each
- ***DO NOT SHAKE TUBES!***
  - Red cells can be damaged and release potassium and other cell contents that can impact results
  - Quantiferon Collection Kit is an exception



Note: If not properly mixed, fine clots may form in tubes containing anticoagulants that may seriously interfere with all testing.

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Processing Best Practices

- Allow gel top tubes to clot in an upright position for 30 minutes at room temperature; no longer than 2 hours before centrifuging
- Allow red top tubes to clot in an upright position for 60 minutes at room temperature; no longer than 2 hours before centrifuging
- Specimens must be centrifuged for the appropriate time at the appropriate speed
- **Do not** re-spin blood in a gel tube after it has been centrifuged to recover additional serum
- Do not refrigerate specimens prior to centrifugation
  - Refrigeration will elevate potassium levels quickly, significantly, and irreversibly
- Do not freeze blood in a gel tube or freeze a serum aliquot if red cells are present.
  - Freezing will release potassium from red cells

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Butterflies (also known as: winged infusion sets)

- Butterfly usage should be kept to a minimum and used with discretio they are inherently higher risk for hemolysis
  - When collecting blood cultures
  - When it is a difficult venipuncture
  - Small/difficult veins
  - Hand veins
  - When a patient is insistent
  - Pediatric patient

- 21 Gauge butterfly is the preferred size to prevent hemolysis
- Reasons **not** to use butterflies:
  - Butterflies with a gauge of 22 or higher are not indicated for certain types of draws (i.e. potassium) because the smaller diameter of the needle may damage red cells
  - Increased risk of needle stick incident
  - Higher cost/expense

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Butterflies (continued)

- Misconceptions:
  - Drawing multiple tubes is easier with a butterfly.
    - Truth: with proper technique, drawing multiple tubes with a standard, straight needle is the same
  - Using a butterfly causes less discomfort.
    - Truth: discomfort is caused by poor technique and certainly not by the length of the needle
    - Butterflies are easier to use and control
      - Truth: more accidental needle sticks occur while performing venipunctures with a butterfly (source: *Medical Data International*)

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Positive Patient Outcomes

- Increased Patient Safety by:
  - ✓ Providing timely test results and treatment
  - ✓ Providing successful venipunctures
  - ✓ Following best practices
- Increased Patient Satisfaction
- Increased Physician Satisfaction

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