

HEMOLYSIS - CAUSE AND EFFECT

Hemolysis should be avoided because it invalidates certain lab determinations. The presence of hemolysis of moderate or greater degree adversely affects the blood specimen in several ways.

- It releases erythrocyte contents, such as potassium, lactate dehydrogenase, and acid phosphatase, into the serum thereby elevating levels.
- It colors the blood plasma and serum, which will interfere with colorimetric assays, especially photometric measurements using shorter wavelengths of the visible spectrum.
- As some red blood cells have been damaged, a falsely depressed PCV-packed cell volume and RBC-red blood cell will likely be obtained. Although the hemoglobin value will be accurate, the calculated red blood cell indices will be affected by the depressed PCV and RBC.¹

Among the more common causes of hemolysis are the following:

- Collection of Blood.** Every effort should be made to avoid excessive venous stasis through prolonged excessive application of the tourniquet (no more than two minutes) The combined effect of raised intravenous pressure and anoxia from sustained occlusion results in passage of water and small molecular size constituents from the lumen of a vein into the surrounding extracellular fluid, since erythrocytes and plasma proteins as well as other large molecules cannot pass through the vein wall; hence, their concentration rises. Prolonged stasis can falsely raise concentrations of hormones and calcium which are bound to protein in the blood stream.² During phlebotomy avoid a probing, traumatic venipuncture, using a needle that is too small (less than 22 gauge), drawing from a hematoma, and make sure venipuncture site is dry(residual alcohol may cause RBC lysis) because all of these can cause hemolysis.³ A slow return of blood flow into tubes could equal a problem, example the pressure created by the vacuum tube or syringe collapses the lumen of the vein against the needle, thereby crushing numerous red cells. Also, the fluttering of the lumen against the needle which can cause hemolysis can be stopped by reducing the negative pressure exerted by repositioning the needle with a slight rotation or deeper insertion.¹ Avoid drawing the plunger back too forcefully, if using a needle and syringe, applying excessive negative pressure can create hemolysis. Our natural tendency is to use more force to enhance blood flow, however patience and alternating gentle pressure with a short release will yield best results.
- Transfer of Blood.** Expelling blood from a syringe through the needle into a tube with force can cause hemolysis. Using a large bore needle will help prevent hemolysis of the blood and maintain the integrity of the sample. Do not apply pressure to the plunger; allow the tubes to fill by the negative pressure of the vacuum tube. Do not shake blood in container to mix with anticoagulants, as frothing results in hemolysis. Gently mix by repetitive inversion 6-10 times. Agitation of whole blood not containing an anticoagulant is certain to produce hemolysis.
- Extreme temperatures.** Extreme temperatures hot or cold can cause hemolysis. Avoid placing ice or frozen gel packs directly on tubes of blood it can result in hemolysis.

Maintaining the integrity of the sample is vital for accurate lab results, requiring both knowledge and skill from phlebotomy until tests are complete. Home HealthCare Laboratories of America hopes this Lab Note will be helpful in that process.

Bibliography

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3. The INTERNET Pathology Laboratory Web Path, pg.9-10, <http://www-medlib.med.utah.edu/WebPath/TUTORIAL/PHLEB/PHLEB.html>

