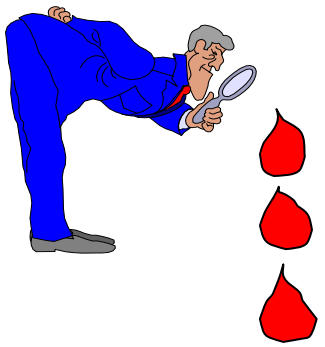
ANOTHER *BLOODY* NEWSLETTER!
VTH Clinical Pathology, July 2007

Welcome: Please welcome our new emergency techs- Tim Kuhnmuench and Joy Fuhrman, both entering the DVM/MBA program.



Retirement: Cheryl Heger, who has been with us for nearly 20 years, will retire in August. We wish her a heartfelt goodbye.

Lab submissions: Please be sure to add the clinician's name, the student's name, and a provisional diagnosis to every lab submission.

Balanced Heparin and Blood Gases- Pre-Analytical Errors:

Different blood gas samples have the capability of giving very different results. The PICO syringes contain balanced sodium heparin. The heparin is lyophilized, so there is no danger of a dilution effect. These may be obtained from Clinical Pathology or are found in CCU, the student lab in a drawer adjacent to the blood gas analyzer, and in anesthesia. Some samples are collected in syringes coated with liquid injectable sodium heparin, which is not balanced.

The difference between the two techniques is notable. Heparin has free negative binding sites which bind all positive ions in blood; so calcium, potassium, and sodium are all affected. When the ions are bound, they are not available to be measured by the ion selective electrodes in the analyzer; so the sodium, calcium and chloride values will be lower than the true value. Electrolytes, and especially ionized calcium, are affected even more. Balanced heparin neutralizes the free negative binding sites, so that the electrolyte concentrations are accurate. If the blood to heparin ratio is not accurate (too much liquid left in the syringe and not enough blood), then there is also a dilution effect. This effect can be significant- i.e., 50µl liquid heparin/1ml whole blood can dilute the plasma phase of the blood by 10%. It is recommended that blood gas samples are not diluted more than 5%, meaning 0.1 ml heparin (dead space volume) in 2ml of blood, using 1000 IU/ml heparin. This provides a final heparin concentration of 50 IU/ml of blood. However, this concentration of heparin will create a negative bias of 0.15 mm/L in ionized calcium results. For this reason, we recommend using only the PICO syringes when collecting samples for ionized calcium. When comparing automated chemistry electrolyte results to ABL electrolyte results, keep in mind that only serum and lithium heparin plasma samples are valid. The sodium heparin often used to heparinize syringes, may interfere.

Up to 60% of errors involving blood gas results are from sample collection and handling. In addition to the above discussion regarding anti-coagulants, other sample problems may affect results:

1. Sampling from catheters
2. Hemolysis
3. Storage, and evaporation.

When collecting from a catheter, it is recommended that at least 3x the volume of the catheter dead space be discarded prior to sampling.

Hemolysis is one of the most frequent causes of preanalytical errors. The RBCs will hemolyze if they come into contact with alcohol used for disinfection of the sampling site, if placed directly on ice (instead of ice-water), or with filling the syringe caused by an obstruction in the needle (or too narrow of a needle size.) Vigorous shaking of the sample may also lead to hemolysis.

Generally, samples for blood gas analysis are run immediately. If storage is necessary, it is best to store on ice-water for no longer than 2 hours.

References:
Higgin, C. The use of heparin in preparing samples for blood gas analysis. Radiometer Newsletter. April 2007.

Wennecke,G. Useful tips to avoid preanalytical errors in blood gas testing: electrolytes. Radiometer Medical. 2003.

Respectfully submitted by Cherie Heger, MT(ASCP)