Troubleshooting Erroneous Potassiums in a Clinical Laboratory Setting

Potassium (K⁺) is one of the most commonly analyzed elements in the chemistry laboratory. It can be ordered by a physician as a single test, or it can be run as part of an electrolyte panel, and analyzed in conjunction with sodium, chloride and CO₂. In the human body, potassium plays important roles in maintaining water balance and distribution, acid-base balance, muscle and nerve cell function, and heart, kidney and adrenal function.

The normal range for serum potassium is 3.5-5.0 mEq/L. When a patient exhibits a low potassium (hypokalemia), it can lead to muscle weakness, irritability, paralysis, and at very low levels, cardiac arrest. Conversely, elevated potassium (hyperkalemia), can be seen in patients with dehydration, diabetic ketoacidosis, severe burns and renal failure. Hyperkalemia is associated with mental confusion, muscle weakness, electrocardiographic...
Notes

From The Editor
In this issue of LabNotes, we are pleased to present you with a new and useful tool, our “TroubleshootingErrorous Potassiums in a Clinical Laboratory Setting” wall chart. We recognize that falsely elevated potassium values are a concern. Often, these erroneous results may be due to several preanalytical variables, including venipuncture technique, specimen handling and processing, or even mixing venous blood collection products from different manufacturers. At BD, we understand how important it is for our customers to be able to report accurate laboratory results, so we hope that you will hang this chart in your lab and use it as a reference guide if you happen to be concerned about potassium values. Another exciting new item that we want to introduce to you in this issue is the BD Vacutainer ® Push-Button Blood Collection Set. As in the past, BD is continuing to provide products that will help to ensure healthcare worker safety. This new blood collection set automatically retracts when the healthcare worker pushes the activation button with his or her index finger. You will also learn about a relatively new CAP question that asks whether your laboratory is using 3.2% sodium citrate tubes for your coagulation testing. We hope you enjoy this issue of LabNotes. As always, we look forward to your comments and suggestions.

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What is OSHA?
The Occupational Safety and Health Administration or OSHA, is a government agency established to save lives, prevent injuries, and protect the health of America’s workers. To accomplish this, the federal and state governments work in partnership with more than 100 million working men and women and their 6.5 million employers covered by the Occupational Safety and Health Act of 1970. OSHA establishes protective standards, enforces those standards, and assists employers and employees with technical assistance and consultation programs. Nearly every working person in the nation comes under OSHA’s jurisdiction. Visit the OSHA website at www.osha.gov to find a wealth of information, including the following:
- Commission Decisions
- Compliance Directives
- FAQs
- Field Inspection Reference Manual
- Interpretive Memos and Letters
- OSHA Directives
- OSHA Standards
- OSHA Regulations and Compliance

The website allows you to search on any topic of interest, for example the Bloodborne Pathogens Standard and the Needlestick Safety and Prevention Act, and includes technical links to other related sites.

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Correction: In the Spring 2003 issue of LabNotes, the CAP question that was referred to in Tool Kit: The BD Vacutainer ® Plus Plastic Tubes had an incorrect number. The correct number is from the CAP General Laboratory checklist and is Gen. 40942, Phase I. We are sorry for any confusion that this may have caused.

DID YOU KNOW...

Question: HEM.22748 Phase I
Are all coagulation specimens collected into 3.2% buffered sodium citrate?

Note: The milder chelation of 3.2% citrate over 3.8% citrate is preferred for accuracy of results.

Sodium citrate is effective as an anticoagulant due to its mild calcium-chelating properties. Of the two commercially available forms of citrate, 3.2% buffered sodium citrate (109 mmol/L) of the dihydrate form of trisodium citrate Na3C6H5O7·2H2O is the recommended anticoagulant for coagulation testing. The citrate concentration in 3.8% sodium citrate is higher and its use may result in falsely lengthened clotting times with calcium-dependent coagulation tests (i.e., PT and aPTT) with slightly underdiluted samples and with samples with high hematocrits. Coagulation testing cannot be performed in samples collected in EDTA due to the more potent calcium chela. Heparinized tubes are not appropriate due to the inhibitory effect of heparin on multiple coagulation proteins.

If the laboratory does not adhere to recommendations for use of 3.2% buffered sodium citrate, it must have data on file to demonstrate that the alternative citrate concentration produces accurate and precise coagulation results.

CAP (College of American Pathologists) revised the Checklist* section for Hematology and Coagulation in November 2002. There are several revisions to this section including a new question recommending the use of 1.2% buffered sodium citrate instead of the 3.8% citrate concentration. The commentary discusses the reasoning behind the recommendation. It states that laboratory currently uses 3.8% sodium citrate tubes they must provide data indicating that this concentration produces accurate and precise coagulation results. To meet your laboratory compliance needs, BD offers an array of BD Vacutainer ® Plus Plastic Crite Tube including the 3.2% sodium citrate concentration.

Reference:
2) Reveille, J. et al. Heparinized protein precipitation time and activated partial thromboplastin time due to underfilled specimen tubes with 100 mmol/L, 3.8% citrate anticoagulant. Arch Pathol Lab Med. 1996;120:704-717

For more information, visit www.cap.org or our website at www.bd.com/vacutainer

LabNotes
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Troubleshooting Erroneous Potassium Values in a Clinical Laboratory Setting

Potassium Values
Factors Resulting in Elevated
1. Medications and other erroneous test results
2. Liver Disease
3. Anticoagulant therapy (Coumadin, Heparin)
4. Myeloproliferative disorders with
5. Discontinuation of Cotrimoxazole normalizes serum potassium levels
6. Pseudohyperkalemia caused by fist clenching
7. Chilling whole blood beyond 2 hours
8. Poor barrier formation in gel tubes
9. Centrifugation at too high g force
10. Delays in processing/transport

Factors Resulting in Lowered
1. Medications and other erroneous test results
2. Liver Disease
3. Anticoagulant therapy (Coumadin, Heparin)
4. Myeloproliferative disorders with
5. Discontinuation of Cotrimoxazole normalizes serum potassium levels
6. Pseudohyperkalemia caused by fist clenching
7. Chilling whole blood beyond 2 hours
8. Poor barrier formation in gel tubes
9. Centrifugation at too high g force
10. Delays in processing/transport

Factors Resulting in Nonreportable
1. Medications and other erroneous test results
2. Liver Disease
3. Anticoagulant therapy (Coumadin, Heparin)
4. Myeloproliferative disorders with
5. Discontinuation of Cotrimoxazole normalizes serum potassium levels
6. Pseudohyperkalemia caused by fist clenching
7. Chilling whole blood beyond 2 hours
8. Poor barrier formation in gel tubes
9. Centrifugation at too high g force
10. Delays in processing/transport

References
2. American Association of Blood
8. Medically induced delays in the clotting process. If tube is
9. Hemoconcentration and possible hematoma due to infiltration of