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The BD Technical Services Department receives many questions about our products. To address these questions we have developed a news bulletin "Tech Talk" to be sent out periodically.

Q: We were using glass BD Vacutainer™ Blood Collection K₃EDTA (tri-potassium ethylenediaminetetraacetic acid) tubes and now we are receiving plastic BD Vacutainer™ Blood Collection K₂EDTA (di-potassium) tubes. What are the differences physically and clinically? What do we need to do? How can BD help?

A: The salts of the chelating agent EDTA are used as anticoagulants for hematology testing because they preserve cellular components of the blood.

Physical Difference:

- K₂EDTA solution is spray-dried on the interior surface of the plastic tubes.
- K₃EDTA is a liquid solution in the glass tubes.

It should be emphasized that irrespective of the EDTA salt used for anticoagulation, **all tubes must be inverted 8-10 times to ensure thorough mixing of the blood with the anticoagulant.**

Clinical Differences:

The International Council for Standardization in Haematology and NCCLS have recommended K₂EDTA as the anticoagulant of choice for blood cell counting and sizing for the following reasons^{1,2}:

- K₃EDTA results in greater RBC shrinkage with increasing EDTA concentrations (11% shrinkage with 7.5 mg/ml blood).
- K₃EDTA produces a larger increase in cell volume on standing (1.6% increase after 4 hours).
- K₃EDTA leads to lower MCV values (typically a -0.1 to -1.3% difference is observed compared with K₂EDTA).
- K₃EDTA is a liquid additive, and therefore, will result in the dilution of the specimen. All directly measured values (Hgb, RBC, WBC, and platelet counts) have been reported to be 1-2% lower than results obtained with K₂EDTA^{2,3}.
- With some instrument systems, K₃EDTA gives lower WBC counts when used at high concentrations. Brunson, et al., reported that plastic tubes containing K₂EDTA gave complete blood count and differential results in excellent agreement with glass tubes containing K₃EDTA, though they confirmed the earlier results of 1-2% higher WBC, RBC, hemoglobin, and platelet count results with the former tube, owing to dilution observed with K₃EDTA⁴.
- Our internal studies showed no clinically significant differences when comparing K₃EDTA glass tubes to K₂EDTA plastic tubes^{5,6}.

THREE KEY COMPONENTS FOR A SUCCESSFUL CONVERSION:

CAP recommendations:

- The lab should provide sufficient data to prove that the tubes do not contribute to analytical interference.
- Data can be a combination of the lab's internal evaluation, published studies and/or information from the tube manufacturer.
- Review of phlebotomy practice is warranted to prevent drawing unnecessarily large blood volumes.

Laboratory's clinical evaluation studies

- The lab should run glass and plastic tubes side by side on all instruments to determine if differences exist.
- The test population should include healthy donors and patients with abnormal results.
- Follow your institution's lab protocol to run studies when appropriate.

BD's Support:

- We can provide clinical documentation, which contain results from internal studies comparing the performance of glass K₃EDTA to plastic K₂EDTA tubes.
- References to journal articles
- Wall charts describing the proper mixing of the tube. Ask for VS #5938. Literature, videos and other support materials
- To obtain support materials contact the Technical Services Department at 800.631.0174

NCCLS documents will assist you with preparing the appropriate studies for your institution.

How to Define and Determine Reference Intervals in the Clinical Laboratory, C28-A2, Vol. 20, No. 13 2000.
This document contains guidelines for determining reference values and reference intervals for quantitative clinical laboratory tests.

Interference testing in Clinical Chemistry, EP7P, Vol. 6, No. 13 1986.

This guideline provides background information and procedures for characterizing the effects of interfering substance on test results.

Method Comparison and Bias Estimation Using Patient Samples, EP9-A, Vol. 15, No. 17 Dec. 1995.

This document addresses procedures for determining the bias between two clinical methods or devices, and for the design of a method comparison experiment using split patient samples and data analysis.

Evaluation of Matrix Effects, EP14-A Vol. 21, No. 3 2001.

This document provides guidance for evaluating the error or bias in analyte measurements that is due to the sample matrix (physiological or artificial) when two analytical methods are compared.

Please contact NCCLS to order these documents:

www.nccls.org

Tel: 610.688.0100

Fax: 610.688.0700

Address: 940 West Valley Road, Suite 1400, Wayne, PA 19087-1898

References:

1. NCCLS, Evacuated Tubes and Additive for Blood Specimen Collection – Fourth Edition; Approved Standard. NCCLS documentation H1-A4, Vol. 16, No. 13 Dec. 1996.
2. International Council for Standardization in Haematology Expert Panel on Cytometry. Recommendation of the International Council for Standardization in Haematology for ethylenediaminetetraacetic acid anticoagulation for blood cell counting and sizing. Am J Clin Pathol 1993;100:371-372.
3. Sears D, Charachie S, Perlstein M. Electronic blood cell counters: Faulty calibration due to type and amount of anticoagulant in collection tubes. Arch Pathol Lab Med 1985;109:247-249.
4. Brunson D, Smith, Bak A, Przyk E, Sheridan B, Muncer DL, Comparing hematology anticoagulants: K₂EDTA vs K₃EDTA. Lab Hematology 1995;1:112-119.
5. VS5244 – BD Vacutainer™ Tube Comparison: Plastic K₂EDTA vs. Glass K₃EDTA Tubes for Blood Counts on the Coulter MAXM™.
6. VS5324 – BD Vacutainer™ Plus Tube 13x100mm with Spray-coated K₂EDTA : An Evaluation of Visual Hemolysis, Foaming, Clotting and Selected Hematology Parameters.

BD Vacutainer Technical Services: 1.800.631.0174

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