Docket #: S13-189

Modification of PET Blood Collection Tubes

Dr. Richard Zare and colleagues have developed an inexpensive, fast and simple method for treating polyethylene terephthalate (PET) blood collection tubes (BCTs) to remove bias and interference in various blood analysis procedures. Blood collection and processing are two major steps in pre-analytical laboratory testing. Traditionally, glass was the preferred material for making BCTs. However, due to danger from broken glass, BCTs are now made of plastic, specifically PET. The PET polymer surface is hydrophobic and not optimal for blood analysis as cells and analytes are adsorbed on the plastic surface. To overcome this limitation, tube manufacturers add a surfactant coating to the tube to make the inner surface hydrophilic. This approach has its own problems as the surfactant additives can interfere with blood analysis. Attempts have been made to minimize this interference but the methods are expensive, time consuming and/or ineffective. To overcome these problems, the inventors have developed an efficient and inexpensive method to prepare glass-like PET surfaces inside BCTs.

Stage of Research
The inventors have compared BCTs modified with their method, commercially available BCTs and glass BCTs in a number of clinical chemistry analyses using quality control material and patient blood samples. The results show that the inventors' modified BCTs exhibit bias-free performance, i.e. they behave like the gold standard glass tubes.

Applications

- Blood collection tubes
- Other types of polymeric objects or devices where a hydrophilic surface modification is advantageous

Advantages

- Process of treating the blood collection tubes is fast (reaction time as short as 10 minutes), inexpensive, and can be carried out at room temperature
- Resulting tubes display bias-free performance - modified surface behaves like glass
- Modified tubes can be used for LC-MS testosterone analysis
- Using the modified tubes reduces the need for hospital and clinical laboratories to re-do blood tests - this saves money for the labs, and results in better patient satisfaction

Publications

- Bowen, RAR; Kim, SC; Sattayapiwat, A; Austria-Esguerra, V; Zare, RN; "a href= "http://www.sciencedirect.com/science/article/pii/S0009912015004336"> "Performance of chemically modified plastic blood collection tubes," Clin Biochem, published online Sept. 14, 2015, doi:10.1016/j.clinbiochem.2015.09.003.
- S Kim, RAR Bowen, RN Zare; Transforming Plastic Surfaces with Electrophilic Backbones from Hydrophobic to Hydrophilic, ACS Applied Materials & Interfaces, published online Jan. 7, 2015.
- Editorial, Clinical Biochemistry, Quality control material testing and the importance of "treating it like a patient's sample" Clin Biochem. 2014 Feb;47(3):147-149.
- RAR Bowen, A Sattayapiwat, V Gounden, AT Remaley, Blood collection tube-related alterations in analyte concentrations in quality control material and serum specimens, Clin Biochem. 2014 Feb;47(3):150-157.
- Run Zhang Shi, Huub H. van Rossum, Raffick A.R. Bowen, Serum testosterone quantitation by liquid chromatography-tandem mass spectrometry: Interference from blood collection tubes, Clin Biochem. 2012 Dec;45(18):1706-1709.
- Bowen RAR, Hortin GL, Csako G, Otañez OH, Remaley AT, Impact of blood collection devices on clinical chemistry assays, Clin Biochem. 2010 Jan;43(1-2):4-25.

- S. Drake, R.A.R. Bowen, A. Remaley, G. Hortin, Potential Interferences from Blood Collection Tubes in Mass Spectrometric Analyses of Serum Polypeptides, Clinical Chemistry 50 No. 12, 2004, p. 2398.

Patents

- Published Application: WO2015069662
- Published Application: 20160251490
- Issued: 10,259,922 (USA)

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