VALIDATION OF A SHORTER SPIN TIME OF BD VACUTAINER PST TUBES FOR URGENT SPECIMENS

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INTRODUCTION

Lithium Heparin (Becton-Dickinson PST) tubes are our preferred sample type due to the prevalence of anticoagulant therapy within our hospital. They have a recommended centrifuge time of 10 minutes at 1300g to 2000g[1].

We use only one centrifuge dedicated for urgent specimens. This means a decrease in the centrifuge time of 5 minutes would result in a saving of 5 to 10 minutes in turnaround time (taking into account the extended wait time for a running centrifuge).

In this study we investigated a shorter centrifuge time (5 minutes) at a higher speed (2400g).

METHODS

30 paired samples were taken from both volunteers and routine patient collections. These samples were centrifuged under two centrifuge settings (10 minutes at 1600g and 5 minutes at 2400g).

After centrifugation, samples were visually inspected for appropriate settling (see Figure 1) and then assayed for twenty five analytes (representing a range of molecular forms and properties). These included ions, small molecules, macroproteins, steroid hormones and lipids.

The results of the paired samples were then compared using criteria based on the RCPA Allowable Limits of Performance for each analyte

RESULT

Plots of selected analytes are shown in Figure 2.
Table 1 shows the slopes and average coefficient of variance for all the analytes (using simple linear regression). The RCPA-QAP[2] allowable limits of performance (ALP) are also included.

The average CV for each analyte was less than 5% except for LDH which was 8%.

Only one analyte (LDH) for one sample showed significant variance when compared with the RCPA ALP. This had a normal white cell and platelet count and appears to be random variability. If discounted the average CV for LDH falls within the RCPA ALP.

Figure 1. Paired specimens after centrifugation demonstrating acceptable settling. Left of each pair spun at 1600g for 10 minutes and the right of each pair spun at 2400g for 5 minutes

Figure 2. Plots of selected analytes with their linear regression equation and correlation

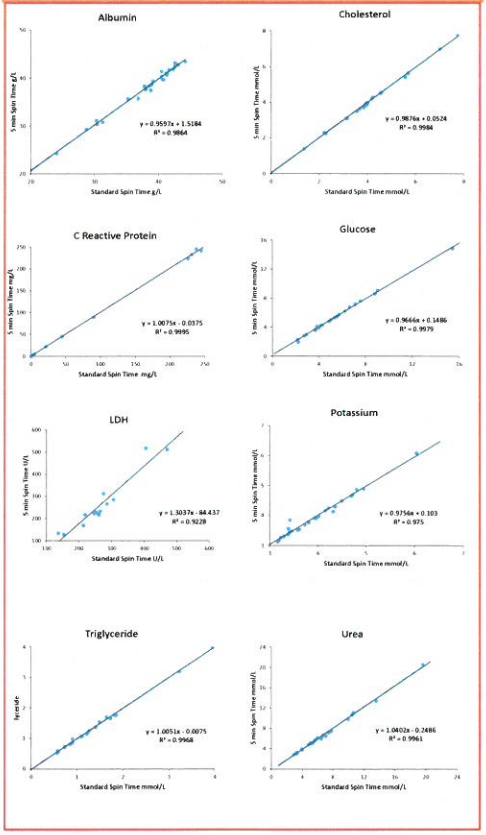

Table 1. Assay CV's
Regression equationsand average CV's for all analytes with the RCPA allowable limits of performance for each.

Analyte	av CV%	Regression Equation	R^2	RCPA ALP
Albumin	0.9	y = 0.96x + 1.5	0.99	±6%
AlkPhos	3.0	y = 1.05x - 5.3	1.00	±12%
ALT	2.9	y = 1.02x - 0.2	1.00	±12%
Total Bilirubin	1.5	y = 1.00x - 0.0	1.00	±12%
Cholesterol	0.9	y = 0.99x + 0.1	1.00	±6%
Chloride	0.4	y = 1.03x - 3.0	0.93	±3%
CO2	4.4	y = 0.97x + 0.7	0.76	±10%
Creatinine	1.1	y = 1.02x - 1.1	1.00	±8%
CRP	2.9	y = 1.01x - 0.0	1.00	±20%
Iron	0.7	y = 0.97x + 0.1	1.00	±12%
Folate	2.6	y = 0.97x + 1.0	0.99	±15%
FT4	3.2	y = 0.87x + 1.4	0.86	±12%
GGT	2.8	y = 1.01x - 0.5	1.00	±12%
Glucose	1.6	y = 0.97x + 0.1	1.00	±8%
IgG	0.7	y = 0.99x + 0.2	0.95	±10%
Potassium	1.1	y = 0.98x + 0.1	0.98	±5%
LDH	8.2	y = 1.30x - 84	0.92	±8%
LH	0.5	y = 0.99x + 0.0	1.00	±25%
Sodium	0.5	y = 0.99x + 0.6	0.87	±2%
Phosphate	3.2	y = 0.93x + 0.1	0.96	±8%
Total Protein	0.7	y = 0.95x + 3.8	0.99	±5%
Triglyceride	2.3	y = 1.0x - 0.00	1.00	±12%
Uric Acid	0.5	y = 1.02x - 3.4	1.00	±8%
HDL Cholesterol	2.9	y = 0.95x + 0.06	0.99	±12%
Urea	1.7	y = 1.04x - 0.2	1.00	±12%

CONCLUSION

For the analytes measured (with the exception of LDH) this study has shown the suitability of the new procedure for implementation. Further investigation for LDH would be required.

1. BD Vacutainer: Evacuated Blood Collection System Refernce material 2012
2. Jones GRD, Sikaris K, Gill J. 'Allowable Limits of Performance' for External Quality Assurance Programs – an Approach to Application of the Stockholm Criteria by the RCPA Quality Assurance Programs
Clin Biochem Rev. 2012 ; 33(4): 133–139.

BD Vacutainer® gel tube FAQs

General SST and PST questions

What is the gel composed of?

The gel is composed of inert components, which are part of a polyester-based proprietary formulation.

What is the purpose of the gel in BD Vacutainer SST and PST tubes?

The gel forms a physical barrier between serum or plasma and blood cells during centrifugation. It is important to note that after collection, BD Vacutainer Serum Separation Tubes (SST) should be inverted five times, allowed 30 minutes clotting time, and centrifuged for 10 minutes at 1000-1300 RCF (g) in a swing bucket centrifuge. BD Vacutainer Plasma Separation Tubes (PST) should be inverted 8 times, and centrifuged for 10 minutes at 1000-1300 RCF (g) in a swing bucket centrifuge.

What is the difference between BD Vacutainer SST and PST blood collection tubes?

SST refers to the Serum Separator Tube containing clot activator and serum separator gel. PST refers to the Plasma Separator Tube containing lithium heparin and plasma separator gel.

How soon after collection should BD Vacutainer gel tubes be centrifuged?

Gel separation tubes should be centrifuged no longer than 2 hours after collection.

Can I re-centrifuge BD Vacutainer gel tubes?

BD does not recommend re-centrifuging gel tubes once the barrier has formed.

Can the serum and plasma be frozen on the gel in the original BD SST and PST tubes?

It is not recommended to freeze the sample in the primary blood collection tube, on the gel barrier. The gel may separate when it is frozen and thawed, resulting in red cell contamination of the sample.

What is the clot activator in BD Vacutainer SST Tubes?

The silica particles that coat the walls of the BD Vacutainer SST tube are the clot activator. Initial activation occurs when blood enters the tube and contacts the particles on the tube wall. To continue the activation process, it is necessary to thoroughly mix the blood and particles by inverting the tube five times.

Why do the inside walls of the BD Vacutainer SST tubes appear white and cloudy? Are the tubes still all right to use?

The walls of BD Vacutainer serum separation tubes are coated with silica particles as a clot activator. The coating process creates a film on the tube surface that appears white and slightly cloudy. The tubes are fine to use. However, it is important to remember to invert the SST tube at least five times after filling. This ensures adequate mixing of silica particles with the blood, which is required for optimal performance

Can the BD Vacutainer SST tubes be used for therapeutic drug monitoring (TDM)?

It is not recommended to use BD gel tubes for any tri-cyclic antidepressant drug testing. BD has done studies using BD SST tubes for 16 other therapeutic drugs. The white paper (VS7049-1) may be accessed on the BD Library of Clinical Documentation.