

Potassium Variability in VACUETTE[®] Serum Separator Tubes and Vacutainer[®] Serum Glass Tubes

Background:

Greiner Bio-One, Austria has sold plastic evacuated tubes (VACUETTE[®]) for venous blood collection since 1986. VACUETTE[®] Serum Separator tubes incorporate an inert gel material into the blood collection tube.

The gel has a controlled viscosity and a specific gravity intermediate to serum and clot. During centrifugation, the gel material forms an impermeable barrier between the serum and clot separating the serum from fibrin and cells.

Serum tubes are coated with micronised silica particles (Clot Activator, CA), which activate clotting when tubes are gently inverted.

The *in vitro* release of potassium from cells and platelets during blood clotting increases serum potassium on average by 0.4 mmol/l. This difference is known and considered to be independent of the collection tube type. The reference range for potassium in serum for adults is 3.3 to 5.1 mmol/l dependent on the analyser and reagents.

As potassium is elevated by the clotting procedure, the preferred specimen for potassium analysis is plasma. Serum can be used too, though, if the shift in the reference range is taken into account.

This paper is a summary of two studies carried out independently, Study I and Study II.

Study Objective:

The aim of this study was to show the variability in potassium values in different serum tube types.

Study design:

The following four types of tubes were evaluated in this study:

Study I / II	ID	Description	Tube Material
I	A	VACUETTE [®] 8 ml Z Serum Separator	Plastic
	B	BD Vacutainer [®] 10 ml Z	Glass
II	C	VACUETTE [®] 4 ml Z Serum Separator	Plastic
	D	BD Vacutainer [®] 4 ml Serum Separator Tube (SST [™])	Glass

Venous blood was collected from 50 donors altogether using the VACUETTE[®] Standard Tube Holder and 21G Needle. Two tubes were collected from each patient (A and B, or C and D) in random order to prevent systemic bias. Directly after venipuncture, the tubes were carefully inverted according to the instructions given by the tube manufacturer. All samples were left at RT for 30 minutes to let them clot completely. The clotted samples were centrifuged in a swing out bucket centrifuge (speed and time according to the instructions provided by the tube manufacturers).

Potassium analysis was performed on the following instruments with the instruments' accompanying reagents:

- tubes A and B on an Integra 700 (Roche)
- tubes C and D on an ADVIA 1650 (Bayer)

Conclusion:

Comparing the potassium values measured from VACUETTE[®] Serum Separator tubes and Vacutainer[®] Serum Separator (SST[™]) / Serum tubes resp., the following conclusions have been drawn:

- Neither statistical significance using Student's T-test at p(0.05) level, nor clinical relevance could be found.
- The absolute bias found in both studies is only minimal (close to zero).
- The correlation coefficient *r* is close to or over 0.9 in both studies.
- Evaluation of variation shows no difference between the use of BD's Vacutainer[®] glass tubes and Greiner's VACUETTE[®] tubes.

Student's T-test and calculation of the correlation coefficient *r* and standard deviation are carried out using Biosoft Stat200 software.

References:

- (1) Thomas L., Labor und Diagnose. TH-Books, 5. Auflage (1998)
- (2) Tietz N.W., Clinical Guide to Laboratory Tests. W.B. Saunders Company, third edition (1995)
- (3) Guder W.G., Narayanan S., Wisser H., Zawta B., Samples: From the Patient to the Laboratory. GIT Verlag (1996)
- (4) Heil W., Schuckließ F., Zawta B., Referenzbereiche für Kinder und Erwachsene - Präanalytik. 4. Auflage (1996)
- (5) Hartland AJ., Neary RH., Serum Potassium is Unreliable as an Estimate of in Vivo Plasma Potassium. Clin Chem. No.7:1091:1092 (1999)

Results / Comments:

Summary:

Study	ID	tube type	absolute bias [mmol/l]	correlation coefficient <i>r</i>	standard deviation	mean +/- std.dev. [mmol/l]
I	A	VACUETTE® Serum Sep.	+0.03	0.937	0.242	3.78 – 4.26
	B	Vacutainer® Z			0.273	3.71 – 4.26
II	C	VACUETTE® Serum Sep.	0.00	0.896	0.322	4.41 – 5.05
	D	Vacutainer® SST™			0.309	4.38 – 4.99





