

Comparison of Greiner VACUETTE® Trace Elements Tubes, VACUETTE® No Additive Tubes, and Becton Dickinson Vacutainer® Trace Elements Tubes

Background:

Greiner-Bio-One, Austria has sold plastic evacuated tubes (VACUETTE®) for venous blood collection since 1986. In addition to the standard product line, Greiner-Bio-One also has an extensive range of special tubes including tubes for trace element determinations.

Sodium heparin activates antithrombins, thus blocking the coagulation cascade and producing a whole blood/ plasma sample instead of clotted blood plus serum. No additive tubes permit normal clotting of the blood for the separation of serum from cells.

The tubes are composed of clear plastic. The caps are royal blue and made of plastic and rubber. The caps inner rings are black and made of plastic.

Study Objective:

Trace elements are inorganic components that are found in the body in a concentration of < 0,01% of the body mass, which are amounts of < 10⁻⁶ g/g body weight.

The aim of this tube comparison was to demonstrate the analytical performance for a variety of trace elements of different tubes from different manufacturers.

Study design:

The following tubes were included in the test :

Sample	Draw Volume	Description
A	6 ml	VACUETTE® Trace Elements Tube with sodium heparin
B	6 ml	VACUETTE® Z No Additive
C	7 ml	VACUTAINER® Trace Elements Tube with sodium heparin

Blood was randomly drawn from 40 individuals, one tube of each tube type. The tubes were spun at 1800g for 10 minutes in a Hettich Rotixa centrifuge and the samples were tested immediately for the following 5 metal parameters:

Element	Symbol	Normal Range
Cadmium	Cd	0,04 – 0,45 µg/dl
Copper	Cu	10 – 26 µmol/l
Lead	Pb	< 15 µg/dl
Nickel	Ni	< 1,1 µg/l
Zinc	Zn	70 – 150 µg/dl

The analysis was performed on an atomic absorption spectrophotometer (AAS) 5 instrument by Zeiss. Reagents from Merck were used for sample preparation.

Results

Comparison Blood Testing Results of VACUETTE® Trace Element tube with sodium heparin to Vacutainer® Trace Element tube with sodium heparin at a confidence level of 95 % (p= 0,05):

Element	Sample C mean	Sample A mean	t-value ^a	P-value ^a	F-value ^b
Cadmium	0,02	0,02	-0,448	0,655	0,201
Copper	16,4	16,8	-0,491	0,625	0,241
Lead	0,04	0,04	-0,138	0,890	0,019
Nickel	1,15	1,36	-1,697	0,094	2,878
Zinc	99,87	100,5	-0,155	0,877	0,024

^acritical t = 1,991 (degrees of freedom: 78)

^bcritical F = 3,963 (degrees of freedom v= 78 (for different donors) and u= 1 (tube types))

Comparison Blood Testing Results of VACUETTE® Trace Element tube containing no additive to Vacutainer® Trace Element tube with sodium heparin at a confidence level of 95 % (p= 0,05):

Element	Sample C mean	Sample B mean	t-value ^a	P-value ^a	F-value ^b
Cadmium	0,02	0,02	-7,1 E-16	1,000	-7,1 E-15
Copper	16,4	16,8	-0,420	0,676	0,176
Lead	0,04	0,02	1,537	0,128	2,363
Nickel	1,15	1,12	0,392	0,696	0,154
Zinc	99,87	107,16	-1,649	0,103	2,719

^acritical t = 1,991 (degrees of freedom: 78)

^bcritical F = 3,963 (degrees of freedom v= 78 (for different donors) and u= 1 (tube types))

Conclusion:

Performing a t-Test assuming equal variances showed that the difference between the means is not significant. The assumption that the variances to not differ significantly was confirmed by carrying out a Single Factor ANOVA- Test.

The Greiner VACUETTE® Trace Element Tubes containing sodium heparin and the Greiner VACUETTE® No Additive Tubes are substantially equivalent to the VACUTAINER® Trace Element tubes containing sodium heparin for the trace elements to be claimed.

From these results it can be concluded that both VACUETTE® tubes show a similar performance in analyzing blood samples for trace elements. Since trace elements are found everywhere in our surroundings, it is strongly recommended to use the VACUETTE® Trace Elements tube for the analysis of trace metals to prevent any contamination

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., Zwata B., Samples: From the Patient to the Laboratory. Wiley-VCH, third revised edition (2003)
- (4) FDA Approval Greiner Trace Element Tubes