Comparison of VACUETTE® Plasma Tubes with Vacutainer® Plasma Tubes for Proteins, Hormones, and Cardiac Markers

Background:

Greiner-Bio-One, Austria has sold plastic evacuated tubes (VACUETTE®) for venous blood collection since 1986.

A clinical evaluation was performed to assess the equivalence of the Greiner VACUETTE® plasma tubes made of plastic (PET) and BD Vacutainer® plasma tubes made of glass.

Study Objective:

The aim of this study is to show equivalence in the performance of VACUETTE® plasma tubes and Vacutainer® plasma tubes on various proteins, hormones, and cardiac markers.

Study design:

Venous blood was collected from up to 40 hospital inpatients using the VACUETTE® Standard Tube Holder and VACUETTE® 21G Multi-Sample Needle. The samples were collected in random order to prevent systemic bias.

Directly after venipuncture, the tubes were carefully inverted and centrifuged according to the instructions given by the tube manufacturer.

The analysis of the following parameters was performed:

Analyte	Used Tube Type	Tube description
α-1-antitrypsin	K3EDTA	K3EDTA
α-1-acid-glycoprotein (Orosomucoid)	K3EDTA	K3EDTA
Haptoglobin	K3EDTA	K3EDTA
Ceruloplasmin	K3EDTA	K3EDTA
C3	K3EDTA	K3EDTA
C4	K3EDTA	K3EDTA
IgG	K3EDTA	K3EDTA
IgA	K3EDTA	K3EDTA
IgM	K3EDTA	K3EDTA
Homocysteine	Sodium Fluoride / Lithium Heparin	NaF/Hep
Renin	K3EDTA	K3EDTA

Proteins were analysed on Hitachi 917 (Roche Diagnostics) with the instrument's accompanying reagents.

Cardiac markers were analysed on Elecsys 2010 (Roche Diagnostics) with the instrument's accompanying reagents.

Homocysteine was analysed on IMX (Abbott) with the instrument's accompanying reagents.

The hormone Renin was analysed on AutoDelfia (PerkinElmer) with the instrument's accompanying reagents.

Conclusion:

Neither statistical significance nor clinical relevance could be found when comparing VACUETTE® and Vacutainer® plasma tubes for the following five analytes: α-1-antitrypsin, Haptoglobin, C4, immunoglobulins, and Renin.

Using Student's T-Test, a small statistical significance at p(0.05) level was noticed for the analytes Orosomucoid, Ceruloplasmin, C3, CKMB, and Homocysteine. However, these differences were too small to have any clinical relevance.

References:

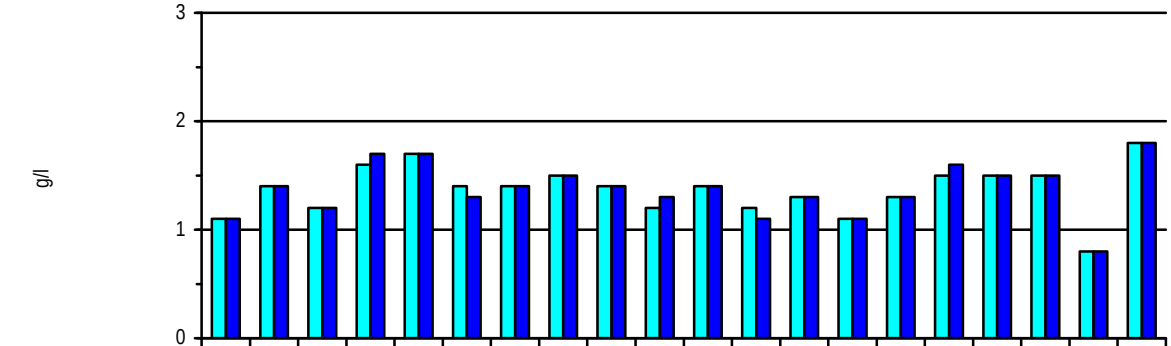
(1) Guder W.G., Narayanan S., Wisser H., Zawta B., Samples: From the Patient to the Laboratory. Wiley-VCH, 3rd edition (2003)

(2) Thomas L., Labor und Diagnose. TH-Books, 5. Auflage (1998)

(3) Tietz N.W., Clinical Guide to Laboratory Tets. W.B. Saunders Company, third edition (1995)

Results:

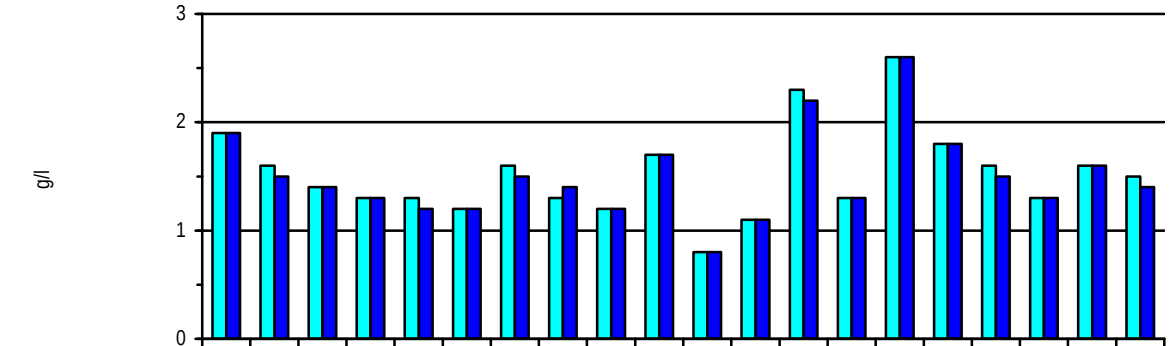
α-1-antitrypsin Normal range: 0.9 - 2.0 [g/l]



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vacuette EDTA K3	1,1	1,4	1,2	1,6	1,7	1,4	1,4	1,5	1,4	1,2	1,4	1,2	1,3	1,1	1,3	1,5	1,5	1,5	0,8	1,8
Vacutainer EDTA K3	1,1	1,4	1,2	1,7	1,7	1,3	1,4	1,5	1,4	1,3	1,4	1,1	1,3	1,1	1,3	1,6	1,5	1,5	0,8	1,8

sample no.

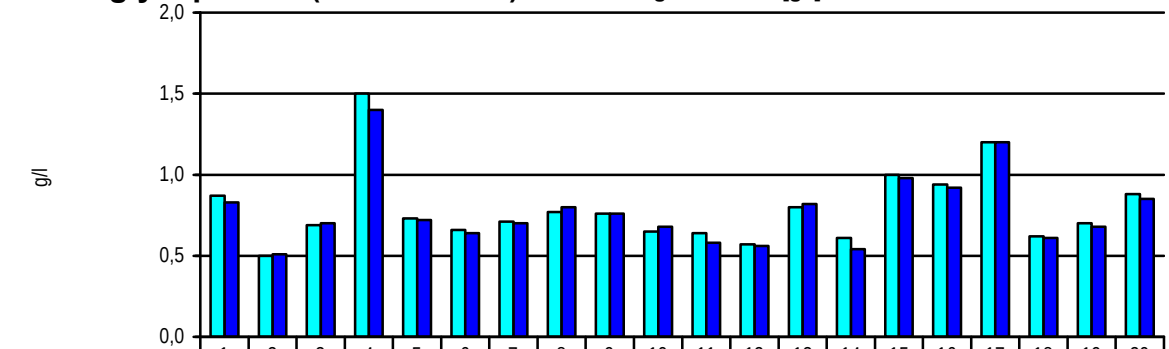
α-1-antitrypsin Normal range: 0.9 - 2.0 [g/l]



	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Vacuette EDTA K3	1,9	1,6	1,4	1,3	1,3	1,2	1,6	1,3	1,2	1,7	0,8	1,1	2,3	1,3	2,6	1,8	1,6	1,3	1,6	1,5
Vacutainer EDTA K3	1,9	1,5	1,4	1,3	1,2	1,2	1,5	1,4	1,2	1,7	0,8	1,1	2,2	1,3	2,6	1,8	1,5	1,3	1,6	1,4

sample no.

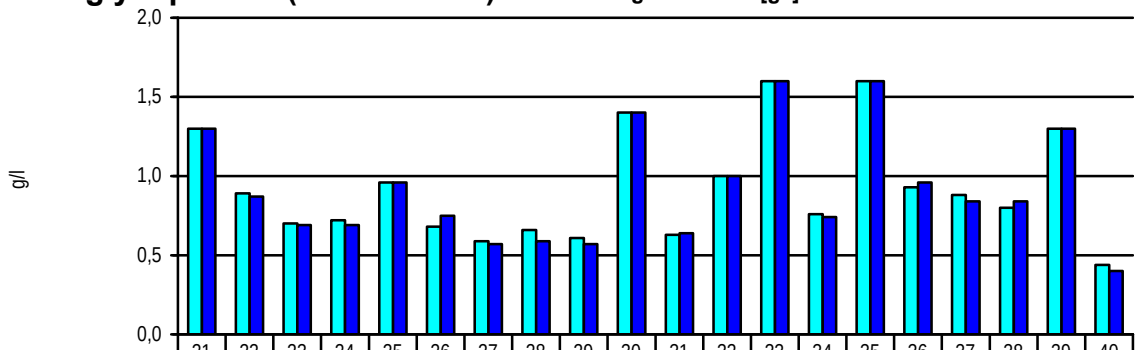
α-1-Acid-glycoprotein (Orosmucoid) Normal range: 0.4 - 1.1 [g/l]



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vacuette EDTA K3	0,87	0,50	0,69	1,50	0,73	0,66	0,71	0,77	0,76	0,65	0,64	0,57	0,80	0,61	1,00	0,94	1,20	0,62	0,70	0,88
Vacutainer EDTA K3	0,83	0,51	0,70	1,40	0,72	0,64	0,70	0,80	0,76	0,68	0,58	0,56	0,82	0,54	0,98	0,92	1,20	0,61	0,68	0,85

sample no.

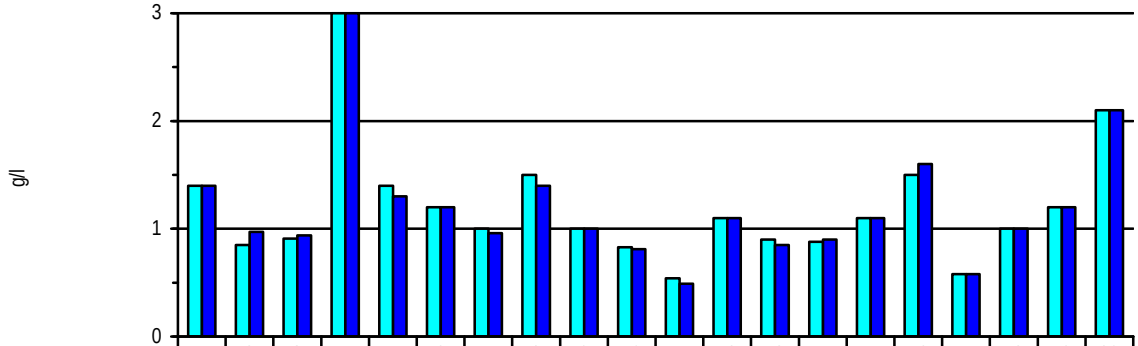
α-1-Acid-glycoprotein (Orosmucoid) **Normal range: 0.4 - 1.1 [g/l]**



	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Vacuette EDTA K3	1,30	0,89	0,70	0,72	0,96	0,68	0,59	0,66	0,61	1,40	0,63	1,00	1,60	0,76	1,60	0,93	0,88	0,80	1,30	0,44
Vacutainer EDTA K3	1,30	0,87	0,69	0,69	0,96	0,75	0,57	0,59	0,57	1,40	0,64	1,00	1,60	0,74	1,60	0,96	0,84	0,84	1,30	0,40

sample no.

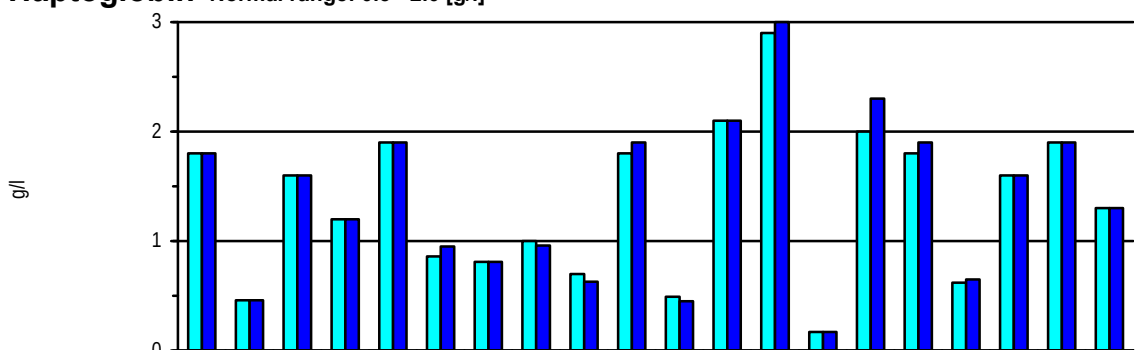
Haptoglobin **Normal range: 0.3 - 2.0 [g/l]**



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vacuette EDTA K3	1,40	0,85	0,91	3,00	1,40	1,20	1,00	1,50	1,00	0,83	0,54	1,10	0,90	0,88	1,10	1,50	0,58	1,00	1,20	2,10
Vacutainer EDTA K3	1,40	0,97	0,94	3,00	1,30	1,20	0,96	1,40	1,00	0,81	0,49	1,10	0,85	0,90	1,10	1,60	0,58	1,00	1,20	2,10

sample no.

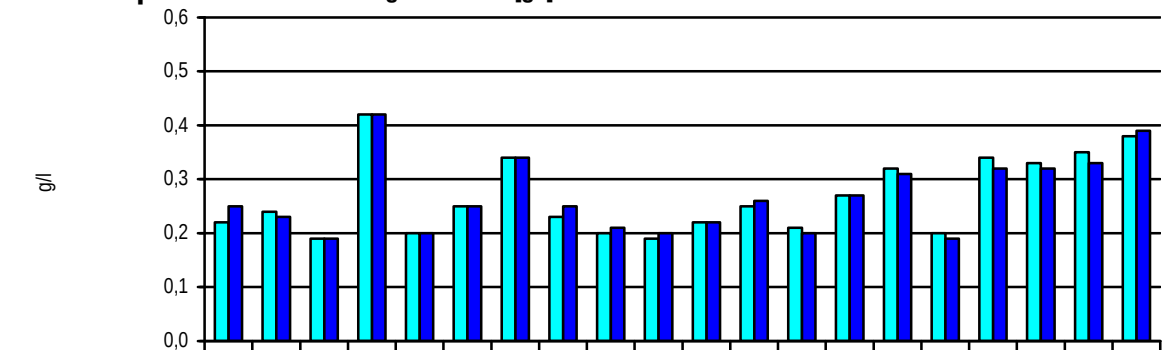
Haptoglobin **Normal range: 0.3 - 2.0 [g/l]**



	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Vacuette EDTA K3	1,80	0,46	1,60	1,20	1,90	0,86	0,81	1,00	0,70	1,80	0,49	2,10	2,90	0,17	2,00	1,80	0,62	1,60	1,90	1,30
Vacutainer EDTA K3	1,80	0,46	1,60	1,20	1,90	0,95	0,81	0,96	0,63	1,90	0,45	2,10	3,00	0,17	2,30	1,90	0,65	1,60	1,90	1,30

sample no.

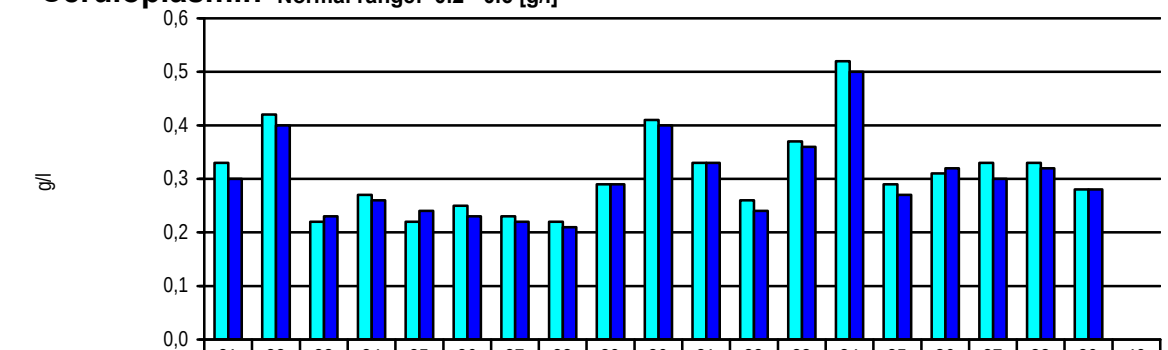
Ceruloplasmin Normal range: 0.2 - 0.6 [g/l]



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vacuette EDTA K3	0,22	0,24	0,19	0,42	0,20	0,25	0,34	0,23	0,20	0,19	0,22	0,25	0,21	0,27	0,32	0,20	0,34	0,33	0,35	0,38
Vacutainer EDTA K3	0,25	0,23	0,19	0,42	0,20	0,25	0,34	0,25	0,21	0,20	0,22	0,26	0,20	0,27	0,31	0,19	0,32	0,32	0,33	0,39

sample no.

Ceruloplasmin Normal range: 0.2 - 0.6 [g/l]

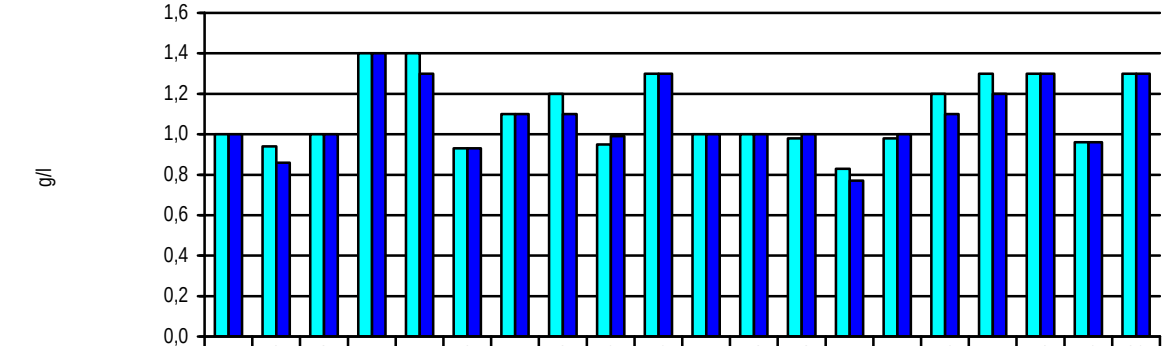


	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Vacuette EDTA K3	0,33	0,42	0,22	0,27	0,22	0,25	0,23	0,22	0,29	0,41	0,33	0,26	0,37	0,52	0,29	0,31	0,33	0,33	0,28	n/a
Vacutainer EDTA K3	0,30	0,40	0,23	0,26	0,24	0,23	0,22	0,21	0,29	0,40	0,33	0,24	0,36	0,50	0,27	0,32	0,30	0,32	0,28	n/a

sample no.

n/a....not available

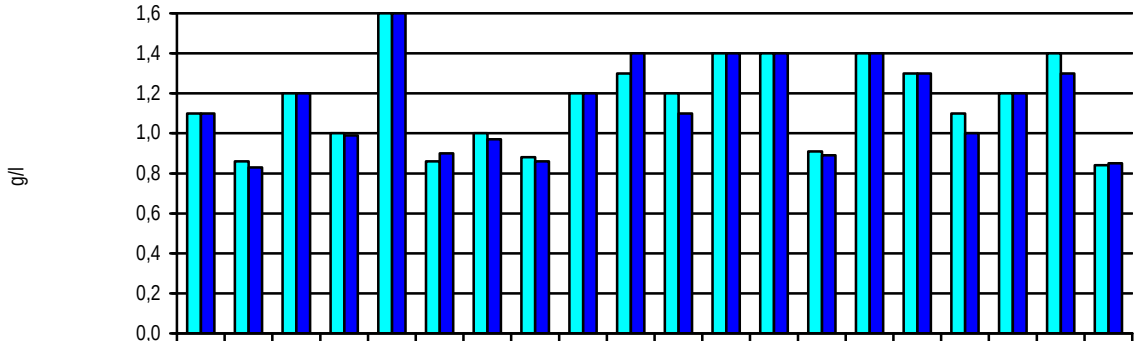
C3 Normal range: 0.9 - 1.8 [g/l]



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vacuette EDTA K3	1,00	0,94	1,00	1,40	1,40	0,93	1,10	1,20	0,95	1,30	1,00	1,00	0,98	0,83	0,98	1,20	1,30	1,30	0,96	1,30
Vacutainer EDTA K3	1,00	0,86	1,00	1,40	1,30	0,93	1,10	1,10	0,99	1,30	1,00	1,00	1,00	0,77	1,00	1,10	1,20	1,30	0,96	1,30

sample no.

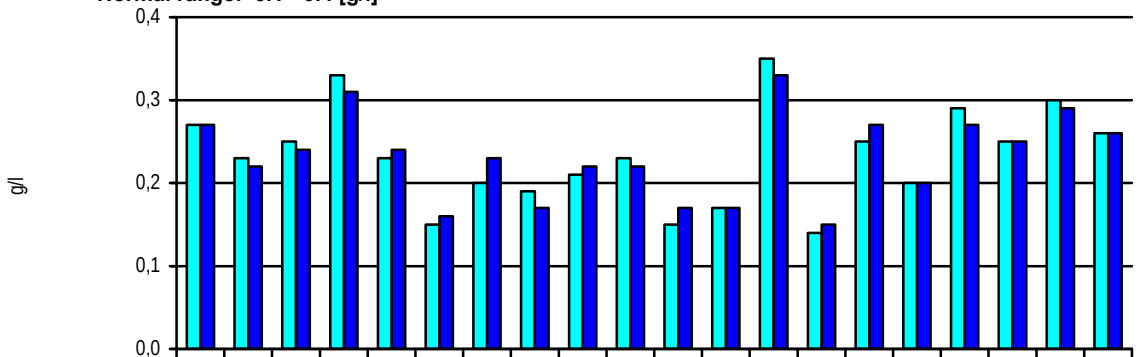
C3 Normal range: 0.9 - 1.8 [g/l]



	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Vacuette EDTA K3	1,10	0,86	1,20	1,00	1,60	0,86	1,00	0,88	1,20	1,30	1,20	1,40	1,40	0,91	1,40	1,30	1,10	1,20	1,40	0,84
Vacutainer EDTA K3	1,10	0,83	1,20	0,99	1,60	0,90	0,97	0,86	1,20	1,40	1,10	1,40	1,40	0,89	1,40	1,30	1,00	1,20	1,30	0,85

sample no.

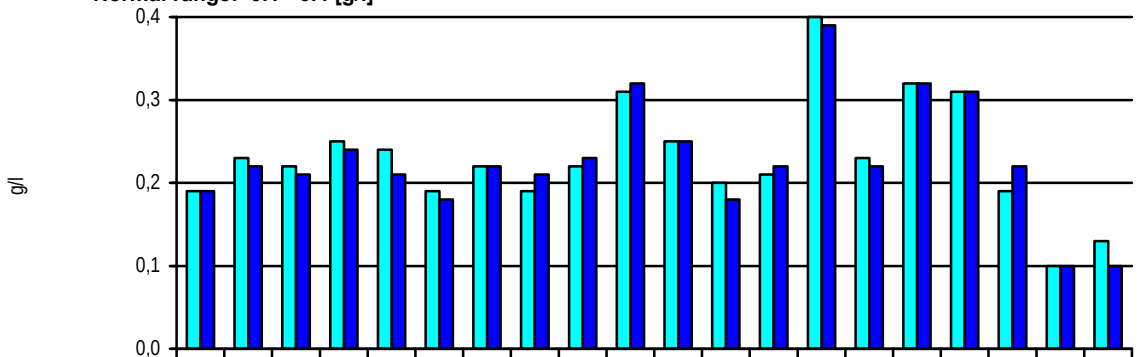
C4 Normal range: 0.1 - 0.4 [g/l]



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vacuette EDTA K3	0,27	0,23	0,25	0,33	0,23	0,15	0,20	0,19	0,21	0,23	0,15	0,17	0,35	0,14	0,25	0,20	0,29	0,25	0,30	0,26
Vacutainer EDTA K3	0,27	0,22	0,24	0,31	0,24	0,16	0,23	0,17	0,22	0,22	0,17	0,17	0,33	0,15	0,27	0,20	0,27	0,25	0,29	0,26

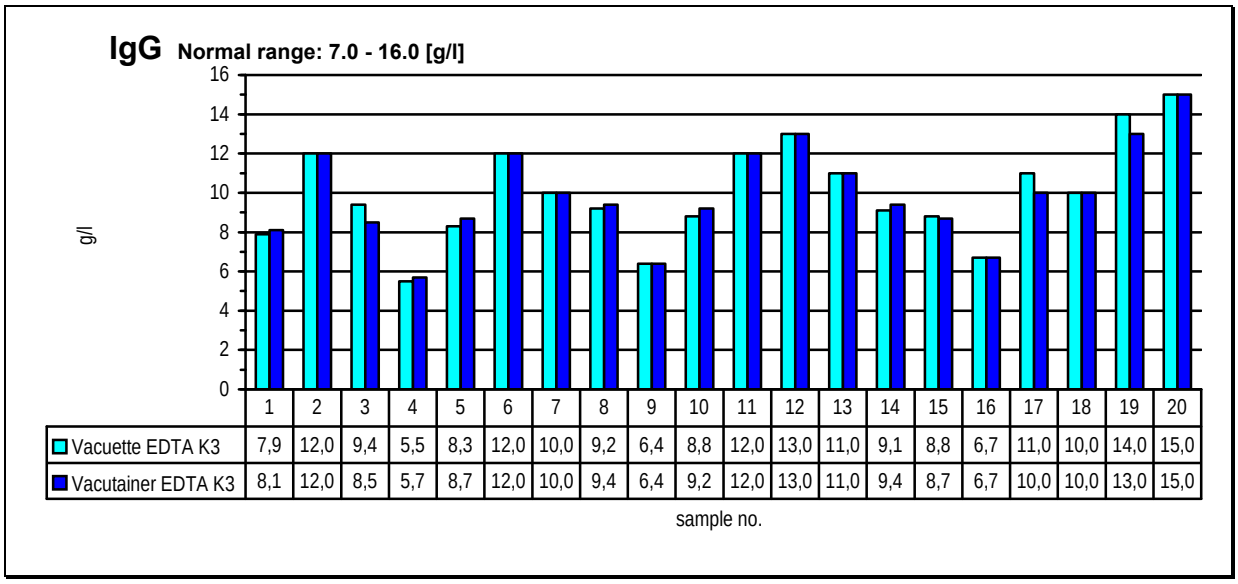
sample no.

C4 Normal range: 0.1 - 0.4 [g/l]



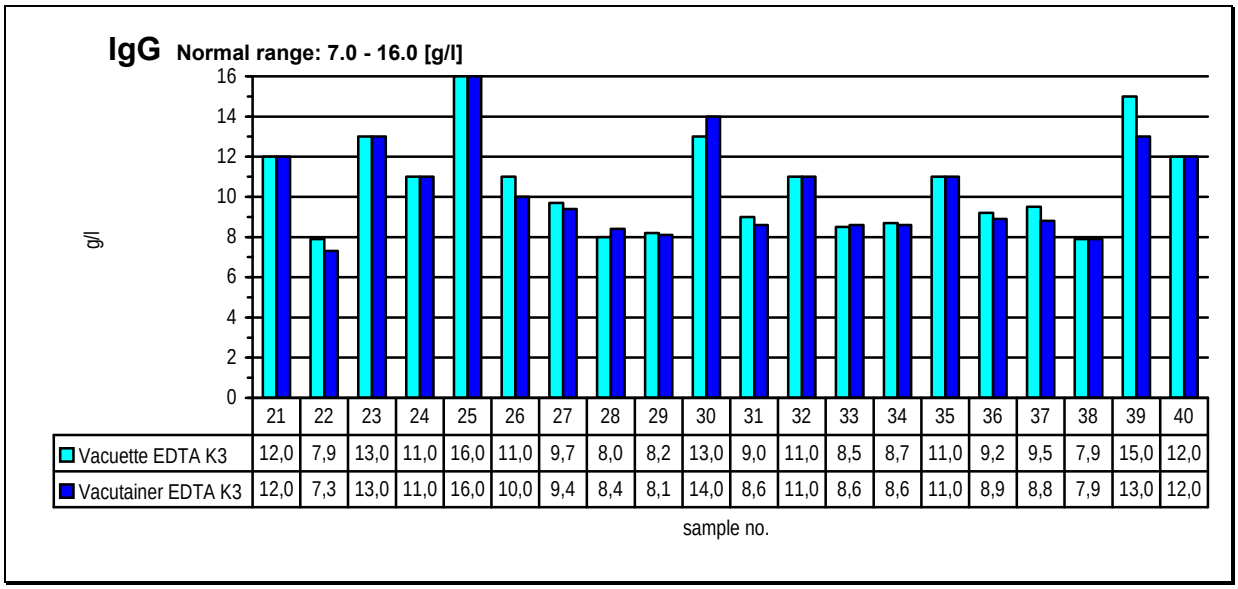
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Vacuette EDTA K3	0,19	0,23	0,22	0,25	0,24	0,19	0,22	0,19	0,22	0,31	0,25	0,20	0,21	0,40	0,23	0,32	0,31	0,19	0,10	0,13
Vacutainer EDTA K3	0,19	0,22	0,21	0,24	0,21	0,18	0,22	0,21	0,23	0,32	0,25	0,18	0,22	0,39	0,22	0,32	0,31	0,22	0,10	0,10

sample no.



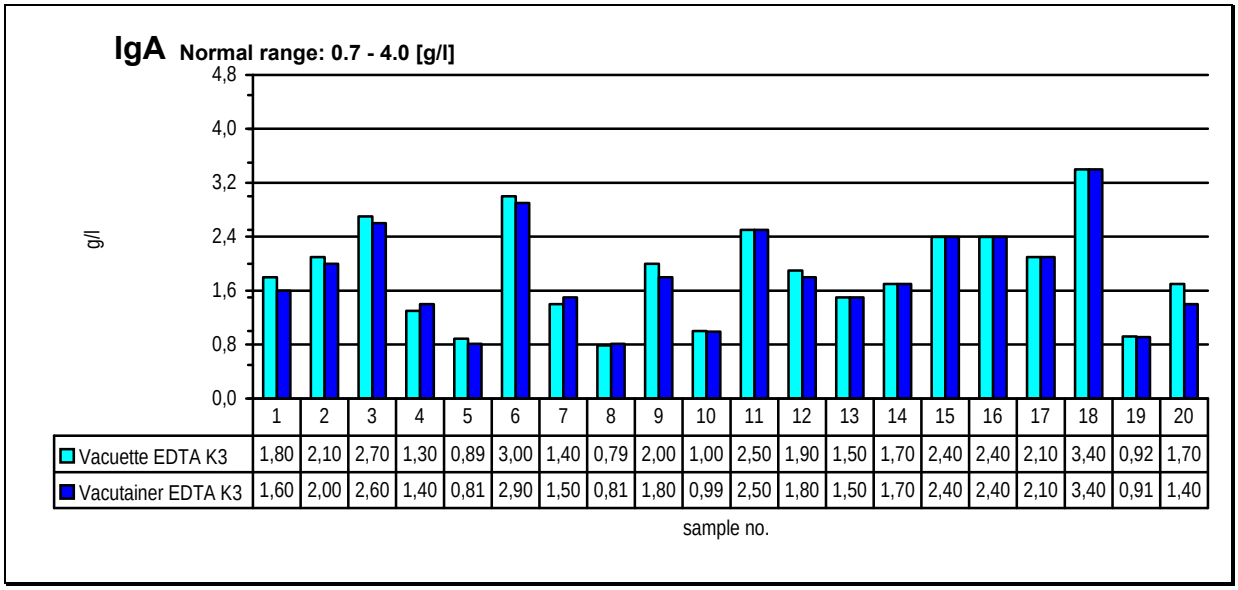
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vacuette EDTA K3	7,9	12,0	9,4	5,5	8,3	12,0	10,0	9,2	6,4	8,8	12,0	13,0	11,0	9,1	8,8	6,7	11,0	10,0	14,0	15,0
Vacutainer EDTA K3	8,1	12,0	8,5	5,7	8,7	12,0	10,0	9,4	6,4	9,2	12,0	13,0	11,0	9,4	8,7	6,7	10,0	10,0	13,0	15,0

sample no.



	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Vacuette EDTA K3	12,0	7,9	13,0	11,0	16,0	11,0	9,7	8,0	8,2	13,0	9,0	11,0	8,5	8,7	11,0	9,2	9,5	7,9	15,0	12,0
Vacutainer EDTA K3	12,0	7,3	13,0	11,0	16,0	10,0	9,4	8,4	8,1	14,0	8,6	11,0	8,6	8,6	11,0	8,9	8,8	7,9	13,0	12,0

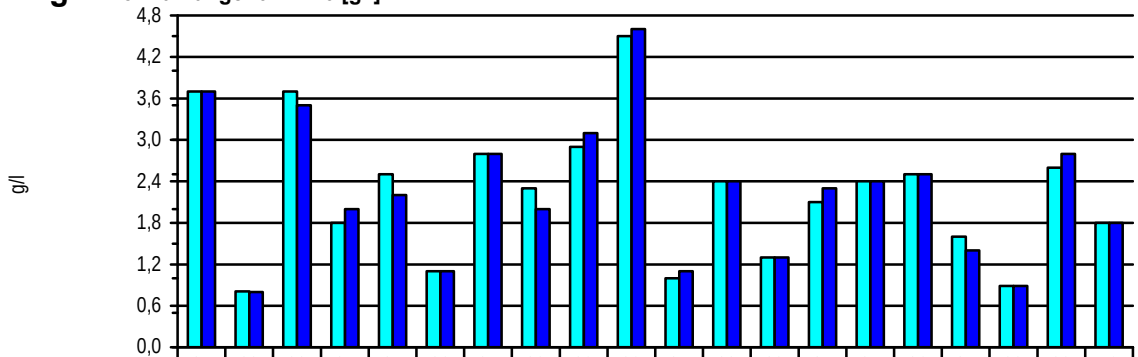
sample no.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vacuette EDTA K3	1,80	2,10	2,70	1,30	0,89	3,00	1,40	0,79	2,00	1,00	2,50	1,90	1,50	1,70	2,40	2,40	2,10	3,40	0,92	1,70
Vacutainer EDTA K3	1,60	2,00	2,60	1,40	0,81	2,90	1,50	0,81	1,80	0,99	2,50	1,80	1,50	1,70	2,40	2,40	2,10	3,40	0,91	1,40

sample no.

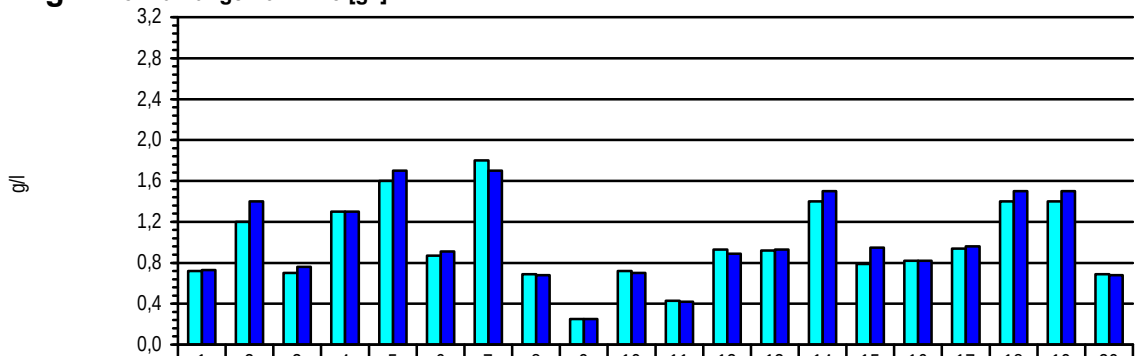
IgA **Normal range: 0.7 - 4.0 [g/l]**



	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Vacuette EDTA K3	3,70	0,81	3,70	1,80	2,50	1,10	2,80	2,30	2,90	4,50	1,00	2,40	1,30	2,10	2,40	2,50	1,60	0,89	2,60	1,80
Vacutainer EDTA K3	3,70	0,80	3,50	2,00	2,20	1,10	2,80	2,00	3,10	4,60	1,10	2,40	1,30	2,30	2,40	2,50	1,40	0,89	2,80	1,80

sample no.

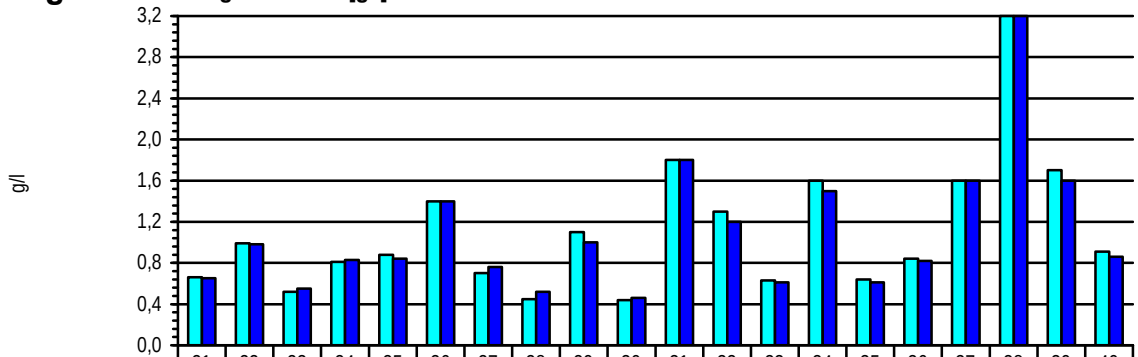
IgM **Normal range: 0.4 - 2.3 [g/l]**



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vacuette EDTA K3	0,72	1,20	0,70	1,30	1,60	0,87	1,80	0,69	0,25	0,72	0,43	0,93	0,92	1,40	0,79	0,82	0,94	1,40	1,40	0,69
Vacutainer EDTA K3	0,73	1,40	0,76	1,30	1,70	0,91	1,70	0,68	0,25	0,70	0,42	0,89	0,93	1,50	0,95	0,82	0,96	1,50	1,50	0,68

sample no.

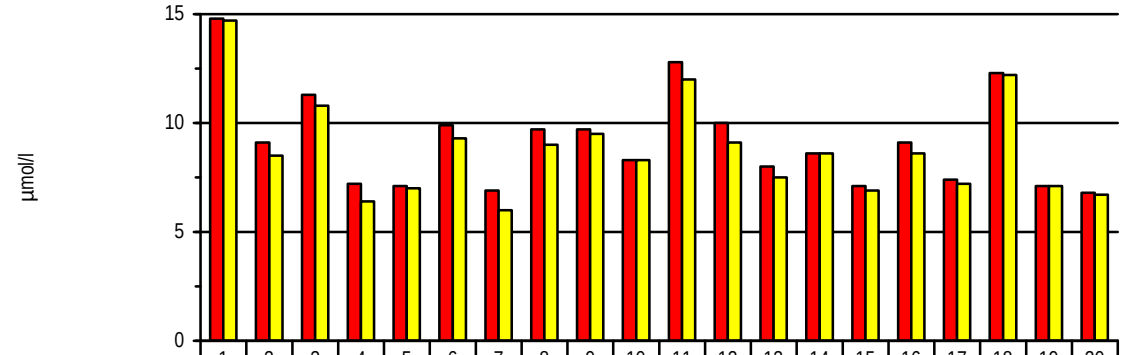
IgM **Normal range: 0.4 - 2.3 [g/l]**



	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Vacuette EDTA K3	0,66	0,99	0,52	0,81	0,88	1,40	0,70	0,45	1,10	0,44	1,80	1,30	0,63	1,60	0,64	0,84	1,60	3,20	1,70	0,91
Vacutainer EDTA K3	0,65	0,98	0,55	0,83	0,84	1,40	0,76	0,52	1,00	0,46	1,80	1,20	0,61	1,50	0,61	0,82	1,60	3,20	1,60	0,86

sample no.

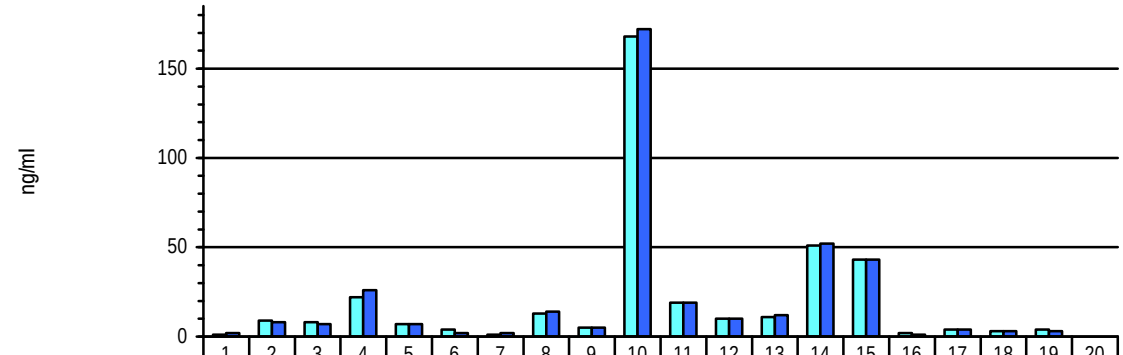
Homocysteine Normal range: 4.1 - 21.3 [µmol/l]



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vacuette NaF/Hep	14,8	9,1	11,3	7,2	7,1	9,9	6,9	9,7	9,7	8,3	12,8	10,0	8,0	8,6	7,1	9,1	7,4	12,3	7,1	6,8
Vacutainer NaF/Hep	14,7	8,5	10,8	6,4	7,0	9,3	6,0	9,0	9,5	8,3	12,0	9,1	7,5	8,6	6,9	8,6	7,2	12,2	7,1	6,7

sample no.

Renin Normal range: 5 - 21 [ng/ml]



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Vacuette EDTA K3	1	9	8	22	7	4	1	13	5	168	19	10	11	51	43	2	4	3	4	n/a
Vacutainer EDTA K3	2	8	7	26	7	2	2	14	5	172	19	10	12	52	43	1	4	3	3	n/a

sample no.

n/a...not analysed