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COMPARISON STUDY BETWEEN THE STATSPIN EXPRESS 3 CENTRIFUGE AND THE HERAEUS LABOFUGE 400 CENTRIFUGE

Sponsored At:
Henry Ford Hospital,
Detroit, Michigan

Comparison Study Between the StatSpin® Express 3 Centrifuge and the Heraeus Labofuge 400 Centrifuge

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Purpose

The StatSpin Express 3 is a high-speed bench top centrifuge used to rapidly produce plasma and serum from whole blood contained in original collection tubes. The Express 3 holds 8 tubes up to 10 mL and has pre-set cycle times of 2, 3, and 5 minutes. This study examined chemistry, coagulation, and residual platelet count testing on samples centrifuged in the Express 3 as compared to the Heraeus Labofuge 400.

Materials and Methods

Chemistry:

Two SST tubes (BD, 16 x 100 mm, plastic) and two EDTA tubes (BD, 13 x 75 mm, plastic) were collected from 20 individuals (n = 22 for BNP) and centrifuged in the Express 3 (3 minutes, 7200 rpm) and the Heraeus Labofuge 400 (10 minutes, 3000 rpm). The serum was tested for glucose, BUN, creatinine, albumin, total protein, calcium, uric acid, total bilirubin, LDH, CPK, alkaline phosphatase, SGPT, SGOT, GGPT, amylase, Na, K, CL, and CO₂ using the Roche Modular DDP. The Bayer Centaur was used to test serum for TSH, T4, CKMB, troponin, and myoglobin and plasma for BNP.

Coagulation and Residual Platelet Count:

Two sodium citrate tubes (BD, 13 x 75 mm, plastic) were collected from 21 individuals and centrifuged in the Express 3 (2 minutes, 7200 rpm) and the Heraeus Labofuge 400 (10 minutes, 3000 rpm). The plasma was tested for PT and PTT using the MLA 1400. D-Dimer was analyzed with the bioMerieux mini VIDAS. Residual platelets were measured using the Coulter AcT 8.

Interpretation

Chemistry:

Samples spun in SST tubes for only 3 minutes in the Express 3 exhibited complete separation of serum and cells. All analytes have acceptable correlation between the Express 3 and Heraeus Labofuge 400. (Troponin results for all samples were below the detectable limit and therefore not included in the calculations.) Correlation coefficients (r) range from 0.805 to 1.000. All p values (paired t-test, two-tailed) are greater than 0.05, indicating there is no statistical difference in means between the two centrifuges. Mean absolute percent biases range from 0.4 % to 12.6 %. Table 1 includes a statistical summary. Data are presented in Table 2 and Chart 3.

Coagulation and Residual Platelet Count:

PT, PTT, and D-Dimer have acceptable correlation (r = 0.963 - 0.996). All p values are greater than 0.05. Mean absolute percent biases range from 1.0 % to 3.7 %.

Residual platelet counts meet the recommendations of the Clinical Laboratory Standards Institute (CLSI, formerly NCCLS) for platelet poor plasma. The percent of results with a platelet count less than 10,000/ μ L is 100 % for Express 3 as compared to 95 % for the Heraeus Labofuge 400.

Discussion

For all 29 analytes tested, these data indicate similar results for Express 3 as compared to the Heraeus Labofuge 400. Express 3 is ideal for rapid plasma for coagulation testing, sample preparation for STAT chemistry, and cardiac profiles in the ER. Express 3 provides faster turnaround times and greater productivity for the laboratory.

Table 1.1 Statistical Summary

	SSX3 Mean	HL400 Mean	SSX3 SD	HL400 SD	Corr. Coeff.	P value	Mean Abs % Bias
Glucose	96	96	16.4	16.6	0.994	0.460	1.6
BUN	15	15	4.8	5.0	0.989	0.772	2.9
Creatinine	0.9	0.9	0.15	0.16	0.921	0.096	6.0
Albumin	4.5	4.5	0.25	0.25	0.930	0.815	1.7
T. Protein	7.4	7.4	0.35	0.36	0.916	0.297	1.4
Calcium	9.5	9.5	0.30	0.31	0.942	0.149	0.8
Uric Acid	4.9	4.8	1.36	1.36	0.999	0.428	0.7
T. Bilirubin	0.5	0.5	0.25	0.25	0.988	0.577	4.3
LDH	169	171	35.7	33.9	0.994	0.074	2.1
CPK	196	197	400.3	402.2	1.000	0.061	1.3
Alk. Phos.	65	66	14.8	15.1	0.995	0.248	1.7
SGPT	22	23	10.0	10.1	0.959	0.256	12.6
SGOT	22	22	11.7	11.9	0.990	1.000	6.9
GGPT	20	20	9.5	9.7	0.998	0.748	2.9
Amylase	72	72	21.4	21.7	0.998	0.591	1.0
Na	140	140	1.8	1.8	0.905	0.577	0.4
K	4.0	4.0	0.25	0.27	0.931	0.649	1.7
Cl	103	103	2.6	2.4	0.949	0.789	0.5
CO2	26	26	1.6	1.7	0.805	0.834	2.5
TSH	3.84	3.89	5.505	5.603	1.000	0.147	3.9
T4	8.69	8.67	1.073	1.156	0.970	0.817	2.8
CKMB	1.1	1.1	0.86	0.90	0.994	0.632	12.6
Myoglobin	30.86	30.56	18.212	19.037	0.998	0.386	4.8
BNP	46.88	46.14	121.190	119.164	1.000	0.122	3.3
PT	11.3	11.4	0.47	0.39	0.963	0.297	1.0
PTT	31	31	2.6	2.8	0.968	0.540	1.3
D-Dimer	273	280	186.4	198.0	0.996	0.169	3.7

Table 1.2 Statistical Summary

	Platelet Count, 000's / μL						% < 10,000/μL
	0-4	5-9	10-14	15-19	20-24	25-29	
Express 3	35	7	0	0	0	0	100
Heraeus Labofuge 400	33	7	0	0	1	1	95

Table 2.1

Sample	Glucose		BUN		Creatinine		Albumin	
	SSX3	HL400	SSX3	HL400	SSX3	HL400	SSX3	HL400
1	86	88	11	12	0.9	0.8	4.4	4.3
2	129	130	16	15	0.9	0.9	4.6	4.6
3	95	94	10	9	0.7	0.8	4.4	4.5
4	93	92	10	10	0.9	0.9	4.8	4.8
5	96	96	12	12	0.7	0.6	4.6	4.5
6	87	83	12	12	0.9	0.8	4.4	4.4
7	122	120	20	22	1.0	1.0	4.5	4.6
8	91	89	13	13	0.8	0.8	4.4	4.3
9	82	84	22	22	0.8	0.7	4.6	4.6
10	88	89	29	30	0.8	0.8	4.1	4.3
11	93	92	11	12	0.9	0.9	4.0	4.1
12	93	95	22	21	1.3	1.3	4.7	4.7
13	105	103	14	14	0.8	0.8	4.6	4.7
14	131	130	13	13	0.8	0.7	4.1	4.0
15	94	95	14	14	0.8	0.7	4.6	4.7
16	91	90	14	14	1.0	0.9	4.6	4.5
17	66	65	16	16	0.8	0.9	4.7	4.6
18	77	77	15	15	0.8	0.8	4.4	4.3
19	89	87	17	16	1.2	1.2	5.1	5.1
20	111	114	14	14	0.8	0.8	4.5	4.6

Table 2.2

Sample	Total Protein		Calcium		Uric Acid		Total Bilirubin	
	SSX3	HL400	SSX3	HL400	SSX3	HL400	SSX3	HL400
1	7.2	7.0	9.4	9.4	4.5	4.5	0.3	0.3
2	7.6	7.6	10.1	10.0	6.5	6.5	0.4	0.3
3	6.8	6.9	9.2	9.4	3.9	3.9	0.3	0.3
4	7.7	7.6	9.9	10.0	5.3	5.4	1.1	1.1
5	7.4	7.1	9.7	9.7	4.8	4.8	0.5	0.5
6	7.6	7.6	9.7	9.6	3.0	3.0	0.7	0.7
7	7.5	7.2	9.1	9.1	6.3	6.3	0.5	0.5
8	6.7	6.7	8.8	8.8	4.2	4.1	0.2	0.2
9	7.4	7.5	9.6	9.6	4.0	4.1	0.3	0.3
10	7.2	7.3	9.5	9.5	4.5	4.4	0.2	0.2
11	7.2	7.0	9.2	9.2	3.4	3.3	0.2	0.2
12	7.5	7.4	9.4	9.5	7.6	7.5	0.9	0.9
13	7.8	7.8	9.8	9.9	5.8	5.8	0.2	0.3
14	7.2	7.1	9.9	10.0	5.6	5.6	0.2	0.2
15	7.2	7.2	9.5	9.7	4.8	4.8	0.7	0.7
16	7.5	7.5	9.5	9.5	4.7	4.7	0.6	0.6
17	8.2	8.1	9.5	9.5	3.7	3.7	0.6	0.6
18	7.6	7.7	9.3	9.4	5.0	5.0	0.4	0.4
19	7.9	7.9	9.5	9.7	7.2	7.2	0.5	0.5
20	7.2	7.5	9.6	9.4	2.3	2.3	0.4	0.5

Table 2.3

Sample	LDH		CPK		Alk. Phos.		SGPT	
	SSX3	HL400	SSX3	HL400	SSX3	HL400	SSX3	HL400
1	170	174	91	89	50	51	27	30
2	173	172	107	106	68	67	37	37
3	145	150	61	62	60	59	18	13
4	140	146	42	42	69	69	9	14
5	203	205	115	116	73	73	11	12
6	146	149	200	206	75	78	12	16
7	192	197	208	209	64	66	41	47
8	145	153	71	73	63	63	15	14
9	152	147	56	55	54	52	21	17
10	238	234	1872	1881	64	65	36	37
11	124	124	108	108	48	50	9	12
12	157	157	158	159	73	73	35	33
13	220	221	134	134	77	78	28	27
14	131	131	89	91	77	79	17	20
15	138	139	55	55	48	47	17	16
16	169	174	70	70	49	49	12	13
17	224	218	64	63	67	66	18	19
18	164	166	29	30	112	113	29	28
19	223	222	316	316	59	57	28	27
20	126	137	80	84	52	55	23	26

Table 2.4

Sample	SGOT		GGPT		Amylase		Na	
	SSX3	HL400	SSX3	HL400	SSX3	HL400	SSX3	HL400
1	27	25	14	14	52	52	142	141
2	22	23	31	31	101	101	141	142
3	18	19	17	17	81	81	139	139
4	12	12	17	17	67	67	139	138
5	22	21	12	11	31	31	139	139
6	18	21	11	12	108	111	139	139
7	33	32	16	15	74	73	144	144
8	14	14	10	9	72	71	141	141
9	13	15	12	12	62	62	140	140
10	64	66	10	11	58	58	139	139
11	12	10	23	22	100	99	141	140
12	21	17	25	25	86	85	142	143
13	30	30	28	29	93	94	140	139
14	13	14	29	29	59	59	138	137
15	16	15	9	9	35	34	140	139
16	14	15	14	14	58	57	142	141
17	21	20	11	11	72	72	136	137
18	21	22	40	41	64	67	141	141
19	28	27	28	28	101	101	138	139
20	19	20	35	36	72	74	139	140

Table 2.5

Sample	K		Cl		CO2		TSH	
	SSX3	HL400	SSX3	HL400	SSX3	HL400	SSX3	HL400
1	4.1	4.0	104	104	27	27	2.41	2.34
2	3.9	3.9	104	104	26	26	1.24	1.40
3	3.8	3.7	102	102	26	26	8.80	8.82
4	4.2	4.2	100	99	25	27	3.52	3.74
5	4.1	4.1	102	101	25	27	3.32	3.35
6	3.7	3.6	105	105	23	23	1.56	1.77
7	3.8	3.8	106	106	25	26	2.35	2.48
8	3.9	3.7	106	106	26	25	25.55	26.04
9	4.2	4.3	103	104	26	25	7.31	7.28
10	4.2	4.3	103	103	28	29	3.96	4.17
11	3.9	3.9	108	107	24	24	0.45	0.46
12	3.9	4.0	104	105	27	28	2.56	2.55
13	4.0	4.0	99	99	29	29	0.95	0.94
14	4.1	4.2	102	101	27	27	2.22	2.20
15	3.7	3.7	103	103	28	26	1.59	1.60
16	4.2	4.1	105	104	27	25	2.11	2.04
17	4.2	4.3	101	101	25	25	2.45	2.30
18	3.8	3.8	103	104	28	28	1.56	1.49
19	4.2	4.3	97	99	26	26	1.77	1.66
20	4.8	4.6	106	105	23	23	1.08	1.14

Table 2.6

Sample	T4		CKMB		Troponin		Myoglobin	
	SSX3	HL400	SSX3	HL400	SSX3	HL400	SSX3	HL400
1	7.7	7.2	0.7	0.6	<0.2	<0.2	18.68	17.88
2	8.4	8.7	1.4	1.3	<0.2	<0.2	28.53	27.84
3	7.8	8.0	0.7	0.5	<0.2	<0.2	17.81	17.18
4	11.6	11.5	<0.4	<0.4	<0.2	<0.2	20.58	19.48
5	8.7	8.5	1.9	1.8	<0.2	<0.2	29.23	27.32
6	9.1	8.6	1.2	1.3	<0.2	<0.2	30.94	28.28
7	7.4	7.5	4	4.1	<0.2	<0.2	84.86	86.78
8	7.0	6.6	1.1	1.2	<0.2	<0.2	21.85	23.46
9	8.9	9.1	0.4	<0.4	<0.2	<0.2	11.62	10.80
10	8.0	8.1	1.9	1.9	<0.2	<0.2	74.29	77.14
11	9.7	9.8	0.5	0.4	<0.2	<0.2	18.74	19.00
12	9.3	8.9	1	1.1	<0.2	<0.2	33.18	33.15
13	7.9	8.1	0.6	0.5	<0.2	<0.2	26.63	25.54
14	7.9	7.9	<0.4	<0.4	<0.2	<0.2	19.77	19.37
15	9.0	9.1	0.8	0.7	<0.2	<0.2	29.22	26.10
16	8.0	7.9	0.8	0.8	<0.2	<0.2	36.89	38.19
17	8.8	8.5	0.7	0.8	<0.2	<0.2	26.44	25.14
18	9.4	9.6	0.4	0.5	<0.2	<0.2	24.69	25.85
19	8.8	9.0	0.9	0.9	<0.2	<0.2	42.21	41.52
20	10.3	10.8	0.4	0.4	<0.2	<0.2	20.99	21.15

Table 2.7

Sample	BNP		PT		PTT		D-Dimer	
	SSX3	HL400	SSX3	HL400	SSX3	HL400	SSX3	HL400
1	11.68	11.95	11.5	11.5	31	31	146	148
2	21.24	20.35	11.5	11.3	28	26	154	151
3	26.14	26.27	11.9	11.7	31	31	195	185
4	22.63	22.74	11.0	11.1	29	28	309	317
5	53.86	54.43	11.7	11.8	30	31	193	192
6	584.89	575.25	11.0	11.1	29	29	406	419
7	15.62	15.21	11.4	11.4	31	30	169	169
8	9.93	10.80	11.7	11.7	27	27	86	86
9	46.50	44.40	10.7	10.7	31	31	375	365
10	21.08	21.18	11.5	11.6	36	36	305	307
11	7.13	6.25	11.6	11.8	30	30	238	255
12	6.65	6.43	10.7	10.8	32	32	934	1010
13	16.45	17.15	11.1	11.2	26	26	217	227
14	21.64	21.60	11.2	11.2	37	37	232	267
15	6.25	6.48	11.0	11.1	30	30	140	150
16	6.33	6.06	11.6	11.5	31	31	241	249
17	16.86	16.11	11.4	11.5	28	28	263	255
18	44.76	43.25	11.5	11.5	31	32	179	193
19	4.99	4.99	12.5	12.2	32	31	566	544
20	4.99	5.14	10.5	10.7	31	31	256	247
21	25.72	25.24	10.8	11.1	32	33	135	134
22	55.91	53.76	n/a	n/a	n/a	n/a	n/a	n/a

Table 2.8

Sample	Platelet		Platelet	
	SSX3	HL400	SSX3	HL400
1	6	1	9	0
2	1	0	2	3
3	7	1	4	8
4	0	2	1	2
5	1	2	5	2
6	2	2	1	5
7	1	0	3	1
8	0	5	2	7
9	2	2	4	5
10	3	1	6	2
11	5	1	4	2
12	2	1	4	1
13	1	2	2	2
14	1	2	2	5
15	4	1	2	4
16	2	1	2	2
17	0	2	0	2
18	1	24	4	25
19	6	1	2	3
20	4	2	2	2
21	1	2	0	5

Chart 3.1

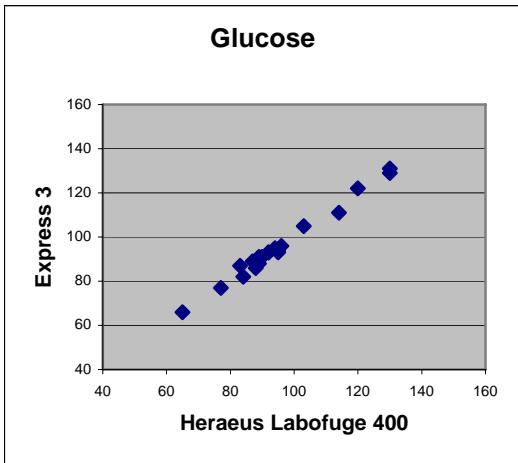


Chart 3.2

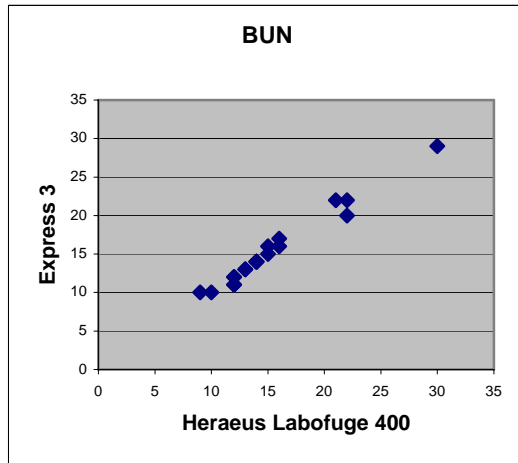


Chart 3.3

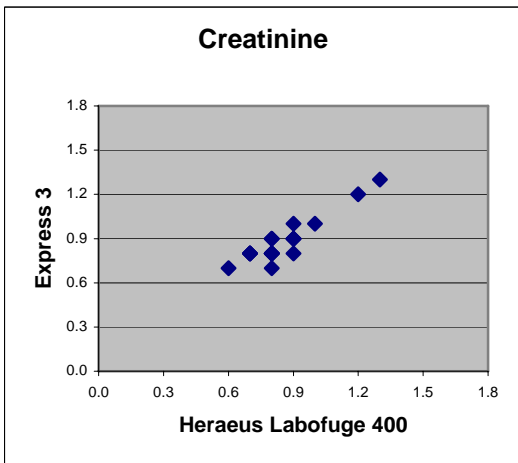


Chart 3.4

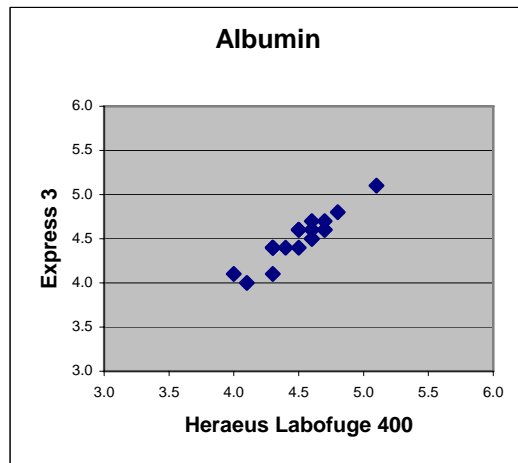


Chart 3.5

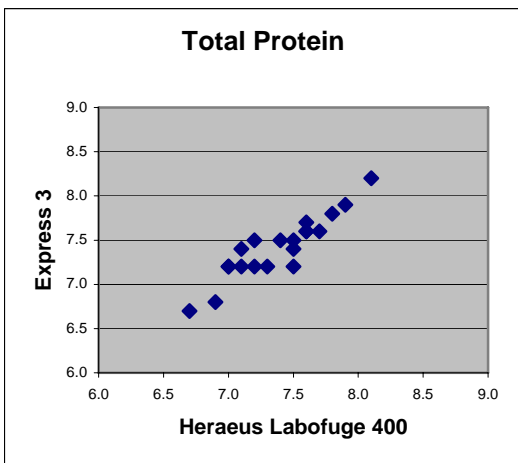


Chart 3.6

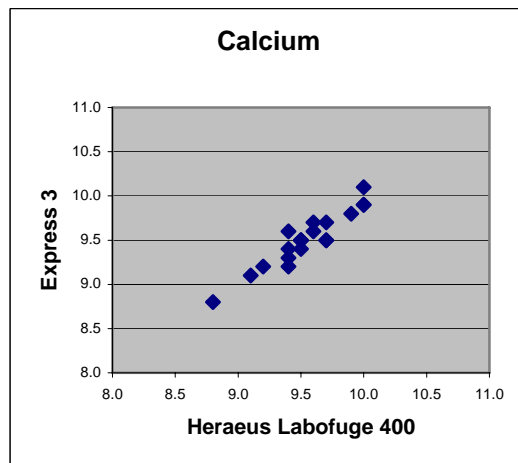


Chart 3.7

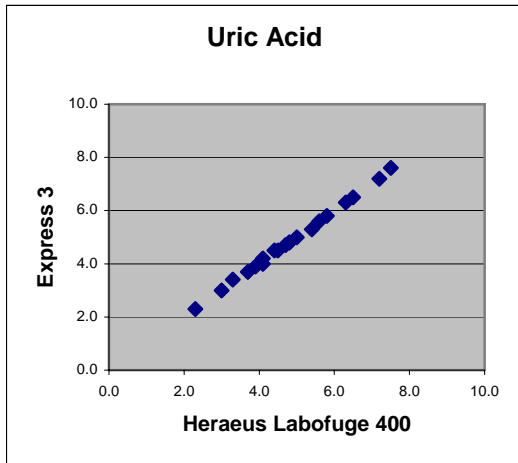


Chart 3.8

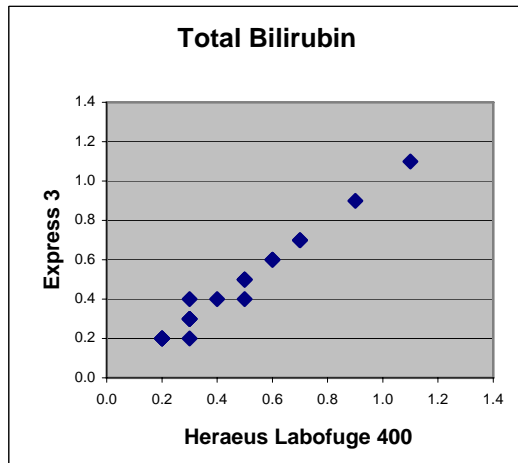


Chart 3.9

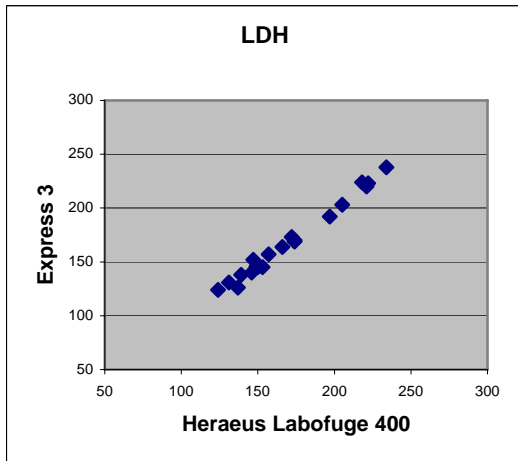


Chart 3.10

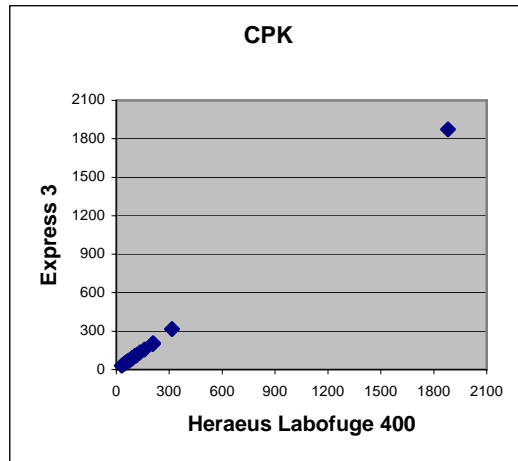


Chart 3.11

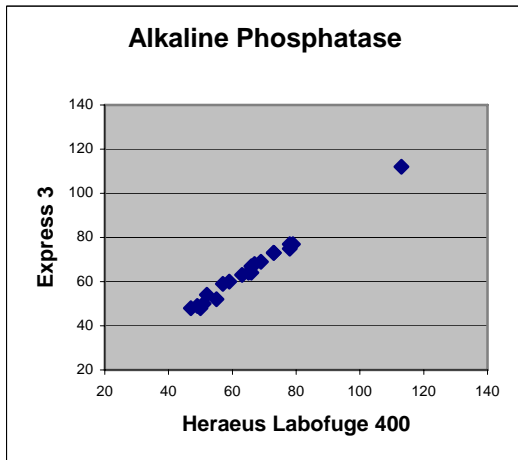


Chart 3.12

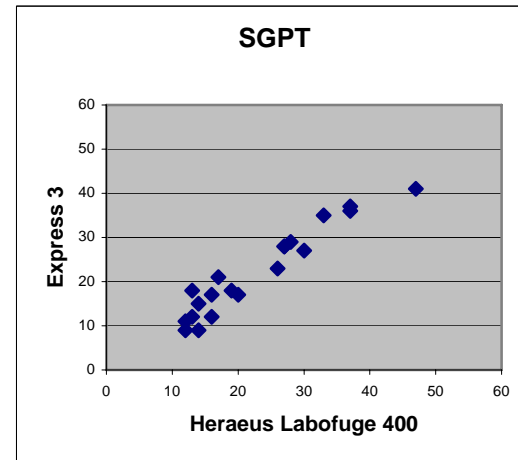


Chart 3.13

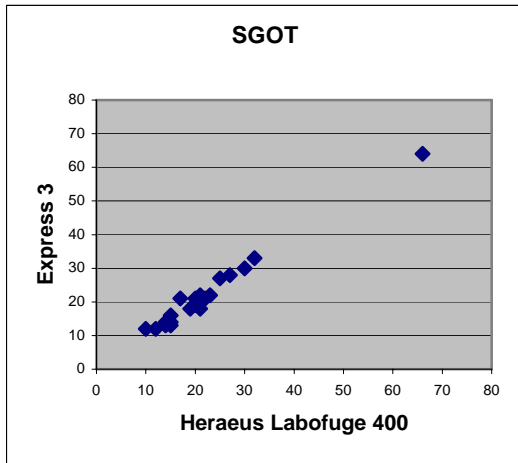


Chart 3.14

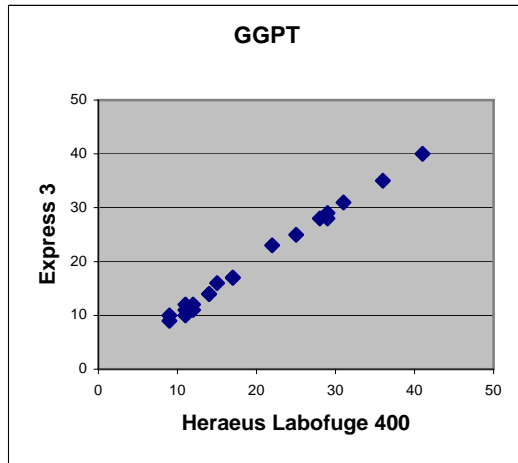


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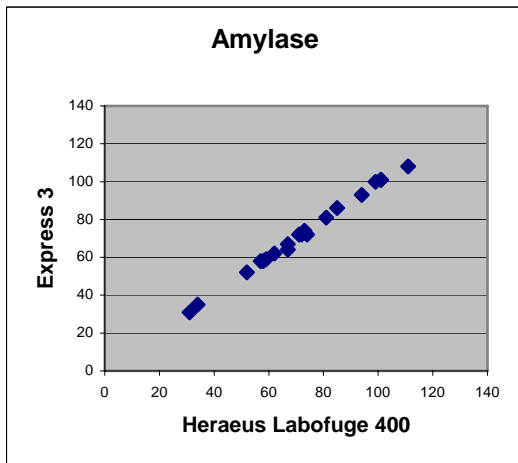


Chart 3.16

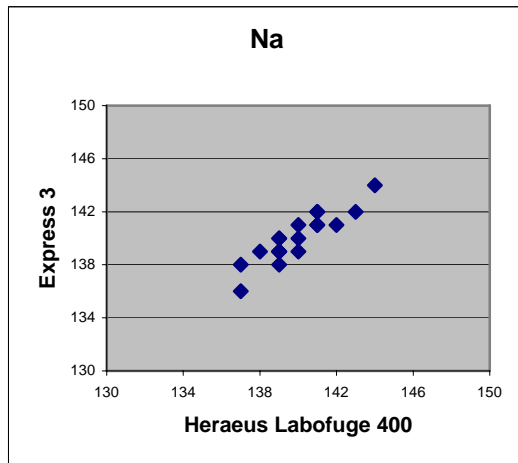


Chart 3.17

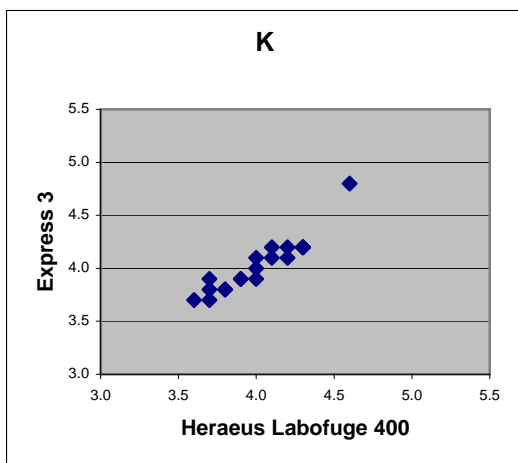


Chart 3.18

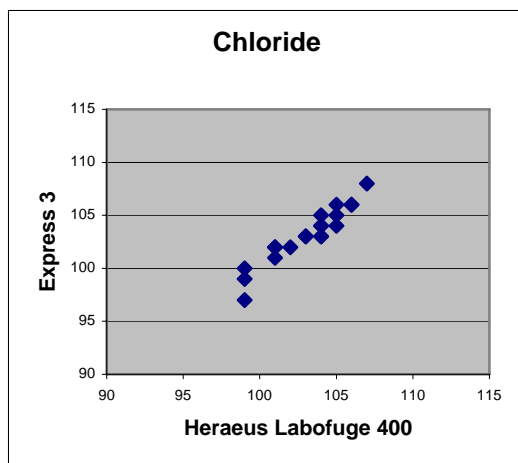


Chart 3.19

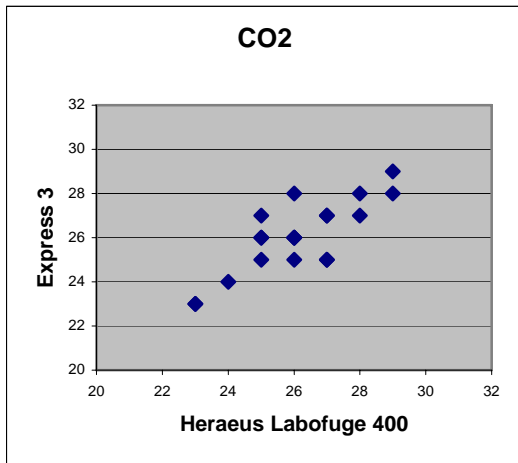


Chart 3.20

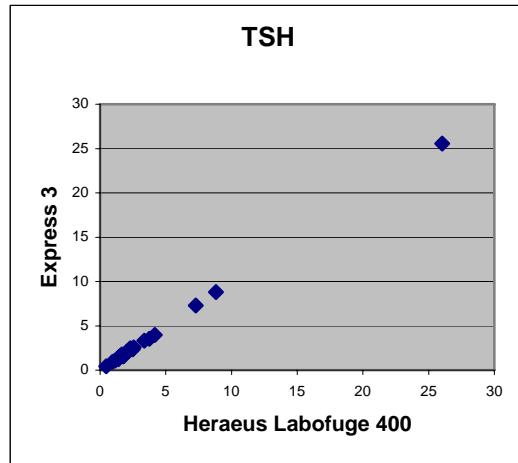


Chart 3.21

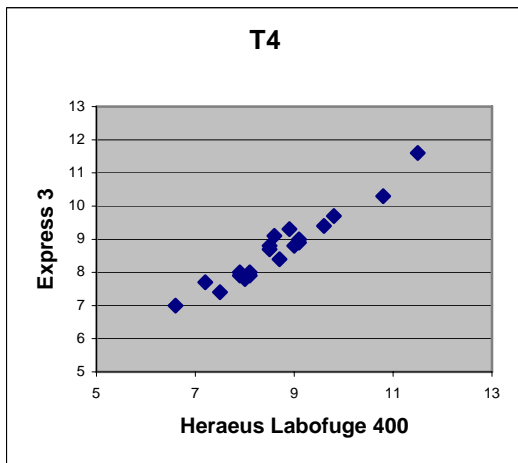


Chart 3.22

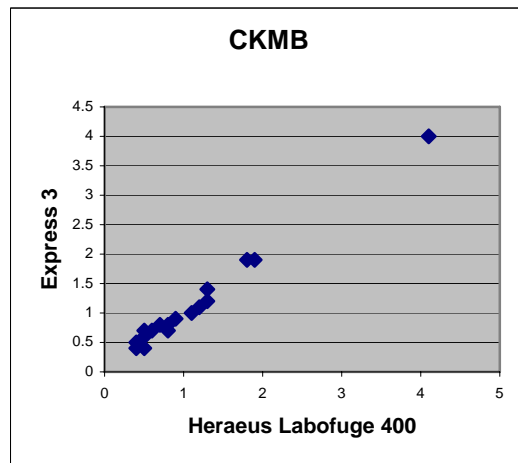


Chart 3.23

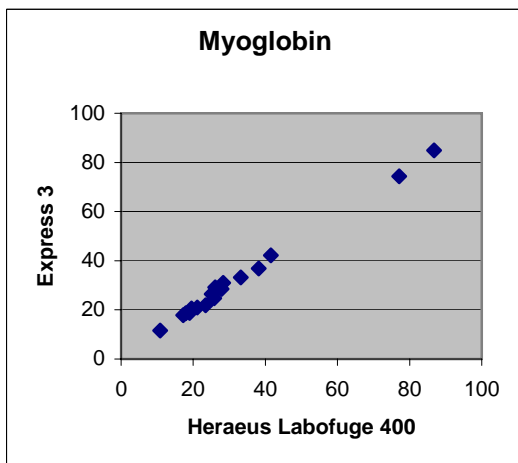


Chart 3.24

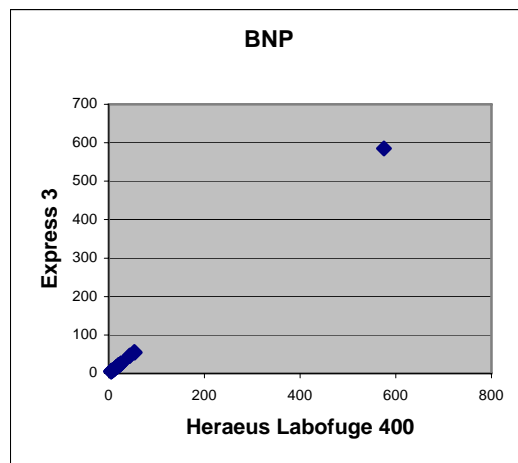


Chart 3.25

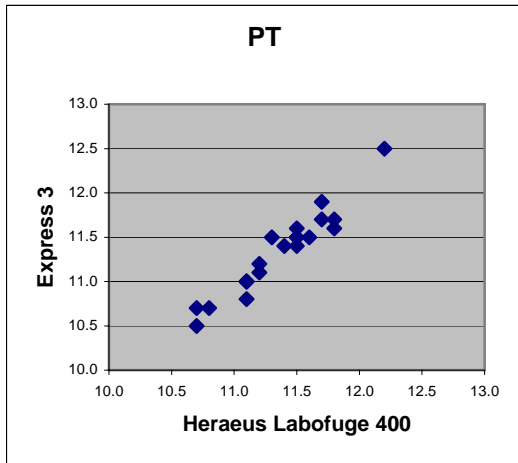


Chart 3.26

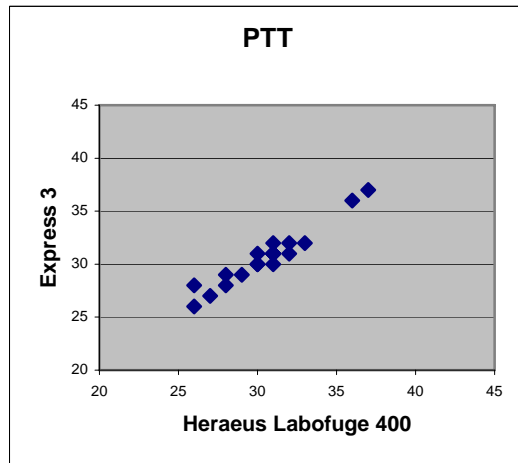


Chart 3.27

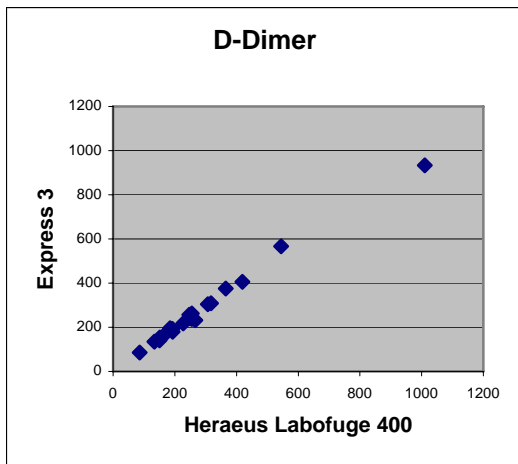


Chart 3.28

