
COMPARISON STUDY BETWEEN THE HELMER QUICKSPIN PLUS AND A TRADITIONAL 400mL CENTRIFUGE IN BLOOD CHEMISTRY DETERMINATIONS



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Introduction

The Helmer QuickSpin Plus is a small high-speed clinical bench top centrifuge developed for stat sample applications. The fixed angle rotor holds up to 8 tubes and accommodates tube capacities from 2.7mL (with included inserts) to 15mL. The QuickSpin Plus has spin times programmable in increments of one minute and speeds up to 8000 RPM programmable in increments of 100.

Study Objective

This study examined and compared chemistry test results for 15 analytes in samples centrifuged in the QuickSpin Plus and a traditional 400mL centrifuge.

Methodology

Two SST tubes (BD, 13x100mm) were taken from 20 individuals and centrifuged in the QuickSpin Plus at 7500 RPM for two minutes and in the traditional 400mL centrifuge at 3500 RPM for seven minutes. Post centrifugation, the serum was tested for the following: glucose, BUN, creatine, albumin, total protein, calcium, total bilirubin, CPK, alkaline phosphatase, SGPT, SGOT, amylase, Na, Cl, and CO₂. The Roche Integra 700 analyzer was used to test the serum.

Results

Table 1 shows the statistical analysis. Table 2 displays the percentage of difference of each sample processed in the QuickSpinPlus from each sample processed in the traditional 400mL centrifuge. Table 3 shows original data for chemistry results. The group of scatter plot charts collectively labeled "Chart 1" shows the plot points defined by the analyte result for the QuickSpin Plus on the x-axis and the result for the traditional 400mL centrifuge on the y-axis.

Data Analysis

Linear regression was used to analyze the results from each centrifuge. Correlation coefficients range from 0.84 to 1.00. Nine of the fifteen analytes tested showed perfect correlation, and 14 out of 15 showed correlations of 0.92 or greater. Slopes range from 0.85 to 1.03, and y-intercepts range from -3.38 to 4.18.

The average percentage difference in sample results for the analytes tested ranges from 0.30% (Cl) to 22.45% (total bilirubin). The total bilirubin values showed 0.00% difference for 16 of the twenty samples. The large average difference is accounted for by sample number 9, which shows a 400% difference between the results (0.5 and 0.1) achieved in the centrifuges.

Interpretation

SST tubes centrifuged in the QuickSpin Plus for just two minutes consistently achieved separation of serum and cells and produced samples suitable for blood chemistry testing.

Additionally, the general 45 degree linear trend demonstrated in Chart 1 indicates a near one-to-one relationship between the values for the analyte test results for the QuickSpin Plus and the traditional 400mL centrifuge.

Conclusion

Results indicate that the QuickSpin Plus is capable of preparing samples suitable for blood chemistry tests in only two minutes, and that it provides comparable clinical efficacy to the traditional 400mL centrifuge that was tested in the study. The QuickSpin Plus provides faster turnaround times (2 minutes versus 7 minutes) without sacrificing the quality and accuracy of the test results.

Table 1: Statistical Analysis

	QuickSpin Plus Mean ± SD	400mL Centrifuge Mean ± SD	Correlation Coefficient	Slope	Y- Intercept
Glucose	134.45 ± 65.50	133.20 ± 64.27	0.99	0.97	2.35
BUN	34.45 ± 26.50	34.40 ± 25.96	1.00	0.98	0.67
Creatine	1.33 ± 0.97	1.34 ± 0.97	1.00	1.00	0.01
Albumin	3.19 ± 0.72	3.15 ± 0.69	0.99	0.95	0.11
T.Protein	5.97 ± 0.76	5.87 ± 0.70	0.93	0.85	0.77
Calcium	8.46 ± 0.72	8.42 ± 0.70	0.84	1.00	-0.33
T. Bilirubin	0.97 ± 1.43	0.95 ± 1.44	1.00	1.00	-0.02
CPK	95.33 ± 75.58	93.75 ± 73.91	1.00	0.98	0.60
Alk. Phos.	74.85 ± 30.88	74.75 ± 30.86	1.00	1.00	0.10
SGPT	25.00 ± 13.08	24.90 ± 12.89	1.00	0.98	0.33
SGOT	23.90 ± 11.39	23.75 ± 10.93	1.00	0.96	0.87
Amylase	65.22 ± 34.67	63.67 ± 34.95	1.00	0.99	0.49
Na	137.65 ± 3.50	137.45 ± 3.66	0.92	0.97	4.18
Cl	104.00 ± 7.18	103.80 ± 7.42	1.00	1.03	-3.38
CO2	26.82 ± 6.00	26.73 ± 6.23	0.99	1.02	-0.70

* There are a few values (samples 4, 14, and 15) for CPK and for amylase (samples 9 and 15) for which there are results for only one centrifuge. These values are provided in Table 3b for completeness, but are not included in calculations of standard deviation, mean, slope, or Y-Intercept.

Table 2: Percentage Difference in Result Values by Sample and Analyte

Sample	Glucose	BUN	Creatine	Albumin	T.Protein	Calcium	T. Bilirubin	CPK	Alkaline Phos.	SGPT	SGOT	Amylase	Na	Cl	CO2
1	0.00%	0.00%	0.00%	0.00%	10.91%	0.00%	0.00%	NA	0.00%	8.33%	0.00%	0.00%	0.00%	0.00%	1.58%
2	2.44%	0.00%	0.00%	0.00%	0.00%	2.27%	0.00%	NA	0.00%	10.00%	0.00%	0.85%	0.00%	0.00%	0.78%
3	3.98%	0.00%	0.00%	3.03%	1.69%	3.19%	0.00%	NA	1.72%	0.00%	0.00%	0.00%	0.72%	0.00%	1.65%
4	0.70%	0.00%	0.00%	2.38%	1.33%	7.87%	20.00%	NA	1.80%	6.06%	3.13%	2.00%	0.00%	0.00%	0.72%
5	2.27%	33.33%	0.00%	7.89%	12.90%	2.78%	0.00%	4.95%	5.56%	13.33%	0.00%	3.57%	0.76%	0.00%	3.03%
6	1.69%	7.69%	0.00%	2.38%	0.00%	0.00%	20.00%	1.64%	4.88%	9.09%	9.09%	0.00%	0.72%	1.00%	2.13%
7	0.00%	4.92%	0.00%	8.57%	8.70%	NA	0.00%	2.96%	2.11%	0.00%	0.00%	2.33%	1.48%	0.95%	8.37%
8	2.81%	1.79%	5.26%	0.00%	5.17%	5.06%	0.00%	NA	4.94%	0.00%	5.00%	3.57%	0.75%	0.85%	3.06%
9	1.98%	3.70%	0.00%	0.00%	3.64%	1.12%	400.00%	5.56%	1.45%	0.00%	0.00%	NA	0.00%	1.04%	2.89%
10	2.97%	1.92%	3.23%	0.00%	3.45%	2.50%	0.00%	2.02%	0.00%	0.00%	5.36%	1.19%	0.00%	0.00%	4.08%
11	0.00%	0.00%	16.67%	0.00%	0.00%	3.70%	0.00%	0.81%	1.20%	3.45%	0.00%	0.00%	3.57%	0.00%	0.99%
12	0.00%	2.15%	0.00%	0.00%	0.00%	11.25%	0.00%	0.00%	1.25%	2.86%	0.00%	1.61%	0.00%	0.00%	1.66%
13	2.17%	0.00%	0.00%	5.88%	0.00%	1.16%	0.00%	0.00%	2.94%	0.00%	0.00%	3.23%	0.72%	0.00%	9.88%
14	2.00%	5.66%	4.76%	4.35%	4.55%	1.32%	0.00%	NA	4.40%	0.00%	2.63%	NA	0.00%	0.00%	1.09%
15	1.09%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	NA	3.16%	6.25%	6.25%	NA	0.73%	0.00%	7.34%
16	15.76%	4.76%	0.00%	0.00%	3.57%	10.00%	0.00%	0.00%	0.00%	3.85%	0.00%	2.70%	0.70%	0.00%	5.14%
17	1.65%	0.00%	0.00%	2.94%	1.72%	2.17%	0.00%	2.74%	5.26%	4.00%	4.17%	1.96%	0.74%	0.00%	0.00%
18	0.95%	0.00%	0.00%	0.00%	0.00%	3.45%	0.00%	0.85%	1.52%	0.00%	3.57%	0.00%	0.72%	0.00%	1.58%
19	1.94%	1.25%	0.00%	3.57%	0.00%	3.33%	9.09%	1.30%	0.95%	0.00%	6.67%	1.22%	0.00%	1.16%	1.34%
20	20.37%	0.00%	0.00%	0.00%	0.00%	2.94%	0.00%	NA	2.99%	7.69%	0.00%	1.54%	0.00%	0.90%	2.43%
Mean Diff.	3.24%	3.36%	1.50%	2.05%	2.88%	3.37%	22.45%	1.90%	2.31%	3.75%	2.29%	1.52%	0.58%	0.30%	2.99%

The chart above shows the percentage difference between the value for the result of the analyte tested in the traditional 400mL centrifuge versus the value for the same analyte tested in the QuickSpin Plus. For example, it could be correctly stated that for glucose sample number 4, there is a 0.70% difference between the result achieved in the traditional 400mL centrifuge and the result achieved in the QuickSpin Plus. A designation of "NA" indicates that the sample was not tested for that analyte.

Table 3a: Original Data

Sample No.	Glucose		BUN		Creatine		Albumin	
	QSP	400mL	QSP	400mL	QSP	400mL	QSP	400mL
1	79	79	9	9	0.8	0.8	3.6	3.6
2	84	82	14	14	0.6	0.6	3.3	3.3
3	235	226	34	34	1.4	1.4	3.4	3.3
4	286	284	13	13	0.7	0.7	4.1	4.2
5	90	88	2	3	0.4	0.4	4.1	3.8
6	181	178	12	13	0.8	0.8	4.1	4.2
7	167	167	58	61	1.5	1.5	3.8	3.5
8	293	285	57	56	1.8	1.9	1.9	1.9
9	103	101	26	27	0.8	0.8	3.1	3.1
10	98	101	53	52	3.0	3.1	1.6	1.6
11	86	86	40	40	0.5	0.6	2.2	2.2
12	101	101	95	93	3.2	3.2	3.6	3.6
13	94	92	15	15	0.8	0.8	3.6	3.4
14	98	100	56	53	2.2	2.1	2.2	2.3
15	91	92	24	24	0.7	0.7	3.3	3.3
16	139	165	20	21	0.6	0.6	3.0	3.0
17	123	121	59	59	1.2	1.2	3.5	3.4
18	106	105	12	12	1.0	1.0	3.4	3.4
19	105	103	81	80	3.7	3.7	2.9	2.8
20	130	108	9	9	0.8	0.8	3.1	3.1

Table 3b: Original Data

Sample No.	T.Protein		Calcium		T. Bilirubin		CPK	
	QSP	400mL	QSP	400mL	QSP	400mL	QSP	400mL
1	6.1	5.5	8.1	8.1	0.4	0.4	NA	NA
2	5.8	5.8	9.0	8.8	0.5	0.5	NA	NA
3	5.8	5.9	9.1	9.4	1.5	1.5	NA	NA
4	7.4	7.5	8.2	8.9	0.6	0.5	69	NA
5	7.0	6.2	7.4	7.2	0.9	0.9	233	222
6	6.5	6.5	8.8	8.8	0.4	0.5	62	61
7	7.5	6.9	NA	NA	6.9	6.9	139	135
8	5.5	5.8	8.3	7.9	0.6	0.6	NA	NA
9	5.7	5.5	8.8	8.9	0.5	0.1	17	18
10	6.0	5.8	7.8	8.0	0.5	0.5	101	99
11	4.8	4.8	7.8	8.1	1.0	1.0	125	124
12	6.6	6.6	8.9	8.0	0.4	0.4	22	22
13	5.4	5.4	8.5	8.6	0.6	0.6	22	22
14	4.6	4.4	7.7	7.6	0.6	0.6	NA	297
15	5.9	5.9	8.9	8.9	0.3	0.3	NA	269
16	5.4	5.6	9.9	9.0	0.4	0.4	37	37
17	5.9	5.8	9.4	9.2	1.0	1.0	75	73
18	6.3	6.3	8.4	8.7	0.5	0.5	233	235
19	6.0	6.0	8.7	9.0	1.0	1.1	78	77
20	5.2	5.2	7.0	6.8	0.7	0.7	NA	NA

Table 3c: Original Data

Sample No.	Alk. Phos.		SGPT		SGOT		Amylase	
	QSP	400mL	QSP	400mL	QSP	400mL	QSP	400mL
1	51	51	13	12	18	18	100	100
2	34	34	9	10	23	23	119	118
3	57	58	40	40	25	25	31	31
4	109	111	31	33	31	32	49	50
5	38	36	17	15	16	16	58	56
6	39	41	12	11	12	11	30	30
7	93	95	22	22	20	20	42	43
8	77	81	17	17	19	20	29	28
9	68	69	15	15	15	15	54	NA
10	164	164	48	48	59	56	85	84
11	82	83	30	29	31	31	62	62
12	81	80	36	35	20	20	61	62
13	70	68	42	42	38	38	64	62
14	95	91	31	31	39	38	NA	NA
15	98	95	15	16	15	16	NA	33
16	43	43	25	26	14	14	36	37
17	60	57	52	50	25	24	52	51
18	67	66	21	21	27	28	70	70
19	106	105	12	12	16	15	166	164
20	65	67	12	13	15	15	66	65

Table 3d: Original Data

Sample No.	Na		Cl		CO2	
	QSP	400mL	QSP	400mL	QSP	400mL
1	138	138	105	105	25.7	25.3
2	140	140	108	108	26.0	25.8
3	139	138	103	103	29.8	30.3
4	135	135	101	101	27.8	27.6
5	133	132	100	100	27.2	26.4
6	140	139	101	100	32.2	32.9
7	137	135	106	105	25.9	23.9
8	134	133	117	118	19.0	19.6
9	132	132	97	96	26.9	27.7
10	138	138	106	106	23.5	24.5
11	135	140	93	93	40.1	40.5
12	137	137	108	108	17.8	18.1
13	140	139	105	105	27.8	25.3
14	146	146	117	117	18.2	18.4
15	138	137	107	107	23.4	21.8
16	142	143	99	99	35.1	37.0
17	137	136	102	102	26.2	26.2
18	140	139	106	106	24.9	25.3
19	132	132	87	86	37.8	37.3
20	140	140	112	111	21.1	20.6

Chart 1





