
COMPARISON STUDY BETWEEN THE HELMER QUICKSPIN PLUS AND A TRADITIONAL 3 LITER 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 17 analytes in samples centrifuged in the QuickSpin Plus and a traditional 3L 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 3 liter centrifuge at 3500 RPM for ten minutes. Post centrifugation, the serum was tested for the following: glucose, BUN, creatine, albumin, total protein, calcium, total bilirubin, CPK, CKMB, troponin, 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 difference between each sample processed in the QuickSpin Plus and each sample processed in the traditional 3 liter 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 3 liter centrifuge on the y-axis.

Data Analysis

Linear regression was used to analyze the results from each centrifuge. Correlation coefficients range from 0.85 to 1.00. Slopes range from 0.85 to 1.20, and y-intercepts range from -22.62 to 10.52.

The average percentage differences for the analytes with number of samples >10 range from 0.85% (Na) to 28.76% (troponin). Analytes with more than ten samples account for 15 of the 17 analytes tested.

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 3 liter centrifuge.

The average percentage difference for all analytes except for troponin was less than eight percent. Troponin has 13 sample values accounted for, and the numerical values are generally small numbers with a small range for normality (0.00-0.03). For the purposes of this study, these numbers were only available to the second decimal place, meaning that very small variances, even well within the normal range, reflect large differences in terms of percentage.

Analytes with significantly small sample populations for the purposes of this test include CPK, with only five samples available for testing, and amylase, with only seven samples available for testing.

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 3 liter centrifuge that was tested in the study. The QuickSpin Plus provides faster turnaround times (2 minutes versus 10 minutes) without sacrificing the quality and accuracy of the test results.

Table 1: Statistical Analysis

	QuickSpin Plus Mean ± SD	Traditional 3 Liter Centrifuge Mean ± SD	Correlation Coefficient	Slope	Y- Intercept
Glucose	114.85 ± 33.58	115.90 ± 31.96	0.99	0.94	7.62
BUN	22.50 ± 14.68	21.95 ± 13.82	0.99	0.94	0.89
Creatine	1.35 ± 1.36	1.36 ± 1.33	0.99	0.97	0.06
Albumin	3.50 ± 0.59	3.49 ± 0.59	0.98	0.98	0.07
T.Protein	6.31 ± 0.71	6.37 ± 0.79	0.93	1.04	-0.18
Calcium	8.54 ± 0.68	8.61 ± 0.62	0.94	0.85	1.39
T. Bilirubin	0.61 ± 0.29	0.64 ± 0.25	0.98	0.85	0.10
CPK	109.60 ± 21.59	108.40 ± 26.17	0.99	1.20	-22.62
CKMB	3.32 ± 2.75	3.22 ± 2.75	1.00	0.99	0.02
Tropinin	1.48 ± 2.79	1.45 ± 2.75	1.00	0.99	0.00
Alk. Phos.	93.12 ± 54.32	93.29 ± 54.06	1.00	0.99	0.68
SGPT	37.12 ± 30.97	37.00 ± 30.71	1.00	0.99	0.21
SGOT	40.71 ± 30.34	40.65 ± 30.05	1.00	0.99	0.35
Amylase	101.29 ± 104.82	100.43 ± 105.01	1.00	1.00	-1.04
Na	138.30 ± 3.16	138.55 ± 3.83	0.85	1.09	-11.69
Cl	103.25 ± 6.32	103.85 ± 5.89	0.97	0.90	10.52
CO2	28.39 ± 6.28	28.17 ± 6.38	0.98	0.93	1.80

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

Sample	Glucose	BUN	Creatine	Albumin	T.Protein	Calcium	T. Bilirubin	CPK	CKMB	Troponin	Alk. Phos.	SGPT	SGOT	Amylase	Na	Cl	CO2
1	9.64%	4.76%	0.00%	NA	NA	3.85%	NA	12.66%	0.00%	25.00%	NA	9.09%	4.76%	0.58%	0.71%	0.00%	0.00%
2	2.09%	0.00%	0.00%	4.65%	6.35%	0.00%	20.00%	5.04%	11.11%	6.67%	0.00%	0.00%	0.00%	0.00%	0.00%	0.96%	5.30%
3	2.42%	8.70%	0.00%	2.94%	0.00%	1.19%	18.18%	0.83%	7.41%	2.35%	0.77%	4.00%	0.00%	3.03%	0.71%	0.00%	9.87%
4	6.03%	14.29%	0.00%	5.26%	2.94%	0.00%	20.00%	0.83%	2.15%	2.05%	2.13%	0.00%	0.89%	2.38%	1.45%	0.97%	2.25%
5	0.98%	7.41%	11.11%	3.33%	0.00%	1.22%	12.50%	1.20%	6.41%	0.44%	0.00%	5.88%	4.35%	2.94%	0.72%	0.93%	2.47%
6	2.54%	8.33%	0.00%	3.70%	0.00%	0.00%	0.00%	NA	11.11%	25.00%	0.00%	10.00%	0.00%	2.78%	0.00%	0.00%	0.34%
7	1.09%	0.00%	0.00%	2.33%	2.63%	0.00%	0.00%	NA	NA	2.84%	1.54%	0.00%	0.00%	3.95%	5.38%	4.08%	2.49%
8	0.00%	0.00%	0.00%	0.00%	9.09%	1.10%	0.00%	NA	20.69%	200.00%	0.00%	7.14%	4.55%	NA	0.70%	0.00%	0.00%
9	1.10%	0.00%	12.50%	0.00%	0.00%	2.30%	0.00%	NA	20.00%	100.00%	1.03%	0.00%	4.17%	NA	0.00%	0.00%	1.09%
10	0.81%	0.00%	12.50%	2.70%	1.47%	1.08%	0.00%	NA	5.00%	9.52%	0.88%	2.50%	0.00%	NA	0.00%	0.00%	0.00%
11	0.00%	0.00%	0.00%	0.00%	0.00%	1.08%	0.00%	NA	7.41%	0.00%	0.00%	0.00%	2.33%	NA	0.00%	5.05%	3.61%
12	1.09%	0.00%	10.00%	2.86%	2.94%	2.44%	0.00%	NA	0.00%	0.00%	3.67%	3.45%	2.50%	NA	0.00%	0.94%	6.74%
13	0.00%	0.00%	57.14%	0.00%	0.00%	2.30%	0.00%	NA	NA	0.00%	0.78%	9.09%	0.00%	NA	1.52%	1.12%	1.21%
14	6.02%	7.32%	5.00%	0.00%	11.54%	5.00%	0.00%	NA	NA	NA	4.65%	0.00%	0.00%	NA	0.75%	0.00%	13.36%
15	3.37%	0.00%	0.00%	4.17%	1.79%	3.37%	0.00%	NA	NA	NA	2.31%	0.83%	0.00%	NA	0.72%	0.96%	2.83%
16	6.19%	0.00%	0.00%	3.03%	3.57%	8.14%	0.00%	NA	NA	NA	0.67%	6.25%	7.89%	NA	2.13%	0.93%	0.78%
17	6.76%	8.33%	4.00%	4.55%	0.00%	5.26%	0.00%	NA	NA	NA	3.23%	3.45%	1.35%	NA	0.00%	0.88%	3.94%
18	9.15%	0.00%	0.00%	NA	NA	2.35%	NA	NA	NA	NA	NA	NA	NA	NA	0.00%	0.98%	1.57%
19	5.68%	11.76%	0.00%	NA	NA	0.00%	NA	NA	NA	NA	NA	NA	NA	NA	1.45%	0.90%	13.33%
20	1.80%	6.90%	10.81%	NA	NA	1.22%	NA	NA	NA	NA	NA	NA	NA	NA	0.72%	0.98%	4.15%
Mean Diff.	3.34%	3.89%	6.15%	2.47%	2.65%	2.09%	4.42%	4.11%	7.28%	28.76%	1.35%	3.63%	1.93%	2.24%	0.85%	0.99%	3.77%

The chart above shows the percentage difference between the value for the result of the analyte tested in the traditional 3 liter 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 10, there is a 0.81% difference between the result achieved in the traditional 3 liter 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	3L	QSP	3L	QSP	3L	QSP	3L
1	75	83	20	21	0.8	0.8	2.7	2.7
2	187	191	17	17	1.0	1.0	4.1	4.3
3	127	124	25	23	0.7	0.7	3.3	3.4
4	123	116	8	7	0.8	0.8	4.0	3.8
5	103	102	29	27	1.0	0.9	3.1	3.0
6	115	118	11	12	0.8	0.8	2.6	2.7
7	91	92	14	14	1.1	1.1	4.2	4.3
8	118	118	9	9	0.8	0.8	4.0	4.0
9	92	91	18	18	0.9	0.8	3.3	3.3
10	122	123	11	11	0.7	0.8	3.8	3.7
11	122	122	9	9	1.1	1.1	3.8	3.8
12	182	184	16	16	1.1	1.0	3.4	3.5
13	154	154	29	29	0.3	0.7	3.2	3.2
14	78	83	38	41	6.3	6.0	3.5	3.5
15	86	89	9	9	0.5	0.5	2.5	2.4
16	106	113	12	12	0.7	0.7	3.4	3.3
17	69	74	65	60	2.6	2.5	4.6	4.4
18	155	142	41	41	0.6	0.6	NA	NA
19	83	88	38	34	1.8	1.8	NA	NA
20	109	111	31	29	3.3	3.7	NA	NA

Table 3b: Original Data

Sample No.	T.Protein		Calcium		T. Bilirubin		CPK	
	QSP	3L	QSP	3L	QSP	3L	QSP	3L
1	5.1	5.2	7.5	7.8	NA	NA	89	79
2	6.7	6.3	9.3	9.3	0.4	0.5	132	139
3	6.3	6.3	8.5	8.4	1.3	1.1	121	120
4	6.6	6.8	8.3	8.3	0.4	0.5	122	121
5	5.1	5.1	8.1	8.2	0.7	0.8	84	83
6	5.8	5.8	7.9	7.9	0.4	0.4	NA	NA
7	7.4	7.6	10.0	10.0	0.5	0.5	NA	NA
8	6.0	6.6	9.0	9.1	0.4	0.4	NA	NA
9	5.9	5.9	8.5	8.7	0.5	0.5	NA	NA
10	6.9	6.8	9.4	9.3	0.7	0.7	NA	NA
11	6.6	6.6	9.2	9.3	0.6	0.6	NA	NA
12	7.0	6.8	8.4	8.2	0.3	0.3	NA	NA
13	6.1	6.1	8.9	8.7	0.9	0.9	NA	NA
14	6.9	7.8	8.4	8.0	0.9	0.9	NA	NA
15	5.7	5.6	8.6	8.9	0.6	0.6	NA	NA
16	5.8	5.6	7.9	8.6	0.5	0.5	NA	NA
17	7.4	7.4	7.2	7.6	1.1	1.1	NA	NA
18	NA	NA	8.3	8.5	NA	NA	NA	NA
19	NA	NA	9.2	9.2	NA	NA	NA	NA
20	NA	NA	8.1	8.2	NA	NA	NA	NA

Table 3c: Original Data

Sample No.	Alk. Phos.		SGPT		SGOT		Amylase	
	QSP	3L	QSP	3L	QSP	3L	QSP	3L
1	81	82	12	11	20	21	173	172
2	31	31	26	26	16	16	310	310
3	131	130	48	50	36	36	34	33
4	46	47	74	74	113	112	43	42
5	59	59	16	17	24	23	33	34
6	51	51	11	10	18	18	37	36
7	64	65	21	21	22	22	79	76
8	60	60	13	14	21	22	NA	NA
9	96	97	13	13	23	24	NA	NA
10	112	113	41	40	63	63	NA	NA
11	71	71	81	81	42	43	NA	NA
12	105	109	28	29	39	40	NA	NA
13	257	255	10	11	16	16	NA	NA
14	45	43	22	22	20	20	NA	NA
15	127	130	121	120	103	103	NA	NA
16	151	150	34	32	41	38	NA	NA
17	96	93	60	58	75	74	NA	NA
18	NA	NA	NA	NA	NA	NA	NA	NA
19	NA	NA	NA	NA	NA	NA	NA	NA
20	NA	NA	NA	NA	NA	NA	NA	NA

Table 3d: Original Data

Sample No.	Na		Cl		CO2		CKMB		Troponin	
	QSP	3L	QSP	3L	QSP	3L	QSP	3L	QSP	3L
1	140	141	111	111	24.6	24.6	3.4	3.4	0.05	0.04
2	138	138	105	104	25	26.4	2.0	1.8	0.14	0.15
3	140	141	109	109	24.5	22.3	2.5	2.7	0.87	0.85
4	136	138	102	103	26.1	26.7	9.1	9.3	2.49	2.44
5	138	139	106	107	24.9	24.3	8.3	7.8	6.73	6.76
6	140	140	106	106	29.9	29.8	1.0	0.9	0.03	0.04
7	137	130	94	98	28.8	28.1	NA	NA	8.32	8.09
8	141	142	104	104	31.7	31.7	2.3	2.1	0.03	0.01
9	140	140	107	107	27.1	27.4	1.2	1.0	0.02	0.01
10	134	134	95	95	30.5	30.5	2.1	2.0	0.23	0.21
11	137	137	94	99	31.6	30.5	2.9	2.7	0.03	0.03
12	139	139	105	106	28.5	26.7	1.7	1.7	0.06	0.06
13	134	132	90	89	41.8	41.3	NA	NA	0.2	0.2
14	133	134	99	99	25.3	29.2	NA	NA	NA	NA
15	137	138	103	104	27.5	28.3	NA	NA	NA	NA
16	138	141	106	107	25.3	25.5	NA	NA	NA	NA
17	145	145	115	114	26.4	25.4	NA	NA	NA	NA
18	145	145	101	102	45.3	44.6	NA	NA	NA	NA
19	136	138	110	111	15.3	13.5	NA	NA	NA	NA
20	138	139	103	102	27.6	26.5	NA	NA	NA	NA

Chart 1





