

Serum and Urine Creatinine Can be Measured using microsamples

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BACKGROUND

- Serum creatinine (SCr) measurement in newborns can lead to significant blood loss, limiting their usefulness in accomplishing clinical/ research objectives.
- SCr can be measured with as little as 20 mcl using Tandem Mass Spectrometry (MS) or Jaffe reaction.
- The stability of specimens over time using these techniques have not been characterized.

Objectives

- We evaluated the differences in serum and urine using microsamples between two techniques (MS vs. Jaffe).
- We evaluated the ability to reliably replicate results when samples are processed immediately (within 2 hours) compared to samples stored at -80 °C for 1, 30 and 90 days after initial collection.
- We assessed how the 1 day sample may be influenced by the type of storage (Refrigeration -4 degree C vs. Freezer -80 degree C).

METHODS

- We performed a prospective laboratory analysis using whole blood and fresh voided urine from 6 healthy adults who had neither kidney or liver disease, and were not taking medications known to interfere with creatinine determination
- Each samples was processed using 20 mcl of sample.
- SCr was evaluated by two methods
 - MS - with tandem Mass Spectrometry using multiple reaction monitoring and quantitated via stable isotope dilution.
 - Jaffe methodology on a Beckman machine.
- Statistical methods
 - Correlation Analysis was done
 - Bald Altman plot used to compare 2 tests
 - Comparison to the reproducibility of machine vs. the reproducibility of the sample over time was performed using analysis of covariance

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RESULTS

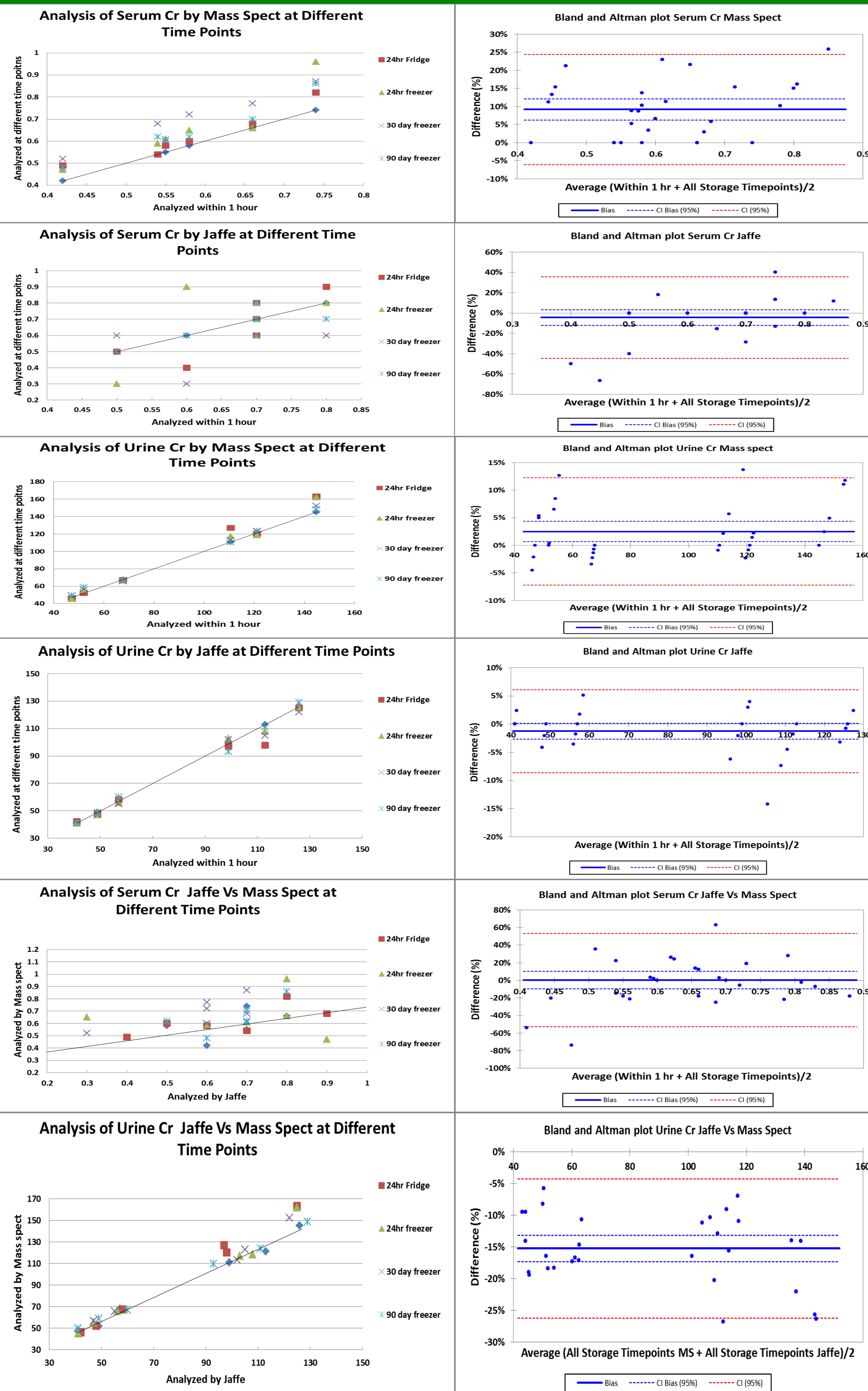


Table 1. correlations and % difference between measurement times and storage type in MS and Jaffe

	Method	% Difference (mean ± SD)	Correlation
Immediate vs 1 day Refrigerated	MS	-5.27 ± 6.67	0.996
Immediate vs 1 day Freezer	MS	-7.43 ± 9.34	0.997
Immediate vs 30 day Freezer	MS	-11.36 ± 9.95	0.999
Immediate vs 90 day Freezer	MS	7.55 ± 6.25	0.999
Immediate vs 1 day Refrigerated	Jaffe	2.89 ± 12.68	0.997
Immediate vs 1 day Freezer	Jaffe	-0.24 ± 20.34	0.999
Immediate vs 30 day Freezer	Jaffe	7 ± 17.15	0.999
Immediate vs 90 day Freezer	Jaffe	0.13 ± 6.27	0.999
Mass Vs. Jaffe		5.07 ± 21.91	0.997

Coefficient of Variation (CV)		
	Mass spect	Jaffe
Serum	7.75%	16.84%
Urine	4.04%	3.02%

There was a very high correlation (r= 0.996) between MS and Jaffe samples and a mean percent differences between samples of 5.15 + 23.49 ng/dl. There was good correlations and limited % difference between measurement times and storage type in both MS and Jaffe. (Table 1)

CONCLUSIONS

1. Although variations exist between creatinine measurements using Jaffe and Mass Spectrometry there is a high degree of correlation even when performing these tests using micro samples.
2. Samples were relatively unaffected after 24 hours in a refrigerator, freezing for 1, 30 and 90 days