RUSH UNIVERSITY MEDICAL CENTER

The Creamatocrit Plus™: A New Centrifuge for Measuring Creamatocrits with Mothers' Milk

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BACKGROUND

The creamatocrit is a simple, inexpensive, and accurate technique for estimating the lipid concentration and caloric density in mothers' milk.

Although the creamatocrit has been used widely in published research, it has only recently been incorporated into the clinical management of infants who are fed mothers' milk.

The creamatocrit technique is especially useful in the neonatal intensive care unit (NICU) to guide the fractionation and feeding high-lipid, high-calorie hindmilk in extremely low birthweight infants when accelerated short-term weight gain is desirable.

THE CREAMATOCRIT PLUS™

The Creamatocrit Plus™ is lighter, more portable, quicker, and quieter than the standard laboratory centrifuge that is used in most settings for creamatocrit measures.

The digital mechanism for measuring the cream and total volume columns is internal, eliminating the use of a hematocrit reader or calipers.

The software has been programmed to automatically convert the creamatocrit measure into lipid concentration and caloric density, so that conversion charts or graphs are unnecessary.

These features make the Creamatocrit Plus™ an ideal instrument for both clinical practice and research, provided that it performs comparably to current standard equipment.

PURPOSE

The purpose of this study was to establish the reliability and accuracy of the Creamatocrit Plus™ for performing creamatocrits on mothers' milk. We also measured equivalence of technique by comparing actual creamatocrit values for the Creamatocrit Plus™, the standard centrifuge with hematocrit reader, and the standard centrifuge with calipers.

METHOD

Fresh milk specimens were collected from 12 women whose infants were hospitalized in the NICU at Rush University Medical Center. Each woman provided three specimens from a single milk expression session: low-fat, low-calorie foremilk; high-fat, high-calorie hindmilk; and composite (full-pumping) milk, for a total of 36 milk specimens.

For each milk specimen, two investigators performed six creamatocrit measures: Two each using the Creamatocrit Plus™, the standard centrifuge with a hematocrit reader, and the standard centrifuge with digital calipers. Investigators were blinded to each others' measures.

Intra- and interrater reliability was determined by comparing the mean differences within and between clinicians' creamatocrit values obtained with the 3 measurement techniques.

Equivalence was determined by comparing actual creamatocrit values obtained with the 3 measurement techniques.

A 5-ml sample of each milk specimen was frozen at –80° C until direct laboratory measures of lipid concentration and caloric density were performed (Univ of Western Australia). Biochemists were blinded to creamatocrit values, and whether specimens were foremilk, hindmilk, or composite milk.

Accuracy was established by regression analysis to determine the relationship between creamatocrit and direct measures for lipid concentration and caloric density. The resulting regression equation was used to estimate lipid concentration and caloric density for the 36 creamatocrit measures. Then, the mean differences between the actual and estimated lipid and caloric values were compared.

RESULTS

There were no significant differences for intra-and interrater reliability among the three measurement techniques, indicating that values obtained with the Creamatocrit Plus™ were as reliable as current standards.
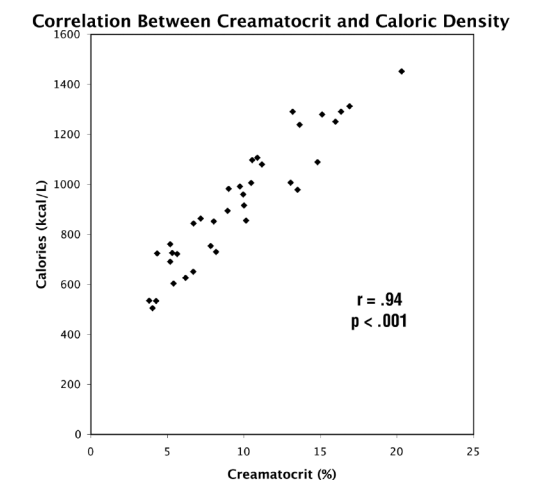

Intra-and Interrater Reliability Comparisons
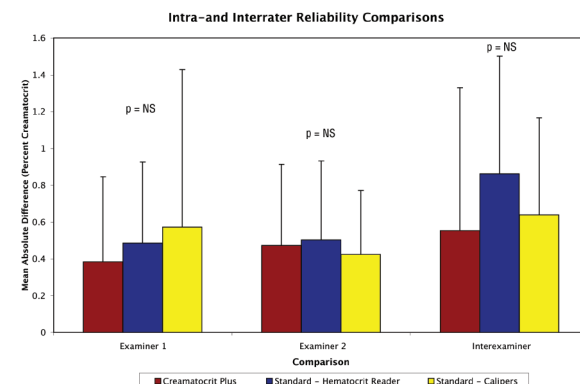
The absolute creamatocrit values obtained with the three measurement techniques were comparable, indicating that values obtained with the Creamatocrit Plus™ were equivalent to current standards.

Comparison of Creamatocrit Values
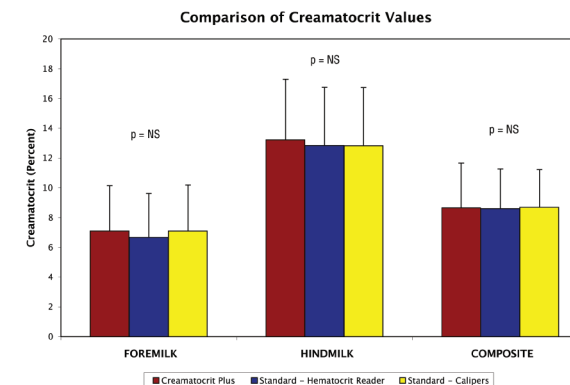
The linear correlation between creamatocrit and actual lipid concentration was extremely high (r = .95), indicating that the Creamatocrit Plus™ accurately estimated lipid concentration. The mean difference between the actual lipid concentration and the lipid concentration estimated by the Creamatocrit Plus™ regression equation was 0.003 g/l (p=NS)

Correlation Between Creamatocrit and Lipid Concentration

r = .95
p < .001
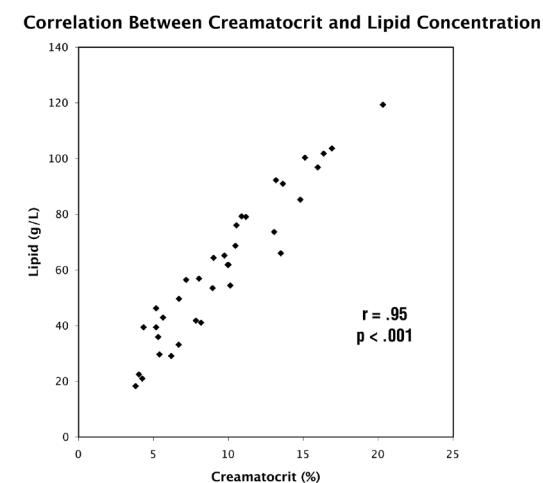
The linear correlation between creamatocrit and actual caloric density was extremely high (r = .94), indicating that the Creamatocrit Plus™ accurately estimates caloric density. The mean difference between the actual caloric density and the caloric density estimated by the Creamatocrit Plus™ regression equation was 0.004 kCal/l (p=NS).

Correlation Between Creamatocrit and Caloric Density

r = .94
p < .001

CONCLUSIONS

Results for intra- and inter-rater reliability and equivalency of technique indicate that the Creamatocrit Plus™ performs comparably to the standard centrifuge using either the hematocrit reader or digital calipers.

Results reveal that the Creamatocrit Plus™ provides excellent accuracy in estimates of lipid concentration and caloric density.

The regression equations obtained from the accuracy analyses were used to program the software for the Creamatocrit Plus™. This step insures that the digitally displayed values for lipid concentration and caloric density were based on research conducted with the Creamatocrit Plus™ centrifuge and its digital reading mechanism.

IMPLICATIONS

The user-friendly features of this device make it feasible for use in any clinical or research setting, especially in the NICU where portability, physical space constraints, professional staff time, and noise level are crucial considerations.

The excellent reliability, equivalency, and accuracy results indicate that the Creamatocrit Plus™ can replace traditional measurement techniques that include the heavier and noisier laboratory centrifuge, the hematocrit reader, and digital calipers.

SELECTED REFERENCES

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