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TRIP REPORT
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Purpose

The primary purpose of my visit to Egypt was to assist in the development of the test weighing procedure to be used in the field site (Kalama), testing alternative methods of assessing milk volume intakes of infants and establishing protocol for milk sample collection and nutrient analysis. In addition, I assisted in the development of questionnaires to be used in collection of data.

Evaluation of Test-Weighing (Conventional)

Percent recovery of a known quantity of milk volume consumed by formula-fed (FF) infants was +95% when the K-Tron electronic balance was used (Table 1). Test-weighing was conducted at the Nutrition Institute and at the village site (Kalama). After visitation to the field site, it was confirmed that conventional test-weighing, at least during the daytime hours, can be accomplished since the mothers in Kalama do not carry the infants with them during the day. It had originally been stated that in all CRSP communities infants were carried about by the mother (1). Although the mothers nurse the infant more frequently in Kalama compared to in the US, the daytime nursing episodes are clearly defined. After questioning, village women repeatedly expressed awareness of the experience of milk "let-down". It is my opinion that conventional test-weighing is the method of choice for daytime milk volume assessment. The possibility exists that a factor can be established for the percent of milk volume consumed at night thus enabling estimation of total milk volume intakes. If improvements can be made in existing facilities at the village site and some incentives offered, the feeling is that some women may be willing to spend the night at the facility so that test-weighings can be performed.

Evaluation of Test-Weighing Alternatives (Hourly)

The modified test-weighing procedure proposed by the University of Arizona (1) was tested at the Nutrition Institute over approximately 4 hour intervals in FF infants. A slight modification in the calculation of milk volume was used. The differences in hourly weights were summed regardless of sign and then the weight of waste was subtracted (only if the diaper had been changed during the test period). This calculation accounts for insensible water loss which could vary greatly between infants and in the same infant on different days.

Milk volume intakes determined by this method were 89-108% of the volume lost from the bottle during the same period. The mean percent difference (Hourly/Bottle) was 97% (Table 1). When milk volume intakes were estimated using weight differences at 2 or 4 hour intervals, percent differences (Hourly/Bottle) were 78%, ranging from 58-92% (Table 1). Thus, it seems that if the modified test-weighing procedure is used, weighings must be performed hourly with strict attention paid to clothing changes, intake of additional foods, etc. It may be noted that this method would not be accurate when solids are introduced to infants. This seems to occur in the majority of Egyptian infants by 5-6 months of age, but may occur earlier.

Table 1. Comparison of conventional test weighing and a modified infant-weighing method at 1,2 and 4 hour intervals to assess milk intake of formula-fed Egyptian infants.

Infant	Age	Weight	Observation		Test weighing WHO	Test weighing Bottle	Test weighing Hourly	Percentage WHO/ Bottle	Percentage Hourly/ Bottle	Percentage Hourly/ WHO
	Mo	kg	Time	Hrs	g milk intake				%	
Test Weighing-One Hour Interval										
0	7	8.90	11-1	3	125	132	142	95	108	114
1	9	7.90	11-3	4	273	302	300	90	99	110
*2	8	6.05	11-3	4	370	376	373	98	99	102
3	8	7.58	11-3	4	372	380	375	98	99	101
*6	8	6.05	12-2	2	330	338	312	98	92	95
7	5	5.10	9-3	6	374	402	388	93	97	104
8	3	4.80	10-3	5	304	312	279	97	89	92
9	3	4.70	10-2	4	309	316	291	98	92	94
**A	9		8-8	12	955	954	1051	100	91	91
								96	96	100
Test Weighing-Two Hour Interval										
1				2	80	94	75	85	80	94
				2	193	208	155	95	75	80
2				2	230	236	200	97	85	87
				2	140	140	107	100	76	76
3				2	247	250	200	99	80	81
				2	125	130	75	96	58	60
6				2	330	338	312	98	92	95
8				2	125	130	103	96	79	82
				2	89	90	59	99	66	66
9				2	211	216	194	102	90	92
				2	98	100	74	98	74	76
								97	78	81
Test Weighing-Four Hour Interval										
1				4	273	302	230	90	76	84
3				4	372	380	275	98	72	73
6				4	370	376	307	98	82	83
9				4	309	316	268	98	85	85
8				4	214	220	162	97	74	76
								96	78	80

*Same infant

**Infant studied in Lafayette, IN (Detecto Scale)

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Analysis of Human Milk for Selected Nutrients

Human milk samples were collected in Kalama and transported to the United States for analysis of selected nutrients. Samples were collected under subdued light into amber vials and kept cool during transport between Kalama and the Nutrition Institute. Samples were frozen at the Nutrition Institute and kept frozen during transport to the United States. Samples were expressed from the right (Rt) and left (Lt) breasts of four women and from one breast of two women on March 17, 1983. In addition, two separate samples of pooled milk obtained from storage at the Nutrition Institute were divided so analysis of specific nutrients could be performed in Egypt and in our laboratory for comparison.

Total Fat Analysis

Fat content (g/l) was determined by personnel at the Nutrition Institute using the Creamatocrit method (2). Data from 6 women and 3 additional women (collected in Kalama by us on March 10, 1983) is presented in Table 2. Total fat content ranged from 9.7-112.4 g/l. The average fat content of mature human milk has been reported to be 34, 38, 45 and 48 g/l (3,4,5). Mean fore milk fat content has been reported to be 22.6 $\pm$ 15.3 g/l (range 1.6-66.8 g/l) whereas mean hind fat content was 39.4 $\pm$ 18.0 g/l (range 5.3-91.1 g/l) (4).

Vitamin Analysis

Milk samples were analyzed for vitamin C, vitamin B-6 and folacin (total and free). Levels of all vitamins, presented on Table 3, were representative of samples previously analyzed in our laboratory. In regards to vitamin C, it may be noted that residents of Kalama seemed to have ample supplies of citrus fruits, especially oranges. The vitamin B-6 content of human milk has been demonstrated to be a sensitive indicator of maternal status of the vitamin. Levels of vitamin B-6 in these samples were similar or higher than those analyzed in this laboratory for unsupplemented women. The differences in free folacin and vitamin B-6 levels in Lt and Rt breasts of some women (#2, #3, #4) may warrant further investigation.

We plan to analyze the milk samples for selected minerals, such as zinc, and for protein.

References

1. Harrison, G.G., Ritenbaugh, C. and Mohs, M. A preliminary pilot study of a modified infant-weighing method to estimate breast milk intake, University of Arizona, January 14, 1983.

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4. Dorea, J.G., Horner, M.R., Bezerra, V.L. Correlation between changeable human milk intake in breast-fed babies. J. Pediatr. 101:80-83, 1982.

5. Jensen, R.G., Hagerty, M.M. and McMahon, K.E. Lipids of human milk and infant formulas: a review. Am. J. Clin. Nutr. 31:990-1016, 1978.

Table 2. Fat content of human milk of Egyptian women determined by the Creamatocrit method.

Mother	Breast Side	Total Fat
		g/l
1	Lt	57.6
	Rt	64.5
2	Lt	78.2
	Rt	56.7
3	Lt	104.7
	Rt	38.8
4	Lt	55.9
	Rt	73.0
5	Lt	16.5
6	Rt	37.9
7	Lt	9.7
	Rt	23.4
8	Lt-fore	---
	Lt-hind	78.2
	Rt-fore	57.6
9	Lt-fore	45.6
	Lt-hind	67.9
	Rt-fore	61.0
	Rt-hind	112.4

Table 3. Vitamin C, vitamin B-6 and folacin content of human milk of Egyptian women.

Mother	Breast Side	Vitamin C	Folacin Total	Folacin Free	Vitamin B-6
		mg/l	µg/l		µg/l
1	Lt	78.4	55.3	46.2	351
	Rt	----	57.3	47.9	283
2	Lt	----	64.6	47.4	335
	Rt	----	54.0	44.1	215
3	Lt	----	74.6	72.8	113
	Rt	----	66.2	30.1	374
4	Lt	76.5	57.3	42.4	101
	Rt	----	----	----	226
5	Lt	78.4	40.6	36.0	151
6	Rt	116.4	72.8	60.9	234
Pooled #1		4.3	15.4	12.1	145
Pooled #2		10.9	67.8	44.1	134