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PROGRESS REPORT ON AID-MIT CONTRACT "EXTENDING PROTEIN CONCENTRATES FOR CHILD FEEDING BY THE ADDITION OF SIMPLE NITROGEN SOURCES".

Our previous report of the work accomplished under this contract indicated that the protein quality of whole cow's milk diluted 10% with non essential nitrogen was no different from whole milk when tested as the only source of protein in protein calorie malnourished children during the initial phase of recovery. A very important question arose once these results were established, this being whether the supplementary value of diluted milk was as good as that of milk when fed as dietary supplement to a diet, which resembled the "rural diet" of poor Central American populations, based on corn and black beans. The rationale for this question was that when milk was the only source of protein the dilution of its essential nitrogen would still leave an excellent quality protein; however, dilution of its essential nitrogen could conceivably reduce the availability of the "relative excess" of essential nitrogen for supplementation of poor quality protein diets.

This second part of the investigations on the possibility of extending the availability of milk protein by diluting it with non essential nitrogen (glycine and diammonium citrate)

has been carried out during the last portion of 1968 and the present year. The research protocol consisted of feeding 6 children between the ages of 1 y 7 m and 3 y 4 m who were fully recovered from malnutrition with a corn and black bean diet alone followed by this diet plus a supplement of milk and diluted milk, in consecutive randomized periods. The supplementary values of milk and diluted milk was evaluated by N balance.

Material and Methods:

The characteristics of the children who were the experimental subjects is shown in Table 1. Child PC-201 was started on this study but had to discontinued after 18 days because of progressive intolerance to the corn and bean diet.

TABLE 1

Child	Age (m)	Months in Clinical Center	Weight for Height %	Height for age %	Creatinine Height Index %	Total serum proteins gm
96	40	7	110	87	1.03	7.60
98	42	5	108	94	1.03	7.70
99	28	2	104	85	1.00	6.00
00	19	2	98	92	0.94	6.20
02	24	3	93	84	0.82	6.40
04	27	2	97	89	0.94	6.30

The study was started by placing the children on a corn and black bean diet which was prepared from a homogenized and lyophilized powder prepared especially for this study at INCAP. The source of protein was 20% from beans and 80% from corn.

The children received 1.6 g Prot/Kg/day from this mixture. Calories were added in the form of carbohydrates and fat to supply 100 Cal/Kg/day, 20% of the total calories in the form of fat. Vitamin and mineral supplements were given throughout the study to supply the recommended allowances of these elements. The children were kept on this diet for 10 days. The first four days were of adaptation and the next 6 days were divided in two 3 day N balance periods, performed by the standard techniques at use at INCAP. This initial dietary period was followed by a second and third dietary periods which consisted of the corn and bean at the same protein level of 1.6 g/Kg/d plus either whole cow's milk or 10% diluted milk to provide 0.4 g Prot/Kg/d. Calories, fat, vitamins and minerals were kept constant at the level of the first period of study. Each dietary period lasted 10 days divided in 4 days of adaptation and two 3 day nitrogen balances. Whole milk preceded diluted milk as a

supplement in 3 children and viceversa in other 3 children. The only variables in the study were, therefore, the level and source of protein. With the milk supplemented diets the only variable was the source of the protein supplement, either whole milk or 10% diluted milk.

			74.80
	7.52	4.71	4.89
<u>Results:</u>	1.72	1.66	1.45

At the moment, 4 children have finished the study. The other two children are finishing the study this week. In three of the children (PC-196, 198 and 199) three balance periods were performed while on the corn and bean diet alone to establish further if the N balance results of two 3 days collection periods of this diet were improved by a third period. The differences were not significant (\bar{X} N retention with two 3 days periods= 7.3%; with 3 three days period= 9.6%). Consequently the other 3 children, and throughout the study, two three days balance periods were used. Figure 1 and table 2 show the results so far obtained.

TABLE 2

		Corn and Bean Diet	Corn and Bean Diet	
			+ Milk	+ Milk diluted 10%
		N = 15	N = 8	N = 10
absorption as % of intake	X	62.21	71.64	74.80
	S	5.52	4.71	4.59
	$S\bar{X}$	1.42	1.66	1.45
		N = 15	N = 8	N = 10
retention as % of intake	X	9.21	26.62	28.75
	S	10.02	5.01	7.48
	$S\bar{X}$	2.59	1.77	2.37

It is evident from these results that the addition of 0.4 g/Kg/d of milk either undiluted or diluted have a significant beneficial effect both on N absorption and retention. Furthermore, there is no statistically significant difference between undiluted or 10% diluted milk in these parameters suggesting that milk whose essential nitrogen has been diluted with 10% of non essential nitrogen still has an adequate supplementary value to a corn and bean diet under the conditions of the experiment.

Comments:

These results and those obtained in the initial phase of this study must be expanded using further dilution of milk

with non essential nitrogen, probably to the 20 and 30% level. The addition of the milk's limiting amino acids (specifically methionine) to the diluted milk at the level at which its supplementary value is reduced with dilution should also be considered in the future.

FIGURE 1.

