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THE EFFECT OF SUPPLEMENTING THE DIETS OF UNDERNOURISHED WEANED INFANTS AND PRESCHOOL CHILDREN WITH A SPRAY DRIED PROTEIN FOOD BASED ON GROUND NUT PROTEIN ISOLATE AND SKIM MILK POWDER ON THEIR GROWTH AND NUTRITIONAL STATUS

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Milk has been used from times immemorial as a supplement to the diets of weaned infants. Recent investigations have shown that skim milk powder together with a vitamin A supplement can also be used as a supplement to the diets of weaned infants.[1] It has the advantage of being less costly than whole milk powder.

In India and several other developing countries, the *per capita* production of milk and other protective foods is highly inadequate to meet the needs of the population.[2] The diets consumed by weaned infants consist predominantly of cereals and other starchy foods and are lacking in protein-rich and protective foods. Consequently diseases due to the deficiency of proteins, certain vitamins and minerals are widely prevalent especially among children in these countries.[1,2] Investigations have been carried out by several groups of workers for developing supplementary foods based on oilseed meals and legumes.[3-5] Many of these products suffer from the disadvantage that they can be fed only in the form of a porridge which is generally less acceptable to children than milk. More recently a process for the preparation of a spray dried protein food based on groundnut protein isolate and skim milk powder and similar in composition to skim milk powder has been developed by Subrahmanyan *et al.*[6] The product on reconstitution yields a milk-like product which is highly acceptable to young children. Growth studies with albino rats have shown that the food when incorporated at 10% level in a poor rice diet brought about a marked improvement in the nutritive value of the diets.[7] In the present investigation, the supplementary value of the food to the diets of weaned infants and young children has been studied.

Experimental

Materials: The spray dried protein food was prepared according to Subrahmanyan *et al*[6] The product was fortified with larger amounts of vitamins than those indicated by these authors. The nutritive value of the protein food and rice supplement determined by A.O.A.C.[8] methods is given in Table I.

Table I. *Nutrients in protein food and rice supplements*

	Protein food *+	Rice and sugar§
Calories (Cal)	169	169
Protein (N x 6.25) (g)	10.6	2.1
Fat (g)	0.6	0.4
Carbohydrate (g)	30.4	39.3
Calcium (as Ca) (g)	0.626	0.003
Phosphorus (as P) (g)	0.438	0.033
Iron (as Fe) (mg)	1.8	0.3
Vitamin A (I. U.)	*1020*	—
Thiamine (mg)	0.28	0.03
Nicotinic acid (mg)	4.6	0.4
Riboflavin (mg)	0.61	0.02
Vitamin D (I. U.)	*120*	—
Ascorbic acid (mg)	9.0	—

* Fortified also with Pyridoxine, 0.18 mg; Calcium Pantothenate, 1.2 mg; Vitamin E, 1.5 mg; Choline, 39 mg; Inositol, 45 mg; Vitamin B_{12}, 0.66μg and Folic acid, 0.03 mg per 30 g of the food.
+ Protein food (30 g) and sugar (15 g)
§ Rice (30 g) and sugar (15 g)

Subjects : The subjects of the experiment were 56 boys and 60 girls in the age group 13 to 46 months. All of them belonged to the lower middle and poor classes of the population. The height, weight, haemoglobin and nutritional status of the children were assessed according to the methods used by Subrahmanyan *et al.*[9] On the basis of the initial height, weight and nutritional status, the children were allotted to two groups (experimental and control) so that each group contained 28 boys and 30 girls.

Composition of the diets consumed by the children and feeding of children : A diet survey was conducted at the beginning of the experiment to determine the composition of the diets consumed by the children. The pattern of diets consumed by the different children were more or less similar. The main cereal consumed was raw milled rice. All the children were receiving small amounts of milk. The diets also contained small quantities of pulses, vegetables and bread. The average patterns of the diets consumed by the two groups are given in Table II. In addition to the home diet, each child in the experimental group was given daily a supplement of 30g of the protein food mixed with 15g of cane sugar, while each child in the control group received daily a mixture of 30g. of rice flour and 15g of cane sugar. The spray dried protein food was reconstituted in warm water and given in three doses while the rice supplement was administered as porridge. The pattern of the diets and the feeding of children were similar to those described by Subrahmanyan *et al*[9]. The nutritive value of the diets consumed by the children, calculated using the food composition tables published by Aykroyd *et al.*,[10] is given in Table III.

The experiment lasted for a period of four and a half months, at the end of which height, weight, nutritional status and haemoglobin content of blood of all the children were determined. All the children in the experimental group relished the

Table II. *Pattern of the diets consumed by the children*

Food	Intake in g/child/day			
	Boys		Girls	
	Control group (Rice supplement)	Experimental group (Protein food supplement)	Control group (Rice supplement)	Experimental group (Protein food supplement)
Basal diet (*Rice diet*) Rice raw milled	121	125	117	123
Ragi (*Eleusine coracana*)	12	14	16	14
Whole wheat flour	16	15	14	16
Pulses : Red gram dhal (*Cajanus cajan*), Bengalgram dhal (*Cicer arietinum*)	10	9	6	6
Vegetables, non leafy : ash gourd, brinjal, calabash cucumber and drumstick	15	16	16	15
Vegetables, leafy: amaranthus and drumstick leaves	7	7	6	8
Fruits : Banana	4	5	5	4
Milk (cow's)	70	75	67	68
Oils and fats (groundnut oil and ghee)	12	11	9	10
Condiments and tamarind	1.3	1.3	1.3	1.3
Common salt	6	6	5	5
Sugar and jaggery	37	40	40	36
Supplements :				
Control group				
Rice, raw milled	30	—	30	—
Cane sugar	15	—	15	—
Experimental group				
Protein food	—	30	—	30
Cane sugar	—	15	—	15

the protein food were significantly greater ($P<0.01$) than those observed in the control group receiving an isocaloric rice supplement. About 70-80% of the children in the experimental group improved in the nutritional status as compared with only 20-25% in the control group.

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