C H A P T E R IV

SUMMARY

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The diets of the poor in the developing countries generally suffer from a scarcity of foods of animal origin such as milk, eggs, fish and meat. They do not include adequate quantities of vegetable foods which can supply the nutrients derived from animal foods and their diets are therefore deficient in nutrients such as protein, calcium, riboflavin and vitamin A. Children in the post-weaning period are particularly affected as the foods prepared from cereals in the adult oriented home are not often suitable for them in texture, taste and digestibility. Foodstuffs such as legumes are omitted from their diets because of mistaken notions about their digestibility. Children in these age groups therefore are most vulnerable to the effects of malnutrition and show a high mortality rate.

Because of the importance of adequate nutrition for children of this age group attempts were made to formulate adequate diets based mainly on vegetable sources of food and available in rural areas. The formulations developed were subjected to chemical, sensory and biological evaluation as well as field trials.

Protein deficiency was sought to be corrected by a suitable combination of wheat, bengal gram, groundnut and

small quantities of skim milk powder. The calcium content of the diet was increased by adding slaked lime powder to a sour fermented batter made of wheat and bengalgram, and used for the preparation of 'dhokla' and the quantities added adjusted so that the resulting pH was below 6.5. and the product acceptable in taste. This ensured an increase in calcium content without destruction of thiamine and riboflavin due to the alkalinity of the lime added. The fermentation involved in the preparation of dhokla, the addition of leafy vegetables and the sprouting of wheat for the preparation of conjee served to increase the riboflavin content of the diet. The leafy vegetables also corrected the carotene deficiency in the diet.

The validity of these formulations was investigated in experiments in which the animals were fed the diets formulated and studies madd of their growth rate and body composition. In experiment I groups of animals were fed wheat and bengal gram in various proportions, and the use of the two in the proportions 2:1 or 1:1 identified as optimal. Experiment II showed that the addition of 50 g of groundnut to 50 g of a mixture of wheat and bengal gram resulted in an increase in weight gain. In experiment III incorporation of slaked lime powder in the fermented batter used for the preparation of 'dhokla' improved significantly the length, weight and calcium content of femur, tibia and the same compared

favourably with that obtained by adding standard calcium salts. In experiment IV groups of animals were fed whole day diets as cooked and consumed either in the home or at the field centre and the nutritive value of the diet fed at the centre compared with that consumed at home. The animals fed the diets formulated were found to be superior with regard to growth rate, body composition, psychological performance, brain biochemistry, blood hemoglobin, liver protein and xanthine oxidase and succinic dehydrogenase activities in the liver.

Chemical analyses showed that fermentation of the dhokla batter increased thiamine, riboflavin and nicotinic acid contents.

Based on the results of the above studies, a diet was formulated so as to provide breakfast and lunch to pre-school children at a baby centre in a selected village. The children were provided for breakfast, a conjee made of : sprouted, roasted, powdered wheat (10-15 g); dehusked bengalgram steeped in water dried, roasted, and powdered (10-15 g); roasted and skinned groundnut (20-30 g); and 10-20 g. of brown sugar.

Lunch consisted of : dhokla, a fermented and steamed product made of wheat and bengalgram in equal proportions (35-50 g.each); 20-25 g. of leaf greens; 20-25 g. of potatoes and a glass of dilute buttermilk. The above diet was fed for a period of six months in 1965-1966 and five months in

1966-1967. In the first year 10 g. of skim milk powder plus 30 g. of seasonal fruit were given in addition. Children receiving these diets were compared with those not receiving them with regard to changes in weight and height, clinical status and urinary excretion of nitrogen, creatinine, thiamine, riboflavin and vitamin C. In the first year additional determinations were made of hemoglobin in blood and amounts in the serum, of protein, albumin, vitamin C, carotene and vitamin E and the activity of serum alkaline phosphatase, Data on all these parameters were obtained on apparently well-nourished upper class children of the same age receiving liberal amounts of milk. The studies showed a significant improvement in the fed children with regard to all the parameters measured, their weight gain and biochemical status being comparable with those of upper class children.

These studies show the possibility of ensuring adequate nutrition for pre-school children with diets based primarily on vegetable source of foods.