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THE DEVELOPMENT OF A WEANING FOOD FOR IRAN

by

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A great part of the arguments in favour of developing a weaning food for Iran will be given in our paper "The changing pattern of malnutrition in the child", and I will not repeat them here. Because of the importance of the problem of malnutrition in the young, UNICEF has agreed to help in putting through a programme for the necessary research, with the aim of setting up a factory capable of producing an Iranian-formulated weaning food, manufactured, hopefully, with ingredients produced in the country. These developments will be carried out with the cooperation of the different Ministries, and under the technical supervision and general coordination of the Food and Nutrition Institute of Iran.

In relation to the experience of setting up the industrial manufacture of such goods in countries that have similar production and nutritional problems than Iran, the following formula, which is a slight modification of that being tried out in Algeria and Turkey, will be tentatively developed :

	g per 100 g
Hard wheat flour	30
Chick pea flour	30
Broken pea flour	25
Skim milk powder	10
Sugar	4
Vitamins, flavor, salts, enzymes, aminoacids	1

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This formula will be manufactured initially by a Swiss concern in quantities that will suffice for the feeding and marketing trials.

Animal experiments will be performed to determine the protein value of the mixture (PER, NPU). Also, the level of enrichment with methionine will be studied, because this aminoacid will have to be added due to the strong limitation in sulphur-containing aminoacids of the proposed mixture. These studies will be carried out by TNO, a Dutch laboratory. Alpha amylase will also be added to the mixture so as to make the preparation liquid and therefore adequate for bottle-feeding. The total cost of production, packaging, capital investment interest, distribution and advertising is estimated at 60 US dollar cents per kg, for a product that contains 20-22% of protein. At the present moment, there are no infant foods being manufactured in Iran. Those that exist are imported and cost 4 to 6 times more at retail level. After the marketing and feeding trials have been completed, it is hoped that a factory, with a total investment of US $ 500 000 will be set up, with the financial assistance of UNICEF and the Iranian Government. It is, of course, possible that the ingredients in the formula will be changed, as the studies on protein materials available in Iran advance. The inclusion of Phaseolus vulgaris, that is cheaper than other pulses, is already being studied at the Institute. Also, the possibility of using oilseed proteins, i.e. soya, cotton and sunflower will merit the interest of the investigators at the Institute.

The process to be used in the manufacture will include mixing, pre-cooking and drying.

The feeding trials consult human and animal experimentation.

Animal

1. Short-term Net Protein Utilization on the mixture as such and diluted to 10% protein calories.
2. Short-term Net Protein Utilization on the mixture after boiling and sterilizing. On a freeze-dried sample.

3. Short-term Protein Efficiency Ratio of the mixture and diluted to the 10% protein calorie level. Biochemical determinations on animals fed the diets.
4. Long-term growth. 6 months.
5. Recovery of malnourished rats when fed the formula.

Human

1. Metabolic ward level. Determination of the protein quality through nitrogen balance technique, when given as sole source of food to infants 6 to 12 months.
2. Short-term testing of acceptability and tolerance at the orphanage level. Infants and pre-school children (6 m. to 3 y.) given the mixture as 2/3 of their protein recommendation, for 6 weeks.
3. Long-term testing of growth performance and biochemical evaluation in pre-school children (1 to 4 y.) at the orphanage level, when given as 2/3 of recommended protein allowance for 6 months.
4. Community testing. Determination of the difficulties encountered in using the product in a poor urban community and at the village level.

The marketing trials will proceed when the results of the trials outlined in 2 are completed.

For a detailed programme of testing, methods to be used, etc.., turn to the Annex.

Annex

Details on the programmed feeding trials for a weaning food for Iran

Animal testing

1. Net protein utilization. Short-term evaluation of the protein quality in weanling rats fed the formula at the 10% protein calories level and on the food as such. Comparison with a standard protein (casein, high Nitrogen, Nutritional Biochemical, Cleveland, Ohio) at both levels of feeding. 3 x 64 rats, 10 days for each 64. (1) Direct and indirect determination of carcass nitrogen.
2. Net protein utilization on the mixture after heating or boiling , the same as 1, , but on the freeze-dried, prepared formulae. 2 x 64 rats, 10 days for each 64.
3. Protein efficiency ratio (2) at 10% protein calories level and that present in the formula. Comparison with a standard protein (casein) at both levels of intake. The following biochemical determinations will also be carried out in the rats, at the end of the experimental period of 28 days :

   a. Serum proteins (3); haemoglobin (4); serum and rat cells free aminoacids (5); liver fat (6); nitrogen (7); body composition fat, water, nitrogen, ash.

   Number of rats 3 x 64 ; 28 days for each 64.

4. Long-term growth. Male and female fed the formula as such for six months after weaning. Weight of organs. Fat in the liver (6) serum proteins (3) haematocrit (8) haemoglobin (4) ; comparison with a casein diet at the same protein concentration.

   24 male and 24 female. Controls 12 of each sex.

Testing in humans

1. Metabolic ward level. Place: Children's hospital medical centre. Chief : Prof. M.Gharib. The hospital is dependant from Teheran University.
Method : 12 to 18 children, 6 to 12 months of age, will be fed the formula for three days and then for another five days, period during intake and output will be measured (balance period). The control food will follow for two similar periods (accustoming and balance).
Analyses : Nitrogen, potassium, calcium, phosphorus in intake and output (10),faecalogram (11). In blood (5th day of balance) aminoacids (red cells and serum) blood urea. Collection of urine and faecal samples according to Donoso and Monckeberg (10).

2. Short-term testing at orphanage level.
Method : 24 children 6 months to 3 years of age that will receive the formula as source of 2/3 of the recommended protein allowance from 6 months of age. The total recommendations will be met, for calories and proteins, by the usual institutional food. The acceptability, tolerance (digestive symptoms: diarrhoea, hard stools, flatulence, colic, skin changes : rashes, scaling, itching) and amount eaten will be recorded. A clinical examination will be performed at the beginning and end of the trial which will take 6 weeks. No control group. No laboratory testing.

3. Long-term testing at orphanage level.
Method : Experimental group, sixty four children, 6 months to 4 years of age, that will receive food as outlined in 2.
Control group : 32 children, same age and sex distribution, fed institutional meals (which will be recorded for composition, and total calorie and protein intake).
Clinical examination and antropometry (height, weight, mid arm circumference, chest circ., thorax circ., mid-arm skinfold thickness).
Neurological development in the younger (sits, stands, walks, talks).
Laboratory : serum proteins (3), haematocrit (8), aminoacids in red

cells and serum (5), urea, urinary nitrogen, creatinine (12), hydroxiproline (13). The feeding trial will be for six months. Clinical examination and biochemical at start and end.

4. Community testing.

a. Leila clinic (poor urban, Teheran) and, b. Isphahan, Workers, Insurance Organization Clinic. In charge : Drs. M. Sadre and A. Emami. c. Gorg Tapeh, (village level). In charge : Dr. H. Bastani.
Method : About 100 children in each place, 6 months to 4 years of age, will receive formula as supplement for one year. Where necessary (i.e. early weaning) as sole source of food. The mothers will be instructed through demonstrations (visual aids, slides and own practice), how to use the food. The understanding of the mothers, and the penetration of the knowledge imparted will be assessed periodically at the Centres and at the home level. Bacteriological examination of the bottle-fed formula will be made in random samples. Also control of dilution, with water and with sugar.
The children will be followed clinically and through antropometry. The incidence of respiratory diseases, diarrhoeas and specific infectious diseases will be recorded.

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