WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTE

PAG Guideline
Weaning Foods

SEMINAR ON PROTEIN PROBLEMS WITH
PARTICULAR REFERENCE TO WEANING FOODS
Cairo, 4-8 November 1974

Unclassified

PAG GUIDELINE ON PROTEIN-RICH MIXTURES FOR USE AS WEANING FOODS

SUMMARY

This guideline is a recommendation for the composition of weaning foods, including specifications for levels of protein, calories, fats, vitamins and minerals. Physical characteristics, flavour, taste and packaging requirements are also covered.

Introduction

The serious and widespread problem of malnutrition during the weaning period in tropical and subtropical countries and the inability of lower income groups to purchase sufficient animal protein foods or high-cost special children's foods calls for marketing of nutritious low-cost mixtures based mainly on vegetable proteins with admixture of other proteins where appropriate. In addition to low cost, satisfactory tolerance and acceptability on the part of the child and acceptability to the adult(s) responsible for providing the child's food are important factors Of paramount importance, however, if the primary purpose is to be achieved, is the maintenance of minimal nutritional and sanitary standards, even though this may mean constraints in relation to cost

Ideally, the protein food mixture should be a supplement which is patterned in accordance with the child's diet in the home and fills the gaps with respect to calories, proteins and other nutrients In order to be certain that the minimal needs are covered even under unfavourable dietary conditions, the weaning food mixture should provide protein, vitamins and minerals corresponding to recommended allowances when consumed at the recommended level. The recommended daily intake of the supplement is usually of the order of 100g dry weight with a protein content of no less than 20%. If the recommended daily intake is less than 100g the content of protein and other nutrients should be correspondingly higher These products should not be recommended for infants below six months of age unless they are specifically treated to ensure complete digestibility.

1. Level of Protein

The provision of adequate protein generally presents the most difficult problem during the weaning period and special attention should be given to the quality and quantity of protein in supplementary weaning foods. The NPU value of the protein should not be less than 60 and preferably near 65 and correspondingly the PER, not less than 2.1 and preferably above 2.3 (casein - 2.5; the value for casein varies with different casein products and the strain of rat used). With protein of this nutritional quality, the level of protein in the supplementary food should be at least 20%. If the quality of the protein is higher the quantity can be reduced accordingly.

2. Calories

The mixture should provide as many calories as possible and this may be achieved by adding fat. Poorly digestible carbohydrate, including fibre, should be held to a practical minimum. The starchy portion of mixtures could be modified through various combinations of heat and mechanical processing or enzyme treatment, so that when prepared with water and ready for feeding, the food has minimal bulk and maximal protein availability and maximum calorie density.

3. Fat

Present knowledge does not permit specifying with certainty a dietary allowance of fat. Even so, it will be of great advantage to incorporate into protein-rich food mixtures as much fat as is technologically feasible without compromising the keeping qualities of the food. The fat will increase the calorie density of the mixture. A level of fat contributing 25% of calories to the mixture would be desirable. The linoleic acid content should be at least 1%. Without any addition of extra fat, the protein food may contain nearly 2 to 3% fat derived from the basic ingredients used in the formula. If the cost, including the need for special packaging to ensure adequate shelf life, is found prohibitive, the addition of food fat or oil when the mixture is prepared for consumption is recommended as a possible approach.

4. Vitamins and minerals

Protein-rich mixtures should be fortified with vitamins and minerals sufficient to satisfy recommended allowances. Special attention should be given to vitamin A, riboflavin, niacin, folate, vitamin B_{12}, ascorbic acid, vitamin D, calcium, iron and iodine. Minimal quantities of various vitamins and minerals as proposed in Section 6 are recommended. However, some adjustment in the light of local nutritional problems may be considered. There may be no need to provide additional vitamins or minerals as medication to the child if the high protein mixture is fed at recommended levels.

Physical characteristics, flavour and taste

Acceptability of formulated foods can be enhanced by modern industrial processing such as precooking and roller drying, extrusion cooking and enzyme treatment. The food mixture should be formulated and processed so that by the addition of minimal amounts of freshly boiled water or by cooking after adding water it is easily and quickly prepared as a gruel or porridge of proper consistency for feeding.

Consideration should be given to the processing of starchy components with amylases or by extrusion cooking which will (a) reduce the cooking time in the home, and (b) reduce the viscosity and water retention capacity, or "bulkiness", of the mixture, thus allowing the feeding of a more concentrated preparation. The addition of sugar to protein-rich food mixtures is permissible provided the cost is not unduly increased, since such an additive enhances acceptability. In general, however, the sweetening of the products should be carried out in the home. There is no evidence that sucrose intolerance is a problem of importance.

There is no need to add ordinary salt to the formulated weaning foods.

Guidelines for composition expressed on dry weight basis

	Units per 100 Grammes
Protein	not less than 20g*
Fat	as much as feasible, up to 10g
Crude fibre	not more than 5g**
Moisture	preferably 5 - 10g
Total ash	not more than 5g
Acid-insoluble ash	not more than 0.05g
Vitamin A	1300 I.U. (as vitamin A palmitate, equivalent to 400mcg retinol)

---

* This protein level assumes an NPU not less than 60 and a PER not less than 2.1. If these values are higher the level of protein may be reduced accordingly.

** Crude fibre higher than this may be acceptable although it would require clinical testing

Thiamine	0.3mg
Riboflavin	0.4mg
Niacin	5.0mg
Folate	0.2mg
Vitamin B_{12}	2.0mcg
Ascorbic acid	20mg
Vitamin D	400 I.U.
Calcium	300mg (as phosphate or carbonate)
Iron	10mg (as food-grade compound of adequate iron availability)
Iodine	100mcg (as iodate or iodide)

Note:

Under certain local conditions, the addition of vitamin B_6 (to approximately the level of thiamine) and of alpha-tocopherol should be considered

The values for vitamins and minerals are considered minimal, except in the case of vitamin D, where no further increase is desirable The excess of each vitamin added during processing should be no greater than that needed to maintain label requirements over the expected shelf life of the product

7. Food additives

Use of excessive amounts of flavouring agents, including salt, sugar or other sweeteners, should be avoided. If any food additives are used, they should be those which have been cleared by the Joint FAO/WHO Expert Committee on Food Additives The amounts used should not exceed the minimum necessary to produce the desired effect. Necessary information must be given on the label about the nature and quantities of food additives used in the product

8. Standards and purity

3.1 The ingredients in the formula should meet the national and/or international standards with regard to purity. The FAO/WHO/UNICEF Protein Advisory Group has prescribed quality guidelines for the following:

a) Edible groundnut flour PAG Guideline No. 2
b) Edible cottonseed protein concentrate PAG Guideline No. 4
c) Edible heat-processed soya grits and flour PAG Guideline No. 5

A draft guideline has been prepared for the development and use of fish protein concentrate (FPC) for human consumption (PAG Document 2.8/26).

3.2 Legumes and oilseeds may frequently contain tryptic inhibitors and other undesirable factors which must be reduced by processing before use in high-protein foods. Since all toxic factors may not be eliminated by processing, it is essential that only grain legumes which are nutritionally wholesome and which are toxicologically safe should be used

3 3 The Preparation of a protein concentrate from oilseeds may require solvent extraction Adequate procedures requiring food-grade solvents are described in the Joint FAO/WHO Expert Committee Report No. 14. It is necessary that adequate methods of extraction using food-grade solvents be used to eliminate the dangers of toxicity.

3.4 Cereals, oilseeds and other source material to be used in the basic mixture may be contaminated with toxic molds. The FAO WHO/UNICEF Protein Advisory Group has reviewed this problem and issued a statement (PAG Statement No 2) on the subject

9. Microbiological and sanitary standards

Separate PAG guidelines for microbiological and sanitary requirements will be issued early in 1971.

10. Packaging

Packages and the containers in which they are shipped should provide protection from the inroads of insects, microorganisms, moisture and contaminants. If foods are dispensed from bulk containers, proper sanitary procedures should be observed Simple but effective information with respect to the correct use of the product should be on the package.

11. Shelf-life

The packaged product should remain acceptable for food use in terms of retention of palatability, nutritional availability and freedom from toxic or other deleterious changes for a period of six months under tropical conditions.