

ACCEPTABILITY AND USAGE OF THE NNRI FOOD MIXTURE (PVM)*

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NNRI research workers and others have established that effects of dietary protein inadequacy apply in South Africa mainly to the non-White sector of the community, and are accompanied by deficiencies of certain vitamins.¹

Many schemes for remedying inadequate diets have been formulated and put into practice in recent years in many countries of the world, with widely varying success.² So many of these have failed that it seemed essential that we should investigate and determine the reasons for the success or failure of existing or former schemes before attempting to lay the foundation for a procedure suitable for South African conditions.

An outstandingly successful operation of this type has been the fortification of bread with vitamins and certain minerals by a number of western countries.^{3,4} In these countries nutritionists had become gravely concerned at the inadequate intake of certain B-complex vitamins and minerals by a large part of the population. The main cause of this was the increasing use of refined flours for breadmaking. The reasons for the success of these schemes lie in the facts that bread is the most widely used item in the diet of the populations in question and that fortification has not affected the acceptability of the product in any way. In addition, the flour from which the bread is made and which has been selected as the ingredient to carry the fortification is produced in large well-equipped mills where additions may be made accurately and economically.

LOCAL CONDITIONS

In South Africa a very large proportion of the population most in need of additional nutrients consumes only small quantities of bread. The failure of the bread fortification scheme in South Africa was due mainly to this fact. In addition, the nutrient supplementation was inadequate unless very large quantities of bread were eaten. The net result was that the greater part of the added protein was wasted on people who did not need it, while most of those requiring it did not receive it in quantities adequate to be effective.

The need for protein supplementation is greatest among non-White infants from weaning to the age of about 5 years. Other sectors of the population are likely to suffer from only relatively minor protein deficiencies. As virtually all of this protein-deficient group does not attend school, school-feeding schemes would fail to solve the problem.

Although a high proportion of the population requiring additional high-grade protein is predominantly maize-eating, it was found that the diets of many protein-deficient children are based on bread or rice.

Some of the maize meal eaten by the protein-needy section of the population is milled at home or under primitive industrial conditions, where fortification of the meal would be difficult or impracticable. In addition, a large part of the population eating maize meal prepared under more sophisticated conditions where fortification would be feasible, does not require additional protein.

The fortification of any one or more staple foods on an industrial basis cannot solve the problem of protein deficiency in South Africa. It is also clear that such fortification would result in wastage of proteins intended for the protein-needy.

Most of the really successful efforts to alleviate or remedy nutritional deficiencies had been concerned with the addition of micro-quantities of vitamins and minerals. Such additions had caused negligible effects on the flavour and other physical characteristics of the enriched food, and no problems involving acceptance had been encountered. The position was likely to be very different where the addition of a macro-nutrient such as protein was concerned, especially as most of the suitable available proteinaceous foods are highly flavoured.

The solution of the problem of malnutrition in South Africa could be found only in the development of a suitable mixture which could be supplied for direct addition to the food of those requiring additional protein or could be used as an ingredient for meals prepared and cooked for such people.

When formulating any food product it is extremely important to ensure that the food concerned will be acceptable to the intended recipient. This is especially diffi-

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cult when the product in question is designed for consumption by large sectors of different population groups with different eating habits and prejudices. The most nutritious food capable of being made serves no useful purpose until it is consumed under the conditions for which it was designed.

Malnourished people, especially when they are uneducated and live in primitive conditions, are reluctant to modify their eating habits and prefer to exist on their habitual inadequate foods rather than to adopt new foods of greater value. Long-term malnutrition probably causes important reductions in intelligence and adaptability⁵ and thus renders the alleviation of the condition, through education and precept, more difficult. It was therefore resolved that the product to be developed should be of such a nature that it could be added easily, in small quantities, to any basic or traditional diet and would have a minimal effect on the flavour and other physical properties of that diet. It was recognized at the outset that difficulties in acceptance would be encountered.

USAGE OF THE NNRI FOOD MIXTURE

The NNRI food mixture (protein-vitamin-mineral supplement, PVM) is intended for use in the diet of young children to the extent of only 1 oz./day. This means that the normal diet of the child is modified to only a minor extent, irrespective of the staple foods on which the diet is based. The NNRI food mixture consists of a mixture of proteinaceous ingredients, such as processed soy-bean flour, skimmed-milk powder, fish flour and egg powder, together with certain vitamin, mineral and flavouring additions. It contains more than 47% high-quality protein (lean meat contains about 21% protein) and is so designed that 1 oz. taken daily with an otherwise exclusively maize-meal diet ensures an adequate intake of virtually all essential nutrients.

The NNRI food mixture is highly concentrated and thus the quantity that will be required to be manufactured and distributed will be as small as possible. As manufacturing, packaging and distribution costs will be reduced to a minimum, it should be possible for manufacture to be undertaken in a few high-capacity factories where adequate technical control can be exercised.

It is not intended that the NNRI food mixture should be used as a snack on its own but rather as an ingredient of, or adjunct to, a meal. Nor should more than the recommended quantity be consumed in any one day. It must also be borne in mind that proteins consumed when inadequate quantities of energy foods are eaten are, to a large extent, not used for body building, but are utilized to provide calories. The greatest benefit from the use of the supplement will be obtained when it is consumed with the main meals of the day, preferably when 3 meals are taken and one-third of the daily requirement of the NNRI food mixture is added to, or taken with, each of these meals. Simple unlettered people will want to eat more than is required, in the belief that, if 1 oz. does good, more than 1 oz. will do even more good.

The NNRI food mixture has been used at the H. F. Verwoerd Hospital in Pretoria for protracted periods while

being tested for its effect on the recovery of kwashiorkor patients. No difficulty was experienced with the acceptance of the product. The children are fed 5 times a day and one-third of the daily requirement of the NNRI food mixture is sprinkled over each of the first 3 meals of mealie porridge, and is then partially stirred into the porridge in such a way that, if any food is left, it will not contain any important quantity of the supplement. Not only have the children readily accepted their food, even when their condition has been aggravated by the effects of an infectious disease, but the Bantu nurses attached to the clinic have also shown their appreciation of the product as a food item. We feel that these facts are very encouraging, especially as ill children are notoriously finicky about what they eat.

ACCEPTABILITY OF THE PRODUCT

In order to determine the acceptance of the NNRI food mixture by various sectors of the population, relatively large quantities of the product were prepared and packed in polythene bags in quantities of $\frac{1}{2}$ lb. The bags were heat-sealed and a label giving directions for use in mealie-meal porridge, gravy and soup, in both English and Afrikaans, was stapled onto the bag above the heat seal. The label was simple and entirely wrapped round the bag, and could be considered to be a reasonable facsimile of what might be used as a permanent packing. As no name had at that time been adopted for the product it was described as a 'fortifying supplement'.

A number of acceptability trials were carried out among Bantu in their homelands, with the cooperation of the Department of Health and certain mission hospitals. A test conducted in the Pietersburg area on an isolated Bantu group over a period of 3 months was very satisfactory. The food supplement was either added to cooked mealie-meal porridge or used as a soup ingredient. It was reported that the children preferred such a soup to the traditional vegetable soup which they normally consumed.

At the Jane Furse Hospital no difficulties were encountered in feeding this mixture to infants or children. Adults were more suspicious and wanted to know what had been done to their 'pap'. Nevertheless, there was no real difficulty in ensuring the consumption of the product. The dietitian at the hospital was convinced that even the adults who were not entirely happy with the supplement in their porridge would have accepted it without comment if it had been made up into a sauce or soup or some other product. At the Botha's Hill TB Settlement the children did not dislike their porridge-supplement mixture, and some of them showed a very distinct preference for this mixture over plain mealie-meal porridge.

At the University of Cape Town Medical School it was found that, with very ill children, milk was preferred. However, when the children were not too ill, most of them readily accepted the supplement, both as a soup and with mealie-meal porridge. Three of 14 children were reluctant to take these products, but when the supplement was used as a sauce ingredient, all the children partook readily. The group concerned consisted of both Bantu and Coloured children.

The total weight of the supplement prepared and packed for the above-mentioned tests was about 1,800 lb.

Dietitians of the Division of Home Economics and Dietetics of the Department of Agricultural Technical Services investigated ways and means of utilizing the supplement in more sophisticated dishes designed for use mainly by town dwellers of all races. The bases of the meals evolved were well-tried recipes such as had been supplied to thrifty housewives for many years to enable them to make tasty, nutritious food at relatively low cost. It was found that it was possible to replace all or part of the meat or other main protein material by a smaller quantity of the supplement and still obtain fully acceptable dishes. These dietitians maintain that PVM can be used in virtually all types of traditional dishes of all South African races. However, due to its content of dehydrated egg, it should not be made into a watery mixture and heated unless some thickening material, such as a starch or flour, is present. In the absence of such material the product curdles and precipitates.

The acceptability of any product is greatly affected by the manner of its presentation to the purchaser. It is, therefore, important that when PVM is marketed or distributed it should not appear cheap or inferior. An inexpensive polythene bag offers adequate protection against deterioration and such a bag can be made attractive. The purpose of the product should be clearly stated on the package in type that can be readily seen. In multilingual South Africa it may be desirable to have more than one type of package, giving usage recommendations and recipes, as well as the conditions under which its use is recommended, in several of our common languages. It is suggested that manufacturers should experiment with various flavouring materials to increase palatability. We have found spices to be promising flavourings and most of the products we tested had proportions of added curry

powder. There is, however, ample scope for the ingenuity of the food technologist.

Parents should not show anxiety or doubt when first feeding food containing the supplement to their children. Tenseness or uncertainty on the part of the parents can cause resistance by the children to any change of diet—even to the extent of causing psychological vomiting.

SUMMARY

Existing and former schemes designed to improve the nutrition status of the population of various countries are examined to determine the causes of their success or failure. The reasons for developing the NNRI food mixture (PVM) as a concentrated food supplement for the heterogeneous population of South Africa are discussed and the advantages of this approach to the problem are expounded. Results of acceptability tests carried out are discussed. Recommended usage procedures for use in children's meals are given. Recipes showing the versatility of the NNRI food mixture are mentioned.

The staff of the Physiology Division of the NNRI arranged the preparation and dispatch of the samples for trial at the various centres.

REFERENCES

1. Potgieter, J. F. and Fellingham, S. A. (1962): *Incidence of Nutritional Deficiency Diseases among the Bantu and Coloured Populations in South Africa as Reflected by the Results of a Questionnaire Survey*. CSIR Research Report No. 190. Pretoria: Council for Scientific and Industrial Research.
2. Belden, G. C. jnr, Congleton, W. L., Devoto, W. R., Hurlbut, T. A. jnr, Johnston, B., Katz, D. P., Michelson, J. T., Pipkin, A. P., Tibbits, C. D. and Weston, D. R. (1964): *The Protein Paradox*, pp. 1-65. Boston: MR Management Reports.
3. National Nutrition Research Institute (1959): *Food Enrichment in South Africa*, pp. 2-52. CSIR Report No. 172. Pretoria: Council for Scientific and Industrial Research.
4. Sebrell, W. H. jnr (1966): *Cereal Science Today*, 11, 228.
5. Stoch, M. B. and Smythe, P. M. (1962): *Proc. Nutr. Soc. Sth. Afr.*, 3, 39.