Improving Young Child Feeding in Eastern and Southern Africa

Household-Level Food Technology

Proceedings of a workshop held in Nairobi, Kenya, 12-16 October 1987
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Editors: D. Alnwick, S. Moses, and O.G. Schmidt

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Abstract

The weaning period, that is the period in a young child's life when supplementary foods are introduced to complement breast milk, poses great nutritional risk to children in developing countries. By the end of the second year of life, one-third of children in eastern and southern Africa are chronically malnourished. The following factors contribute to the growth faltering commonly observed in weaning-age children: low nutrient intake, high incidence of diarrheal disease (often caused by contaminated weaning foods), and recent declines in duration and intensity of breastfeeding.

Food scientists, nutritionists, and health planners working in Africa and South Asia met in an international workshop to examine household-level food technologies that hold promise for improving nutrition of infants and young children. After reviewing current knowledge of breastfeeding and weaning practices in eastern and southern Africa, participants discussed the use in weaning diets of fermented foods and germinated flour, for both improved nutrient intake by young children and decreased risk of food contamination. Research that should be conducted into the effectiveness of the food technology was identified and its diffusion at the community level discussed.

This publication contains the proceedings, conclusions, and recommendations of the workshop. It is directed at scientists and health planners who are involved in nutrition research and developing programs to improve feeding of infants and young children in developing countries.

Résumé

Le sevrage, c'est-à-dire la période où l'on commence à donner des aliments solides à un jeune enfant en complément du lait maternel, présente de graves risques nutritionnels pour les enfants dans les pays en développement. Dès la fin de leur deuxième année, le tiers des enfants en Afrique orientale et australe souffrent de malnutrition chronique. Les facteurs suivants sont à l'origine du retard de croissance que l'on retrouve couramment chez les enfants en âge d'être sevrés : carence nutritionnelle, forte prévalence des maladies diarrhéiques (qui s'expliquent souvent par la contamination des aliments) et diminution récente de la durée et de l'intensité de l'allaitement maternel.

Des spécialistes des sciences de l'alimentation, des nutritionnistes et des planificateurs de la santé travaillant en Afrique et en Asie du Sud se sont réunis dans le cadre d'un atelier international afin d'examiner des technologies alimentaires applicables au niveau des ménages qui semblent prometteuses pour améliorer la nutrition des nourrissons et des jeunes enfants. Après avoir examiné les connaissances actuelles en matière d'allaitement au sein et les pratiques de sevrage en Afrique orientale et australe, les participants ont discuté de l'utilisation, au cours du sevrage, d'aliments fermentés et de farine germée, tant pour améliorer l'apport nutritionnel chez les jeunes enfants que pour diminuer les risques de contamination des aliments. Ils ont également discuté des recherches qu'il y aurait lieu d'entreprendre sur l'efficacité des technologies alimentaires et sur leur diffusion dans la collectivité.
Cette publication fait un compte rendu des discussions de l'atelier et présente ses conclusions et ses recommandations. Elle s'adresse aux scientifiques et aux planificateurs de la santé qui participent à des recherches en matière de nutrition et à l'élaboration de programmes visant à améliorer l'alimentation des nourrissons et des jeunes enfants dans les pays en développement.

Resumen

El período de destete, es decir, aquel período en la vida de un niño en que se introducen en su dieta alimentos suplementarios para complementar la leche materna, representa un gran riesgo nutricional para los niños de países en vías de desarrollo. Hacia el final de su segundo año de vida, un tercio de los niños en África oriental y del sur muestran síntomas de malnutrición crónica. Los siguientes factores contribuyen al crecimiento vacilante que se observa comúnmente en los niños que se encuentran en edad de dejar la lactancia materna: baja ingestión de nutrientes, alta incidencia de diarrea (a menudo causada por alimentos para el destete contaminados), y nuevas disminuciones en la duración e intensidad de la alimentación proveniente del pecho de la madre.

Científicos del campo de los alimentos, especialistas en nutrición y planificadores de la salud que trabajan en África y en el Sur de Asia se reunieron en un taller internacional para examinar las tecnologías de alimentos que se utilizan en el hogar y que prometen buenos resultados en el mejoramiento de la nutrición de lactantes y niños pequeños. Después de analizar el conocimiento que existe actualmente sobre la alimentación recibida a través del pecho de la madre y las prácticas que se utilizan para el destete en el oriente y sur de África, los participantes discutieron el uso en dietas para el destete de alimentos fermentados y harina germenada para que los niños puedan ingerir nutrientes mejorados y haya una disminución en el riesgo causado por la contaminación de los alimentos. Se identificó la investigación que se debe realizar sobre la efectividad de las tecnologías de alimentos y se discutió su difusión en el seno de la comunidad.

Esta publicación contiene las actas, conclusiones y recomendaciones del taller. Está dirigida a científicos y planificadores de la salud que participan en la investigación nutricional y en programas de desarrollo para mejorar la alimentación de lactantes y niños en los países en desarrollo.
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FOOD PROCESSING IN UGANDA WITH SPECIAL REFERENCE TO INFANT FEEDING

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Abstract A current survey in Uganda is examining the processing of several foods, among them bananas, cassava, maize, milk, millet, and sorghum. The processing methods under study include sun drying, fermentation to produce sour porridges or alcohols, detoxification of certain toxic cassava species, and the addition to foods of souring fruits. The resultant improvements are discussed, together with the value of processed foods, especially those that are fermented or germinated, in infant feeding. Particular attention is given to problems associated with weaning and with the feeding management of sick children. Preliminary findings suggest that the use of locally available foods in the feeding of sick infants prevents further deterioration of their nutritional status. Protein energy malnutrition (PEM) in Ugandan children is now believed to be related to improper weaning practices; among other consequences of these practices are the infectious and noninfectious diarrheas that exacerbate an already dangerous situation. It should be possible, in developing processing techniques, to take advantage of the wealth of traditional experience with which Ugandans have met the nutritional problems of infants. Agriculturally, Uganda has the potential to produce enough food for its population; to alleviate the problem of infant feeding, therefore, these rich, natural food resources should be more efficiently used.

Uganda's nutritional problems have long been recognized, and much research has been undertaken to find causes and possible solutions. Today, however, about 30% of preschool children in Uganda suffer from chronic malnutrition (RTI 1984). This situation will remain unchanged until appropriate intervention measures are identified. In her historical review of Uganda's nutritional problems during the pre- and post-colonial eras, Sserunjogi (1985) found that the dominant causal factor for protein energy malnutrition (PEM) in Ugandan children was not a shortage of available food, but rather the existence of improper weaning practices.

The weaning period presents many nutritional and developmental problems. This critical period is associated with a high rate of
infection, particularly of diarrhea, that eventually precipitates the condition of malnutrition. The infant's breast-milk diet guarantees anti-infective protection, ease of digestibility, and ready availability. Foods are often given that are difficult to digest and that are therefore poorly utilized by the fragile digestive system of the young infant; these foods are, moreover, often prepared, stored, and fed to the infant under conditions that are only marginally hygienic. The availability of appropriate weaning foods that would ensure adequate nutritional intake depends both on regional and on domestic food supplies; the nutritional status of weaning infants also depends, however, on the manner in which these foods are handled.

Problems associated with weaning can also be traced to inattention to maternal welfare. The importance of maternal nutritional status during pregnancy and during lactation must not be underestimated: good nutritional status ensures not only adequacy of lactation, but also appropriate timing for the initiation of weaning.

Prospects for local food production, eating habits, and urbanization are all factors that are likely to influence traditional weaning patterns. This paper briefly discusses preliminary results from an ongoing study in Uganda that is attempting to identify ways of improving the health and nutritional status of weaning infants. This study is evaluating attitudes toward weaning foods and the ways in which they are used, with particular attention to the use of fermented foods in the management of diarrheal disease. Careful consideration of traditional practices (practices that are usually based on generations of practical experience) often suggests important and appropriate solutions that are more easily accepted by mothers than the "modern" techniques.

Agricultural Potential of Food Crops

Uganda is a rich agricultural country: about 70% of its land area is suitable for agricultural activities. The last agricultural census was carried out in 1963-64 (Uganda 1965). Because of a lack of comprehensive data on subsequent changes in farming systems, the analyzed data of this census have regularly been used to give a general picture of the food-production characteristics of the past, as they compare with the recent agricultural situation (1971-85 yield estimates). Because of an improvement in the provision of agricultural services, there was, at the time of the earlier census, some improvement in farming practices; this momentum was lost, however, during the political events that occurred between 1971 and 1985, and it is argued that domestic production has now fallen to the 1963-65 levels (Muthee 1987).

Although the entire population of Uganda experienced conditions of social disruption for many years, the country did not undergo serious food shortages between 1971 and 1985. This can be attributed to the rich natural resource base and to the diversity of agricultural production in most areas of the country. Even when the standard of technology was low, adequate rainfall and fertile soils helped to maintain sufficient food output; although the agricultural sector producing cash crops collapsed, the sector producing subsistence crops thrived. Domestic food crops afterwards became important cash crops, and now sales of small domestic surpluses contribute more than
one-third of the rural household cash income (Bank of Uganda 1987). Were the management of the food-crop sector to improve, Uganda would have definite potential for increased food production. Allowing for such an improvement, the government projects a surplus yield in the food-crop sector for the 1986-90 period.

In summary, the food-crop sector in Uganda has, during the last 15 years, produced only enough for broad self-sufficiency. So that the country may be self-sufficient in food production and have surpluses for export, the government has indicated that the food-crop sector is in future to be given the highest priority (Uganda 1987). It remains to be seen whether the struggle for an exportable surplus will allow the agricultural sector to satisfy the needs for domestic food consumption.

**Nutrition Problems in Uganda**

Those segments of the population most severely affected by nutritional problems in Uganda are children, mothers, the elderly, the urban poor, and the displaced. The most prevalent nutritional deficiency disease is PEM, clinically manifested as kwashiorkor or marasmus, often associated with anemia.

Protein deficiency in the traditional Ugandan diet was for many years believed to be the cause of kwashiorkor. The predominance of a vegetarian diet with high carbohydrate content was blamed for the low protein intake. It was recommended, therefore, that output of animal food products be increased.

In the early 1960s, nutrition rehabilitation centres were established in which nutrition education would be used to persuade mothers to feed their young children with foods high in animal and vegetable protein. Mothers were considered ignorant about the nutritional needs of their children and were blamed for misusing the locally available foods.

In the mid-1960s, a new food product was introduced to the Ugandan infant diet: soy products - to be promoted as locally available, high-protein processed foods - were introduced for the low-income consumer (Harrison 1972). The technology of multimixes came at about the same time; this technology was intended to help balance local diets and thus improve the essential nutrient intake for infants.

Around this time, a new perspective opened on the problem. Bennett and Stanfield (1972) found that marasmus occurred in areas with low total food intake, despite the fact that the quality of the diet in these areas was adequate. This line of research, pursued by Rutishauser and Frood (1973), suggested that the fundamental problem in infant feeding was not in fact protein deficiency, but rather an inadequate intake of energy: not only had most of the foods a low fat content, but the traditional cooked staples were high in bulk, meaning that the number of meals consumed were fewer than was desirable. It was recommended, therefore, that diets include traditional relishes made from groundnuts and sesame seed mixtures; in this way, energy density would be increased and the bulkiness of the diet reduced (Church and Doughty 1976; McDowell 1976; Goode 1982). By means of
this strategy of high-energy intake, the local, traditional Ugandan diet, with its low-protein intake, would be protected.

Frequency of feeding depends on several factors: availability of adequate cooking fuel; distance of the water source from the home; time required by mothers in preparing extra meals; and economic constraints. The typical Ugandan family has two main meals per day - the morning meal and the evening meal. This trend cannot change without disrupting the local pattern of life; measures that encourage change must, therefore, encompass an understanding of these factors.

Rutishauser and Whitehead (1974) found that frequent episodes of illness, especially of diarrhea, take place during the weaning period. These episodes cause lowered appetite, which in turn limits food intake. Moreover, although the sick children have nutritional needs that are higher than normal, proper food utilization is made more difficult by the illness itself. Appropriate intervention is urgently required in the feeding management of sick children; only in this way will they be protected from further deterioration in nutritional status.

When we examine the many causes of nutritional problems, we must not overlook poverty and low purchasing power. As long as the standard of living remains low, especially in the urban areas, nutritional problems will continue to exist.

In the past, much criticism of the African diet has been based on the high carbohydrate content of the foods. In view of the fact that, over the years, estimates of nutrient requirements have been revised downward, we should acknowledge that these bulky staples are a major source of total nutrient intake in the local diet and that many people will continue to survive on them. There is, however, a need to improve on this diet of bulky staples: traditional processing methods could be employed to facilitate the assimilation and utilization of valuable nutrients in the food.

**Infant Feeding Practices in Uganda**

Mothers are currently taught that all babies, until they are 4 months of age, can grow well by feeding solely on breast milk; although the teaching includes the fact that very few babies can continue to grow properly if they receive only breast milk after the age of 6 months, many of the mothers in the survey started supplementary feeding as early as 1 month or as late as 12 months of age. The fact that breastfeeding may continue for up to 2 years does not solve the problems created by late initiation of supplementary feeding.

A number of reasons are given for early supplementary feeding or cessation of breastfeeding: insufficient milk production by the mother; the onset of a new pregnancy; the appearance of the infant's teeth; the mother's poor health; the mother's return to work; and, most commonly, the decision that the child is big enough that he or she may stop.

During the period of supplementation, the foods most commonly used are: diluted cow's milk; porridge made out of maize, millet, or sorghum flour; vegetable stews; and tea. This period is followed by
one in which the child partakes of the typical family diet. Because, in this situation, young children traditionally obtain their meals whenever the mother is ready to have hers, the concept of frequent feeding for infants becomes difficult to implement. Most of the foods that can be prepared for infants have a short shelf life, and mothers rarely have enough time to prepare extra meals for their children. Sanitary conditions are poor, especially in urban areas; water supplies are inadequate; and a great deal of cold leftover food is consumed. The resultant bacterial food contamination leads to diarrheal diseases in the children.

Traditional Food-Processing Techniques

The foods commonly processed include millet, sorghum, bananas, maize, milk, and cassava. These foods are usually processed for consumption as cold or hot porridges, or for alcoholic drinks. It has traditionally been found that processing brings the following advantages: prolonged shelf life, improved flavour, better texture, easier grinding, and stimulation of the appetite; processing also allows detoxification of toxic cassava species and facilitates the preparation of butter fat and the making of beer.

Cassava

Cassava is processed in different ways by different cultures. Fresh cassava roots are soaked in water ponds or pots and left to ferment for 3-4 days; alternatively, these roots may be peeled and then heaped or piled in the house or in a hole in the ground, then thoroughly covered with banana leaves and left to ferment for 3-4 days. Eventually, the mould is scraped off, and the roots are broken into pieces and sun dried. The dried cassava is normally stored in baskets. With its susceptibility to insect infestation, cassava cannot be stored in a powdered form for long; it is therefore ground or pounded into flour only when needed.

Cassava can also be processed by sun drying the roots without prior fermentation. In this form, the dried cassava roots can be stored in granaries for a longer time than can the fermented type. In some areas of Uganda, particularly in the northwest, the cassava root is very bitter and contains high levels of cyanide toxin; this cassava must be processed by the first method - that is, by fermentation, followed by sun drying.

Even for the nontoxic cassava, the processing that involves fermentation is said to be preferable: this method makes the root much easier to grind into flour; it also provides a better texture for bread-making; and the dishes cook much more quickly, thus saving on cooking fuel and time. For bread-making, fermented cassava flour is mixed with either nonfermented millet, sorghum, or maize; the choice of grain depends on cultural preference. This main dish is prepared once or twice a day for the family meal.

Except in the northwestern regions, where, in times of abundant supply, it is used as a breakfast porridge for children, cassava flour is not used for porridge as often as are the cereal flours. In northwest Uganda, where cassava is consumed only in fermented form, cassava porridge is used mainly when there is diarrheal disease: it is
believed to help stop the diarrhea and to restore the physical strength of the sufferer. The porridge, when cooked, is smooth in texture, nonfilling, and has a pleasant, appetizing flavour for the invalid. In the eastern region (Teso district), the thick texture of nonfermented cassava porridge is believed to help stop diarrhea and is therefore preferred to the fermented types.

**Millet and Sorghum**

Millet and sorghum can be processed into sour porridge ("bushera") and alcoholic beverages in the following way: the dry grain is soaked in water for 1 day to initiate germination; the wet grain is then mixed with ash and left to germinate further for 2 or 3 days, covered with banana leaves; eventually, the grain is sun dried and ground into fine flour.

"Bushera" is commonly processed in the southwestern region of Uganda. The dry, germinated sorghum flour is boiled into a porridge that can be drunk hot or cold. "Bushera" can also be prepared by boiling ungerminated millet flour into a thick porridge; freshly germinated millet flour is then added to sweeten the porridge and to lower its viscosity.

"Bushera" can be taken at any time of the day, and can be kept for 3-4 days before it becomes a strong alcoholic beverage. Very young children can safely consume "bushera" within the first 2 days before it becomes sour; because the sour type of "bushera" is believed to cause stomach upset in very young children, it is not given to infants under 8-12 months. In most of the southwestern region, "bushera" is drunk instead of water or tea. It is said to be very palatable, especially for invalids, and is believed to stimulate the appetite.

In other areas of the country, the nonfermented (or germinated) millet or sorghum porridge is commonly used as an early weaning food. (Except for beer making, the practice of fermenting millet is nonexistent in these areas.) Nonfermented millet and sorghum porridge can be made sour by the addition of tamarind (traditionally known as "kiti" or "pitei" in northwest Uganda and as "chwa" in eastern Uganda), lemon juice, or herbal mixtures. The acidic water from these fruits or vegetables is used to boil the porridge, leaving it with a low viscosity, a smooth texture, and a distinctly acidic flavour. Porridge is often soured to improve the flavour and to make it palatable when there is no sugar; it is not, however, recommended for very young children. Because this soured porridge is believed to improve the appetite, it is very popular during convalescence.

**Milk**

Sour milk is most popular in pastoral areas, mainly in the western and eastern parts of the country. Sour milk is a staple food for the whole family, with the exception of very young infants of less than 6-8 months old. The "ghee" or butter fat, obtained through the process of churning the milk, is one of the main constituents of relishes and sauces, especially for the lactating mother; the energy intake of the family diet is thus improved, both for the children and for the adults. (We should bear in mind the fact that young children often nibble on whatever the mother is eating, provided it is soft.)
Because sour milk is believed in some areas to cause diarrhea, it is not always a part of the staple diet.

Bananas

Certain types of sweet bananas are processed mainly for alcoholic drinks. A nonalcoholic drink can be made by crushing the fruit with spiky grass to extract the juice. When the beverage is within the 1st day of preparation, it is quite safe to give to children. It is sometimes added to boiled porridge when there is no sugar available. Banana juice ferments into alcohol within 2-3 days and is then unsuitable for consumption by children.

Seasonal Availability and Use of Land

Patterns of consumption depend on many factors. Most people in rural communities know, for example, those seasons suitable for the planting and harvesting of specific food crops. Cassava is a perennial food crop and is, therefore, available all the time. The roots of the toxic species must, however, remain in the soil for not less than 2 years; availability depends, therefore, on whether the crop is mature enough for consumption. For proper agricultural planning to take place, there must be sufficient land available for crop rotation. The adequacy of the food supply depends, therefore, on the amount of land available for agriculture.

During the harvesting season, when there is enough food to guarantee a surplus, the consumption of sorghum and millet, sour porridge, and cassava porridge is much more common. Children can then have porridge more often during the day, in addition to the family meals.

Most people in rural areas are subsistence farmers, often working for long periods in the fields, away from their homes. Because sour porridge can be safely carried to the fields, it is popular as the main food of the day; it is also the first meal taken when people return home after a heavy day's work. Not only is it a digestible and nutritious food for all types of people, but it is also cool, refreshing, appetizing, and has a lengthy shelf life; these factors combine to make it an extremely valuable food.

The low standard of living has made people turn away from traditional eating patterns. It is cheaper to depend on household food supplies for the family's main meals and on porridges for supplementary snacks or meals for the children. Food crops in most areas have become a source of cash income, and the people tend to sell most of what they grow in surplus. There is, therefore, no surplus food stored in granaries; in times of household food shortages, most families depend on purchased food. In those times, food is often not available for preparing extra meals for infants.

Certain methods of preparation are not acceptable in some religious sectors of the population. There is a taboo against alcohol in Muslim communities; caution must, therefore, be exercised when advocating any method of preparation that might, with time, make a food or beverage alcoholic.
In the ongoing study, the mothers interviewed to date have given lists of foods that they would either use or avoid during their children's illnesses. The following are among those foods widely recommended for sick infants: germinated and nongerminated sorghum porridge, fermented and nonfermented cassava porridge, and nongerminated maize porridge. Millet porridge and millet bread are avoided completely, as are sour milk, potatoes, eggs, boiled beans, peas, fruit, and porridges soured with fruit or vegetables. This paper cannot give in detail the reasons behind these beliefs. There should be some investigation into the effects on child feeding of those situations in which "avoided" foods are the only foods available.

Conclusions

The benefits obtained from fermented or germinated food products have been exhaustively discussed in the literature (Tomkins et al. 1987). Among these benefits are: improved nutritional value, better storage capability (ensuring ready availability of the feeds), improved digestibility because of microbial and biological reactions, and low pH content, thought to prevent bacterial growth. The most important problem to be identified regarding the use of traditionally processed foods for infant feeding may be that of inadequate household food supplies; this inadequacy can usually be traced to economic and social constraints. To guarantee infants an adequate provision of these processed foods, families must grow a surplus of food not only to supply their domestic needs but also to generate cash income.

Although they may not know the scientific theory behind the technology, the indigenous people of Uganda do appreciate the value of processed foods. They are often aware of what is suitable for infants, and what can be used in such circumstances as illness and convalescence; it may nevertheless be possible to recommend changes that would further the solving of specific, well-defined problems in infant feeding, such as the feeding of a sick child or the management of a child with acute diarrheal disease.

The technology of germination and fermentation has a significant role to play in solving the problem of inadequate weaning practices. Early weaning affects the maintenance of adequate milk production; cow's milk, diluted with possibly contaminated water, appears to be the most common supplement given during this early weaning period. There is a need for a safe weaning food that can supply the nutritional needs of all stages of the infant's development. There is also a need to determine the "safety margin" of fermented foods as weaning foods: these foods offer some protection against the common disease pathogens of infants, usually present through poor sanitary conditions.

In Uganda, production of food crops is promising. A fuller understanding of the benefits that accrue from the use of local, traditional technologies will help in promoting existing local food resources.

Finally, it should be remembered that if any achievements in child feeding are to be appreciated by the local population, traditional cultural practices must be respected.
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