

Dialogue on Diarrhoea

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Safer weaning

Children with diarrhoea need foods which are nutritious and easy to eat, both to help them fight infection, and to ensure that any lost growth is made up. Weaning age children are very prone to infection, and need frequent feeding. Therefore, it is especially important to ensure that weaning foods are nutritious and free from diarrhoea germs. In food preparation, both fermentation (or souring) and germination (sprouting), can help to ensure safer wean-

ing. In this special issue of *DD*, Andrew Tomkins and Fiona Watson of the London School of Hygiene, together with David Alnwick of UNICEF, Kenya, contribute a guest editorial introducing a series of articles from around the world which take a new look at these traditional techniques.

Fermentation

Fermentation has been widely practised for centuries as a way of preserving food. *DD 40* reports on studies which show that fermentation can prevent the growth of diarrhoea germs in cereals. Fermented

maize porridge in Ghana has been found to contain fewer diarrhoea bacteria than freshly prepared porridge (see page 3). On page 6, an article on the use of fermented foods in different Kenyan communities raises a number of questions. Are people forgetting traditional methods of food preparation? Have they been discouraged from using them by health workers who promote the benefits of freshly prepared food? Are there problems with fermented food?

Helping children to eat enough

The thickness or bulk of food can prevent children from eating enough, especially if they have poor appetites due to diarrhoea. Often, mothers prepare a more dilute, watery feed, which is less nutritious, but easier for a sick child to eat. It would be better if a food could be prepared with a high nutrient content, but which was not so thick. Pages 4 and 5 describe how adding flour made from sprouted grains can make thick porridge more liquid, without reducing its food value.

Community beliefs

It is essential to assess cultural acceptability before recommending widespread promotion of fermented or germinated foods. The example from Tanzania on page 7 highlights this very clearly. We would be most interested to hear from readers about the kinds of weaning foods commonly used in their communities, and those foods which are given to children during and after diarrhoea to speed recovery and growth.

Andrew Tomkins, David Alnwick, Fiona Watson



Aga Khan Foundation/Jean-Luc Ray

Weaning foods should be nutritious and free from diarrhoea germs. Can traditional food preparation methods help?

In this issue:

- Improved weaning foods
- Fermented food – reducing contamination
- Adapting food technologies – but what do mothers think?

AHRTAG

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Technologies Action Group Ltd

Anti-diarrhoeal withdrawn

The Wellcome pharmaceutical company has suspended sales of its Anti-Diarrhoeal Mixture (ADM), following questions raised after a UK television programme on inappropriate drug use. The programme, 'Hard to Swallow' by Granada Television for the World in Action series, featured ADM on sale in Kenya where it was being recommended for infants. ADM is a mixture of pectin and kaolin. The World Health Organization, among others, has stated that this is not recommended in the treatment of diarrhoea and can be dangerous, especially for infants. Oral rehydration therapy for diarrhoea is always more important than any drug treatment. Following complaints from the public and the involvement of members of the UK government, Wellcome has ordered the drug to be withdrawn from sale worldwide.

Vitamin A project

Recent studies have found links between vitamin A deficiency and child mortality. This has led to a new project (supported by the US Agency for International Development) to prevent vitamin A deficiency in young children. The VITAL project provides:

- technical assistance, including design of interventions, monitoring and evaluation
- support for operational research to test new ways of increasing coverage
- information gathering and dissemination, on vitamin A problems and programmes worldwide

For further information, contact: **Mr Robert Pratt, VITAL, 1601 N Kent St., Suite 1016, Arlington, VA 22209, USA.**

A picture from the flipchart produced for teaching families about Sanquito.



Improved weaning foods: Peru

The Dietary Management of Diarrhoea project (DMD) has been working in Peru to reduce problems of malnutrition associated with childhood diarrhoea, by developing a nutritious and culturally appropriate weaning food. A study was carried out in Callejon de Huaylas, a farming valley 400km from Lima. After local food use and beliefs about feeding were investigated, recipe trials were carried out in several communities, to develop an easy-to-prepare weaning food that could be used during diarrhoea. Mothers themselves were involved in the development of the recipes, and assessed their feasibility.

It was found that most recipes prepared for children with diarrhoea were soups and porridges with low energy density (energy per weight of food). The exception was 'sancu', a traditional semi-liquid with a high caloric density (200kcal/100g). Sancu was not usually given to children, but the research team decided to adapt it to include pre-toasted bean flour as well as the usual ingredients. This new product

was called 'sanquito' to emphasise the fact that it was especially for children.

In a second set of recipe trials, mothers were given the ingredients of sanquito and asked to prepare it at home. Results were positive: it was well accepted by both mothers and children, and increased the daily energy consumption of young children.

Sanquito recipe

Put one grated carrot in six tablespoons of heated oil, add one cup of water, and sugar to taste. Mix thoroughly while adding one cup of pre-toasted wheat flour and half a cup of pre-toasted bean flour. Cook and mix until smooth.

The DMD project in Peru was jointly undertaken by the Johns Hopkins University (USA), the Nutrition Research Institute and the Ministry of Health (both Peru). For further information, contact: **Enrique Jacoby, 103 E M Royal Ave., Apt. 706, Baltimore, MD 21202, USA.**

Book reviews

Village eye health

Clearly written and beautifully illustrated, this welcome and attractive book provides a practical guide to the diagnosis and safe effective management of common eye problems in the context of primary health care within the community.

Hanyane: A Village Struggles for Eye Health. Written and illustrated by Erica Sutter et al. for the International Centre for Eye Health, London. Macmillan Ltd, 1989, 263 pages, paperback. Price UK£3.00, from Dr Alan Foster, ICEH,

27-29 Cayton Street, London EC1V 9EJ, UK. Cheques or money orders payable to Institute of Ophthalmology.

Community water

Readers of *DD* are especially aware of the health hazards associated with a lack of safe water and adequate sanitation. This book sets out original concepts and field experiences which could assist community planners and field workers in their efforts to improve water supplies, especially in rural areas. Eleven very useful chapters

are linked by explanatory notes and cover a wide range of countries. Well illustrated, the book includes a useful note on currency conversion rates, a comprehensive reference list and suggestions for further reading, together with a guide to agencies involved in the International Drinking Water Supply and Sanitation Decade.

Community Water Development. Selected and edited by Charles Kerr. Intermediate Technology Publications, 1989, 279 pages, paperback. Price UK£9.95, from IT Publications, 103-105 Southampton Row, London WC1B 4HH, UK.

Reducing contamination

Fermentation kills some of the germs which cause diarrhoea; fermented food is suitable for infants, and may be safely stored for longer than fresh food. DD presents a report from Ghana.

Contaminated weaning foods are a major cause of infant diarrhoea. Foods become contaminated with diarrhoeal germs from faeces where there is a lack of both clean water and safe sanitation. Good hygiene is essential to prevent contamination. Hands and utensils which come into contact with food must be clean. Even when hands look clean, they may be covered with tiny germs, and should always be washed with soap before eating or preparing food.

Storing food in warm conditions allows germs to breed and multiply, increasing the risk of diarrhoea. Freshly cooked food contains less bacteria than food cooked hours or days earlier. Health workers, therefore, have advised mothers to prepare food freshly for every meal, but this is not always practical or possible, because fuel, food and time for cooking are usually limited, and so infant food is often stored and used for several meals. A preparation method which prevents bacterial contamination and growth in weaning foods during storage could improve infant health and nutrition. Fermentation of cereals - a traditional practice in many countries - could provide an answer.

Fermented porridge

During fermentation, food becomes more acid (which is why it tastes sour), and this reduces or prevents the growth of diarrhoea germs. In Ghana, maize dough is commonly fermented before being cooked and eaten as porridge. In our research, we put diarrhoea-causing bacteria (*Shigella flexneri*, which causes dysentery, and *Escherichia coli*) into fermented maize dough. We found that these bacteria would not grow at all in the uncooked dough, and that they would grow only at a very reduced rate in dough cooked into porridge.

We continued this study in a village in Ghana where there was no chlorinated piped water or adequate sewage disposal. Samples of fermented and unfermented maize dough porridges prepared by mothers were examined for levels of coliform

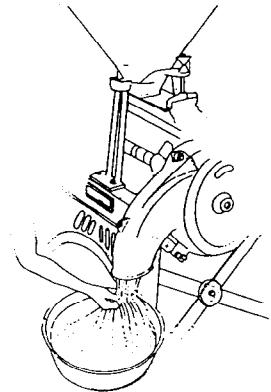
bacteria. Figure 1 shows that, immediately after cooking, both fermented and unfermented porridges contained very few bacteria. After six and 12 hours, however, the fermented porridges were less contaminated than the unfermented porridges. (The uncooked fermented maize dough was less contaminated than the fermented porridge).

We have concluded that germs which cause diarrhoea are inhibited by an antimicrobial substance produced during fermentation. This could explain why fermented maize porridge is less effective in inhibiting these germs than fermented maize dough: possibly, the water added to make porridge dilutes the antimicrobial substance.

Patience P A Mensah, Andrew Tomkins and Bohumil Drasar, Noguchi Memorial Institute for Medical Research, Ghana; and Clinical Nutrition Unit, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK.

Making fermented maize dough porridge

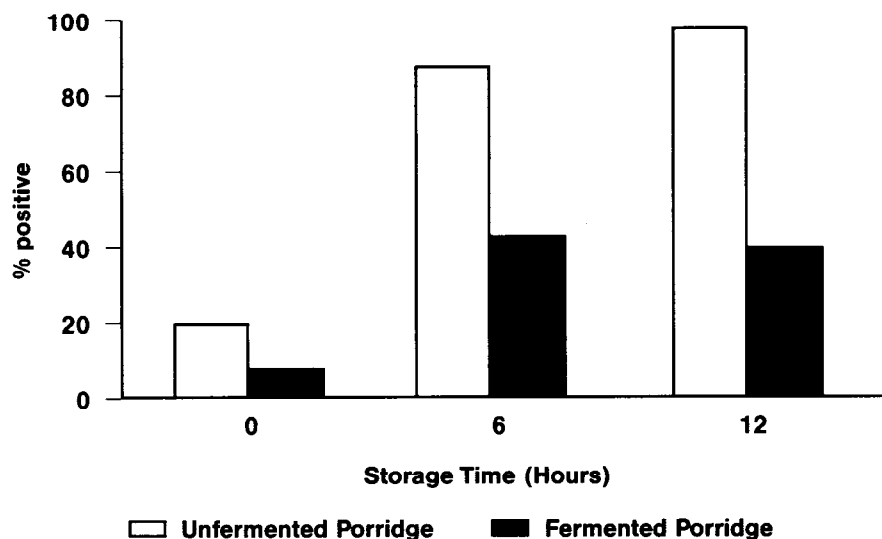
- 1 Soaked maize grains are ground to produce unfermented maize meal.



- 2 Maize dough is made by adding water to the meal. Desirable bacteria and yeasts ferment the dough and make it acidic.
- 3 The dough is cooked into porridge before being given to infants.



Figure 1: coliform bacteria in porridge during storage



Improved weaning foods

Germinated flours

Adding flour made from sprouted cereal grains to weaning porridges makes them more liquid, helping young children to eat more of them. Stephanie Gallat explains.

Many weaning age children suffer from protein-energy malnutrition. This is often because weaning diets are based on staple cereals or root crops which contain a lot of starch. Weaning porridges made from starchy foods cooked in water can be thick and difficult for young children (less than two years old) to chew and swallow. However, if porridge is diluted to make it easier to swallow, the energy density (calories per gram of food) is reduced. A young child is usually unable to eat enough porridge - either thick or watered down - to supply the energy needed for healthy growth.

How can young children get more energy from weaning porridge? The use of germinated cereal flour is one possibility, because it makes thick porridge semi-liquid without diluting it. Germination of cereals (allowing them to sprout) activates amylase enzymes in the grain. These enzymes attack starch molecules and break them down into sugars. As the starch is broken down, it loses its capacity to absorb water and swell. Therefore, porridge made with germinated flour has a higher concentration of energy but a liquid consistency. Only a small amount of germinated flour (five per cent of the total flour) is needed, and it can be added after cooking ordinary thick porridge in the usual way.

Power flour

The idea of using germinated flour to make weaning foods more liquid, but no less nutritious, was pioneered in Tanzania in the early 1980s, by the Tanzanian Food and Nutrition Centre. The promotion of germinated flour (called kimea or 'power flour') for use in weaning porridges has been one aim of the Joint Nutrition Support Programme supported by UNICEF (and WHO) in the Iringa region of Tanzania, and has since spread to other parts of the country. Research about power flour, also known as Amylase Rich Flour (ARF) has also been undertaken in some Asian countries, notably India and the Philippines.

Flour made from sprouted sorghum or



Most weaning diets are based on staple cereals.

millet is recommended in Tanzania, as these cereals are cheap and widely available, and during germination they develop a high starch-breaking capacity. Sprouted wheat, rice and maize have all been used successfully in India, as have sprouted legumes (beans and peas) in the Philippines. Trials in India, carried out by members of the Department of Food and Nutrition, MS University of Baroda, have shown that porridges made more liquid with ARF are acceptable to both mothers and children. Children fed porridges with ARF ate three to four times the amount per meal com-

pared to a control group given porridge without ARF. More recent trials have shown that children aged seven to 24 months fed porridge with ARF once a day for six months grew better than children fed other porridge. Also, the ARF group had fewer days of illness.

The safety of using germinated sorghum for children has been questioned. Some varieties produce significant amounts of cyanide when sprouted, and so could be toxic. Our research has shown that boiling cyanide-containing germinated flour in water reduces the cyanide content to safe levels. Therefore, we recommend that after the addition of germinated flour, the porridge is kept boiling for a further two to three minutes. As well as reducing cyanide content, this also destroys diarrhoea bacteria which may be present in the germinated flour.

Feeding during diarrhoea

The use of germinated flour in weaning foods may be a valuable way of feeding during and after a diarrhoeal episode. Anorexia (loss of appetite) is one of the major problems of severe diarrhoea. If taking food by mouth leads to vomiting, tube feeding can be used. But, because they have to be liquid, most tube feeds have a very low energy density and do not provide enough calories. If cereal flour is added to the tube feed to increase the energy content, the feed becomes too thick and will not pass through a standard sized tube (AK30 or French size 8). To solve this problem, dietitians in India tried using a porridge which includes ARF. A feed was prepared with 19g ungerminated flour, 1g wheat ARF, 15g sugar, 2g oil and 80ml water. The cooked feed was kept in a pot with a lid to prevent loss of water by evaporation and possible thickening. This mixture was thin enough to pass easily through a standard tube.

Stephanie Gallat, Overseas Development Natural Resources Institute, Central Avenue, Chatham Maritime, Chatham, Kent ME4 4TB, UK.

Improved weaning foods

Sprouted grains, peas and beans: research from the Philippines

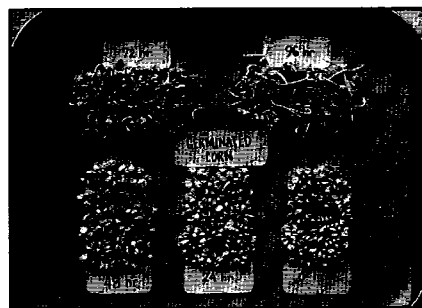
We have been doing research to develop four weaning food flour mixes based on combinations of germinated cereal grains (rice or maize) and germinated legumes (mung beans or cowpeas), with promising results. (The four mixes were based on germinated rice/mung bean; germinated rice/cowpea; germinated corn/mung bean; and germinated corn/cowpea.)

The process

1. **Germination** - in either a clay pot with cover, or a plastic basket, at room temperature. The germination times that resulted in porridge with the best thickness and flavour were three days for grains and two days for legumes.
2. **Drying and winnowing**
3. **Roasting (for three minutes)**



Sprouting grains and legumes



Sprouting maize

4. Milling to flour

5. **Mixing** - to a 70:30 ratio of germinated cereal to germinated legume, which we found resulted in the ideal eating consistency for infants, good taste and nutritional content.

This process makes weaning porridge more digestible, as well as making it less thick and easier to eat. The anti-thickening capacity produced by germination was not removed from the flour by drying and roasting.

Food value

A 100g serving of any of these germinated grain and legume mixes provides more than a third of the daily requirements of energy and protein recommended for infants. (The combination of beans or peas with grains provides a

good source of protein). Because the ingredients have been germinated, the resulting porridge is liquid enough for young children to eat 100g easily at one meal, even with extra solids added.

Storage and contamination

All four flour mixes kept for six months stored at room temperature in plastic bags or boxes, and remained safe for infants to eat.

Cost

The average cost of these foods is about a quarter of the cost of commercially available weaning foods.

Lydia M Marero, Senior Science Research Specialist, Food and Nutrition Institute, Ermita, Manila 1000, Philippines.



During a ten day feeding test, all four foods were well received by infants

Adapting food technologies

But what do mothers think?

Mothers are often given advice about how to feed their children and on looking after children with diarrhoea at home. How often are they asked if the advice is appropriate or acceptable? Fiona Watson describes two studies in which the views of mothers and health workers were sought. The findings show how important it is to understand what people think and do before introducing new ideas.

1 Fermentation in Kenya

This study describes finding out about the use of fermented foods in feeding young children, and the prevention and management of diarrhoea in Kenya - before the promotion of new ideas.

In Kenya, cereal based porridge (uji) and milk are traditionally fermented, but very little research has been done to find out how widespread the practice is, and whether fermented foods are given to young children. It is thought that fermented foods are becoming less popular, especially in urban communities where commercial products are beginning to replace traditional foods. The aim of the study was to discover how widely fermentation is still practised in Kenya, and what mothers and local health workers think about it. Interviews took place with 451 mothers: from an urban area (the slums of Nairobi) and from a rural area (Kibwezi). Fifty health workers in these areas were also interviewed.

Over half the mothers interviewed gave their children fermented foods, although this was more common in the rural area. Fermented uji was the most frequently given fermented food, followed by fermented milk. Although many mothers reported giving their children fermented foods, most of them thought they were not good for very young children (see Figure 1). Reasons given were that fermented foods were inappropriate for babies less than one year old, as they were too sour for young stomachs and could cause stomach ache. Another reason was the disapproval of health workers, some of whom associated fermented foods with rotten or left over food. Most mothers and health workers also said that fermented foods should not be given to sick children as they may increase sickness (including diarrhoea) and be hard to digest.

There was general agreement that fermented foods are less popular now than in

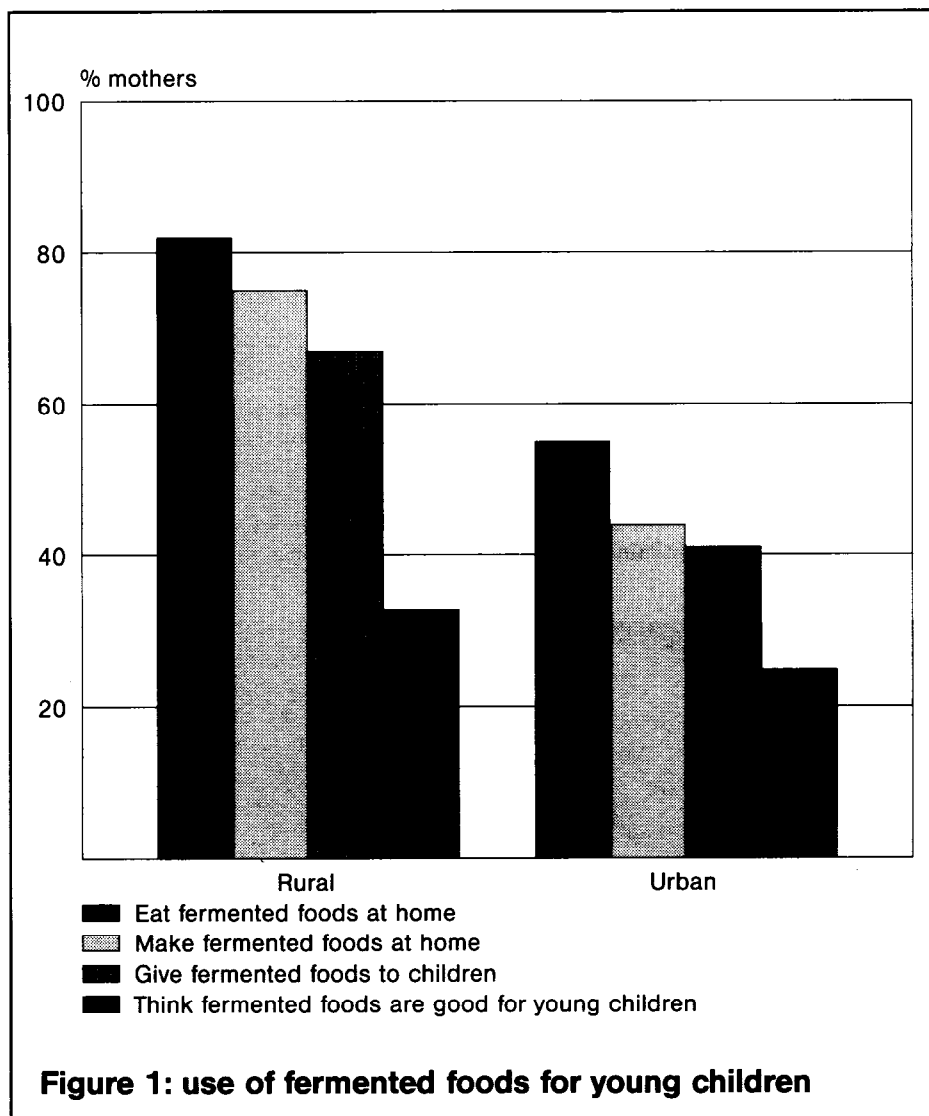


Figure 1: use of fermented foods for young children

the past. This was thought to be mainly due to a change in lifestyle and because tea, soft drinks and milk have replaced fermented uji at breakfast.

These findings suggest that, although foods are still frequently fermented at home and given to children, the practice is changing, partly because health workers are dissuading mothers from giving their children fermented foods. Therefore, health workers need to know about the be-

nefits of fermented foods to ensure that they reinforce appropriate traditional feeding practices which may be helping to prevent diarrhoea in young children.

The Kenyan study reported on this page was carried out in collaboration with the African Medical and Research Foundation (AMREF). The Tanzanian study described on page 7 was carried out in collaboration with the Southern Region's Health Project, Mbeya Region.

Adapting food technologies

2 Germination in Tanzania

This study evaluates the use of germinated cereal (kimea) for feeding young children in an area of Tanzania where it has been promoted within a broader health and nutrition intervention programme.

In Tanzania, one solution to the problem of thick, starchy weaning foods has been to promote the use of 'kimea' or 'power flour' (see page 4). Kimea is germinated cereal, usually millet or sorghum, which is traditionally used in Africa for brewing beer. When a small amount of kimea is added to a thick porridge it makes it more liquid, but no less nutritious. Kimea is available in most households and is a cheap and simple method of increasing the energy density of weaning foods.

Promotion of kimea has, however, been initiated in Tanzania largely without examining its acceptability to mothers. Use of kimea was evaluated in Kyela district, in four project villages where kimea has been promoted and four non-project villages where there had been no promotion. Questionnaires were used to interview 131 mothers and 37 dispensary staff at mother and child health clinics on a particular day.

Just over 40 per cent of the mothers living in the project villages and some from the non-project villages had heard about

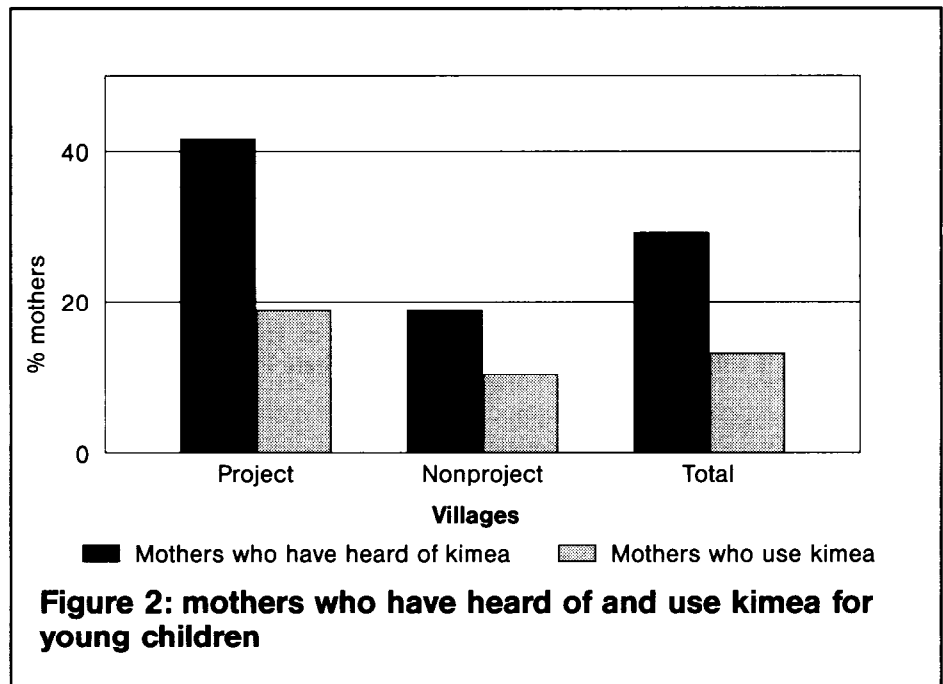


Figure 2: mothers who have heard of and use kimea for young children

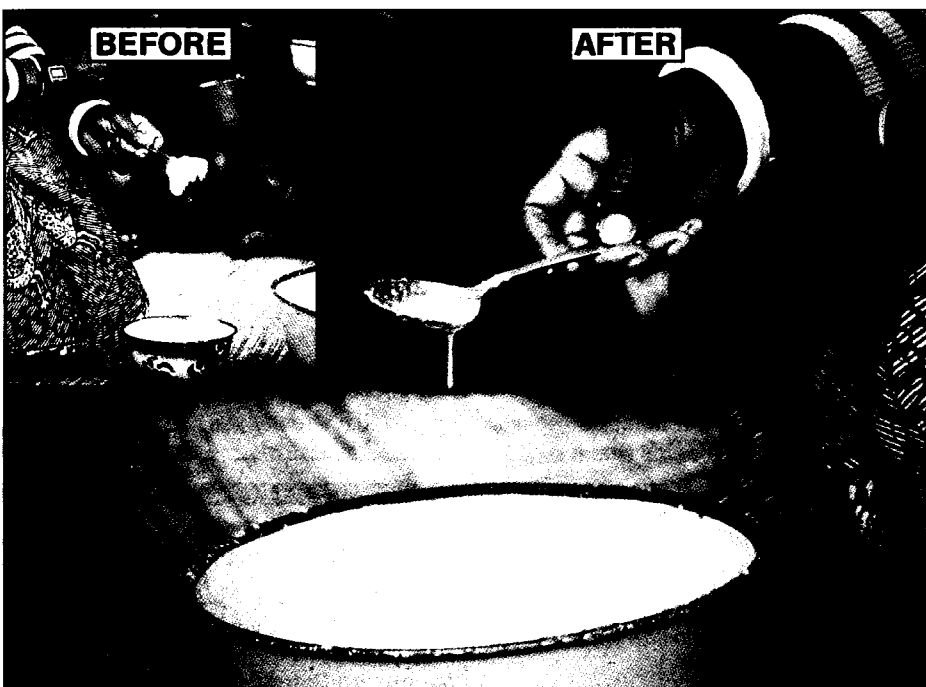
using kimea for feeding children, which suggests that the promotion programme has had some success (see Figure 2). However, less than half of the mothers who had heard that kimea could be used in children's porridge had actually adopted the practice, and 40 per cent of these project village mothers were unable to describe how to cook uji with kimea correctly.

The mothers who had heard about kimea and health workers who demonstrated how to cook uji and kimea were asked why porridge thinned with kimea was good for young children. Many of them said that it increased the energy in porridge or gave strength, while only two mothers mentioned that it helped children to eat more. This implies that mothers and health workers in this project do not fully understand the concept of increasing energy density. Some respondents appeared to have the wrong idea that kimea was like a magic powder which added energy to the food.

Nearly all the mothers used kimea in the preparation of some food or drink (usually beer), and many prepared kimea themselves. There was strong feeling, however, that beer was not an appropriate food for young children, raising the question of whether mothers will mix a product used mainly for brewing into their children's food.

The findings from this study suggest that the kimea promotion programme in Kyela has been of limited success and few mothers have adopted the practice. There appear to be problems of acceptability which could override the potential advantages of introducing kimea into child feeding.

Fiona Watson, Clinical Nutrition Unit, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK.



The same porridge shown both before the addition of kimea (inset), and a few minutes afterwards (main picture).

Ulf Svanberg/Wilbald Lorri

Education is most important

I agree with Cordula Ran (*DD37*, page 8) that malnutrition and diarrhoea (and possibly measles) are major contributory causes of vitamin A deficiency. I have three specific points:

- most children coming to our health centre with corneal lesions have had, or have, diarrhoea;
- they have been given ORS, but not nutritious food;
- ORS is saving children's lives, but not their sight.

It has been suggested that brief information about preventing vitamin A deficiency could be printed on ORS packets. I support this idea, but emphasis should be given to health education. This has always been the missing link in our health policies. For instance, if the women in Nepal knew that nutritious food should be given as well as ORS, and also that naturally occurring nutrients are cheaper and better than vitamin A capsules, their children might not have vitamin A deficiency.

I believe it would be easier for mothers to understand health education given by local instructors than instructions written on an ORS sachet, usually in languages they hardly comprehend.

Dr Johnny Onyekoro, Randle Health Centre, Surulere, Lagos, Nigeria.

More than plain water

In *DD35* (page 7), William Brieger stressed the value of discussion and culturally sensitive dialogue in health education. I would like to share my own experiences on this issue with other *DD* readers. Until recently, in this part of Sri Lanka, mothers often had very little faith in ORT, and expected diarrhoea to be treated with different pills and mixtures. To them, ORS seemed to be 'just plain water', and they believed that increasing fluid intake would lead to more watery stools. The ORT failure rate was always higher when the treatment was carried out at home, because mothers did not know how to mix and give oral rehydration solution. Since

the start of the CDD programme, health workers have been promoting ORT within a health education campaign. The preparation of ORS is shown to groups of mothers, who then realise that it is more than plain water. We now have ORT units in all our health posts and the dramatic results have impressed mothers so much that they ask for ORS straight away in an attack of diarrhoea.

M C W Perera, Hospital and Dispensary, Neuchatel State Plantations, Neboda, Sri Lanka.

Vitamin A in ORS?

Undernutrition (including vitamin A deficiency) is common in my area, and cases are often worsened by diarrhoea. ORS is commonly given here, as well as home fluids. But would it not be a good idea if vitamin A was included in ORS sachets?

H D Sefu, Medical Assistants Training School, P O Box 415, Blantyre, Malawi.

Breastfeeding and pregnancy

Dr Katherine Elliott, Scientific Editor, replies to a number of DD37 readers who asked questions about breastfeeding protecting against pregnancy.

Frequency and intensity of sucking are the most important factors which control the length of time during which breastfeeding protects against pregnancy. Once the menstrual cycle returns, breastfeeding mothers need some form of contraception so that they and their children can have the benefits of adequate family spacing. But mothers who breastfeed fully on demand, suckling their babies often during both day and night, and giving no other foods, enjoy at least several months of natural protection against pregnancy in most circumstances. There are contraceptives that are specially recommended for use by breastfeeding women if need be - that is when menstruation begins again.

More information

References provided by the authors of articles in this issue are available on request to *DD* at *AHRTAG*.

Nursing Mothers' Association of Australia

We apologise to the Association for printing their address incorrectly in issue 37 of *DD*. The correct address is: P O Box 231, Nunawading, Victoria 3131, Australia.

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...if your letter in *DD* puts you in touch with other readers. We always like to hear of contacts made through the *Dialogue*. We also like to know how readers use the newsletter - do you share your copy with others, use it for teaching, reproduce or translate any of it? Would you like information on new subjects, or in different languages? Please write and let us know.

Explanation of Terms

FERMENTATION: a method of preserving food, usually cereals or milk, which allows harmless micro-organisms (special bacteria, yeasts or moulds) to grow in the food. These organisms can prevent the growth of other micro-organisms which cause disease and make food go bad. Fermented foods often taste sour.

GERMINATION: allowing grains or seeds (such as rice, maize, or beans) to sprout, and produce small shoots. This usually takes about two to four days. Flour made from germinated grains contains enzymes which can make thick food more liquid without reducing its food value.

LEGUMES: vegetables which grow in pods: usually peas and beans.

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