

# Dialogue on Diarrhoea

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The international newsletter on the control of diarrhoeal diseases

UNICEF photo by Steve Maines



Mothers need to know about oral rehydration therapy, and primary health care workers can provide appropriate information.

The well known journal, *The Lancet*, suggested in 1978 that oral rehydration therapy was potentially the most important medical advance of the century. Our last issue looked at what has been achieved in treatment and control of diarrhoea over the past decade by WHO, UNICEF and USAID. Our next issue will feature highlights from the Third International Conference on Oral Rehydration Therapy (ICORT III), held in December 1988.

## State of the World's Children

Meanwhile, UNICEF's newly published report on The State of the World's Children criticises many cur-

rent approaches to development as being of least benefit to those most in need. Immunisation and oral rehydration programmes help greatly to reduce illness and death among children. But adequate nutrition, clean water, safe sanitation, improved housing, primary health care and basic education remain key factors in child survival; and child spacing and family size limitation are increasingly recognized as essential to maternal as well as child health.

Recent *DDs* have covered many of these themes and especially emphasized the value to families of female education. As the concept of home-based ORT gains acceptance, spread of

knowledge and understanding becomes a key issue at every level.

## Looking forward

Development of even more effective ORT solutions and diarrhoeal disease control measures must go hand-in-hand with wider understanding of why diarrhoea causes dehydration and how ORT works (see pages 4 and 5), more accurate home measurement alternatives (see page 6) and better appreciation of how cultural, behavioural, economic and environmental factors influence the spread and outcome of diarrhoeal infections.

KME and WAMC

## In this issue:

- Diarrhoea pathophysiology
- Zimbabwe: measuring home-made ORS
- AIDS and diarrhoea

# AHRTAG

Appropriate Health Resources &  
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# New publications

## Health Care Together

Health Care Together — Training Exercises for Health Workers in Community Based Programmes, edited by Mary Johnston and Susan Rifkin, contains teaching exercises for all levels of health personnel who are likely to be involved in community based primary health care. The manual is aimed at trainers and the exercises are designed to encourage health workers to develop appropriate skills and attitudes — particularly in the area of communications — so that they can respond to the needs of communities. Published by Macmillan, the manual is available from Teaching Aids at Low Cost, P O Box 49, St Albans, Herts AL1 4AX, U.K. and costs £1.95 (plus postage and packing).

ory Service, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK, the bulletin costs £3.00 (inclusive of postage and packing).

## Wall Chart

Helminths Eggs and Larvae Found in Faeces is a plastic-coated A2 wall chart (colour), available to readers in developing countries at a special price of £1.00 (plus £0.50 airmail postage) from Tropical Health Technology, an organisation which provides a non-profit equipment service to district hospitals and primary health care laboratories in developing countries. For further information please write to Tropical Health Technology, 14 Bevills Close, Doddington, March, Cambridgeshire, PE15 0TT, UK.

includes practical advice and information about low cost aids and equipment.

*CBR News* is published three times a year, by AHRTAG and the Institute of Child Health in London. Like AHRTAG's other newsletters — *DD*, *ARI News* and *AIDS Action* — *CBR News* is available free of charge to readers in developing countries (there is a subscription fee of £10.00 or US\$20.00 per year to other readers). Please write to AHRTAG for further information.

## News about *DD*

Readers may be interested to know that *Dialogue on Diarrhoea* is now available in Chinese, Bangla and Tamil editions as well as French, Spanish, Portuguese and Arabic. If you would like to receive *DD* in any of these languages please write to AHRTAG, 1 London Bridge Street, London SE1 9SG, UK.

Children's Poster Competition. An exhibition of some of the best posters entered for the *DD* Children's Poster Competition was held at the Commonwealth Institute in London in October 1988. The exhibition created a great deal of interest and many organisations have asked if they can use the posters to promote better health awareness. The posters were also displayed at the Third International Conference on ORT in December 1988 in Washington D.C., USA. Prizes have been sent out to all winners and runners up, and in addition, all children who submitted a poster will receive a small prize as well as a certificate.

The *DD* editors would like to say a belated but special thank you to the Voluntary Health Association of India for their help, VHAI not only widely publicised the poster competition in India, but also arranged for the many entries this publicity generated to be brought over to the UK. VHAI have also kindly offered to help with distribution of prizes within India. Many thanks also to the Hog Harbour primary school in Vanuatu, as well as to all other readers who collected posters for the competition. Finally, the editors would like to thank Air India for their generous assistance in transporting prizes to India.



Health Care Together

Talking together is an effective way to develop good communication skills.

## Small Scale Sanitation

The Ross Bulletin No 8 on Small Scale Sanitation, has recently been updated and revised by Dr Sandy Cairncross. Its sixty pages cover, in easy to read language, the advances of the last ten years in knowledge about low cost sanitation. The booklet contains many excellent illustrations, a useful glossary, references and lists of addresses, and will be useful for environmental health workers at all levels. Available from the Ross Institute Information and Advis-

## Rehabilitation newsletter from AHRTAG

*Community Based Rehabilitation (CBR) News* is a new international newsletter providing practical information about rehabilitation of disabled people. *CBR News* is especially concerned with bringing rehabilitation services to the disabled in their own families and communities, involving disabled people themselves in planning and providing these services, and

**Enteric disease is a frequent clinical finding in acquired immunodeficiency syndrome (AIDS). Micro-organisms known to cause diarrhoea are found in the stools of many AIDS patients with diarrhoea; however, in a significant proportion of cases, no agents are found. Leonardo Mata reports.**

Diarrhoea is considered to be an 'indicator disease' of AIDS, if it is caused by *Cryptosporidium*, *Isospora* and cytomegalovirus, or in some instances by *Salmonella* or *Shigella*. People with AIDS have an impaired immune function and succumb to gut colonisation or invasion by common enteroviruses, *Cryptosporidium* or *Isospora*. Persistence of enteric agents is associated with both acute and chronic diarrhoea and with wasting. Bacterial overgrowth may also develop in the small intestine of AIDS-infected persons, causing chronic diarrhoea and malabsorption. This resembles the non-HIV tropical jejunitis seen in less developed countries. Last but not least, the human immunodeficiency virus (HIV) — itself the accepted cause of AIDS — is found in the intestinal crypts and lamina propria of persons with AIDS. It is likely that other organisms will be added to the list of agents associated with AIDS diarrhoea, for example *Trichinella spiralis*, *Capillaria philippinensis*, papovavirus.

Similarities have been noted between the faecal flora of AIDS-infected persons and those of immunocompetent (normally immune) children living in deprived rural circumstances. Pathogenic and opportunistic agents are similar in both groups; both show multiple infections; in both, acute and chronic diarrhoea are frequent, often leading to malabsorption and wasting (in children, failure to thrive).

### Supportive therapy

There is no effective cure for the diarrhoeal diseases of AIDS. Abatement of the illness after antimicrobial therapy may be followed by relapse, or proliferation of other diarrhoeal organisms. Supportive therapy consists of giving oral and intravenous rehydration solutions to correct fluid and electrolyte imbalance, and food. Management of AIDS diarrhoea is complicated by the difficulties in eliminating the agent and associated symptoms, and by the critical condition of the patients.

Since gut pathogens are significantly more prevalent in less developed countries, they are likely to play a greater role in AIDS there. HIV infection rates are similar in both sexes in central Africa, as are rates of AIDS diarrhoea. Transmission of enteric agents in the general population is by the faecal-oral route, person-to-person, and via contaminated food/water and flies; and rates of diarrhoeal disease are also similar in both sexes.

Currently in North America and Western Europe, HIV infection and hence, AIDS diarrhoea, occurs primarily in homosexual men. Efforts to improve personal hygiene and environmental sanitation should continue to receive a high priority in less developed countries where transmission of diarrhoea agents is favoured by poor hygiene and environmental sanitation.

**Professor L Mata, Professor and Head of Microbiology, Institute for Health Research (INISA), University of Costa Rica, Costa Rica.**

Enteric agents associated with diarrhoea in AIDS*		
Group	Agent	Clinical spectrum
helminths	<i>Strongyloides stercoralis</i>	diarrhoea, cramps, wasting
protozoa	<i>Isospora belli</i> <i>Cryptosporidium</i> spp. microsporidia <i>Giardia lamblia</i> <i>Entamoeba histolytica</i> <i>Dientamoeba fragilis</i>	diarrhoea, cramps, malabsorption, wasting
bacteria	<i>Chlamydia trachomatis</i> <i>Campylobacter jejuni</i> Other <i>Campylobacter</i> <i>Shigella</i> spp. <i>Clostridium difficile</i> <i>Vibrio parahemolyticus</i> <i>Mycobacterium avium intracellulare</i> bacterial overgrowth of small intestine	diarrhoea, cramps, septicemia, colitis, wasting
viruses	cytomegalovirus herpes simplex human immunodeficiency virus (HIV)	diarrhoea, colitis, wasting

\* Adenoviruses and other enteric viruses are common in persons with AIDS

Archer, D L, and Glinsmann, W H, 1988. Enteric infections and other cofactors in AIDS. *Immunology Today*, 6:292-5.

Budhreja, M, Levendoglu, H et al., 1987. Duodenal mucosal T-cell sub-population and bacterial cultures in acquired immune deficiency syndrome. *Am. J. Gastroenterol.*, 82:427-31.

Laughton, B E, Drickman, D A, et al., 1988. Prevalence of enteric pathogens in homosexual men with acquired immunodeficiency syndrome. *Gastroenterology* 94:984-93.

Mata, L, Urrutia, J J, et al., 1984. Infectious agents in acute and chronic diarrhoea of childhood. In: Lebenthal, E (ed) *Chronic diarrhoea in children*. Raven Press, NY pp. 237-252.

Nelson, J A, Wiley, C A, et al., 1988. Human immunodeficiency virus detected in bowel epithelium from patients with gastrointestinal symptoms. *Lancet* i:259-62.

Smith, P D, Lane, H C, et al., 1988. Intestinal infections in patients with the acquired immunodeficiency syndrome (AIDS). *Ann. Int. Med.* 108: 328-33.

# Diarrhoea pathophysiology

## Mechanisms of diarrhoea and why they matter

**What happens in the body when someone has diarrhoea? How can understanding the mechanisms help us to give better treatment to patients? William Cutting discusses these questions.**

With diarrhoea, the water content and, usually, the number and volume of stools all increase. Stools also change in consistency, colour and smell. Because normal patterns of defaecation differ considerably, it is usually the patient or the mother who first diagnoses diarrhoea — noticing that the stools have become more liquid, frequent and different in appearance.

In many cases diarrhoea stools are watery but, if blood is visible in stools, the condition is called dysentery. Most episodes of diarrhoea are acute, coming on suddenly and lasting only a few days. In some, the diarrhoea persists and the condition becomes protracted or even chronic. This article concentrates on acute diarrhoea.

### Structure and function of the bowel

The alimentary tract is much more than a tube from mouth to anus. Its main function is to take in and absorb the fluid and nourishment the body needs for function, growth and repair. A series of glands pours in the digestive juices and the muscles of the bowel mix and propel the contents. Food and drink may often be contaminated with dangerous organisms. The body is protected by the acid stomach juices and also by specific and non-specific immune defence mechanisms. These differentiate between different types of protein molecules swallowed. Food protein must be absorbed, but the immune responses of the bowel have to block, inactivate or kill dangerous micro-organisms — pathogens — but not those which normally live in the bowel and do no harm (commensals).

The small bowel or intestine is where most fluid and food is absorbed. The

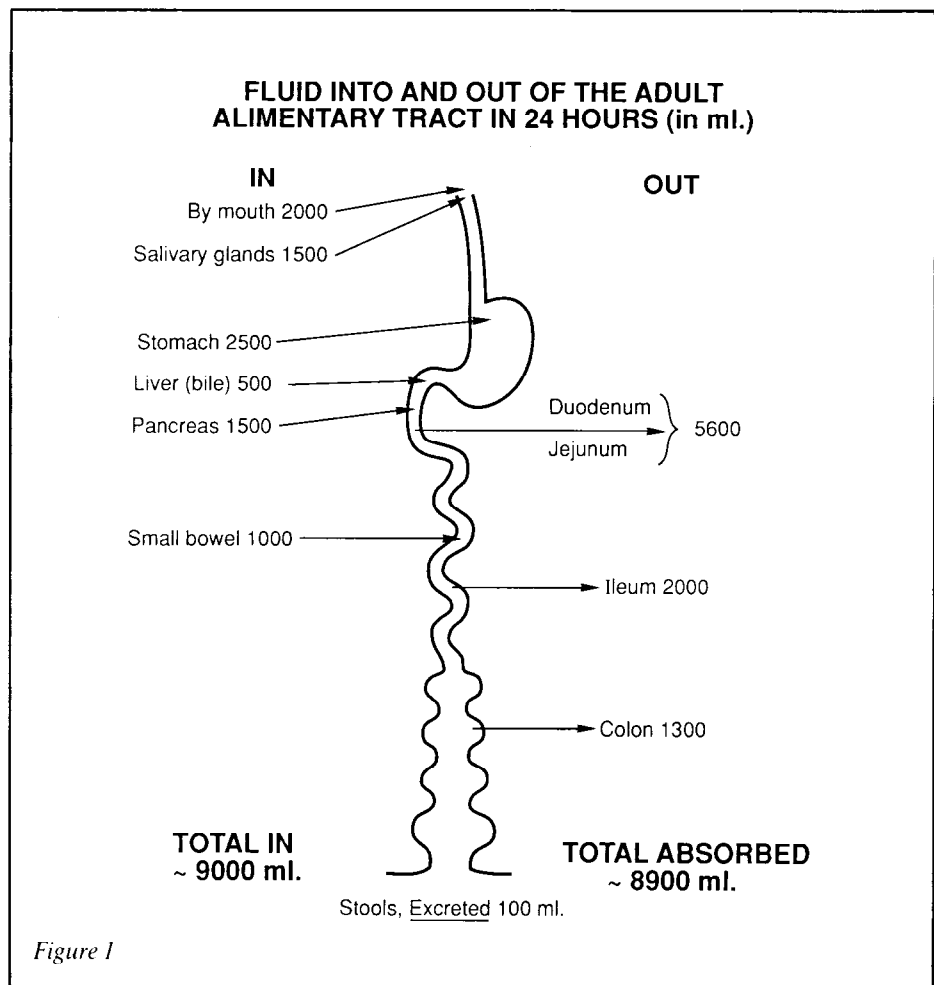
large bowel or intestine absorbs less water, and also acts as a reservoir. The structure of the small bowel is designed to give a maximum surface area of contact between the fluid contents of the lumen (the central cavity or space of the bowel) and the tissue of the bowel wall.

Although an adult small bowel looks from the outside like a tube about three metres long and 4 cms in diameter, its inner surface shows a series of folds covered by many finger or leaf-like pro-

cesses, the villi. Each villus is covered with specialised cells, called enterocytes, responsible for secretion, digestion, acting as a defence barrier and absorption. They have a short life, the whole membrane lining being replaced every three to four days. Brush-like filaments cover each enterocyte, further increasing the surface area. It has been calculated that the inner surface area of the healthy small bowel is enormous: approximately 2000 square metres, or about the size of a football pitch. The final function of the bowel is to excrete unabsorbed food and fluids, old and damaged cells, toxins, harmful agents and other waste materials.

### Fluid exchanges and diarrhoea

A healthy adult in a temperate climate drinks about two litres of fluid per day. Much more is needed in hot climates. Usually much less fluid is taken by



**The majority of the fluid taken into the bowel is normally reabsorbed. A significant increase in the amount of fluid excreted constitutes diarrhoea.**

mouth than is secreted into the bowel (seven to eight litres) by the various digestive glands along its length (see Figure 1). Most bowel fluid is reabsorbed, as the stools normally contain only about 100-200 ml (0.1 to 0.2 litres) of fluid per day. A significant increase in this excreted fluid volume constitutes diarrhoea. This is due either to a failure of the bowel to absorb or reabsorb fluid, or to a great increase in fluid secreted into the bowel. How germs and other factors cause watery diarrhoea will be considered below.

Most serious consequences of diarrhoea are due to the loss of water and salts in the stools. Too much water loss is called dehydration. Fluid is first lost from the bloodstream and so the heart tries to compensate by beating faster. Fluid is then drawn into the blood vessels from the body tissues, and circulation to less essential areas closes down. Limbs begin to feel cold and pulses are weak. Eventually even circulation to essential areas like the kidneys and brain begins to collapse, urine volume decreases and consciousness is impaired. In some types of diarrhoea, for example cholera, there is an excessive loss of sodium ions. The acid-based regulating system may be disturbed, and deep and rapid respiration indicates the onset of acidosis.

### How germs cause diarrhoea

To cause diarrhoea, pathogenic organisms must be swallowed, they must survive the acid in the stomach, colonise the small bowel and stick to the enterocytes. They produce their harmful effects by one of several mechanisms.

#### Secretory diarrhoea

Two types of bacteria produce diarrhoea in a similar way, *Vibrio cholerae* and enterotoxigenic *Escherichia coli* (ETEC). After adhering (sticking) to the wall of the bowel, a toxin enters the enterocytes and stimulates an enzyme called adenylate cyclase (see Figure 2). This causes a chain of reactions which releases energy and results in the secretion of sodium and chloride ions (electrolytes) — accompanied by water — into the lumen of the bowel. Once a cell has been stimulated in this way it will continue to secrete fluid and electrolyte for the rest of its short life. With thousands and even millions of entero-

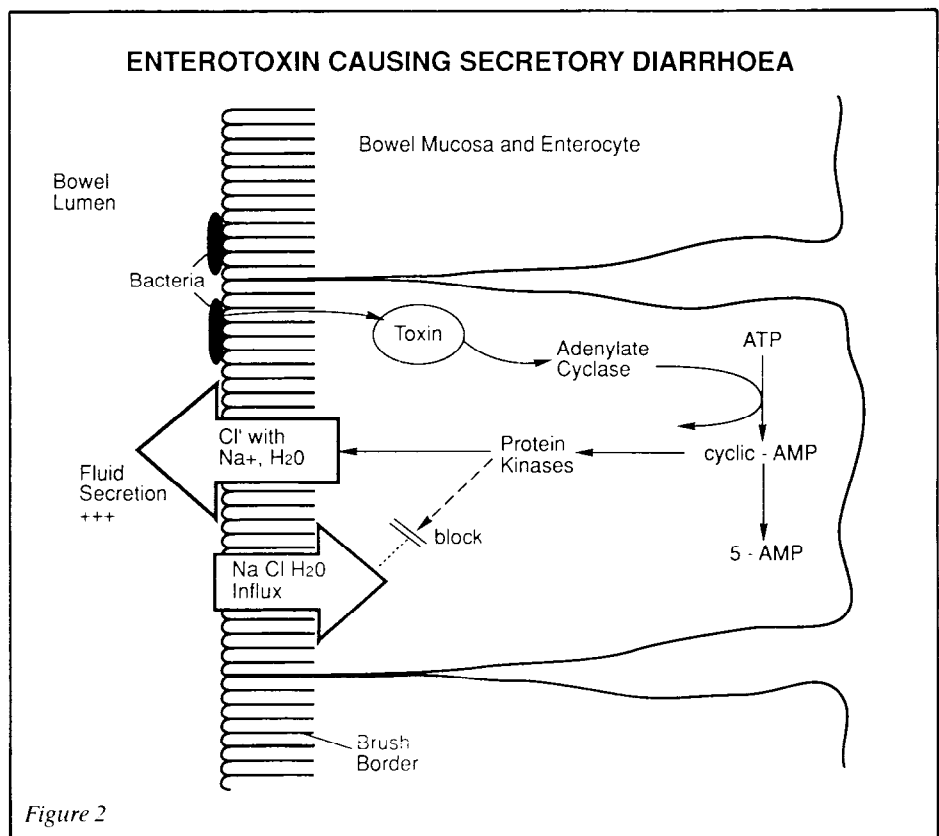


Figure 2

Secretory diarrhoea is caused by the above chain of events.

cytes all secreting uncontrollably, the bowel cannot reabsorb all the fluid and the result is watery diarrhoea. This 'secretory diarrhoea' can cause dehydration, circulatory collapse and death.

#### Invasive diarrhoea

Other pathogens produce diarrhoea in a different way. The *Shigella* bacteria not only colonise the surface of the small bowel but they also penetrate and invade the mucous membrane. Many enterocytes are destroyed, blood vessels may rupture, the white cells of the patient's defence mechanism die and are excreted as pus along with blood and tissue fluid. The result is dysentery diarrhoea. Other invasive germs include the food-poisoning *Salmonellae* bacteria. These cause less local damage but penetrate blood vessels causing bacteraemia — circulation of pathogens in the bloodstream — and generalised illness with fever and vomiting.

The rotavirus is also a common cause of acute diarrhoea in small children. The organisms penetrate the small bowel in patches, killing many entero-

cytes and in this way reducing the surface for absorption. They may also have some secretory mechanism since they often produce a watery diarrhoea.

#### Practical importance of the diarrhoea mechanisms

Because water and electrolytes are lost in all types of diarrhoea, replacement of these by rehydration is always the first priority treatment. Examination of the diarrhoea stools by eye can help to identify invasive diarrhoea. Cases in which there is much blood suggest *Shigella* dysentery. Children with this type of diarrhoea who seem seriously ill require specific antibiotics in addition to rehydration. In the severe secretory (watery) diarrhoea, it is known that sodium deficiency and acidosis are common. Specific correction by appropriate rehydration fluids should be started as early as possible.

**Dr W A M Cutting, Senior Lecturer in Child Health, Department of Child Life and Health, University of Edinburgh, Edinburgh, Scotland.**

## Home-made ORS

**Drs Pisacane and Matsitukwa present findings based on their experience in the Mashonaland West Province of Zimbabwe, where a standard beer or soft drink bottle-top has been used to measure sugar and salt.**

Even in countries where packets of oral rehydration salts (ORS) are available, mothers need to know how to make up an effective, standard, cheap recommended home solution, from available ingredients. In Zimbabwe the nationally recommended home solution is sugar-salt solution.

One major disadvantage of home-made sugar-salt solutions (SSS), however, can be the great variability of the salt and sugar concentrations. Several different sized measuring instruments may be used, and incorrect measuring takes place due to lack of appropriate education. Solutions containing too much sugar and/or salt can be dangerous, especially for infants (*see references*).

### How the study was carried out

We worked with two groups of mothers. Group A consisted of 70 women attending two rural clinics; Group B of 50 women living on a remote farm. Almost all the mothers knew about the National Policy for preparing SSS, which is to add six level teaspoons of sugar and half a level teaspoon of salt to 750 ml of water. This is the volume of fluid held in the available standard soft-drink bottle. All the women were asked to measure amounts of salt and sugar for making a standard solution and to put the

volumes of solid ingredients in separate plastic bags. To measure salt and sugar, Group A mothers were shown seven spoons and asked to choose and use a teaspoon similar to the one they used at home. The women on the farm, Group B, used their own teaspoons which were all alike and rather flat. The same two groups were then asked to measure salt and sugar using the commonly available soft-drink bottle-tops, and again putting the ingredients into separate labelled plastic bags. The instruction for this was to use one level bottle-top of salt and ten level bottle-tops of sugar for the standard 750 ml of water.

### Assessing the results

The outcome was assessed by weighing the salt and sugar in the plastic bags and calculating the concentration of sodium in mmol per litre and of sugar in grams per litre.

Most mothers in Group A, who had to choose a spoon, prepared solutions with too much salt and sugar. (There was also a very wide variation in concentration, both in range and standard deviation). The mothers in Group B, who used their own home spoons which were all alike and more shallow, produced concentrations nearer to the safe and appropriate values intended by the National Policy. Out of Group A, 61

per cent of mothers prepared a solution containing over 90 mmols of sodium per litre, but only 12 per cent of Group B mothers prepared such a concentrated solution (*see Table*). Using the bottle-tops, concentrations of both sugar and salt were more consistent; only 11 per cent of Group A mothers and 8 per cent of Group B mothers produced sodium concentrations above 90 mmol and sugar concentrations showed a similar pattern of greater accuracy.

### Discussion

The variations found when using spoons is probably because most mothers in Group A selected a spoon that was quite deep. This type of spoon, larger than the standard 5ml teaspoon, is commonly found in the shops around the clinics. A smaller, flatter spoon was the only type available on the farm of the Group B mothers. The more consistent results from both groups when using bottle-tops was not only because their size was completely standard, but also because screw-on type bottle-tops have clear edges. With some spoons the edges slope and it is difficult to define what is a true 'level teaspoonful'. In the situation of rural Zimbabwe, the bottle-top is widely available, gave reliable measurements and is therefore the more satisfactory measuring device. Other countries promoting home-made SSS rehydration solutions may benefit from this experience and consider using bottle-tops as the standard for measuring sugar and salt.

**Dr Lovemore Matsitukwa, Health Information Officer, Mashonaland West, Zimbabwe and Dr Alfredo Pisacane, Istituto di Paediatrica, Universita di Napoli, Via Surgio Pansini 5, 0131 Naples, Italy.**

*Harland, PSEG et al., 1981: Composition of oral solutions prepared by Jamaican mothers for treatment of diarrhoea. Lancet i:600.*

*de Zoysa, I et al., 1984: Home-based oral rehydraton therapy in rural Zimbabwe. Trans. R. Soc. Trop. Med. 78: 102-105.*

*Cutts, F, 1985: The use of ORT in health facilities in Zimbabwe. Zimbabwe Epidem. Bull. 14:29.*

*A Decision Process for Establishing Policy on Fluids for Home Therapy of Diarrhoea, 1987. WHO, CDD, SER/87.10.*

*Waldman, R, 1987: Problems with home ORS. Dialogue on Diarrhoea 28:6.*

**Concentrations of sodium and sugar as measured by mothers using spoons or bottle-tops**

Instrument used	Group A (Clinic mothers selected spoons) N = 70		Group B (Farm mothers own spoons) N = 50	
	spoon	bottle-top	spoon	bottle-top
<b>Sodium</b>				
mean mmol/lit	101*	77*	70	63
(Standard deviation)	(29)	(4)	(18)	(16)
% over 90 mmol/lit	61#	11#	12	8
<b>Sugar</b>				
mean g/lit	42	40	31	40
(Standard deviation)	(10)	(3)	(6)	(5)
% over 40 g/lit	40	8	6	6

\* and # p<0.001

## Changing patterns of drug use

In DD33, page two under the title 'Viewpoint', the editors wanted to hear from other readers regarding the use of antibiotics. I, as regional co-ordinator for the CDD Programme in the central province of the Kingdom of Saudi Arabia, would like briefly to explain doctors' attitude to the use of antibiotics in this part of the world.

The use of antibiotic and anti-diarrhoeal drugs in Saudi Arabia was found to be high in a study carried out three years ago. Over 20 per cent of the diarrhoea patients received anti-diarrhoeal drugs besides the common use of antibiotics. In 1985-1986, a one-year training programme was carried out by the Regional Directorate General of Health Affairs to orient doctors and nurses in the management of diarrhoeal diseases. This covered 84 per cent of hospitals in Riyadh and 100 per cent of hospitals outside Riyadh. The effect of the orientation was very significant. Anti-diarrhoeal drug usage dropped to less than five per cent. Doctors used antibiotics only in selected cases of diarrhoea. ORT became very popular. Over 85 per cent of patients with diarrhoea now receive ORS. ORS is widely available and distributed free to patients by the government. All government health facilities have abundant ORS supply, catering for increasing consumption each year.

Over 80 per cent of Health Centres in the city have set up a diarrhoea management room or corner to demonstrate the preparation of ORS and to give some educational information.

## Aetiology and drug sensitivity

Hospital based studies have revealed that about 90 per cent of children who had diarrhoea were under five years of age. The child:adult ratio was 4.5:1. Prevalence of giardia (about 18 per cent) was greatest for older children aged five to 12 years whereas *Entamoeba histolytica* was significantly more common in adults. Isolation rate for rotavirus was found to be 30 per cent, followed by *Shigella* (8.3 per cent), non-typhoidal *Salmonella* (4.5 per cent), *Campylobacter* (3.5 per cent), and *Vibrio cholera*, none. Ampicillin was found to be the drug of first choice with 70 per cent sensitivity for *Shigella sonnei* (commonest pathogen seen here) and 60 per cent for *Shigella*

*boydii*, but in the case of *Shigella flexneri*, cotrimoxazole was the drug of first choice (15 per cent sensitive to ampicillin and 50 per cent to cotrimoxazole).

All of the species of *Shigella* and *Salmonella* were found to be sensitive to nalidixic acid. Nalidixic acid was therefore regarded as a drug to be reserved for only those cases where ampicillin or cotrimoxazole failed to achieve response, in order not to use randomly for fear of creating resistance in future.

**Dr M Wasiful Alam, Diarrhoeal Control Centre, P O Box 7855, Riyadh, Saudi Arabia.**

## Accepting ORT

In DD33, Dr Sharif Salry Nassif rightly pointed out that mothers often reject treatment for diarrhoea (or other diseases for that matter), when the results do not meet their expectations. In this case Egyptian mothers were concerned that ORT did not necessarily stop diarrhoea, so they demanded drug therapy.

To solve such problems, more attention must be paid to the cultural context of diarrhoea. Then, with a more thorough understanding of local beliefs, health workers should be encouraged to provide appropriate counselling and education. Simply telling mothers that anti-diarrhoeal drugs are not good will not address their underlying concerns. Culturally sensitive dialogue between health workers and mothers is essential.

The problem of ORT acceptance due to cultural factors is not unique to Egypt. In Papua New Guinea, mothers also rejected ORS because, unlike traditional medications and modern anti-diarrhoeals, it did not stop diarrhoea immediately<sup>(1)</sup>. In Zimbabwe it was documented that mothers did not see the connection between diarrhoea and one of the signs of dehydration, sunken fontanelle, because the latter was thought to be a completely different disease requiring its own topical treatment<sup>(2)</sup>. In Nigeria some mothers expressed fear that the sugar content in home-made SSS formula was too much and might lead to constipation/haemorrhoids, a more dreaded condition<sup>(3)</sup>.

These problems were overcome with patient discussions with mothers where health workers were willing to listen carefully to mothers' concerns, and in turn address those concerns with care-

ful explanation using local terminology and concepts.

**William R Brieger, Senior Lecturer, University of Ibadan, Nigeria.**

1. Frankel, S J, and Lehmann, D, 1985. Oral rehydration: What mothers think. *World Health Forum*: 6(3): 271-273.
2. de Zoysa I, 1985. Treating diarrhoea early. *Dialogue on Diarrhoea* 20:3.
3. Brieger, W R, Ramakrishna, J, et al., 1988. Developing health education for oral rehydration therapy at a rural Nigerian clinic. *Patient Education and Counselling* 11:189-202.

## Using ORS packets to measure water volume

I have read the viewpoint expressed by Dr Chan, which appeared in DD33 under the caption 'Using ORS packets to measure water volume?' with great interest. As you have invited the views of readers, I thought of writing to you as we encounter similar problems in this context.

I am attached to a large plantation of tea and rubber with a resident population of well over 1,800 workers and their families, in the capacity of the Medical Assistant in charge of its dispensary and hospital. We use ORT extensively and we have been able to achieve wonderful results in the reduction of infant deaths due to diarrhoea in our plantation.

As a standard container is not being introduced into the market to measure one litre of liquid, in OR therapy we encounter similar difficulties. Earlier we were advising the mothers to take two and a half times the standard (400cc) soft drink bottle of water or one and a quarter times the standard liquor bottle of water. Either way it is not easy to measure a standard volume of water.

To overcome these practical difficulties I have distributed empty saline bottles which are freely available and contain 500cc.

Now we provide a plastic disposable measurer with a capacity of 200cc, but I find that we have to issue one with every ORS packet we give to a mother as often they become playthings of the children.

In my experience I find the introduction of empty saline bottles can be of great use in measuring an accurate volume  
*continued on page 8*

ume of water needed to dissolve a packet of ORS.

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

## A problem solved?

I am interested in the 'Viewpoint' of Dr O J Chang on using ORS packets to measure water volume. He has highlighted the problem which mothers may experience in measuring accurately the correct volume of water in making ORS solution.

In the past our village health workers were taught to use and teach the use of the beer bottle (½ litre) as the measure, with corresponding quantities of salt and sugar measured by hand or by spoons. When sugar disappeared from the shops and the ORS packets appeared with the Essential Drugs Kits, it was easy to teach one packet to two beer bottles. However, not every mother can lay hands on a beer bottle and in recent years the orange squash bottle has appeared and is to be found in many homes. The first type of bottle to appear happened to have a decorative marking which corresponded to half a litre, but the newer type of bottle is different and one and a half bottles are equal to a litre. It was through answering Dr. Cutting's questionnaire which came recently that we discovered mothers are using one orange squash bottle to a packet of ORS, thus making a too concentrated solution. So now we have invited the mothers to bring whatever measure they intend to use to the clinic and allow us to show them a litre mark on it. We are waiting to see how this will work out! As the editors say in their notes, more operational research is needed.

**Sr Dr Margaret Garnett, Medical Missionaries of Mary, Nangwa Village Health Programme, P O Box 144, Babati, Tanzania.**

## ORS — correct use?

I have been working for the last year and a half on a study of household management of diarrhoea in Managua, Nicaragua. I have found a number of misconceptions about ORS use, often propagated by the health care system itself. One practice in particular which seems to be rather commonplace is the diluting of powdered cow's milk with ORS during diarrhoea. It is considered a way to get the ORS into the child, and to dilute the cow's milk, thought to be too heavy during diarrhoea. My question is whether this practice is harmful, and if so, why. In a similar fashion, ORS is sometimes used in place of water to make such things as rice water drinks. I would like to know more about the effects of heat on the ORS, since these drinks are often cooked first, then cooled. And finally, what effect adding more sugar has on the effectiveness of ORS. Any references on these issues would also be greatly appreciated. Thanks for a great newsletter!

**Patricia Hudelson, Dept of Anthropology, U-176 Rm 429, University of CT, Storrs, CT 06268, USA.**

## Dr O Fontaine, Medical Officer, CDD WHO, replies:

It is not advisable to dilute cow's milk with ORS solution. Although it is not clear from Ms Hudelson's letter how the dilution is done and what is the final composition of the solution, this mixing procedure may produce an oral rehydration solution with increased carbohydrate and sodium concentrations, both of which could be harmful. For infants aged six months or older, dilution of cow's milk during diarrhoea is not necessary unless clinical signs of lactose intolerance are observed after milk is taken (i.e. increased diarrhoea, with abdominal pain and distension). Diluting milk may have a harmful effect on their nutritional status by reducing calorie intake.

The standard WHO-ORS formulation, properly diluted in drinking water,

provides all the necessary salts and sugar to efficiently and safely treat dehydration due to diarrhoea. Using ORS solution to prepare rice water, or adding sugar to the ORS solution to improve its acceptability are unnecessary, and the latter would result in an ORS solution with too much sugar, which could worsen diarrhoea and aggravate the dehydration. ORS solution should be prepared only with drinking water and should not be mixed with other ingredients.

Sodium bicarbonate is unstable when heated, therefore, ORS containing sodium bicarbonate should not be heated or boiled. There is no reason to heat or boil ORS solution if it is mixed in potable drinking water.

## Practical disinfection

I was interested to read the letter 'The right soaking solution' in DD 32. We live high in the foothills of the Himalayas and our main sources of water are natural springs, but they can get polluted. There is a long held belief here that potassium permanganate is an effective purifier of water, and this is added to the water from time to time. Could you suggest a more efficient water purifier for such a water source, which is very small, just a bucket's depth and a metre wide? For cleaning uncooked vegetables you suggest very weak hypochlorite solution. What name this might be available under in ordinary shops?

**David Hopkins, Kasturba Mahila Utthan Mandal, PO Kausani, District Almora, U. P. 263639, India.**

**Dr Sandy Cairncross, Department of Hygiene and Tropical Medicine replies:** Bleach, which is a solution of chlorine, is the answer to both of these questions, and is widely available. In the right concentration it is a powerful disinfectant suitable for water supplies, and a dilute solution is ideal for soaking vegetables.

**Note:** Bleach, especially concentrated bleach, is **dangerous** and must be kept in a safe place where children cannot get hold of it.

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