Specialized Bibliography Series No. 15

Annotated Bibliography on

Oral Rehydration in Diarrhoeal Diseases

Specialized Bibliography Series No. 15

ANNOTATED BIBLIOGRAPHY ON ORAL REHYDRATION IN DIARRHOEAL DISEASES

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PREFACE

The **Specialized Bibliography Series** is a part of the larger effort to facilitate the exchange of information and to establish an information network in the field of diarrhoeal disease and related subjects, – – an effort being carried out by the Diarrhoeal Diseases Information Services Centre (DISC) of the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B). The present issue, the fifteenth of the series, includes citations of 567 papers and publications on oral rehydration in diarrhoeal diseases, published during 1985 – 1990. Of the 567 papers, 278 include abstracts. The **Annotated Bibliography on oral rehydration in diarrhoeal diseases** was compiled from existing information available at the DISC of ICDDR,B, and it is possible that inadvertent omissions may have occurred.

We hope that the present bibliography will contribute towards generating greater interest and awareness on research in oral rehydration therapy and the results obtained from these studies. Most of the published papers and publications, cited in this bibliography, are available from the DISC of ICDDR,B to interested persons/organisations for consultation and dissemination. We will consider this attempt successful if the bibliography serves the interests of the diarrhoeal disease researchers and practitioners, demographers, nutritionists, and other interested groups.

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Mr. Arifuzzaman Khan of DISC prepared 11 abstracts for this bibliography. The assistance of Mr. Khan and other DISC staff members who directly or indirectly contributed in successfully completing this bibliography is acknowledged. MEDLINE and POPLINE databases on CD-ROMs were of immense help in finding out information on relevant literature.

Publication of this bibliography was made possible by a special grant from the International Development Research Centre (IDRC), Canada.

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USER'S GUIDE

The **Specialized Bibliography Series** includes abstracts and citations of currently available literature from sources worldwide. The materials, cited in the "**Annotated Bibliography on Oral Rehydration in Diarrhoeal Diseases**", are available at the DISC, ICDDR,B for consultation and dissemination. The working language used in the bibliography is English.

The bibliography is arranged in an author-alphabetic order, i.e. citations are arranged alphabetically by the first author and then by the title of paper. 278 of the 567 papers and publications cited in the bibliography include abstracts (authors' abstracts, where available, were taken without any change) Whenever an abstract was prepared, every effort was made to include information, if available, on the scope of the paper cited, the study area, the age and number of the subjects studied, the time framework covered, new, improved or significant methods used and the findings and/or conclusions of the study.

An index to co-authors is appended at the end of the main text for easy search by co-authors' names. The numbers cited in the co-author and the subject indexes refer to the sequential numbers of the citations.

ORAL REHYDRATION FOR DIARRHOEAL DISEASES: AN INTRODUCTION

Early in the 1960s, Robert Phillips showed that glucose when added to oral perfusions could produce a positive fluid balance in purging cholera patients. In the late 1960s, studies in Dhaka and Calcutta defined the parameters for a successful oral rehydration salt (ORS) solution, which was standardised and put to global use by WHO and UNICEF to save the lives of millions of children with diarrhoea. This formulation containing glucose and three salts can prevent and correct diarrhoeal dehydration.

Appropriate feeding during and after diarrhoea is an essential component of the case management of diarrhoeal illnesses with oral rehydration therapy (ORT). The ORS solution can alone rehydrate 90% of patients with dehydration; it can reduce the hospital admission rate for treatment of diarrhoea by at least 50% and also reduce diarrhoeal mortality and limit weight loss when used with appropriate feeding. In addition, ORT, using the currently popular ORS solution (standard ORS), is one of the least expensive health interventions. However, ORT with the standard ORS solution does not reduce diarrhoea or shorten an episode of the illness; but that is what mothers and health care providers desire most.

Improved ORS formulations

It has been proposed that absorption efficiency of an ORS solution can be further improved by optimally exploiting: a) organic nutrient-linked intestinal absorption, b) osmotic and kinetic advantage of using polymers, c) colonic salvage of salts (sodium, potassium, and chloride) and water by short-chain fatty acids produced by fermentation of unabsorbed carbohydrates, and d) weak organic acid-linked enhanced absorption from the small bowel. Such an improved ORS formulation could not only successfully replace the deficit of salts and water in diarrhoea, but could also induce reabsorption of endogenous intestinal secretion and thus, reduce the volume and duration of diarrhoea. In other words, it will then act as an absorption-promoting anti-diarrhoeal medicine.

About seven years ago, encouraged by promising results from a few clinical trials, the Diarrhoeal Diseases Control programme of the World Health Organization started supporting research projects to develop improved ORS formulations. In addition, several investigators around the globe began independent evaluations of the improved ORS formulations. Two general approaches towards such solutions have been examined. In both, the objective is to enhance the intestinal absorption of sodium and water by providing larger quantities of different types of organic carriers. In one approach, glucose (20 g/l) is replaced by a cereal powder (e.g. 50 g/l), such as cooked rice powder. Alternatively, chemically defined ingredients, such as glucose polymers (e.g. maltodextrin) or amino acids, are either combined with or used in place of glucose in the ORS preparation. The advantage of using a starch-containing cereal powder is that glucose is slowly released from starch during digestion thus promoting sodium absorption, as in the glucose ORS. However, because of its polymeric structure, relatively large amounts of starch can be given without causing ORS to become hyperosmolar. If these amounts are given as glucose, the osmolality of the solution could be excessive and cause an outpouring of fluid into the intestine which could worsen the diarrhoea. Further, amino acids and small peptides liberated from digestion of cereal proteins may further enhance sodium absorption. The use of synthetic amino acids and peptides is based on evidence that they are capable of promoting water and salt absorption by mechanisms that are distinct from that of glucose. This suggests that they may provide an additional benefit when combined with glucose (or a polymer of glucose).

Improved ORS solution based on glucose plus an amino acid glycine and/or a dipeptide glycyl-glycine: About half-a-dozen studies have been completed using such formulations and based on the results of these studies, it may be concluded that this approach may have some advantage in treating cholera and possibly diarrhoea caused by other toxigenic bacteria. But they were no more effective than the standard ORS solution for patients with diarrhoea of more diverse aetiology, particularly in infants.

ORS containing a glucose polymer and an amino acid: By substituting maltodextrin for glucose in ORS solutions it is possible to provide a source of glucose (in the form of polymers) in amounts equivalent to that of the standard ORS solution and to add an amino acid or a peptide without the solutions becoming hyperosmolar. Several studies have been completed, and the results from these studies suggest that an intermediate grade of maltodextrin plus an amino acid glycine and, in some studies, a dipeptide of glycine have provided no additional benefit when compared to the standard ORS solution.

ORS based on minimally hydrolysed and more starch-like maltodextrin: This type of maltodextrin is readily soluble and relatively inexpensive; it is stable when stored under tropical conditions. Studies of such an ORS formulation are seeking to determine whether such a maltodextrin can enhance ORS efficacy to the same extent as a rice-based ORS. Preliminary results using 50 g of minimally hydrolysed maltodextrin in ORS solutions showed that no appreciable additional benefit could accrue from such formulations compared to the standard ORS solution. The results elude explanation as to why such a glucose polymer should not act like rice starch.

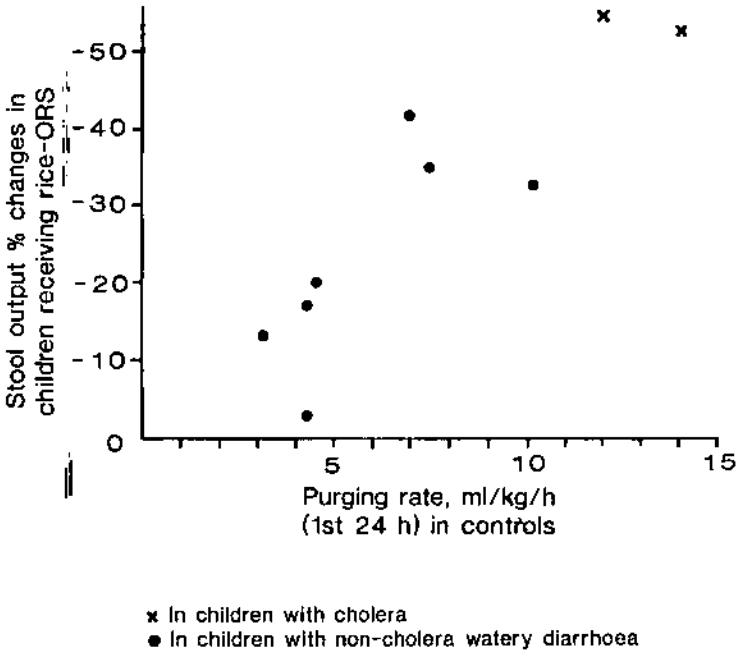
Amino acid l-alanine and glucose-based ORS: Using l-alanine plus glucose in an ORS formulation has demonstrated that absorption efficiency can be markedly improved when used in heavily purging cholera patients. However, initial results from studies in children aged less than 3 years with non-cholera diarrhoea showed that this solution has no beneficial effect on stool output or duration of diarrhoea.

Amino-acid l-glutamine and glucose ORS: A recent *in vitro* study by Mark Roades demonstrated that l-glutamine, when used with glucose, stimulates metabolism of intestinal epithelial cells and transport of sodium; in addition, it uniquely stimulates electroneutral sodium chloride absorption across the normal and rotavirus-damaged pig intestine. Two clinical trials have been initiated with such formulations, results of which are not yet available.

Cereal-based ORS: In 1982, Molla and colleagues and Patra and colleagues demonstrated that a rice powder-based ORS was effective in children and in adults with severe watery diarrhoea. In addition, Patra's study also demonstrated that such a rice-ORS containing 50 g/l of rice powder could significantly reduce the stool volume and the duration of diarrhoea. Since then, several studies have been conducted with rice-ORS in adults with cholera, in children with cholera, in infants with rotavirus diarrhoea and in infants and children with diarrhoea from other causes. Although the levels of efficiency demonstrated by these studies are variable, they all follow a similar direction.

A recent analysis of published results of clinical trials with rice-ORS in children attempted to relate the demonstrated absorption efficiency of a rice-based ORS formulation with the purging rate. It appears that the studies which demonstrated the rice-ORS as highly absorption-efficient were conducted in patients whose purging rates were high. Those studies which showed either no improvement or marginal improvement in the volume of stool output during diarrhoea were conducted in infants and children whose purging rates were low (Figure). Studies are underway to evaluate the safety and efficacy of the rice-ORS in severely malnourished children and in infants aged less than 4 months who may not be able to digest rice well.

The preparation of a rice powder ORS is time consuming and requires fuel. Thus, studies have been initiated to determine whether an ORS that contains pre-cooked rice powder could remain sufficiently stable to be used in a pre-packaged form. Two varieties of industrially produced pre-cooked rice preparations have undergone stability tests and have been found to be highly stable. They compare favourably with the glucose-ORS when packaged in aluminium foils. Recently, investigators at the ICDDR,B have prepared a pre-cooked packaged rice-ORS from traditional pre-cooked rice snacks commonly prepared by village women in Bangladesh and in the whole of the subcontinent. Some of these preparations have been shown to be stable in a packaged form for at least six months when packaged in polyethylene bags. Preliminary trials have also been conducted with these products.



Effect of a diet containing cooked rice on efficacy of glucose-ORS: Can the efficacy of a rice-ORS be equalled by giving glucose-ORS and a diet containing cooked rice? Rice ORS would have little practical advantage if comparable benefits could be achieved by early feeding of patients given the glucose-ORS, since early feeding as such is an essential component of optimal case management. A review of studies using a rice-ORS in which the study design included early feeding with a rice-based diet (255 subjects mostly with cholera) or a rice-based formula (136 children with non-cholera diarrhoea) showed that the rice-ORS retains its advantage over the glucose-ORS and the magnitude of the benefit is similar to that seen in patients who were fasted or given a diluted formula during the first 24 hours of ORT. Recently, in a randomised four-cell clinical trial conducted at the ICDDR,B in adults with cholera, early liberal feeding with a rice-based diet did not improve the efficacy of the glucose-ORS or rice-ORS. Observations suggest that a rice diet does not make the glucose-ORS as absorption- efficient as rice-ORS.

Studies of ORS formulations based on other cereals: Findings of two clinical trials using ORS formulations based on cereals other than rice have recently been reported. One from ICDDR,B used formulations based on one of the following: rice, maize, sorghum, millet, wheat, or potato, and compared them with the standard glucose-ORS in children with acute diarrhoea mainly due to cholera or enterotoxigenic Escherichia coli. The other study, reported from Kenya, also used ORS formulations based on one of the following:

maize, sorghum, rice, or millet, and compared them with the glucose-ORS in infants and children with diarrhoea from an area where cholera is not endemic. Other cereals were shown to be more effective when used in ORS formulations in place of glucose than the glucose-ORS, but in general they were not as absorption-efficient as the rice-based ORS solution.

A field evaluation of packaged rice-ORS: A field evaluation of packaged rice-ORS over a two-year period in 3 communities in Bangladesh showed that the failure rate (as defined by hospital admission or death) was also significantly reduced in the community provided with the rice-ORS solution compared to the community provided with glucose-ORS (1.2 versus 5.5 per thousand episodes); median duration of diarrhoea was significantly less (3 days versus 5 days respectively).

What have we learnt from clinical trials of rice-ORS?: Research studies suggest that: 1) stool output during the first 24 hours is significantly reduced in patients with acute diarrhoea given a rice-ORS as compared with patients given the standard ORS, the effect being substantially greater in severely purging patients than in less severe diarrhoea; 2) treatment with rice-ORS also reduces the duration of diarrhoea; 3) the combined effect of a reduced rate of stool loss and the shortened duration of diarrhoea leads to an even greater percentage reduction in total stool output till the cessation of diarrhoea; 4) the effect of a rice-ORS on total stool output in acute non-cholera diarrhoea in small children has not been precisely defined and requires further study; and 5) feeding a rice-based diet to patients given the standard ORS does not reduce stool output to the extent that treatment with a rice-ORS solution does.

This bibliography provides an update on research done on this topic since 1985. The work, though not entirely exhaustive, is believed to cover most recent studies carried out worldwide on ORT.

We hope, scientists, researchers, practitioners, health workers and students will have access to useful references on the topic from this publication and gain new insight for future research.

Dilip Mahalanabis, F.R.C.P.
Editor-in-Chief

BIBLIOGRAPHY ON ORAL REHYDRATION IN DIARRHOEAL DISEASES

001 Abdalla S, Helmy N, El-Essally M, Nasser S, Hirschhorn N. Sodium balance in low birthweight babies after oral rehydration [letter]. Lancet 1985 Mar 30;1(8431):757

002 Abed FH. Household teaching of oral rehydration therapy in rural Bangladesh. J Indian Med Assoc 1987 Jul;85(7):205-9

The Bangladesh Rural Advancement Committee (BRAC), a non-government organisation, after research and field trials, has developed a health message for dissemination in rural households of Bangladesh. The seven-point message provides simple directions to treat and prevent diarrhoea at home with home-available material. Emphasis is on treatment by quick replenishment of the water and salt lost, with a rehydration solution prepared with salt, molasses, and water. BRAC's efforts, aimed at popularising the home-based solutions have been successful. In a country where people are largely illiterate and distribution channels for manufactured solutions are undeveloped, the 'seven-point' awareness-creation and teaching programme with a nutrition-education component can serve as a useful vehicle for containing diarrhoeal diseases in the rural areas.

003 Abiodun PO, Distler G, Weidler B, Sommermeyer K, Lohmann E. [The "super oral rehydration solution". Modifications of the oral rehydration solution recommended by WHO]. Fortschr Med 1988 Oct 20;106(30):610-4

004 Adamafio JA. Collaboration between the public and private sectors in ORS production, supply, and distribution. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:67-71

005 Adel Moneun ANM. The impact of CDD program activities in Egypt on infant and child mortality. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:106-12

006 Adhikari RK, Rai SK, Pokhrel BM, Khadka JB. Comparative bacterial study of oral rehydration solution (ORS) prepared in plain unboiled and boiled drinking water of Kathmandu valley. Indian J Pediatr 1989 Mar-Apr;56(2):213-7

"Result of bacterial study on oral rehydration solution (ORS) prepared in plain unboiled and boiled drinking water of Kathmandu valley is reported. Of the total 100 water samples collected from different sources and area all the samples, as a base line study, were subjected for the examination of bacterial presence. Eighty eight percent of the water samples studied were found to be unsatisfactory for drinking. Thirty five percent of the ORS prepared in unboiled water and kept for 24 hours at room temperature showed increased bacterial count whereas none of the ORS prepared in 5 minute boiled water and kept for 24 hours at room temperature showed any bacterial growth. Decreased bacterial count was not found in any of the ORS prepared in unboiled water. Typical coliform bacilli were found grown in 57.0% of the ORS prepared in unboiled water samples." (Authors' abstract)

007 Ahmed A, Malik IA, Iqbal M, Nawaz M, Azim S, Bukhtiari N, Bhatty RS, Anjum S, Ashraf L, Luqman M, Anwar CM. The use of ORS (Nimkol) in management of childhood diarrhoea by mothers in the suburbs of Rawalpindi-Islamabad. J Pak Med Assoc 1990 Aug;40(8):178-82

"A total of 595 respondents (200 from urban Kachi-abadis and 395 from rural communities of Rawalpindi-Islamabad) were interviewed for their knowledge about the use of

ORS (Nimkol) in childhood diarrhoea. Most of the respondents were mothers with low literacy rate (23%). The prevalence of current diarrhoea among children was 36.8% on the day of interview whereas 57% of the children had history of having suffered from an episode of diarrhoea during the past two weeks. About 75% respondents claimed that they had an experience of using ORS (Nimkol). Most of them (72.1%) had used ORS (Nimkol) for childhood diarrhoea and dehydration and 28% had used it for diseases other than childhood diarrhoea or on doctor's advice. Only 11% mothers of children who were currently suffering from diarrhoea were using ORS (Nimkol) and a few mothers mentioned of giving home made fluid remedies like salt-water, salt-sugar-water or lemon-sugar-salt water for childhood diarrhoea. The use of ORS (Nimkol) was more common among the families with higher income. Regarding the preparation of ORS (Nimkol) solution, 57.8% respondents had fairly accurate knowledge. Fifty percent of the respondents had procured ORS (Nimkol) from the hospitals or clinics." (Authors' abstract)

008 Ahmed HS, Molla AM. Rice-based oral rehydration. J Diarrhoeal Dis Res 1987 Mar;5(1):1-6

009 Ahmed SM, Islam MR, Butler T. Effective treatment of diarrhoeal dehydration with an oral rehydration solution containing citrate. Scand J Infect Dis 1986;18(1):65-70

The clinical efficacy of oral rehydration salt solutions (ORS) from effervescent tablets containing citrate was compared to that of the WHO-recommended ORS formulation for the treatment of dehydration due to acute diarrhoea in a randomised clinical trial carried out at the International Centre for Diarrhoeal Disease Research, Bangladesh. Fifty-seven adults and 58 children, aged less than 5 years, were selected for the study. These patients had mild or moderate degrees of dehydration and acidosis due to acute watery diarrhoea, caused by enterotoxigenic *Escherichia coli* in 43-47% of the cases. The composition of the solution of effervescent tablets in terms of mmol/l was sodium 90, potassium 20, chloride 80, citrate 30, and glucose 100. The composition was identical to that of the WHO-ORS with the exception that WHO-ORS contained bicarbonate 30 mmol/l in place of citrate. Efficacies were compared by measuring oral fluid intake, stool output, gain in body weight, decrease in serum specific gravity and correction of acidosis during treatment. Successful rehydration and maintenance of hydration was achieved in 25 adults and 24 children treated with citrate-containing ORS and 25 adults and 24 children treated with the WHO-ORS. The mean intake of ORS/kg of body weight in children receiving the WHO-ORS was greater ($p<0.05$), and correction of acidosis was quicker than the citrate group during the initial 24 hours of therapy ($p<0.05$). By 48 hours, however, both groups showed satisfactory and comparable intake of ORS and correction of acidosis. There was a higher incidence of vomiting during initial rehydration in children receiving the WHO-ORS (76%) than in children receiving the citrate-ORS (52%; $p>0.05$). Thus, ORS from effervescent tablets containing a sodium citrate base is effective for management of diarrhoea in both adults and children and is a convenient stable form of ORS for use at home and for travellers. The prolonged shelf-life of the effervescent tablets is another advantage for diarrhoeal disease control programmes of developing countries.

010 Ahmed SM, Islam MR, Kabir I. Efficacy of oral rehydration solution in correcting serum potassium deficit of children with acute diarrhoea in Bangladesh. J Trop Pediatr 1988 Feb;34(1):24-7

"Sixty children under 4 years of age with acute watery diarrhoea and moderate dehydration were treated with sucrose based oral rehydration solution (ORS) with 20 mEq potassium chloride per litre and monitored to determine the efficacy of this fluid in raising serum potassium level. ORS only was given for the first 4 hours and then the child was given diluted mild formula and bread as well. No fruits or potassium rich fluid (e.g. green coconut water) were allowed during the study period. Rehydration as well as maintenance of fluid loss was done with ORS only. The serum potassium dropped significantly at 24 hours from the admission level and remained reduced at that level even

after 48 hours of therapy with ORS. Of these 60 patients, 22 were hypokalaemic (serum potassium <3.5 mEq/l) on admission and 10 patients out of 19 remained so after 48 hours of therapy. Thus, it appears that the present concentration of potassium in World Health Organization recommended ORS is not sufficient to correct deficits in some patients. The implications of this in underdeveloped countries where repeated attacks of diarrhoea are very common in children, is discussed." (Authors' abstract)

011 Alam AN, Sarker SA, Molla AM, Rahaman MM, Greenough WB, III. Hydrolysed wheat based oral rehydration solution for acute diarrhoea. Arch Dis Child 1987 May;62(5):440-4

"A randomised three cell study was carried out in 78 children with acute diarrhoea to evaluate the relative efficacy of oral rehydration solution (ORS) made from partially hydrolysed wheat grain, cooked rice powder, or glucose. Twenty six patients with comparable age, body weight, duration of diarrhoea, and degree of dehydration were studied in each of the three groups. Initial rehydration was carried out by using intravenous Dhaka solution within one to two hours followed by administration of oral rehydration solution. The mean ORS intake during the first and second 24 hours of treatment in patients with cholera receiving wheat-ORS and rice-ORS was significantly less compared with those receiving glucose-ORS. The stool output during the same period in patients receiving wheat-ORS and rice-ORS was significantly less compared with those receiving glucose-ORS. Similar trends in both ORS intake and stool output were observed during the next 24 hours". (Authors' abstract)

012 Ali MMA. Control of diarrhoeal diseases in Sudan: regionalization, involvement, and cooperation. In: Prather CJ, ed. ICORT III; proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:32-5

013 Altamirano-Lagarda S, Cardenas-Romero C. [The impact of oral rehydration on the mortality from intestinal infections in the state of Jalisco, 1984-1986]. Salud Publica Mex 1988 Mar-Apr;30(2):227-33

014 Anokbonggo WW, Odoi-Adome R, Oluju PM. Traditional methods in management of diarrhoeal diseases in Uganda. Bull WHO 1990;68(3):359-63

"A total of 292 traditional healers were interviewed in five districts of Uganda to discover how diarrhoeal diseases were treated by them. At least two healers were present in every village visited, and over 42% of their case-load was concerned with diarrhoeal treatment. The investigation showed that a great variety of herbs/plants were used by traditional healers in the treatment of diarrhoeal diseases. All those interviewed used water as the main vehicle for their herbal preparations, the amount prescribed daily ranging from 20 ml to over 100 ml for children (in the case of 54.5% of healers) and 100 ml to over 500 ml for adults (56.6%); 26.4% of healers considered fluid supplements as mandatory and 70.5% advised patients to take as much fluid as possible. Only 3.1% of healers either limited or did not advise fluid intake. These findings indicate that traditional healers could play an important role in interventions to control diarrhoeal diseases using modern oral rehydration therapy if they are assisted to improve their techniques." (Authors' abstract)

015 Ansaldi N, Dell'Olio D, Poli E, Grandi G. [Importance of oral rehydration in acute infantile diarrhea. Comparison of 2 rehydration solutions] Minerva Pediatr 1990 Jan-Feb;42(1-2):9-14

Oral rehydration therapy has gained worldwide acceptance as the standard treatment for acute diarrhoeal diseases in infants and children. Besides the high sodium glucose-electrolyte solution based on the WHO/UNICEF recommendations, many diverse formulations of oral rehydration solutions (ORS) have withstood the trial of prolonged clinical use, their

main differences concerning the concentration of sodium, the choice of the glycidic component, the use of bicarbonate as buffer or its substitution with acetate or citrate. It was recently hypothesized that glucose polymers - containing ORS markedly improve the intestinal sodium/glucose cotransport by delivering glucose at its critical site on the luminal villous membrane and therefore diminish stool output and duration of the diarrhoea. To investigate this hypothesis, the efficacies of two marketed ORS, one containing sucrose and maltodextrin (solution A) and the other containing glucose (solution B) were compared. The study group comprised 13 infants and toddlers, 1 to 18 months old, who presented with acute diarrhoea; 5 were males and 8 females; 7 were randomly allocated to receive solution A (Group A), 6 solution B (Group B). There were no significant differences between the groups in age, sex, causation of diarrhoea or severity of dehydration before receiving ORS. Both groups showed a satisfactory response to 24 hours of treatment with either ORS, but a significantly lower stool output (number and global weight of stools) and higher blood glucose and bicarbonate levels were detected in group A... (MEDLINE)

016 Antony TJ, Mohan M. A comparative study of glycine fortified oral rehydration solution with standard WHO oral rehydration solution. Indian Pediatr 1989 Dec;26(12):1196 - 1201

"The safety, efficacy and acceptability of glycine - fortified oral rehydration solution (ORS) was compared with that of standard WHO - ORS in a controlled randomized trial. Fifty male infants with acute, watery, non - cholera diarrhea were studied. Glycine - fortified ORS at a concentration of 111 mmol/L (8.4 g/L) was used. The electrolyte and glucose concentrations of both the solutions was identical. The proportion of successfully treated patients was 92%. There were two failures in each group. Both solutions were found to be equally safe in correcting and maintaining the hydration status and in correcting hyponatremia and hypokalemia. The acceptability and efficiency of the solutions were also comparable. Addition of glycine does not add to the efficacy of conventional WHO - ORS, therefore offering no additional advantage but adds to the cost of production." (Authors' abstract)

017 Aras RY, Jha SS. Impact of oral rehydration therapy and feeding advice in children with diarrhoea. J Indian Med Assoc 1987 Jul;85(7):202 - 4

A study was carried out to assess the effectiveness of oral rehydration therapy (ORT) with reference to feeding advice in the treatment of childhood diarrhoeas at home in selected slums of Bombay, India. Three hundred children aged up to five years were examined in 3 groups. The mothers of children in the first group were asked to carry out ORT at home, and advice on the appropriate feeding regimen was given. In group 2, instructions on the administration of ORS were given but without any advice or feeding. Group 3 was given neither instructions nor ORS. The study children were examined regularly twice a week and their weights were recorded once in a fortnight for six months. Specific criteria were set to assess varying degrees of dehydration. Sixty - eight per cent of the children in group 1, 53% in group 2 and 56% in group 3 suffered from diarrhoea in the period of study, one - third of whom were aged less than one year. There was no clear change in the feeding pattern during diarrhoea. Food was completely withdrawn for only 1% of the study children. Only 38.6% of the children showed symptoms of mild dehydration and 11.4% showed moderate dehydration. Correct feeding practices during diarrhoea had greater impact on weight gain than administration of ORT alone. ORT was effective and was well accepted by the mothers. The combined application of ORT and the appropriate feeding regimen was suggested for rapid recovery and weight gain after a bout of diarrhoea.

018 Arur VR. Use and misuse of oral rehydration solutions in general practice. Indian Pediatr 1988 Aug;25(8):750 - 3

"A survey was conducted among general practitioners to evaluate their understanding and

usage of ORS. Of the 3000 questionnaires sent out to general practitioners practising in different states of India, 739 completed questionnaires were returned. Only 10% of doctors were found to reconstitute ORS as per the recommendations on the sachet. 74% of doctors used reconstitution of 1 measure of the powder to 1 cup of water irrespective of the brand used. 44% of doctors selected the proper brand as per their preference of either WHO or low sodium formula. The present study highlights the need to reconstitute ORS correctly in order to achieve results close to 95% success achieved in controlled conditions." (Author's abstract)

019 Atanda CSO. The involvement of traditional healers in CDD programs. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14 - 16 Dec 1988. Washington, DC: Creative Associates International, 1989:40 - 2

020 Aung MM, U - PP. The effect of sodium tetraborate and alum in the management of acute childhood diarrhoea. Ann Trop Paediatr 1986 Mar;6(1):27 - 9

"The effect of oral rehydration (OR) has been well established in the management of dehydration in acute childhood diarrhoea. Many authors have been trying to find additives of all types which would be effective in retaining oral fluids and promoting their active absorption into the circulation. Any agent which will effectively reduce oral rehydration requirements should be considered for prospective studies. Amongst the traditional medicines, it was noticed that sodium tetraborate (borax) and alum reduced appreciably the fluid requirement in many cases of acute childhood diarrhoea. This traditional usage of these chemicals without any noticeable side effects has been described for centuries. During preliminary observations on 26 of our children given these salts no side effects were detected." (Authors' abstract)

021 Avery ME. Oral rehydration therapy. Turk J Pediatr 1986 Apr - Jun;28(2):137 - 40

022 Avery ME, Snyder JD. Oral therapy for acute diarrhea: the underused simple solution. N Engl J Med 1990 Sep 27;323(13):891 - 4

In most developing countries, appropriate oral therapy for diarrhoeal diseases remains underused. Commonly used fluids, such as carbonated beverages or juices, are not effective in severe diarrhoea cases mainly because of their high osmolality and improper ratio of sodium to carbohydrate. In many rural households, ignorant mothers tend to withhold food at the onset of diarrhoea, despite recent recommendations for continued feeding. This review explains the rationale for using an oral rehydration solution (ORS), which are centred on clinical trials that have demonstrated their positive usefulness. Current practices for diarrhoea treatment and different ORS formulations are examined in this work. Results of trials, using various additional ORS ingredients supplemented with optimal feeding regimens, have been reported. It was overwhelmingly established that an ORS containing between 40 - 60 mmol/l of sodium per litre along with breast - milk and lactose - free, carbohydrate - rich foods are well tolerated. Antibiotics and antidiarrhoeal agents are not considered as components of oral therapy, since a majority of diarrhoeal attacks are self - limited in nature. Antimotility drugs are not recommended because of their side - effects, including ileus, while antisecretory drugs have a limited clinical effect and require very high doses. Pectin, kaolin and charcoal have not shown promising results either. Reasons for slow adoption of oral therapy include its labor - intensive nature and its lack of recognition as a "treatment" mode as compared to intravenous therapy, which is more convincing for parents to accept. Oral therapy is recommended for diarrhoeal disease treatment, especially those that are constituted with inexpensive, widely available foods. Such ORS can overcome the cost, logistical and cultural barriers of using a packaged, commercially marketed solution.

023 Ayres D. Oral rehydration therapy. Asean J Clin Sci 1985 Sep;5(3):171 - 4

024 Bac DJ, Ferrinho PDLGM. An evaluation of the impact of care groups on knowledge about oral fluid therapy. S Afr Med J 1989 Nov 4;76(9):500 - 2

"Care groups (CGs) consist of unpaid volunteers, mostly women from local villages, with a commitment to promote health and well - being, with a particular emphasis on child health. CGs have been shown to be effective in promoting changes in health practices, promoting better personal hygiene and helping in the control of infectious diseases. The CG system was introduced in Venda's Donald Fraser Health Ward and oral fluid therapy (OFT) for diarrhoeal diseases was promoted from the beginning. In 1985 a survey was conducted to identify to what extent diarrhoea was a problem in the community and to determine the degree of knowledge about OFT in the population. Six hundred households in 10 villages with CGs and 600 households in 10 villages without CGs were surveyed. Despite the fact that in the CG area 76% of the respondents were aware of OFT, only 38% of these knew how to prepare the solution correctly (X^2;$p<0.001$). The findings are discussed in the context of the theory on communication of innovations, and some recommendations are made." (Authors' abstract)

025 Baker J, Kramer LH, Furst BG. Oral rehydration therapy in Asia: report of a workshop, 17 - 21 Mar 1985, Dhaka, Bangladesh. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 54 p.

026 Balistreri WF. Oral rehydration in acute infantile diarrhea. Am J Med 1990 Jun 20;88(6A):30S - 3S

027 Banerjee AK, Angulo AF, Dhasmana KM, Kong A, San J. Acute diarrhoeal disease in rabbit: bacteriological diagnosis and efficacy of oral rehydration in combination with loperamide hydrochloride. Lab Anim 1987 Oct;21(4):314 - 7

028 Bansal RD. Impact of health education on the use of oral rehydration fluid in diarrhoeas in a rural area of Pondicherry. Pondicherry: Jawaharlal Institute of Postgraduate Medical Education and Research, 1985. 31 p.

029 Banwell JG. Treatment of travelers' diarrhea: fluid and dietary management. Rev Infect Dis 1986 May - Jun;8(suppl 2):S182 - 7

"Travelers' diarrhea is associated with a mild or moderately severe loss of fluid and electrolytes. Severe fluid deficits are encountered only rarely. Mortality associated with fluid deficits is very rare; significant morbidity occurs only in older adults or in patients with chronic intestinal diseases or other chronic diseases (cardiac, pulmonary, or renal). Treatment of fluid and electrolyte deficits may be effectively achieved by rehydration with oral rehydration solution (World Health Organization) or with a commercial solution of similar composition. Dietary recommendations should emphasize the necessity of resuming a normal diet once a reduction in symptoms makes this feasible. Eating small portions frequently and omitting caffeine and lactose - containing food and drink may be advantageous." (Author's abstract)

030 Banwell JG. Worldwide impact of oral rehydration therapy. Clin Therap 1990;12(suppl A):29 - 37

"The worldwide consequences of (ORT) are discussed in four categories: (1) adoption of ORT as the primary therapy for acute dehydrating diarrhea; (2) establishment of national ORT programs; (3) scientific knowledge gained from studies into intestinal absorption of oral rehydration solutions; and (4) implications of ORT for the next decade". (Author's abstract)

031 Bari A, Rahman ASMM, Molla AM, Greenough WB, III. Rice - based oral rehydra -

tion solution shown to be better than glucose-ORS as treatment of non-dysenteric diarrhoea in children in rural Bangladesh. J Diarrhoeal Dis Res 1989 Mar & Jun;7(1&2):1-7

"Mothers living in rural Bangladesh were provided with either rice-based oral rehydration solution (rice-ORS) (Group A) or glucose-ORS (Group B) for treating non-dysenteric diarrhoea in their children aged under 5. Mothers living in a third area (Group C) were advised to use locally available treatment facilities, mainly unregistered medical practitioners. The incidence and duration of diarrhoea was recorded in all children over a two-year period. The outcome of each episode was recorded either as a success if the mother reported her child had recovered or as a failure if the child died or was admitted to hospital. Mothers in Group A used rice-ORS as the only treatment for 71% of episodes of non-dysenteric diarrhoea, mothers in Group B used glucose-ORS as the sole treatment in 60% of episodes, while mothers in Group C used drugs alone in 55% of episodes. Almost all children recovered successfully but the duration of diarrhoea differed significantly between groups: in the group treated with rice-ORS, 60% of children recovered within 3 days and less than 1% had diarrhoea which lasted for more than 14 days. By the criteria of early recovery and low rate of prolongation of diarrhoea, rice-ORS was found to be better than glucose-ORS." (Authors' abstract)

032 Barriga P. Folk media: an alternative for health education. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:54-5

033 Barron PM, Ephraim G, Hira M, Kathawaroo S, Thomas C. Dispensing habits of Johannesburg pharmacists in treating acute infantile diarrhoea. S Afr Med J 1989 Nov 4;76(9):487-9

"Sixty pharmacists in Johannesburg were randomly selected and questioned on their suggested treatment of acute infantile diarrhoea as well as their knowledge of oral rehydration therapy (ORT); 53 (88%) responded. Of 51 pharmacists who had treated diarrhoea in children, 8 (16%) had never heard of ORT, while 20 (39%) treated this condition with antidiarrhoeal drugs. These findings are perturbing, because acute diarrhoeal disease is the biggest cause of mortality of children aged 1-4 years in South Africa and ORT is recognised as an effective means of prevention of death." (Authors' abstract)

034 Bates J, Quick J. ORS supply management. In: LeSar J, Harrison P, Buxbaum A, eds. Manual for assessment and planning of national ORT programs. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 27 p.

035 Batra R, Baker J. Marketing and sale of ORS. In: LeSar J, Harrison P, Buxbaum A, eds. Manual for assessment and planning of national ORT programs. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 23 p.

036 Beau JP, Fontaine O, Garenne M. Management of malnourished children with acute diarrhoea and sugar intolerance. J Trop Pediatr 1989 Dec;35(6):281-4

"A protocol of nutritional rehabilitation using fermented milk, vegetable oil, and castor sugar has been tested on 54 Senegalese children age 6-36 months admitted with acute diarrhoea and malnutrition. At time of admission, 39 per cent of children were dehydrated and 26 per cent had sugar intolerance. In the course of treatment three absconded and one died from acute pneumonia with respiratory and heart failure. Among those with marasmus there were no differences in mean weight gains between children with sugar intolerance and others, despite a longer duration of diarrhoea in the first group. Furthermore, the treatment protocol has never been compromised because of worsening diarrhoea or weight loss. These results indicate that a formula based on fermented milk

together with oral rehydration can be used to treat malnourished children with acute diarrhoea and sugar intolerance." (Authors' abstract)

037 Behrens R, Nichter M, Herman E, Brown K. Integrating ORT and feeding: dietary management of diarrhoea at the household level. In: Elliott K, Attawell K, Wilson R, Hirschhorn N, Snow J, Jr., Greenough WB, III, Khin-Maung-U, eds. Cereal based oral rehydration therapy for diarrhoea; report of the International Symposium on Cereal Based Oral Rehydration Therapy, Karachi, 12-14 Nov 1989. Karachi: Aga Khan Foundation, 1990:33-9

038 Behrens RH, Tomkins AM. Food-based oral rehydration salt solution for acute childhood diarrhoea [reply]. Lancet 1989 Oct 7;2(8667):868-9

039 Benakappa DG, Benakappa A. Putting ORT and rehydration therapy in peoples' hands. Indian J Pediatr 1990 Jan-Feb;57(1):21-4

040 Bender D. Effectiveness of slide tapes for instructing medical students in oral rehydration therapy. J Biocommun 1988 Fall;15(4):2-5

041 Bentley ME. The household management of childhood diarrhea in rural North India. Soc Sci Med 1988;27(1):75-85

"An in-depth anthropological study of child diarrhea in 3 villages in rural North India investigated the variation in the household management of child diarrhea. Qualitative and quantitative methodologies were used to collect data on a series of variables, including maternal knowledge, beliefs, and practices during diarrhea, feeding and fluid intake during diarrhoea, treatment choices, and knowledge and use of oral rehydration therapy (ORT). The results showed both positive and negative diarrhea management behaviors. Almost all mothers continued to breastfeed normally, and did not decrease fluids during diarrhea. A shift in the child's diet toward 'softer' and 'cooler' foods rather than the withholding of food was the norm. The use of anti-diarrheals was widespread. Acceptance and sustained use of ORT was found to be inversely related to an understanding of the function of ORT. Eighty-one percent of mothers who had previously used ORT but who do not plan to use it again were dissatisfied because it 'did not stop the diarrhea'. These mothers thought that ORT was a medicine that would cure the diarrhea. Therefore, in ORT interventions there is a need to explain that the function of ORT is to replace lost fluids, and not to stop the diarrhea. Anthropological research of household diarrhea management can provide important information that will result in improved intervention design. Messages that are meant to change behavior must be based upon the target group's perception." (Author's abstract)

042 Berger H. [Old and new problems in the treatment of acute diarrheal diseases in infancy]. Padiatr Padol 1987;22(2):101-7

043 Berih AA, McIntyre L, Lynk AD. Pharmacy dispensing practices for Sudanese children with diarrhoea. Public Health 1989;103:455-8

"In order to study the dispensing practices of Khartoum and Khartoum North pharmacies with respect to the management of infantile diarrhoea, a Sudanese woman presented pharmacists with a brief description of an infant with acute diarrhoea. Sixty-three pharmacies were visited; only 3 (5%) recommended oral rehydration salts (ORS) alone. An additional 4 pharmacies (6%) recommended ORS plus either an antimicrobial agent or a physician visit. 39 pharmacies (62%) recommended antimicrobial therapy alone, 9 (14%) recommended a physician visit alone and 7 pharmacies (11%) had no available treatment. On average, antimicrobials cost four times more than two packets of ORS. In order to increase pharmacists' recommendation of ORS, health professional training may be required, perhaps in association with dispensing subsidies. Increased public awareness of ORS should also be encouraged." (Authors' abstract)

044 Bhan MK, Arora NK, Khoshoo V, Raj P, Bhatnager S, Sazawal S, Sharma K. Comparison of a lactose-free cereal-based formula and cow's milk in infants and children with acute gastroenteritis. J Pediatr Gastroenterol Nutr 1988 Mar-Apr;7(2):208-13

"Sixty children <2 years of age suffering from mild acute gastroenteritis with <5% dehydration were randomly assigned to two different isocaloric feeding regimens, viz., a locally prepared milk-free formulation (group A) of rice, lentil, sugar, and coconut oil and a spray dried commercial cow's milk formula (group B). There were two treatment failures in group A and one in group B. The postintervention duration of diarrhea (days) in group A (11.0 ± 10.0) was higher than in group B (7.6 ± 10.8), but these differences were not significant ($p > 0.05$). The energy intake (kcal/kg/24 h) on postintervention day 4 was 78.7 ± 31.7 in group A and 101.3 ± 41.1 in group B ($p > 0.05$). The corresponding values for day 7 were 74.2 ± 29.1 and 110.0 ± 41.1, respectively ($p < 0.05$). The mean weight gain (g/kg/24 h) between admission and the day of recovery in group A (2.0 ± 4.2) was significantly lower ($p < 0.05$) than in group B (5.8 ± 7.8). Similar trends in weight gain were observed at days 4 and 7. These findings suggest that a cow's milk-based formula is well tolerated by majority of the infants with mild acute gastroenteritis after initial rehydration with ORS. The infants who were fed the milk-free cereal-based diet showed significantly less energy intake and gained weight less rapidly than those who were fed the cow's milk-based formula." (Authors' abstract)

045 Bhan MK, Ghai OP, Khoshoo V, Vasudev AS, Bhatnagar S, Arora NK, Rashmi, Stintzing G. Efficacy of mung bean (lentil) and pop rice based rehydration solutions in comparison with the standard glucose electrolyte solution. J Pediatr Gastroenterol Nutr 1987 May-Jun;6(3):392-9

Children with acute diarrhea and moderate dehydration between 3 months and 5 years of age were randomly assigned to receive treatment with standard WHO oral rehydration solution (ORS) (n = 33) and two other solutions in which the 20 g/L glucose was substituted by 50 g/L of pop rice (n = 31) and 60 g/L of mung bean (lentil) powder (n = 29). Satisfactory oral rehydration, as assessed clinically and by changes in PCV and total serum solids (TSS), was achieved in 90.9% with WHO ORS, 96.8% with pop rice, and 96.6% in the mung bean ORS treated group (p greater than 0.05). The purging rates (ml/kg/h) until recovery were 2.49 ± 1.5 (pop rice); 2.91 ± 2.0 (WHO), and 3.41 ± 1.7 in the mung bean group ($p > 0.05$). The percentage of patients recovering from diarrhea within the 72 h study period was 58.0 (pop rice), 48.4 (WHO), and 44.8 for mung bean group ($p > 0.05$). Though differences in stool volumes and duration in the three groups were not statistically different, there was a trend toward improvement in efficacy with the pop rice ORS in several parameters: greater weight gain, higher percentage decline in TSS, higher urine output despite lower ORS intake, and lower purging rates. The intake of semisolids in the 24-72 h study period was also higher in the pop rice group as compared to the other two groups ($p < 0.05$). The number of breast feeds and intake of artificial milk was however similar in all groups ($p > 0.05$).

046 Bhan MK, Sazawal S, Bhatnagar S, Bhandari N, Guha DK, Aggarwal SK. Glycine, glycyl-glycine and maltodextrin based oral rehydration solution. Acta Paediatr Scand 1990 May;79(5):518-26

"We evaluated the efficacy and safety of an oral rehydration solution containing glycyl-glycine, glycine, and maltodextrin (GGG-ORS), in comparison to the glucose based ORS (standard ORS). The osmolality of the GGG-ORS (305 mOsm/l) and standard ORS (311 mOsm/l) was similar. Ninety-two children presenting with acute gastroenteritis and moderate dehydration, aged 3 months to 3 years, were randomly assigned to receive standard ORS or GGG-ORS. All the patients were successfully rehydrated orally. The two groups were comparable for baseline characteristics including the microbial etiology. Rotavirus (49%, 36%), ETEC (11%, 18%) or a combination of rotavirus and ETEC (15%, 9%) were the main stool pathogens isolated. There was no significant difference in the

mean stool output or duration of diarrhoea between the two groups. Patients in the GGG-ORS group had higher urine output ($p<0.01$) and weight gain ($p<0.05$) in the initial 6 hours when feeding was withheld, but no such differences were observed beyond this period. Hypernatremia did not develop in any patient during the study. We conclude that glycine and glycyl-glycine supplemented oral rehydration solution does not have any therapeutic advantage in the treatment of acute gastroenteritis with moderate dehydration caused predominantly by rotavirus." (Authors' abstract)

047 Bhan MK, Khoshoo V, Bhatnagar S, Bhandari N, Ghai OP. Increased food intake in children treated with puffed rice based ORS. Indian Pediatr 1988 Feb;25(2):193-5

048 Bhan MK. Management of dysentery and prolonged diarrhea. In: Prather CJ, ed. ICORT III; proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:78-84

049 Bhan MK, Bhandari N, Ghai OP, Arora NK, Khoshoo V, Malhotra BD, Ramachandran K. Treatment of acute diarrhoea with wide use of ORS packets or sugar salt solution in a rural community. Indian J Med Res 1988 Feb;87:197-201

"An oral rehydration therapy programme was introduced in a rural community in India. During the initial 20 months (phase-I) packeted oral rehydration solution (ORS) was promoted and made available through the dispensary and also through 5 village health workers for treatment of all diarrhoeal illnesses, irrespective of their severity. In the subsequent 11 months (phase-II), the supply of ORS packets was restricted only to cases of obvious dehydration who sought treatment at the local dispensary; the preparation and the correct use of sugar salt solution for early treatment of diarrhea were explained to all the mothers in the villages. The diarrhoeal episodes and use of ORS were monitored through household visits by data collectors throughout the 31-month period. In phase-I, ORS packets were used in 68.6% of the diarrhoeal episodes, whereas in phase-II, sugar salt solution during 79.3% of the episodes. The mean intake (in liters) per diarrhoeal episodes was higher ($p<0.05$) for sugar salt ($1.9+1.6$) as compared to the ORS solutions prepared from packets ($1.2+0.7$). The percentage of samples with sodium concentration >120 mEq/l was 4.9% with ORS packets and 20% with sugar and salt (>0.05). The diarrhoeal deaths per 100 episodes were 0.73 (ORS packets phase) and 0.50 (sugar salt phase), respectively ($p<0.05$)." (Authors' abstract)

050 Bhargava SK, Sachdev HP. Neonatal diarrhoea and oral rehydration therapy. J Indian Med Assoc 1989 Oct;87(10):243-4

051 Bhargava SK, Sachdev HP, Mohan M. Oral rehydration of low birth weight infants. Indian Pediatr 1985 Sep;22(9):708-9

052 Bhargava SK, Sachdev HP, Das-Gupta B, Mohan M, Singh HP, Daral TS. Oral therapy of neonates and young infants with World Health Organization rehydration packets: a controlled trial of two sets of instructions. J Pediatr Gastroenterol Nutr 1986 May-Jun;5(3):416-22

The World Health Organization (WHO) recommends an oral rehydration solution (ORS) that has been linked with a risk of hypernatremia in young infants when extra water or dilute milk is withheld. A controlled, randomized study was therefore undertaken in 50 male infants aged 0-3 months to evaluate the relative safety, efficacy, and practicability of two methods of obviating this risk without negating the concept of a universal rehydrating packet. Twenty-five infants in Group A were rehydrated with a 2:1 regimen (two parts, i.e., 60 ml, WHO-ORS followed by one part, i.e., 30 ml, plain water in an alternating manner) whereas 25 infants in Group B received diluted WHO-ORS (1.5 L water instead of 1 L). In two patients, one in each group, oral therapy failed and they were excluded from analysis. Sub-Group Ac was comprised of 15 cases in Group A in whom

the rehydrating instructions were followed correctly. Diluted WHO-ORS provided as safe and effective rehydration as the 2:1 regimen administered properly (sub-Group Ac). Both methods adequately corrected and maintained the hydration status and serum sodium levels, but a few infants in each group had subnormal serum K+/HCO-3 levels during therapy. Rehydrating instructions in Group A were misinterpreted in nine (37.5%) cases. Excessive ORS intake in five infants resulted in hypernatremia (three cases, 12.5%), periorbital edema (three cases, 12.5%), excessive irritability (two cases, 8.3%), and mild pedal edema (one case, 4.2%). Excessive water intake in comparison to ORS in four infants was responsible for delayed rehydration (three cases, 12.5%) and asymptomatic hyponatremia and hypokalemia (two cases, 8.3%) ...." (MEDLINE)

053 Bhattacharya R, Kaur P, Reddy DCS. Impact of education in the knowledge and practices of rural mothers and key family members on diarrhoea and its treatment at home. J Diarrhoeal Dis Res 1988 Mar;6(1):15-20

"Ready-made sachets of oral rehydration solution for the treatment of diarrhoea are constantly in short supply in developing countries. Thus, the effective use of home-made salt-sugar solution (SSS) by trained persons in the community is considered crucial. An education material for such a training was prepared based on the findings of beliefs and practices regarding diarrhoea in children, obtained from 116 randomly selected mothers of key family members in the Barain village of Chiraigaon block, Varanasi, India. In the present study, the material was used to train 66 mothers or key family members (key persons) in a joint family to identify diarrhoea, signs of dehydration, prepare SSS at home, use it to rehydrate their sick children and continue normal diet throughout the diarrhoea period. A control sample comprising 50 matched mothers or key persons were taken in the study who did not get the education. An evaluation was done 6 weeks after the educational sessions by interviewing the 116 persons (test, 66; control, 50), using the same pre-scored proforma blanks which were used during the initial survey. The mean pre- and post-education scores in the knowledge of mothers and key persons regarding various aspects of diarrhoea showed that there was a significant post-education gain in knowledge in both the groups in all aspects of diarrhoea, except the knowledge of the beneficial effect of continuing normal food during diarrhoea. An almost identical result was seen when both the groups were combined and assessed. Regarding various practices during diarrhoea, the data showed that the pre- and post-education practices regarding breast-feeding and food- and fluid-restriction did not vary significantly. People of the area knew from beforehand about the beneficial effect of breast-feeding and not restricting food and fluid during diarrhoea. However, there was a significant rise in the practice of using home-made SSS both among the trained and untrained groups ($t=3.5$, $p<0.01$; $t=2.19$, $p<0.05$). Among the trained groups, the practice was adopted significantly more among mothers, but not among the key persons such as grandmothers. The limitations and implications of the study are discussed. An inference is drawn with caution that this type of education may be a powerful tool to train mothers to identify acute dehydrating diarrhoea in their children and to treat them orally at home by preparing SSS." (Authors' abstract)

054 Bhattacharya SK, Dutta P, Bhattacharya MK, Mukherjee HN, Dutta D, Sinha AK, Mitra U, Nashipuri JN, Pal SC. Efficacy & safety of glycine fortified oral rehydration solution in the treatment of acute dehydrating diarrhoea in children. Indian J Med Res 1989 Dec;90:426-9

"Efficacy and safety of glycine fortified oral rehydration solution (ORS) was compared with a standard ORS (WHO formula) in a randomized clinical trial in children aged between 4 months and 5 yr with moderate degree of dehydration owing to acute watery diarrhoea. No significant differences ($P>0.05$) were observed in diarrhoeal stool output, duration of diarrhoea and intake of ORS between the study and control groups respectively. Thus glycine fortified ORS does not have any additional advantage over standard ORS. Moreover, two children developed hypernatraemia after receiving glycine fortified ORS in contrast to the control group. It is therefore suggested that glycine supplemented ORS

should not be prescribed for the treatment of diarrhoeal dehydration in children." (Authors' abstract)

055 Bhutta II, Mazhar A, Chughtai MA. Oral versus intravenous rehydration of infants and children with diarrhoeas. Pak J Med Res 1985;24:147-52

The effects of oral vs. intravenous (i.v.) rehydration were compared on 128 infants and children (89 males and 39 females), all of whom were aged under 2 years. On their admission, complete physical examinations were done including weighing and serum electrolyte estimation. Fifty-seven severely dehydrated patients were rehydrated with i.v. fluids. Seventy-one moderately dehydrated cases were divided into two groups of 41 on oral rehydration solution (ORS) and 30 on i.v. fluids. The oral solution was based on the WHO formula, containing (in g/l) sodium chloride 3.5, sodium bicarbonate 2.5, potassium chloride 1.5, and glucose 20. The total amount of fluid was calculated by the formula: admission weight in kg x per cent dehydration. ORS was administered either with a spoon or a feeding bottle. I.v. fluids were given as 8.18% dextrose saline for neonates and 0.45% dextrose saline for the other children. Serum electrolytes were re-estimated 24 hours after admission and before discharge. From the first group of 41 cases on ORS, 39 improved to a satisfactory state of health, while another 9 had to be converted to i.v. therapy due to persisting vomiting. The mean rehydration time was 10.5 hours with a mean hospital stay of 3.7 days. The 30+9 cases on intravenous fluid replacement had a mean hospitalisation of 2 days. All the patients in both groups recovered irrespective of being hypernatraemic or hyponatraemic. Oral rehydration has proved successful in acute watery diarrhoea in all age groups. Duration of treatment is short if the patient has been well nourished and has no complications. ORS does not respond in cases with persistent vomiting. It is equally effective in hyponatraemic or hypernatraemic dehydration. ORS has, thus, proved to be a cheap and satisfactory method of treatment of uncomplicated mild-to-moderately dehydrated diarrhoea patients. (Modified authors' abstract)

056 Biddulph J. Oral rehydration therapy. Papua New Guinea Med J 1985 Dec;28(4):303-9

"This paper discusses the use of oral rehydration therapy (ORT) in the clinical management of diarrhea with no dehydration, diarrhea with some dehydration, and diarrhea with severe dehydration. The 1st step in ORT is to weigh the patient and assess the degree of dehydration. It should be recognized that a child who has had 4 loose stools in the past 24 hours and is thirsty has some degree of dehydration, and ORT should start as soon as possible. If the child has no signs of dehydration, the mother should be given 3 instructions for treating diarrhea at home: 1) give the child more fluids more often; 2) continue to breastfeed; and 3) return the child to the clinic if he develops signs of dehydration, if the diarrhea gets worse, or if he is not better after 2 days. If a child has 2 or more of the signs of some dehydration (4-10 loose stools/day, more than a little vomiting, thirstiness, and less urine than usual), he should be rehydrated with oral rehydration solution (ORS). If available, the World Health Organization ORS packets should be used. After the child has been given 10-20 ml/kg of ORS each hour for 4 hours, the hydration should be reassessed. ORS should be given for each loose stool. If the child has 2 or more of the signs of severe dehydration (more than 10 loose stools/day, much vomiting, inability to drink fluids, and no urine for 6 hours), intravenous rehydration is necessary. A major problem with use of ORS is the time involved to explain the process to parents. Parents must understand that ORS does not treat the diarrhea per se; rather, it replaces fluids and salts lost by the child and prevents dehydration. If parents do not understand this, they may become discouraged if the diarrhea continues and stop ORT. ORT is as effective in treating adults with diarrhea as it is in children. In addition, ORT is just as good as intravenous rehydration, except in cases where the dehydration is severe." (POPLINE)

057 Billoo AG. Infantile diarrhoea: management with oral rehydration. Med Prog 1986

Feb;13(2):15 - 24

058 Blanco RA. Concepts of health personnel in relation to the management of acute diarrhea. Bol Med Hosp Infant Mex 1989 Feb;46(2):94 - 101

059 Blanco RA. Concepts of pharmacy employees concerning the management of diarrhea in children. Bol Med Hosp Infant Mex 1989 Jul;46(7):463 - 9

060 Blum D, Brasseur D, Kahn A, Brachet E. Safe oral rehydration of hypertonic dehydration. J Pediatr Gastroenterol Nutr 1986 Mar - Apr;5(2):232 - 5

"Eighteen infants with severe hypernatremic dehydration secondary to acute gastroenteritis were rehydrated during the 1st day with an oral glucose electrolyte solution containing 60 mmol sodium/L at a mean rate of 120 ml/kg/24 h. These 18 children were safely treated with oral therapy alone. No convulsions were observed during treatment. The mean decrease in natremia was 0.32 mmol/L/h, which compared favorably with the mean fall in natremia of 26 other infants in similar initial conditions who were treated intravenously. The present study lends additional support to the opinion that a slow decrease in plasma sodium (less than 0.5 mmol/L/h) helps to avoid seizures during treatment. As no other untoward effects were observed, this study also confirms that oral solutions given at a slow rate can effectively replace intravenous fluids in the majority of such children." (Authors' abstract)

061 Boon WH. Rice gruel in management of infantile diarrhoea. Asean J Clin Sci 1985 Sep;5(3):192 - 204

"Arising from the increasing prevalence of cow milk allergy in infants in Singapore as a result of the fall in breast feeding, rice water was utilised in treating these babies with gradual increase in solids being offered. The success in the use of rice gruel suggested to us its use in infantile diarrhoea in Singapore. It was found that rice gruel is more effective than the World Health Organization (WHO) oralyte solution which was then in current use. Rice gruel has replaced WHO oralyte solution in the Department of Paediatrics, National University of Singapore. The mechanisms whereby rice water is superior to other oralyte solutions are discussed." (Authors' abstract)

062 Booth IW, Smith DE. Oral rehydration with fizz but no chloride [letter]. Lancet 1988 Mar 5;1(8584):540

063 Boulos R. The role of private voluntary organizations in ORT/CDD programs: the cite Soleil experience. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14 - 16 Dec 1988. Washington, DC: Creative Associates International, 1989:92 - 6

064 Bowie MD, Hill ID. Management of persistent diarrhea in infants. Indian J Pediatr 1987 Jul - Aug;54(4):475 - 80

065 Bowie MD, Hill ID. Oral rehydration therapy - - South African Paediatric Association recommendations [opinion]. S Afr Med J 1989 Nov 4;76(9):461 - 2

066 Brown JD. Oral rehydration therapy for diarrhea. Milit Med 1985 Nov;150(11):577 - 81

067 Bruckstein AH. Diagnosis and therapy of acute and chronic diarrhea [see comments]. Postgrad Med 1989 Dec;86(8):151 - 9

"Many patients who present with acute or chronic diarrhea do not have an important organic disease. Most have functional diarrhea. The history, clinical examination, and initial laboratory studies should lead to a provisional diagnosis with respect to organic or func-

tional origin and help define whether the disease affects the small or large intestine. Specific studies are then obtained to define organic causes. The most common causes of acute diarrhea are infections and drugs, while the most common causes of chronic diarrhea are inflammatory bowel disease, malabsorption, parasitic infections, carcinoma of the large bowel, and metabolic diseases. Clinicians should remember that patients with functional diarrhea are as prone to other severe disease as the rest of the population and avoid allowing the functional problem to mask other signs." (Author's abstract)

068 Bryant J, Ghosh S, Rohde J, Cash R. Strategic planning at global and national levels: strengthening ORT programmes through a multiplicity of approaches. In: Elliott K, Attawell K, Wilson R, Hirschhorn N, Snow J, Jr., Greenough WB, III, Khin-Maung U, eds. Cereal based oral rehydration therapy for diarrhoea; report of the International Symposium on Cereal Based Oral Rehydration Therapy, Karachi, 12-14 Nov 1989. Karachi: Aga Khan Foundation, 1990:55-61

069 Burke V, Gracey M, Robinson J, Cooper M. An antibacterial and antiviral powdered soft-drink base. Trans R Soc Trop Med Hyg 1988;82(3):479-81

"Soft-drink powdered mixtures have been developed which are bactericidal against a range of enteric bacteria and *Staphylococcus aureus* and which kill some enteric viruses *in vitro*. These mixtures could be used to help reduce risks of water-borne diarrhoeal illnesses, and as the basis for oral rehydration solutions, which would resist bacterial contamination after their preparation, to treat patients with diarrhoeal dehydration." (Authors' abstract)

070 Butler T, Islam M, Azad AK, Islam MR, Speelman P. Causes of death in diarrhoeal diseases after rehydration therapy: an autopsy study of 140 patients in Bangladesh. Bull WHO 1987;65(3):317-23

"The cause of death (besides dehydration) for 140 diarrhoeal patients who died in hospital following rehydration was determined by autopsy examination. Children under 5 years comprised 74% of the patients. Diarrhoeal pathogens were identified as *Shigella* spp. in 27%, enterotoxigenic *Escherichia coli* in 17%, *Entamoeba histolytica* in 16%, *Campylobacter jejuni* in 12%, *Salmonella* spp. in 4%, *Vibrio cholerae* in 4%, and *Giardia lamblia* in 4% of cases. The most frequent underlying causes of death were colitis in 44% and pneumonia in 38%. The most frequent immediate causes of death were septicaemia in 27%, hypoglycaemia in 9%, and hypokalaemia in 9%; multiple causes of death were present in 89% of cases. Kwashiorkor or marasmus was present in 59% and fatty degeneration of the liver was detected in 61% of cases. It is concluded that, in susceptible children, diarrhoeal pathogens produce destructive inflammation in the intestine and cause death or contribute to it by provoking disease in other tissues, especially septicaemia and fatty liver, or by combining these effects with antecedent or concomitant conditions, especially pneumonia and malnutrition." (Authors' abstract)

071 Bwibo NO. The role of oral rehydration therapy (ORT) in community health. Kenya Nurs J 1987 Dec;15(2):9-11

072 Caglayan S, Acar U, Kasirga E, Kologlu F. Diluted yogurt (Ayran) versus water in dissolving oral rehydration salts. Turk J Pediatr 1989 Jan-Mar;31(1):25-7

"Seventy-six children with gastroenteritis were treated with oral rehydration salts dissolved in ayran (diluted yogurt), and eighty patients were treated with oral rehydration salts dissolved in water. The patients whose ages ranged between three and twelve months accepted both solutions equally. However, the acceptance of the ayran-based solution was significantly greater than WHO's salt solution in the patients whose ages ranged between one and four years. It is proposed that ayran be used to dissolve oral rehydration salts in the treatment of diarrhea since it is more palatable and easily acceptable by children." (Authors' abstract)

073 Caichac A, Aviles CL, Romero J, Pinto G. [Oral rehydration in infants with acute diarrhea]. Rev Chil Pediatr 1985 May-Jun;56(3):162-4

074 Cameron J. Diarrhea treatment: oral rehydration salt? [letter]. Can Med Assoc J 1985 Nov 15;133(10):952-3

075 Cancio Alvarez M, Interian Dickinson M, Gomez Vasallo A, Sanchez Hernandez C, Gonzalez RG. [Use of oral rehydration in the Gastroenteritis Service at the Matanzas Pediatric Hospital]. Rev Cubana Enferm 1987 Jan-Apr;2(1):62-7

076 Candy DCA. Rehydration in gastrointestinal infections. In: Black JA, ed. Paediatric emergencies. London: Butterworths, 1987:403-11

077 Carcamo JTO. Diarrheal disease control in Honduras. In: Prather CJ, ed. ICORT III; proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:114-6

078 Carlo WR, Beyreiss K, Heine W. [Dehydration therapy with electrolyte-glucose solutions in oral rehydration]. Z Arztl Fortbild (Jena) 1987;81 (20):1075-8

079 Carlo WR, Beyreiss K, Heine W. [Use of oral electrolyte-glucose solutions in diarrhea in infancy and early childhood]. Kinderarztl Prax 1987 Apr;55(4):163-72

080 Carpenter CC. The erratic evolution of cholera therapy: from folklore to science. Clin Therap 1990;12(suppl A):22-7

"Cholera is an exceptionally frightening epidemic disease because it kills its victims so very rapidly. The development of cholera therapy is traced from the early 19th century purges and bloodletting to the current use of oral rehydration solutions." (Author's abstract)

081 Carpenter CC, Greenough WB, III, Dale CB. Introduction and background: symposium on oral rehydration therapies. J Diarrhoeal Dis Res 1987 Dec;5(4):247-9

082 Carpenter CCJ, Greenough WB, Pierce NF. Oral-rehydration therapy - the role of polymeric substrates [editorial]. N Engl J Med 1988 Nov 17;319(20):1346-8

083 Cash R, Furst BG. Oral rehydration therapy in Africa: report of a workshop, Lilongwe, Malawi, 29-30 Mar 1985. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 97 p.

084 Cash RA. A history of the development of oral rehydration therapy (ORT). J Diarrhoeal Dis Res 1987 Dec;5(4):256-61

"This article is a discussion of the history of the development of oral rehydration therapy (ORT) in the 1960s. 3 points are emphasized: 1) the importance of the scientific method in developing ORT and in creating support for its use; 2) the importance of conducting this research where the problem of life-threatening diarrheas exists; and 3) the fact that the process of developing new medical therapies is both competitive and complementary. In 1962-4, a project in Taiwan demonstrated that glucose enhanced the movement of sodium across an isolated intestinal membrane. The next major breakthrough occurred in 1965 when it was demonstrated that an increase in intestinal transmural potential occurred when glucose was added to the electrolyte solution bathing the small intestine. In late 1968, glycine and the combination of glycine and glucose were used instead of just glucose in the solution. The dramatic effectiveness of ORT was established beyond doubt during a successful treatment of cholera outbreaks in Bangla-

desh in 1971. The most exciting area of research now is that of cereal-based solutions." (POPLINE)

085 Cash RA. Oral rehydration therapy. In: Farthing MJG, Keusch GT, eds. Enteric infection: mechanisms, manifestations and management. London: Chapman, 1989:441-51

086 Casteel HB, Fiedorek SC. Oral rehydration therapy. Pediatr Clin North Am 1990 Apr;37(2):295-311

"Diarrhea is a major cause of mortality and morbidity affecting infants and children in many parts of the world. Research and understanding of normal and abnormal gastrointestinal physiology allowed the development of oral electrolyte solutions to treat dehydration. These solutions were initially used for treatment of cholera in areas with poor access to medical care and are now used extensively by the WHO. Therapy with OES has expanded to other nonsecretory causes of diarrhea. Two types of solutions are available in the United States. Maintenance solutions contain 40 to 60 mEq per liter of sodium and are used for prevention of dehydration or after rehydration. Rehydration solutions contain 60 to 90 mEq per liter of sodium and are effective for the oral repletion of fluid and electrolyte deficits in both secretory and nonsecretory diarrhea." (Authors' abstract)

087 Castro R, Bronfman M, Castro V, Guiscafre H, Gutierrez G. Strategies for improving the therapeutic patterns used in acute diarrhea in primary medical care units. IX. Analysis of the economic impact of the strategy used. Arch Invest Med (Mex) 1988 Oct-Dec;19(4):427-36

088 Catley-Carlson M. Sustaining the momentum of ORT. In: Prather CJ, ed. ICORT III; proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:87-90

089 Chekalina KI, Maleev VV, Brodov LE, Golokhvastova EL, Gabrielian NI. [Evaluation of the efficacy of oral rehydration therapy in food toxico infections]. Sov Med 1987(8):88-90

090 Chekalina KI, Golokhvastova EL, Brodov LE. [Oral rehydration therapy of patients with food toxicoinfections]. Klin Med (Mosk) 1986 Nov;64(11):32-7

091 Chekalina KI, Maleev VV, Brodov LE, Golokhvastova EL, Anikina NV, Bogin IB. [Use of polyionic solutions in the treatment of acute intestinal infections]. Sov Med 1989;(11):111-4

092 Chowdhury AM, Vaughan JP, Abed FH. Mothers learn how to save the lives of children. World Health Forum 1988;9:239-44

093 Chowdhury AMR. Evaluating community ORT programmes: indicators for use and safety. Health Pol Plann 1986 Sep;1(3):214-21

"Community-based oral rehydration programmes to reduce diarrhoea-related mortality have been initiated in many developing countries in recent years. However, to date few evaluation studies have been carried out on these programmes and there is poor standardization in the indicators used. This paper discusses mainly the problems surrounding the intermediate process indicators: availability of ingredients; people's perceptions about diarrhoea and its treatment; and knowledge, safety and usage of oral rehydration solutions (ORS), with usage being discussed in some detail. Impact indicators based on mortality are discussed more briefly. Although most evaluations have studied the mortality impact of these programmes, it is suggested that programme evaluations should initially concentrate on process indicators to demonstrate how well the programme has been implemented. Only when implementation is successful and usage of ORS per diarrhoea

episode is high can there be an appreciable impact on mortality." (Author's abstract)

094 Chowdhury AMR. Evaluation of a community based oral rehydration programme in rural Bangladesh. London: Evaluation & Planning Centre for Health Care, London School of Hygiene and Tropical Medicine, 1986. 303 p.

In rural Bangladesh, a community-based programme, called the Oral Therapy Extension Programme (OTEP), has been teaching mothers on the preparation and use of oral rehydration salt solutions (ORS) using local household salt (lobon) and unrefined brown sugar (gur). The programme organised by a national non-governmental organisation, called the Bangladesh Rural Advancement Committee (BRAC), plans to visit 16 million households throughout the country by 1990. More than 5 million households have been visited by December 1985. The results from an earlier evaluation of the First Phase of the programme were encouraging. A further, more detailed evaluation, which concentrated on determining the usage and safety of home-made lobon-gur solution, was undertaken in 1984, and this work presents the findings. The literature has been reviewed on the problem of diarrhoeal diseases and on the discovery of oral rehydration therapy (ORT) and its applications. Methodological issues in undertaking the evaluation of such programmes are considered. This evaluation focussed on usage and safety using two main approaches, firstly through an in-depth village case study and then by using a household sample survey. The cultural perceptions and practices associated with diarrhoea were studied in the village case study, which revealed that, in the study population, there were 4 types of illnesses, all of which had the symptoms of diarrhoea. The sample survey found that the usage of ORT ranged from 2 to 55% of episodes, depending on how usage is defined. The ability of mothers to prepare ORS was also studied, and this showed that the ability, although originally good, had declined over time after some months of teaching. The policy and programme implications of these results are discussed and recommendations presented. (Modified author's abstract).

095 Chowdhury AMR, Vaughan JP. Oral rehydration therapy for diarrhoea. Bangladesh J Child Health 1987 Dec;11(4):132-42

The treatment of diarrhoeal episodes through use of an oral rehydration solution (ORS) is now well established. Various ORS preparations are now available including a home-based solution which uses readily-available ingredients. The pre-packaged ORS has been commercially available for a long time, and it has gained popularity in many developing countries. The home-mixed solution holds greater promise in the less-developed countries where retail distribution systems are poor and the commercially marketed ORS are beyond the reach of many rural households. Despite the increase in popularity of oral rehydration therapy, the actual adoption rates are still quite low in many developing countries.

096 Chowdhury AMR, Vaughan JP. Perception of diarrhoea and the use of a home-made oral rehydration solution in rural Bangladesh. J Diarrhoeal Dis Res 1988 Mar;6(1):6-14

"Oral rehydration therapy (ORT) is being widely promoted in developing countries, but the socio-cultural aspects of diarrhoea are often poorly investigated prior to planning the programmes. Since 1980, the Bangladesh Rural Advancement Committee (BRAC), a non-governmental organisation, has promoted a home-made ORT solution for use in all diarrhoeal episodes, called *lobon-gur* solution (LGS), which is made from household *labon* (salt) and *gur* (unrefined sugar) using the 'pinch-and-scoop' method. One mother per household is trained in its preparation and use during a half-hour home visit. By late 1986, over 7 million of Bangladesh's 16-million households had been visited. Initial programme monitoring showed that most mothers could prepare a safe and effective solution, but that its use was less encouraging. A village study undertaken to investigate this low use found that villagers recognise four different types of diarrhoeal illnesses, which are *dud haga* due to breast-milk in infants; *ajirno* due to over-eating or bad

food; *amasa*, a mucoid diarrhoea, with or without blood and of unknown cause; and *daeria* which is severe watery diarrhoea or cholera. LGS was most frequently used for *daeria* episodes which, although representing only 5% of all episodes, are those most likely to lead to dehydration and death. Thus, the BRAC message promoting LGS for all types of watery diarrhoea was understood by the people to be of most use for severe watery diarrhoea. The importance of this local classification of diarrhoea has only just received recognition, despite more than 25 years of diarrhoeal disease research in Bangladesh." (Authors' abstract)

097 Chowdhury AMR. Reaching millions with the message of ORT. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14–16 Dec 1988. Washington, DC: Creative Associates International, 1989:8–16

098 Chowdhury AMR, Karim F, Ahmed J. Teaching ORT to women: individually or in groups? J Trop Med Hyg 1988 Dec;91(6):283–7

"Programmes to promote the widespread use of oral rehydration therapy (ORT) for diarrhoea used a variety of methodologies to carry the message to mothers. The Bangladesh Rural Advancement Committee (BRAC) sent its health workers to individual households, and mothers were trained through a one-to-one approach. The cost of training a mother was 72 US cents. Recently, an alternative approach was tried. Instead of individually, mothers were trained in groups which halved the cost. Outcome indicators, such as usage, knowledge and safety of ORT solution, were looked at for each type of approach and were not found to be significantly different." (Authors' abstract)

099 Chowdhury AMR, Vaughan JP, Abed FH. Use and safety of home-made oral rehydration solutions: an epidemiological evaluation from Bangladesh. Int J Epidemiol 1988 Sep;17(3):655–65

"Home-made oral rehydration solutions (ORS) have been promoted in developing countries for preventing dehydration due to diarrhoea. Evaluations of this method must take into account the effective usage rates achieved and the safety of the solutions used. A community programme organized by the Bangladesh Rural Advancement Committee (BRAC) has visited over a third of all the households in Bangladesh and taught the preparation and use of an oral rehydration solution made from lobon (common salt) and gur (unrefined sugar) – abbreviated to LGS. An evaluation study based on over 7000 households enabled different usage rates to be calculated for four different diarrhoea types. The overall usage of LGS for all diarrhoea episodes was around 5–10% but for what the people called 'Severe Diarrhoeas' or cholera it was found to be between 25% and 52%. The mother's ability to prepare a safe lobon-gur solution appeared to deteriorate about six months after training and it was significantly poorer in the second phase than the first phase of the BRAC programme." (Authors' abstract)

100 Chumpitasi ME. ORS production, supply, and distribution. In: Prather CJ, ed. ICORT III; proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14–16 Dec 1988. Washington, DC: Creative Associates International, 1989:101–2

101 Cleghorn GJ, Shepherd RW, Patrick MK, Chin SE. Comparison of two oral rehydration solutions in children with gastroenteritis in Australia. Clin Therap 1990;12(suppl A):81–5

"An open-label inpatient study is in progress to compare the efficacy and safety of two oral rehydration solutions in children and infants with acute diarrhea and mild to moderate dehydration. One solution (ORS-60) contains 60 mmol/L of sodium and 1.8% glucose, with a total osmolality of 240 mosm/kg; the other (ORS-26) contains 26 mmol/L of sodium, 2.7% glucose, and 3.6% sucrose, with a total osmolality of 340 mosm/kg. An

outcome analysis of 28 children with gastroenteritis indicated that ORS-60 (n = 13) reduced stool volume during the first eight hours after admission to a significantly greater (P less than 0.05) extent than did ORS-26 (n = 15). Diarrhea had ceased by 24 hours in 64% of ORS-60 patients but in only 31% of ORS-26 patients, and the patients' clinical condition was improved at eight hours in 84% of ORS-60 patients versus 60% of ORS-26 patients. Differences between treatments in degree of dehydration at each follow-up point, total duration of diarrhea, and duration of hospital stay were not detected. No adverse drug reactions occurred. Four patients received intravenous rehydration therapy, but none was considered a treatment failure. We conclude that the lower osmolar solution, ORS-60, conferred earlier recovery and reduced continuing fluid losses in the management of gastroenteritis." (Authors' abstract)

102 Coetzee N, Yach D, Fisher SA. Knowledge and availability of oral rehydration solution in Khayelitsha [letter]. S Afr Med J 1989 Nov 4;76(9):514-5

103 Coetzer PWW, Kroukamp LM. Diarrhoeal disease -- epidemiology and intervention. . S Afr Med J 1989 Nov 4;76(9):465-71

104 Collins BJ, van Loon FPL, Molla A, Molla AM, Alam NH. Gastric emptying of oral rehydration solutions in acute cholera. J Trop Med Hyg 1989 Aug;92(4):290-4

"Gastric emptying of rice powder electrolyte solution and of glucose electrolyte solution was measured by a marker dilution double sampling technique in 14 and in 16 adult patients respectively after intravenous rehydration during an attack of acute cholera. Six patients who received rice powder electrolyte solution and seven who received glucose electrolyte solution re-attended for a repeat study with the same test meal 16 days later, when fully recovered from cholera. No differences in gastric emptying patterns of the two electrolyte solutions were observed, either in the acute or in the recovered patients. Similarly, gastric emptying of both solutions was rapid during acute cholera and comparable to that observed in recovered patients. This study indicates that gastric emptying is not impaired in acute cholera and that the rate of emptying of oral rehydration solutions is adequate to account for their observed clinical efficacy in fast purging patients with acute cholera." (Authors' abstract)

105 Cooper RH. Control of acute diarrhoeal diseases in children: a document for nurses, social workers, teachers. Paris: International Children's Centre, 1985. 12 p.

106 Cordero P, Araya M, Espinoza J, Figueroa G, Pacheco I, Brunser O. [Effect of oral rehydration and early re-feeding in the course of acute diarrhea in infants]. Rev Chil Pediatr 1985 Nov-Dec;56(6):412-8

107 Coreil J, Genece E. Adoption of oral rehydration therapy among Haitian mothers. Soc Sci Med 1988;27(1):87-96

"The paper reports findings from a study of mothers' knowledge and use of oral rehydration therapy (ORT) for childhood diarrhea in a mixed urban and rural population in Haiti. From the perspectives of the adoption of a medical innovation and the decision to use it in various situations, we assessed the differential exposure to information about the treatment and identified sociocultural factors which predict ORT knowledge, utilization, and choice between alternative methods of preparation (packaged mix versus home recipe). Three hundred and twenty mothers and caretakers of preschool children were given a questionnaire to compare respondent characteristics and attributes of recent episodes of child diarrhea in relation to knowledge and use of ORT. The data were analyzed with multiple regression techniques to determine which factors had independent effects on 6 outcome variables. Significant effects were found for urban/rural residence; literacy; economic position; use of medical services; conjugal status; and the explanatory model of the effect of ORT. No characteristics of diarrheal episodes had predictive effects in the multivariate analyses." (Authors' abstract)

108 Cowtan ER. Malnutrition and dehydration in the Third World: practical treatment. Can Fam Phys 1985 Nov;31:2109 – 12

109 Currey M. Evaluation of the National Oral Rehydration Programme. Ministry of Health and Population Control, Govt. of Bangladesh and UNICEF, 1985. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1985. 287 p.

110 Cutting WA. Is rice water right for rehydration? [letter]. Lancet 1986 May 31;1(8492):1267 – 8

111 Cutting WA, Belton NR, Gray JA, Brettle RP, Welsby PD, Todd WT, Elton RA, Westwood A, Davidson S. Safety and efficacy of three oral rehydration solutions for children with diarrhoea (Edinburgh 1984 – 85). Acta Paediatr Scand 1989 Mar;78(2):253 – 8

"Of 357 children with acute diarrhoea admitted to the City Hospital, Edinburgh, over a 12 – month period, only 5 (1.4%) required IV infusions. Three hundred and nineteen were treated with oral rehydration (OR). Of these 269 were studied in detail and 43% had signs of dehydration, but in none of them was it severe. There were no fatalities. Patients were randomly allocated to treatment with one of three OR solutions in a double blind trial. The solutions had sodium concentrations of 35, 50 and 90 mmol (mEq)/l, and dextrose of 200 (36 g/l), 111 (20 g/l) and 110 (19.8 g/l) mmol/l, respectively. Hypernatraemia was not a clinical problem and only 5 children (2%) were biochemically hypernatraemic on admission. Treatment did not cause clinical hypernatraemia. At the second assessment only 3 children were biochemically hypernatraemic, one from each treatment group, and no one had clinical signs. All three solutions were safe and effective in the relatively mildly dehydrated patients currently seen in the UK." (Authors' abstract)

112 Cutting WAM. Why is rice water effective for diarrhoea? [letter]. Lancet 1989 Apr 29;1(8644):966

113 Cutts F, Cliff J, Reiss R, Stuckey J. Evaluating the management of diarrhoea in health centres in Mozambique. J Trop Med Hyg 1988 Apr;91(2): 61 – 6

"An evaluation of the health centre management of paediatric cases of diarrhoea, comprising observation of the consultation, interview of the guardian immediately afterwards and home follow – up was performed in one rural and three urban areas of Mozambique. Oral rehydration therapy was advised for 83% of patients, of whom 71% received ORS packets. Eighty – seven per cent of mothers followed up stated that they had given ORT, but only 37% had a solution present at the time of interview. The main weakness in case management was the lack of health education, especially about the quantity of fluid to give, which was reflected in the mothers' belief that ORT is a medicine to 'stop the diarrhoea' and their consequent administration of it like a syrup, one teaspoonful three times a day. The results of the evaluation have facilitated the design of more appropriate health education and health worker training materials and methods." (Authors' abstract)

114 Dabis F, Roisin A, Breman JG, Helal A, Waldman RJ. Improper practices for diarrhoea treatment in Africa. Trans R Soc Trop Med Hyg 1988 Nov – Dec;82(6):935 – 6

115 da Cunha Ferreira RMC, Walker – Smith JA. Controversies in oral rehydration therapy: a way forward. Gastroenterol J Club 1989 Oct;1(2):2 – 10

116 da Cunha Ferreira RM, Cash RA. History of the development of oral rehydration therapy. Clin Therap 1990;12(suppl A):2 – 11

"Humans have often used oral fluids to replace perceived losses of water, either instinctively or with a therapeutic orientation in the form of folk remedies. Replacement therapy

with intravenous (IV) fluids was formally introduced in the last century for the treatment of patients with cholera. The modern implementation of oral replacement therapy was begun by pediatricians in the 1940s who used electrolyte solutions as maintenance therapy in mildly purging children with diarrhea. However, the scientific development of oral rehydration therapy (ORT) has occurred only in the last 30 years. Basic physiologic research in the 1950s demonstrated the cotransport mechanism of sodium and organic solutes (sugars and amino acids) in the intestinal cells, thereby establishing the scientific basis for ORT. The use of ORT based on scientific observations was first reported in 1964 from the Philippines by Phillips and coworkers. Research laboratories in Dhaka and Calcutta subsequently demonstrated that the mechanism of sodium and glucose cotransport remains intact in cholera patients and that oral solutions can successfully rehydrate and maintain hydration in these patients. Clinical studies carried out in Dhaka and Calcutta confirmed the efficacy of oral rehydration solutions (ORS) and showed that nearly 80% of IV fluid could be saved if patients were hydrated by the oral route. Further studies demonstrated the safety and efficacy of ORT in patients of all ages suffering from acute diarrhea of any cause. The use of ORT has substantially reduced morbidity and mortality from acute diarrhea, particularly after the World Health Organization adopted and promoted ORT on a worldwide scale. Researchers continue to search for better ORS formulations in terms of safety, efficacy, availability, and cost. Food-based ORS are a promising area of research. The use of a sound scientific method, the establishment of a close link between basic and clinical science, and the use of field studies have proved to be major assets in the development of ORT." (Authors' abstract)

117 da Cunha Ferreria RMC. Optimising oral rehydration solution composition for the children of Europe: clinical trials. Acta Paediatr Scand 1989;(suppl 364):40-50

"Clinical trials testing different oral rehydration solutions (ORS) are reviewed. The effects of individual components and their concentrations are analysed in order to establish margins of safety for the composition of the ideal ORS for children in Europe. Glucose is the solute of choice for ORS and concentrations of 70-140 mmol/l are adequate. Glucose may be replaced by sucrose or glucose polymers. "Low" sodium concentrations (35-60 mmol/l) are advised for rehydration and maintenance in acute non-cholera diarrhoea, for children of all ages, including neonates, and for any degree of dehydration except shock. Although intended for children who are not malnourished, the European ORS should have an adequate potassium concentration (20-30 mmol/l), namely the same concentration as found in WHO-ORS. Chloride concentration depends upon other constituents for ORS, namely sodium and potassium, but the range of 30-90 mmol/l is considered to be adequate. Base or base percursors are not required for correction of acidosis except in the severe cases that always need intravenous replacement. A relatively low osmolality seems advisable." [Author's abstract]

118 Dale CB, Northrup RS, eds. Symposium proceedings; cereal-based oral rehydration therapy: theory and practice, Washington, D.C., 17 Feb 1987. Columbia, MD: International Child Health Foundation, 1987. 59 p.

119 Datta T. Awareness about breast feeding, immunisation and oral rehydration [letter]. Indian Pediatr 1985 Dec;22(12):929-30

120 Daulaire NMP, Joshi M, Thorne MC. Field testing the pinch and scoop method of oral rehydration solution preparation. In: Shrestha RPB, ed. Souvenir of the 3rd Nepalese Congress of Paediatrics, Kathmandu, 5-8 Mar 1986:119-27.

121 David CB, Pyles LL, Pizzuti AM. Oral rehydration therapy: comparison of a commercial product with the standard solution. J Diarrhoeal Dis Res 1986 Dec;4(4):222-6

The efficacy of a commercial oral rehydration solution (ORS) was compared with that of the standard WHO formula ORS in treating infants hospitalised with acute diarrhoea in Saudi Arabia. The commercial product contained less sodium and more glucose than

the standard ORS. Among patients more than 2% dehydrated, 16 of 17 who received the standard ORS, were free of clinical signs of dehydration within 24 hours. Of the 17 patients who received the commercial product, 9 needed intravenous therapy because of worsening dehydration. Patients on standard ORS had a greater mean weight gain in the first 8 hours and lower mean stool output. They showed significantly more rapid correction of acidosis and of azotaemia, with higher intestinal absorption and urinary excretion of sodium. Diarrhoeal stools in patients on the commercial product were low in sodium and contained reducing substances, findings which suggest osmotic diarrhoea from unabsorbed glucose. (Modified authors' abstract)

122 Deb BC, Sircar BK, Sengupta PG, Mondal S, Gupta DN, Bhattacharya SK, Pal SC. Implementation of oral rehydration therapy in villages. Indian J Pediatr 1985 Sep-Oct;52(418):475-8

"Oral rehydration therapy was implemented amongst 6410 population in four villages through six locally recruited volunteers, who were trained for preparation of oral rehydration solution and treatment of diarrheas with milk and moderate degrees of dehydration. The volunteers acted as depot holders for ORS packets as well treatment providers. No monetary incentive was provided to any of them. A two year-period of observation showed that on an average 59.1 per cent of the diarrhea cases received ORS treatment from these volunteers (having a quarterly range of coverage from 41.7-81.0%). There was no diarrhea-associated death and no case needed referral to hospital. None of the volunteers dropped out from the study during the above period." (Authors' abstract)

123 DeClerque JL. The role of mothers' attitudes and beliefs influencing behaviors associated with infant diarrhea. North Carolina: Department of Maternal and Child Health, University of North Carolina at Chapel Hill, 1987. 167 p. (PhD dissertation).

"This study assesses the determinants of mothers' personal hygiene behaviors associated with the risk of fecal contamination. The elucidation of these behavioral patterns is designed to provide health educators and public health program planners with information on the effects of sociocultural factors that influence mothers' child-health practices. This study was conducted as part of the Philippine Infant-Feeding Project, a longitudinal study of a population of pregnant women and their infants in 16 rural and 17 urban districts of Cebu Province in the Southern Philippines. The results of this research confirm the important role of maternal behaviors and the determinants of these behaviors for child health outcomes. In caring for her child, a mother does not necessarily distinguish between nutrition, breastfeeding, weaning practices, and diarrhea. According to a mother's beliefs, there may exist different kinds of diarrheas--"hot diarrhea" and "cold diarrhea;" for some diarrheas it is good to continue breastfeeding; for others, breast milk is detrimental and must be stopped. Such beliefs exist even among highly educated, highly knowledgeable mothers. In order to influence mothers' health behaviors, health education efforts will have to go beyond superficial slogan campaigns. Mass media efforts used for promoting oral rehydration therapy or contraceptives are important tools for generating awareness and even increasing knowledge about specific issues. The incorporation of trusted sources of health information in the community, namely traditional healers, hilots, herbalists, and midwives is a logical and practical approach to influencing mothers' beliefs. Another focus for health education efforts is that of the siblings of young children. Busy mothers are not always able to guard their children's behaviors and sanitary habits. If older siblings in the 7-14 age range were the focus of special education programs, they could be trained to promote protective hygiene behaviors for themselves as well as their younger brothers and sisters, whom they often take care of. Although it has been possible to assess maternal stool disposal behavior with relative success, there is still a need to investigate the timing and frequency of handwashing patterns in more depth than was feasible with the timing and budget constraints of this study." (POPLINE)

124 de Leon Gonzalez M, del Castillo Medina JA. [Management of the newborn infant with water-electrolyte imbalance using a pure oral rehydration solution]. Bol Med

Hosp Infant Mex 1987 Jan;44(1):32-5

125 Delucchi MA, Guiraldes E, Hirsch T, Nunez N, Schele C, Gutierrez H, Torres-Pereyra J. The use of oral hydration in the treatment of children with acute diarrhea in primary care. J Pediatr Gastroenterol Nutr 1989 Oct;9(3):328-34

"The use of oral rehydration solutions (ORSs) for treating children with diarrhea is spreading in hospitals in Chile, but it has not yet been incorporated into routine primary care programs. We sequentially compared the effectiveness of an ORS, with 60 mmol/L of Na^+, with the standard treatment for diarrhea used in primary care centers, in a study with 285 diarrheal children under 2 years of age who consulted a health center in a low-income periurban neighborhood of Santiago. When compared with the control group, the patients treated with ORS showed a significantly higher percentage weight gain in the first few days after treatment was begun, required fewer medical visits for follow-up treatment at other facilities (8.4 vs. 15.5%; $p<0.05$), and experienced fewer episodes of subsequent clinical dehydration that needed rehydration (oral or intravenous) in emergency services (2.8 vs. 10.6%; $p<0.01$). In addition, there were no metabolic complications in either group. Our results reinforce the feasibility, efficaciousness, and safety of programs that use ORS at the primary care level and indicate that this is an effective method of preventing metabolic complications and reducing hospitalizations of children with acute diarrhea." (Authors' abstract)

126 Desjeux JF, Lestradet H. [Oral rehydration solution or physiology in public health]. Bull Acad Natl Med 1990 Jan;174(1):55-9

127 De Swardt R, Ijsselmuiden CB. Knowledge and practice of oral rehydration therapy in a village in Gazankulu after the introduction of the Morley spoon. S Afr Med J 1989 Nov 4;76(9):506-8

"Oral rehydration therapy (ORT) is effective in preventing dehydration during acute gastro-enteritis, thus decreasing morbidity and mortality. There is, however, reluctance among mothers and child-minders to use ORT when faced with the crisis of acute diarrhoea. This study describes the effects of a health education campaign, using the Morley (sugar and salt) spoon, on knowledge and practice of ORT in one community in Gazankulu, and compares care group (CG) with non-care group (non-CG) members. Two years after its introduction, the Morley spoon was still the most commonly used method of preparing oral rehydration solution (ORS). Ninety-seven per cent of CG members could produce the spoon when asked to, as opposed to 55% on non-CG members ($P<0,001$). Eighty-two per cent of respondents had actually used ORT in the past. Fifty-three per cent mixed the ORS incorrectly. Sixty-one per cent believed that ORT would stop diarrhoea and 29% that it was used for rehydration. Only 26% would give ORS after every loose stool, but 54% would give ORT until the diarrhoea has stopped. Fifty-nine per cent of women would feed their children soft porridge, 20% would continue breast-feeding, and 2% would starve the child while it had diarrhoea. Women who had retained the Morley spoon showed a greater knowledge of ORT ($P<0,005$) and had used ORT more often in the past ($P<0,001$). Possession of a Morley spoon was, however, not associated with a higher frequency of correct preparation of ORS, although it appears that the giving out of the spoons did increase the knowledge and practice of ORT in the village. This study also showed that community members may have been confused by the different methods of ORT taught. A strong plea is made to teach only one method of ORT, and not to lose sight of the importance of water supply and sanitation programmes to control diarrhoeal disease." (Authors' abstract)

128 Di John D, Levine MM. Treatment of diarrhea. Infect Dis Clin North Am 1988 Sep;2(3):719-45

"Diarrheal diseases remain a leading cause of morbidity and mortality in the developing

countries and represent at least a nuisance in the industrialized world. Fluid and electrolyte replacement, particularly via oral rehydration, is the mainstay of therapy for the prevention and treatment of dehydration associated with these illnesses. Antibiotics are not indicated for the majority of enteric infections, and their promiscuous use can contribute to the escalating prevalence of bacterial resistance worldwide. Used judiciously, however, antimicrobial agents can ameliorate illness or curtail pathogen excretion and spread of disease, or both, in some diarrheal infections. Antimicrobial agents are indicated for shigellosis, cholera, traveler's diarrhea, amebiasis, and giardiasis. They are indicated in some specific circumstances to treat infections caused by *Campylobacter*, some categories of diarrheagenic *E. coli*, *C. difficile*, nontyphoidal *Salmonella*, and certain *Vibrionaceae*. Few adjunctive treatments provide proven benefit without risk of adverse reactions; most offer no advantage over placebo, and their general use is not encouraged." (Authors' abstract)

129 Duffau-Toro G, Emilfork-Soto M. [Acute diarrhea syndrome. Rehydration and maintenance therapy using oral gluco-electrolyte formulas]. Bol Of Sanit Panam 1985 Feb;98(2):136-43

130 Duhamel JF. Acute infectious diarrhoea in children; physiopathology, etiology and treatment. Paris: International Children's Centre, 1985. 8 p.

131 DuPont HL. Progress in therapy for infectious diarrhea. Scand J Gastroenterol 1989;169(suppl):1-3

132 Dutta P, Dutta D, Bhattacharya SK, Bhattacharya MK, Sinha AK, Mondal BC, Pal SC. Comparative efficacy of three different oral rehydration solutions for the treatment of dehydrating diarrhoea in children. Indian J Med Res 1988 Mar;87:229-33

"The efficacy of two cereal based (30 g of rice powder and 50 g of pop rice powder) oral rehydration solutions (ORS) were compared with a standard ORS (WHO formula) in a randomized clinical trial in children aged between 4 months and 4 years with moderate degree of dehydration owing to acute diarrhoea. This study demonstrated that there were no statistically significant differences in stool output, duration of diarrhoea, ORS intake and percentage of weight gain in all the three groups." (Authors' abstract)

133 Ebrahim GJ. Looking beyond oral rehydration therapy. Br Med J 1987 Nov 14;295(6608):1222-3

"Oral rehydration therapy (ORT) is a simple, effective, and cost-effective means of increasing child survival in developing countries; however, any lasting impact on diarrheal diseases requires preventive measures as well as treatment. Programs that have been found to decrease the incidence of childhood diarrhea include breastfeeding promotion, immunization against measles, improvements in the water supply, and education about the importance of hand washing. Many developing countries need not only preventive programs, but also an adequate infrastructure for delivering primary health care. Given the increase in the number of urban shanty towns and the accompanying unsanitary living conditions, an innovative approach to urban primary health care is a priority. Moreover, any crash programs of health education in the mass media must be coordinated with other activities in health so that the message can be reinforced. Since most countries have a better infrastructure in education than in health, school teachers and school children are often a more effective means of changing behavior in traditional communities than the mass media." (POPLINE)

134 Ebrahim GJ. Oral rehydration therapy in the 1990s [editorial]. J Trop Pediatr 1989 Oct;35(5):209-10

135 Edelman R. Prevention and treatment of infectious diarrhea. Speculations on the next 10 years. Am J Med 1985 Jun 28;78(6B):99-106

"The next decade should explode with exciting schemes and novel agents for the prevention and treatment of infectious diarrhea. The development of oral, nonabsorbed antibiotics will continue, but new antidiarrheal drugs, such as gastrointestinal hormone analogues and alpha-adrenergic agonists, will be added to our therapeutic armamentarium. Improved oral rehydration solutions, such as glycine in electrolyte solution, promise to revolutionize the management of diarrhea by diminishing diarrheal stool volume to the point where losses are too small to be clinically relevant. Infant formulas and adult oral solutions fortified with antibodies raised against selected enteropathogens may provide a way to prevent infectious diarrheas in infants and travelers. Advances in genetic engineering will usher in a new era of experimental and licensed enteric vaccines, including those against cholera, *Escherichia coli*, *Shigella*, typhoid fever, and rotavirus." (Author's abstract)

136 Edginton ME. Oral rehydration solutions in 'section 30' areas: a study in two farming districts in the southern Transvaal. S Afr Med J 1989 Nov 4;76(9):509-10

"Six hundred and twenty-three black mothers of young children were interviewed on the white-owned farms on which they lived and/or worked in two magisterial districts of the southern Transvaal. Only 8% described an acceptable method of preparing oral rehydration solution (ORS). Of those mothers whose children had recently had diarrhoea, 5% had given ORS. Thirty-one per cent of mothers had litre containers, sugar and salt in their homes, while 84% had cups, sugar and salt. Recommendations are made about health education appropriate to the needs and the resources of black women living on farms." (Author's abstract)

137 Eggleston FC. Simplified management of fluid and electrolyte problems. 1. Normal balance, abnormalities and practical management. Trop Doct 1985 Apr;15(2):55-64

138 Eisemon TO, Patel VL. Understanding instructions for oral rehydration therapy. World Health Forum 1989;10(3/4):365-7

"Oral rehydration mixtures are readily available in rural Kenya, but the instructions that accompany them are not always clear. Mothers will understand such instructions more readily if they explain the principles of oral rehydration and describe in a logical way the sequence of procedures to be followed." (Authors' abstract)

139 Eisemon TO, Patel VL, Sena SO. Uses of formal and informal knowledge in the comprehension of instructions for oral rehydration therapy in Kenya. Soc Sci Med 1987;25(11):1225-34

"Information for using pre-mixed oral rehydration salt solutions, which have been made widely available in rural Kenya, is normally obtained from what is printed on the packets in English and either read or explained to the purchaser. Consequently, the comprehension can be improved with simple changes in the printed text, particularly those that reinforce appropriate modern or indigenous medical knowledge. However, the knowledge involved in effectively using oral rehydration therapy is not merely an awareness of its benefits, but an understanding of the environmental and biological causes of diarrhoeal diseases and an ability to explain the course of treatment that secondary schooling seems to develop." (Authors' abstract)

140 Elder JP, Pradesaba ME, Pineda OP, Enge KI, Graeff JA, Urban D, Romero J. A behavior analysis of the promotion of oral rehydration therapy (ORT) in Guatemala. Int Q Commun Health Educ 1988-89;9(2):139-50

"The present report presents the results and preliminary recommendations of a behavior analysis study of an oral rehydration therapy (ORT) promotion in four localities in San Marcos, Guatemala. In this study, we used behavioral observation techniques to look at one-to-one communication and health education efforts in health clinics as well as to evaluate the effectiveness of these health education efforts by observing mothers' behav-

loral skills in their own homes. Subsequently, we also observed *canalizacion* (outreach) strategies to see whether we could learn more from these health workers' activities, and conducted "behavioral focus group" research with teams of health workers to determine how best to promote effective health education activities to other health workers. Results of our study indicate that health workers already spent a substantial amount of time doing health education and primary prevention, and were fairly effective at doing so. Their communication, however, tended to be relatively unilateral and failed to involve some of the more progressive aspects of behavioral skills training." (Authors' abstract)

141 Elkamel FM. Communication strategies to sustain ORT program impact. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14–16 Dec 1988. Washington, DC: Creative Associates International, 1989:56–9

142 Elliott EJ, Walker-Smith JA, Farthing MJG, Hunt J, Cameron D. Clinical experience with a hypotonic oral rehydration solution for treatment of pediatric gastroenteritis in the United Kingdom. Clin Therap 1990;12(suppl A):86–94

"Animal and human perfusion studies suggest that water absorption can be optimized by glucose-electrolyte solutions with low total osmolality. A new oral rehydration solution (ORS), reformulated as Dioralyte® (RD), containing 60 mmol/L of sodium and 90 mmol/L of glucose with an osmolality of 240 mosm/kg, was tested for safety and efficacy in children in the United Kingdom with acute gastroenteritis. In a double-blind, controlled trial, RD was compared with standard Dioralyte® (SD), a widely used low-sodium, high-glucose solution containing 35 mmol/L of sodium and 200 mmol/L of glucose, with an osmolality of 310 mosm/kg. Infants and children aged 2 weeks to 3 years admitted with acute gastroenteritis of less than five days' duration and mild-to-moderate dehydration were randomized to receive either RD or SD. Clinical and laboratory assessments were made on admission and 12, 24, and 48 hours after treatment. Thirty-two children were enrolled in the study; 14 received RD and 18 SD. No adverse effects from either ORS were reported. Efficacy was evaluated in 24 patients, of whom eight received RD and 16 SD. Total ORS intake and intake in milliliters per kilogram were similar in both treatment groups. Mean fluid balance, mean percentage weight change, and median stool frequency did not differ between the groups at 12, 24, and 48 hours after onset of treatment. Three (12.5%) patients had ≥0.05% reducing substances in the stool during treatment, and the incidence was similar in both groups. A decrease in mean urea during the first 24 hours of treatment occurred in the group receiving SD ($p=0.02$) but not in the group receiving RD. No abnormal serum sodium levels developed during treatment. Changes in mean serum sodium levels between admission and 24 hours and mean group serum sodium levels at 24 hours were similar in both treatment groups. All five dehydrated children receiving SD were rehydrated by 12 hours after onset of treatment. Of the five dehydrated children receiving RD, one (20%) was rehydrated by 12 hours and four (80%) by 24 hours after onset of the oral rehydration therapy. Time to rehydration was significantly ($p=0.02$) shorter in the group receiving SD. Preliminary data suggest that a hypotonic solution (RD) is safe in children with predominantly viral gastroenteritis, mild to moderate dehydration, and minimal electrolyte disturbance. Small numbers and low power of the nonsignificant variables (15% to 20%) make comparison of efficacy of these ORS difficult." (Authors' abstract)

143 Elliott EJ, Watson AJM, Walker-Smith JA, Farthing MJG. Effect of bicarbonate on efficacy of oral rehydration therapy: studies in an experimental model of secretory diarrhoea. Gut 1988 Aug;29(8):1052–7

"*In situ* perfusion of rat intestine was used to evaluate the effect of bicarbonate on the efficacy of a low sodium (35 mmol/l) glucose-electrolyte oral rehydration solution in normal and cholera toxin-treated rat small intestine. In normal intestine, absorption of water was greater (108 (8.1) µl/min/g;$p<0.01$) and sodium secretion less (-4.3 (0.3) µmol/min/g;$p<0.01$) from the oral rehydration solution containing bicarbonate than from

the solution in which bicarbonate was replaced by chloride ions (59.5 (7.2) µl/min/g and −7.8 (0.8) µmol/min/g, respectively). Glucose absorption in normal intestine was similar with both solutions. In the secreting intestine, both oral rehydration solutions reversed net water secretion to absorption, but inclusion of bicarbonate resulted in significantly less net absorption of both water (2.18 6.9) µl/min/g;$p<0.05$) and glucose (18.7 (2.1) µmol/min/g;$p<0.001$) compared with bicarbonate free oral rehydration solution (19.4 (3.9) µl/min/g and 35.8 (3.7) µmol/min/g, respectively). Net sodium secretion occurred in normal and secreting intestine but was significantly less with the bicarbonate containing oral rehydration solution. These findings suggest that the demonstrable advantage of bicarbonate in promoting water absorption from this oral rehydration solution in normal rat intestine does not apply to cholera toxin treated secreting intestine." (Authors' abstract)

144 Elliott EJ, Da Cunha Ferreira RMC, Cameron D, Farthing MJG, Walker-Smith JA. Evaluation of three oral rehydration solutions designed for use in developed countries. Aliment Pharmacol Therap 1989;3:233-43

145 Elliott EJ, Hunt JB, Watson AJM, Walker-Smith JA, Farthing MJG. Oral rehydration solutions: assessment in human and animal models of intestinal perfusion [abstract]. Pediatr Res 1987 Jul;22(1):108

146 Elliott EJ, Armitstead JCM, Farthing MJG, Walker-Smith JA. Oral rehydration therapy without bicarbonate for prevention and treatment of dehydration: a double-blind controlled trial. Aliment Pharmacol Therap 1988 Jul;2(7):253-63

147 Elliott EJ, Walker-Smith JA, Farthing MJG. Relationship between glucose and sodium in oral rehydration solutions: studies in a model of secretory diarrhoea [abstract]. Pediatr Res 1986 Jul;20(7):690

148 Elliott EJ, Walker-Smith JA, Farthing MJG. The role of bicarbonate and base precursors in treatment of acute gastroenteritis. Arch Dis Child 1987 Jan;62(1):91-5

Oral rehydration therapy (ORT) has generally been accepted for promotion of water and sodium absorption and correction of acidosis. As early as 1832, intravenous saline was used to treat cholera and its associated acidosis with effective results. Later in the mid-1950s, Darrow recommended an alternative method which used a glucose-electrolyte solution. This oral rehydration solution (ORS) was gradually developed in terms of composition to ultimately evolve a more effective treatment for diarrhoeal patients. This review provides a brief history of the efforts to perfect the solution. The mechanism through which the bicarbonate stimulates water and sodium absorption in the human jejunum and ileum is explained, while the role of the base in the correction of metabolic acidosis is also outlined. However, it has been indicated that bicarbonate may not be beneficial with respect to the promotion of water absorption in the enterotoxin-mediated diarrhoeas. Clinical observations do not strongly favour the inclusion of base in the treatment of acidosis and dehydration in acute diarrhoea. Base precursors, such as acetate, citrate, and lactate have been used in rehydrating fluids with limited success. Summaries of recent controlled clinical trials of base precursors in ORS are provided. It has been suggested that ORS compositions should be guided by considerations of simplicity, effectiveness and economy. Caution should be exercised in including bicarbonate and base precursors because of their dubious role in the correction of acidosis and rehydration. Their exclusion can make the solutions cheaper and also easier to administer at home.

149 Elliott EJ. The role of human perfusion techniques in the assessment of oral rehydration solutions. Acta Paediatr Scand 1989;(suppl 364):31-9

"Early human intestinal perfusion studies provided valuable information on gut transport procession *in vivo*. Subsequently, similar models have proved a useful means of assess-

ing the efficacy of glucose-electrolyte oral rehydration solutions. In contrast to clinical trials they enable quantification of water and solute movement across the small intestine and, unlike animal studies, results are directly applicable to man. However, limitations exist, including the fact that a short, usually normal, segment of intestine is studied. Recent studies confirm the relationship between oral rehydration solution sodium concentration and sodium movement; the stimulatory effect of glucose on sodium and water movement; and the detrimental effect of high glucose content. Glycine, bicarbonate, citrate and acetate provide little additional benefit for water absorption when added to solutions containing glucose. Preliminary comparative studies of results obtained in the rat and in man show parallels between these models suggesting they may be complimentary methods of assessing new oral rehydration solutions." (Author's abstract)

150 Elliott EJ, da Cunha-Ferreira R, Walker-Smith JA, Farthing MJG. Sodium content of oral rehydration solutions: a reappraisal. Gut 1989 Nov;30(11):1610-21

This review attempts to define the most appropriate concentration of a particular solute in an oral rehydration solution (ORS). This is important because myriad recommendations exist for the correct choice of an ORS, particularly with regard to its sodium content, since this is likely to vary with the aetiology of the diarrhoea and the age and nutritional status of the patient. The ingredients of different commonly available ORS and their usefulness are examined in this work in an historical perspective. Researches done worldwide have established that oral glucose-electrolyte solutions are useful for rehydration, maintaining hydration and preventing dehydration in childhood diarrhoea, regardless of their aetiology and severity. Variations in the composition of the ORS have confused health practitioners in many parts of the world. Comparisons of efficacy of different ORS in terms of their abilities to correct hyponatraemia, hypernatraemia, and rehydration have revealed that solutions containing 50-60 mmol/l sodium are effective both for rehydration and correction of acidosis. This implies that additional free water, as recommended by the WHO for maintenance therapy, may not be necessary. It is recommended that a single "all purpose" physiological ORS be evolved which would render ORT in developing countries cheaper, simpler and safer and the choice of the practitioner or clinician more definitive.

151 Elliott K, Attawell K, Wilson R, Hirschhorn N, Greenough WB, III, Khin-Maung-U, eds. Cereal based oral rehydration therapy for diarrhoea; report of the International Symposium on Cereal Based Oral Rehydration Therapy, Karachi, 12-14 Nov 1989. Karachi: Aga Khan Foundation, 1990. 99 p.

152 El-Mougi M, Hegazi E, Galal O, El Akkad N, El-Abhar A, Nour N, Emam ME-H, Ahmadi AR. Controlled clinical trial on the efficacy of rice powder-based oral rehydration solution on the outcome of acute diarrhea in infants. J Pediatr Gastroenterol Nutr 1988 Jul-Aug;7(4):572-6

"We report a controlled clinical trial of rice powder-based oral rehydration solution (ORS) versus glucose ORS on the outcome of acute diarrhea in infants. The rice ORS group (n = 30) received ORS containing 50 g rice powder instead of standard WHO solution (20 g glucose, n = 30). Formula-fed male infants were enrolled to enable calculation of milk intake and excretion of urine. Patient allocation to either group depended on the method of random permuted blocks. Both groups were comparable regarding age (4-18 months), duration of diarrhea, number of bowel movements or vomiting per 24 h, rectal temperature, dehydration score, and nutritional status. Results revealed that the rice ORS group had a shorter duration of diarrhea (28.4±5.1 vs 34.3±2.3 h) and greater mean weight gain in the first 24 h as percentage of recovery weight (5.7±0.5% vs 4.1±0.6%). Furthermore, the mean amount of ORS intake, mean stool output, and mean number of episodes of vomiting were lower in the rice-ORS group as compared with the glucose ORS group. All differences were statistically significant. Due to its observed superiority and low cost, the widespread use of rice ORS should be considered for treatment of acute diarrhea." (Authors' abstract)

153 El-Mougi M, Hegazi E, Amer A, el-Abhar A, el-Malky F, el-Shafie A. Efficacy of rice powder based oral rehydration solution on the outcome of acute diarrhoea in infants 1-4 months [letter]. J Trop Pediatr 1989 Aug;35(4):204-5

154 El-Mougi M, El-Akkad N, El-Hadi Emam M, Talkhan AM. Evaluation of a programme of teaching mothers the management of acute diarrhoea. J Trop Pediatr 1986 Feb;32(1):24-5

"The methods applied in this program are taken from behavior sciences and aim to teach Egyptian mothers skills to diagnose dehydration in their children, mix the oral rehydration solution (ORS) and administer appropriate amounts as well as to ensure adequate nutrition. A random sample of 100 women attending the teaching program were interviewed, using a special questionnaire about dehydration and its treatment and were asked to prepare the ORS. Each woman was also asked to identify a good friend in the same building who was then similarly interviewed. A control group of 100 mothers from a distant neighborhood was also interviewed. The social profiles of the 3 groups were not different. The results clearly demonstrate that with the methods of teaching used, mothers retain essential information for several months and what is more, they pass it on to neighbors. Although 98% of trained mothers use ORS, 90% of them also used mixtures containing pectin, kaolin or intestinal antiseptics. 100% of mothers in the other 2 groups used such antidiarrheal mixtures. 87% of the trained mothers correctly knew the steps involved in preparing ORS. 5% used a solution with a high sodium concentration. It is concluded that with the right approach, mothers will retain what physicians and nurses teach and spread the word about rehydration therapy. With proper instructions, mothers will become the central figure in the management of rehydration." (POPLINE)

155 El-Rafie M, Hassouna WA, Hirschhorn N, Loza S, Miller P, Nagaty A, Nasser S, Riyad S. Effect of diarrhoeal disease control on infant and childhood mortality in Egypt: report from the National Control of Diarrheal Diseases Project. Lancet 1990 Feb 10;335(8685):334-8

"The effect of the National Control of Diarrheal Diseases Project, started in 1983, on infant and childhood mortality in Egypt was assessed by means of national civil registration data, nationwide cluster sample surveys of households, and local area studies. Packets of oral rehydration salts are now widely accessible; oral rehydration therapy is used correctly in most episodes of diarrhoea; most mothers continue to feed infants and children during the child's illness; and most physicians prescribe oral rehydration therapy. These changes in the management of acute diarrhoea are associated with a sharp decrease in mortality from diarrhoea, while death from other causes remains nearly constant." (Authors' abstract)

156 Enge KI, De Calderon SH. Oral rehydration and immunization: the role of the rural health promoter, Guatemala. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1988. 194 p.

157 Engo R. The role of water and sanitation programs in the prevention of diarrhea. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:126-8

158 Espino Aguilar R, de la Torre Cecilia C, Perez Navero JL, Velasco Jabalquinto MJ, Barcones Mingueza F, Romanos Lezcano A. [Saline poisoning caused by an oral rehydration solution]. An Esp Pediatr 1989 Jul;31(1):73-5

159 Evian CR. Health education and oral hydration therapy -- some issues to consider [opinion]. S Afr Med J 1989 Nov 4;76(9):463-4

160 Evian CR. Preparing oral hydration solution with a cup method. S Afr Med J 1989 Nov 4;76(9):502 - 5

"In a survey of 195 homes in four villages in the Mhala area of Gazankulu, 90% of women caring for under - 5 children were able to make an oral hydration solution (OHS). Seventy - five per cent of these women indicated that they would use an OHS as first - line management for diarrhoea. Seventy - nine per cent (139) of these solutions were prepared using a cup method and 13% (23) using a litre - bottle method. A biochemical - ly ideal sodium concentration was found in 31% (43) of solutions made using the cup method and in 17% (5) of those made using the litre method. The solutions are further analysed. The appropriateness of the cup and litre measures for home - made OHS in these circumstances is studied and discussed. The cup method is considered to have advantages because utensils and ingredients for this method are more readily available in these rural homes. Dual messages given to this community may be responsible for the apparent confusion about making OHS, and it is advocated that health education about OHS should where possible be standardised." (Author's abstract)

161 Fabricant S. Local production of ORS. In: LeSar J, Harrison P, Buxbaum A, eds. Manual for assessment and planning of national ORT programs. Arlington, Virginia: Tech - nologies for Primary Health Care Project, Management Sciences for Health, 1985. 12 p.

162 Fakhir S, Ahmad SH. A comparative study of three types of ORS in the man - agement of diarrheal dehydration. Indian J Pediatr 1990 Jan - Feb;57(1):81 - 7

"Seventy five infants and children aged 6 months to 4 years admitted to pediatrics serv - ices of J.N. Medical College, A.M.U., Aligarh with acute watery diarrhea with or without vomitings and associated with varying degree of dehydration were studied. They were randomly divided into three groups - (A,B,C) and were rehydrated with WHO standard ORS, super ORS and rice water electrolytes solution. These children were subjected to investigations like hemogram, hematocrit, blood urea, blood glucose, plasma electrolytes, recorded on admission and repeated at 6 hours, 24 hours and at the time of discharge. The observations emerging out of this study include lower rate of purging, earlier control of vomitings, greater weight gain, earlier urination and consistently lower requirement of ORS and shorter time required for initial rehydration associated with early normally in laboratory parameters in dehydrated children receiving either super ORS or rice water electrolyte solution as compared to those on standard ORS. The difference in all these parameters was statistically significant." (Authors' abstract)

163 Farthing MJG. Disease - related animal models for optimising oral rehydration solution composition. Acta Paediatr Scand 1989;(suppl 364):23 - 30

"To optimise the composition of oral rehydration solutions (ORS) for European children is not a simple task. Although controlled clinical trial is ultimately the only way to deter - mine whether a new solution is superior to an established ORS, testing many different formulations is neither feasible nor ethical. Several groups of investigators have evolved the concept of using animal models to test new ORS formulations. Disease - related animal models using perfusion of cholera toxin - treated rat small intestine or experimental rotavirus infection of neonatal rats suggest that optimal water absorption will be obtained by using a hypotonic ORS with a sodium concentration of 50 - 60 mmol/l and a glucose concentration of 50 - 100 mmol/l. Addition of citrate or bicarbonate had no benefit with respect to the promotion of water absorption." (Author's abstract)

164 Farthing MJ. History and rationale of oral rehydration and recent developments in formulating an optimal solution. Drugs 1988;36(suppl 4):80 - 90

"Oral rehydration therapy with glucose - electrolyte solutions has been one of the major therapeutic advances of the century. This alarmingly simple intervention developed from a basic scientific observation in the laboratory, when it was shown that sodium and glucose

transport in the small intestine are coupled and thus the presence of glucose in an electrolyte solution promotes absorption of both sodium ions and water. Even more important, sodium/glucose co-transport continues despite the secretory diarrhoea of cholera and enterotoxigenic *E. coli* and after intestinal damage due to rotavirus. Despite widespread use of the oral rehydration solutions (ORS) recommended by the World Health Organization (WHO), controversy continues about the optimal composition of these solutions. Discussion centres around the sodium and glucose concentrations, the osmolality and whether base (bicarbonate) or base-precursor (citrate) is necessary. Already there is a clear divide between the developing world, where the WHO solution (Na 90, glucose 111 and bicarbonate 30 mmol/L) is widely used, and the industrialised world, where solutions with lower sodium and until recently higher glucose concentrations have been favoured. Recently, attempts have been made to optimise ORS using animal and human model systems before submitting new candidate ORS to clinical trial. Results to date suggest that hypotonic ORS containing 50-60 mmol/L sodium and 90-100 mmol/L glucose produce maximal water absorption. The presence of base or base-precursor appears to offer little with regard to the promotion of sodium and water absorption and its role in combating acidosis remains controversial. Complex substrates such as rice powder and glucose polymers may eventually replace glucose in ORS, since their addition reduces ORS osmolality still further." (Author's abstract)

165 Farthing MJ. Studies of oral rehydration solutions in animal models. Clin Therap 1990;12(suppl A):51-62

"Ideas about the optimal composition of oral rehydration solutions (ORS) continue to evolve. A controlled clinical trial is the only way to determine whether a new ORS is superior to an established solution, but attempts have been made to prescreen new ORS in a variety of animal models, most of which involve intestinal perfusion. Most of the work has been performed in the healthy small intestine of rats, either in short segments or in its entirety, or in the diseased small intestine that has been infected with rotavirus or exposed to cholera toxin to induce a secretory state. Despite the marked pathophysiologic differences between these models, the qualitative findings using new and established ORS have been remarkably similar. Overall, these animal models have emphasized the potential benefit of using a hypotonic ORS (osmolality, 240 mosm/kg or less). The optimal sodium concentration has been found to be 50 to 60 mmol/L, and the optimal glucose concentration 90 to 111 mmol/L. These models have also been satisfactorily used to examine the value of glucose polymer and food-based ORS. The findings suggest that for a given substrate load initial osmolality is probably the chief determinant of water absorption, which is substantially greater from the more hypotonic solutions. Results from animal experiments must be interpreted with caution because of their physiologic limitations. Nevertheless, they have provided insight into the physiology of oral rehydration therapy and may be useful in identifying ORS for evaluation by clinical trial." (Author's abstract)

166 Faruque ASG, Rahman ASMM, Zaman K. Young childhood diarrhoea management by mothers and village practitioners in rural Bangladesh. Trop Geogr Med 1985 Sep;37(3):223-6

"The role and success of mothers and village practitioners in treating diarrhoeal episodes have been evaluated in Bangladesh in 1979-1980 in 11 villages with 1801 children under age 5. Diarrhoeal episodes were recorded by weekly house-to-house visits. Among the study children, 1079 diarrhoeal episodes occurred during one year's observation. The attack rate was 60 per 100 children per year. Mothers treated more total episodes and more watery diarrhoea incidences, while practitioners attended more patients with dysentery. The ORS use pattern was significantly higher in watery diarrhoea in children under age 1. Measures are suggested to improve health care delivery to Bangladeshi children with diarrhoea." (Authors' abstract)

167 Feachem RG. Preventing diarrhoea: what are the policy options?. Health Pol

Plann 1986 Jun;1(2):109 – 17

"Oral rehydration therapy (ORT) has become the cornerstone of most programmes of diarrhoea control, and is highly effective in preventing death from dehydration caused by acute watery episodes of diarrhoea. The effectiveness of ORT in reducing mortality from chronic or dysenteric diarrhoeas is believed to be low and, in addition, ORT can be expected to have little or no impact on diarrhoea morbidity rates. In view of this, ORT should be complemented by other interventions designed to avert mortality not averted by ORT, and to reduce morbidity rates. The Diarrheal Diseases Control Programme of WHO has initiated a systematic study of the effectiveness and cost of interventions that are potentially useful in diarrhoea control. This paper summarizes the findings of this study, concentrating on those interventions for which the evidence for high effectiveness and feasibility is strong. These are: promotion of breast feeding, weaning education, measles immunization, improving water supply and sanitation, promotion of hygiene, and, when the new vaccines are available, rotavirus, and possibly cholera, immunization. Estimates are presented of the cost – effectiveness of these interventions in reducing diarrhoea morbidity and mortality rates among children under 5 years of age." (Author's abstract)

168 Feachem RG. Unfinished business: in ORT, CDD, and child health. In: Prather CJ, ed. ICORT III; proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14 – 16 Dec 1988. Washington, DC: Creative Associates International, 1989:119 – 20

169 Ferrinho PDLGM, Gear JSS, Reinach SG. Diarrhoeal diseases and oral fluid therapy in the Gelukspan health ward. S Afr Med J 1989 Nov 4;76(9):496 – 9

'This study reports the results on diarrhoeal disease and oral fluid therapy (OFT) obtained during a survey on maternal knowledge and child health in the Gelukspan health ward (GHW) in 1985 – 1986. We studied 210 women sampled by means of a multistage sampling procedure. Strict selection criteria ensured that the baby had been born in the GHW, that it was the first – born and the only child, and that it had been cared for by the mother from birth until the time of interviewing. All the children were between 12 and 24 months old. Information was collected by interviewing the mother and by analysing data on the home – retained 'Road to Health' cards (RTHCs) of the study children. Ninety – three per cent of the children had an RTHC and 97% of these had at least one record about reasons to visit the health service. Most visits were 'well' visits (71%), 18% were associated with respiratory tract complaints, and 12% were associated with gastro – intestinal complaints (most commonly diarrhoea). Sixty – three per cent of children with data on visits to the health services attended at least once with gastro – intestinal complaints during the first year of life. About two – thirds of the mothers knew the composition of an acceptable oral fluid solution for home therapy of diarrhoeal disease. Only 40% knew how frequently it should be given and only a quarter knew how much to give. After multivariate analysis the only independent variables that remained predictors of knowledge on OFT were maternal knowledge on signs and symptoms of dehydration (SSD) and frequency of gastro – intestinal complaints as recorded on the RTHC. Maternal knowledge on SSD was also assessed. About half of the mothers knew no signs of SSD. About a quarter knew one SSD and about one – fifth knew two or more. After multivariate analysis the only independent variables that remained predictors of knowledge on SSD were knowledge of OFT and maternal education. The results are explained and discussed. We conclude that time spent with mothers of children with diarrhoeal disease will result in adequate awareness of OFT independently of level of maternal education. However, there is a need to emphasise the 'how – to – use' aspects of OFT. What determines maternal knowledge on SSD needs further research." (Authors' abstract)

170 Ferrinho PDLGM, Ijsselmuiden CB, Gear JSS, Jacobs ME. Survey of oral fluid therapy practices in South Africa. S Afr Med J 1989 Nov 4;76(9):480 – 2

"The objectives of this study were to document the official oral fluid therapy (OFT) policies of all the ministries of health in South Africa and of the four provincial authorities, to determine what methods of OFT are used in hospitals providing paediatric care, to determine the OFT methods recommended by hospital staff for use at home, to establish the level of support for the idea of one national policy for OFT and to determine what senior academic paediatricians think about these issues. We conducted structured telephonic interviews of professional staff in charge of paediatric wards in 159 randomly selected hospitals providing general inpatient care. The hospitals were stratified as private, provincial and 'homeland'. We also interviewed the directors-general or the secretaries or their deputies in each ministry of health as well as directors of hospital services or their deputies in each one of the four provinces of the Republic. Lastly, we spoke to the academic heads of paediatric departments in each of the country's eight medical schools. The results show that the use of OFT for inpatient care of diarrhoeal disease is far from universal, and that the picture with regard to promotion of home OFT is even less favourable. We identified an unacceptable diversity in the OFT methods being promoted as well as a degree of resistance to the development of one national policy. We recommend that one policy, based on the recommendations of the South African Paediatric Association, be adopted by all health authorities in South Africa as a matter of urgency. Furthermore, we recommend that a national campaign to promote both the clinical and the home use of OFT be instituted." (Authors' abstract)

171 Ferrinho P, Evlan C, Wagstaff L, Pretorius JHO, Gear J. Towards consensus on oral fluid therapy in diarrhoeal diseases [editorial]. S Afr Med J 1989 Nov;76(9):459-60

172 Field M, Greenough WB, III, Molla AM, Hirschhorn N, Rolston D, Pierce N. Biomedical aspects of oral rehydration therapy: discovering new dimensions and potentials. In: Elliott K, Attawell K, Wilson R, Hirschhorn N, Snow J, Jr., Greenough WB, III, Khin-Maung-U, eds. Cereal based oral rehydration therapy for diarrhoea; report of the International Symposium on Cereal Based Oral Rehydration Therapy, Karachi, 12-14 Nov 1989. Karachi: Aga Khan Foundation, 1990:23-30

173 Finau SA, Latu R. Oral rehydration salts and diarrhoeal diseases: effects of changing inpatient management in Tonga. Ann Trop Paediatr 1987 Jun; 7(2):128-33

"Methods of inpatient management of children with diarrhoeal diseases in 1978 and in 1980 were compared to assess the use of oral rehydration salts (ORS) and a national antidiarrhoeal programme. Inpatient notes of 369 children admitted with diarrhoeal diseases were reviewed. The management of diarrhoeal diseases differed significantly but the clinical outcome was similar, with the exception of the case-fatality rate. All deaths occurred within the first 24 h of admission, indicating that this difference was attributable to improved management of diarrhoeal diseases in the community rather than changes in the inpatient treatment regime." (Authors' abstract)

174 Finberg L. Water and solute imbalance in oral rehydration. J Pediatr Gastroenterol Nutr 1986 Jan;5(1):4-5

175 Finch MH, Younoszai KM. Oral rehydration therapy. South Med J 1987 May; 80(5):609-13

176 Finkam KT. The National Oral Rehydration Program of the National Council of Brazilian Bishops (CNBB): 1987-1990. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:20-3

177 Fitzgerald JF. Management of acute diarrhea. Pediatr Infect Dis J 1989 Aug;8(8):564-9

This paper furnishes a comprehensive account of the entire gamut of diarrhoea management, including the pathophysiology of diarrhoea. The symptoms of bacterial and non-bacterial diarrhoea, their associated pathogens and their clinical manifestations are described. The effects of dehydration and the means available for rehydration and maintenance are explained. Also described are four key steps in the management of acute diarrhoea, which are: 1) the assessment of fluid and electrolyte deficit, 2) rehydration, 3) maintenance fluid therapy, and 4) the re-introduction of normal nutrients. Rehydration is particularly emphasised and the various solutions available for it are compared in terms of efficacy and immediacy of action in correcting the diarrhoea. For patients with clinical signs of shock, intravenous therapy has been recommended. Oral rehydration solution (ORS) is strongly recommended for mild and short-lived diarrhoeas because of the easy absorption of glucose and sodium. ORS with lower sodium content is better for prevention rather than correction of dehydration. It is believed that ORS should be given in a volume that can appropriately correct the calculated deficit over a pre-determined period. The patients' clinical conditions must be reassessed at the end of that time and, if needed, additional rehydration therapy should be commenced. Antimicrobial and antidiarrhoeal agents should be given with care. The principles of oral rehydration have transformed the manner in which diarrhoea is tackled and managed in the present day.

178 Flores Alvarado A, Gomez Carrillo G, Suarez Castaneda J. [Experience of the Mexican Institute of Social Security COPLAMAR program with the use of oral hydration in rural communities of Mexico]. Salud Publica Mex 1987 Jan-Feb;29(1):49-54

179 Fontaine O, Beau JP, Ndiaye AM. Oral rehydration and nutritional rehabilitation of severely malnourished children. Child Trop 1985;(158):56-63

"This report of results obtained at the Center for Nutritional Rehabilitation and Oral Rehydration in Senegal suggests that simple techniques can be extremely effective in the treatment of diarrhea and severe malnutrition. The Center operates as a day hospital, with children and their mothers attending each day from 8 AM until 6 PM. The oral rehydration solution used has a rice flour base (30 gm) and includes 3.5 gm of sodium chloride, 2.5 gm of sodium bicarbonate, and 1.5 gm of potassium chloride. Breastfeeding is never interrupted, and nutritional rehabilitation is often begun before dehydration is completely corrected. The renutrition solution used is composed of curdled milk, oil, and sugar mixed together to form a paste that keeps for about 2 weeks. Mothers meet with the health auxiliary each day for nutrition and health education sessions. Of the 233 children completing treatment at the Center over a 9-month period, 214 had marasmus and 19 had kwashiorkor or kwashiorkor-marasmus. The average weight gain was 11.6 gm/kg/day in the former group (average duration of stay 17.3 days) and 8.0 gm/kg/day in the latter group (average duration of stay 27.0 days). The greater weight gain among children with marasmus than those with kwashiorkor reflects the edemas in the latter group. Overall, the success rate was 84% among children with a weight/age ratio under 55%. The average weight gain 1 month after discharge was 1 kg. The cost of this protocol was US25 cents/child/day. The simplicity of the infrastructure required should encourage the development of similar centers in peripheral and underserved areas." (POPLINE)

180 Ford EG, Jennings LM, Andrassy RJ. Therapy for intractable diarrhea [letter]. J Pediatr 1987 May;110(5):815-6

181 Fox KFA. Social marketing of oral rehydration therapy and contraceptives in Egypt. Stud Fam Plann 1988 Mar-Apr;19(2):95-108

"This article examines the antecedents, activities, results, and prospects for institutionalization of two large social marketing programs currently in operation in Egypt: the National Control of Diarrheal Diseases Project, which promotes oral rehydration therapy to treat diarrheal dehydration, and the Family of the Future, which is recognized as one of the most sophisticated and effective contraceptive social marketing programs operating today.

This examination of two health-related social marketing programmes operating simultaneously in the same country can highlight the factors that contribute to successful programs." (Author's abstract)

182 Frankel SJ, Lehmann D. Oral rehydration: what mothers think. World Health Forum 1985;6(3):271-3

"The findings of an anthropological study of the attitude toward oral rehydration therapy (ORT) among the Huli women of the Southern Highland Province of Papua New Guinea are summarized in this report. The findings suggested that the continued success of the ORT program, introduced in 1979, would be determined by the degree to which program promoters were able to provide Huli women with a culturally understandable explanation of the way ORT functions. The Huli people derive their living primarily from subsistence farming and most Huli have ready access to medical care at local health posts. Prior to 1979, health workers prescribed kaolin or sulfadimidine syrup for children with diarrheal diseases. This treatment generally resulted in the rapid cessation of loose stools. Given the high visibility and desirability of the drugs' effects, the Huli women developed considerable confidence in the advice given by health workers. The women often supplemented the drug treatment with traditional remedies, e.g., conducting prayer rituals and restricting the patient's fluid intake. When the ORT program was introduced, the health workers completely stopped prescribing the drugs. ORT was generally administered at the health posts; however, Oralyte packets and mixing containers were occasionally given to mothers who treated their infants at home and all of the mothers were encouraged to increase the fluid intake of children with diarrhea. Despite the fact that ORT contradicted the traditional practice of withholding fluids from the patient, the Huli women were willing to take the advice of the health workers and try ORT. An indicator of the initial success of the program was the decline in the annual number of diarrhea specific death/1000 Huli children under the age of 5 years from 3.3 in 1977-80 to 1.3 in 1981-82. Despite this initial success, the present study found that in 1983, women brought their children for treatment to the health post on only 25% of the days during which their children exhibited symptoms of diarrhea. The respective proportion of days was 52% in 1978. By 1983, the majority of the women questioned indicated they were dissatisfied with ORT because it failed to produce a quick reduction of loose stools. The program failed to make clear to the Huli women that the effects of ORT are delayed. Program promoters should help the Huli women develop a better understanding of the relationship between dehydration and diarrhea and of the way in which ORT works. The Huli women are able to recognize symptoms such as dry skin and sunken eyes. Furthermore, Huli traditional medicine places considerable emphasis on the skin as an indicator of the health status of the individual and makes a distinction between treatments which provide symptomatic relief and treatments which address the underlying cause of an illness. Health administers could use these Huli concepts to help Huli women gain an understanding of the nature of ORT." (POPLINE)

183 Furst BG. Social Marketing Oral Rehydration Therapy/Solution: a workshop, 1-2 Nov 1984, Arlington, Virginia. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 82 p.

184 Gabr MK. The oral rehydration program: the Egyptian experience. In: Prather CJ, ed. ICORT III; proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:53-63

185 Gaye PA, Test DJ. Training of trainers' workshop for launching an oral rehydration therapy campaign in Togo. V. I. Summary of three training workshops. Arlington, Virginia: Water and Sanitation for Health Project, 1986. 92 p. (WASH field report, 168)

186 Gebesh VV, Lenartovich LS, Proleeva VV, Shevchuk VB, Rudenko, IN. [Oral rehydration method in the therapy of patients with acute intestinal infections]. Vrach Delo

1985 Oct;(10):120 – 2

187 Ghishan FK. The transport of electrolytes in the gut and the use of oral rehydration solutions. Pediatr Clin North Am 1988 Feb;35(1):35 – 51

188 Ghosh JB. Oral rehydration solution – – its erroneous use [letter]. Indian Pediatr 1986 Sep;23(9):743

189 Ginies JL, Verneau AM, Perignon N, de Rasilly A. [Oral rehydration and feeding for infants with diarrhea]. Soins Gynecol Obstet Pueric Pediatr 1985 May;(48):37 – 44

190 Golokhvastova EL, Chekalina KI, Brodov LE, Maleev VV. [The detoxication and rehydration effect of oral rehydration therapy in acute intestinal infection] Ter Arkh 1989;61(11):11 – 4

191 Gomaa A, Mwafi M, Nagaty A, El Rafie M, Nasser S, Kielmann A, Hirschhorn N. Impact of the National Control of Diarrhoeal Diseases Project on infant and child mortality in Dakahlia, Egypt. National Control of Diarrheal Diseases Project. Lancet 1988 Jul 16;2(8603):145 – 8

"The Egyptian National Control of Diarrheal Diseases Project (NCDDP) started in 1983. A field trial done in Dakahlia Governorate in 1980 to promote oral rehydration therapy showed that the mortality rate for the under – fives during the diarrhoea season was 18.1/1000 in control villages and 10.5/1000 in "outreach" villages (p less than 0.001). In 1986 mortality rates had become similar in the two areas and lower than in 1980 (6.5/1000 and 6.0/1000, respectively), even though there were no significant changes in diarrhoea incidence. Virtually all the reduction in mortality was due to a decline in diarrhoea – associated deaths. The principal differences between 1986 and 1980 were better case – management by mothers and doctors, in both outreach and control villages, and far greater television ownership. Village civil registers showed only slight changes in under – five mortality from all causes after 1980, but an accelerating decline from 1983. Governorate – wide civil registration data showed slowly falling infant death rates from 1970 onward, accelerating after 1982, with most of the decline corresponding to the seasonal pattern of diarrhoea – associated mortality throughout the year. Thus NCDDP promotion of better treatment seems to have been responsible for the decline in mortality." (Authors' abstract)

192 Goodall R. ORS in the context of the essential drug program. In: Cash R, ed. Proceedings of the International Conference on Oral Rehydration Therapy, Washington, D.C., 7 – 10 Jun 1983. Washington, D.C.: US Agency for International Development, 1985:159 – 61

193 Goodall RM. UNICEF: 11 years in the field. World Health 1986 Apr:12 – 3

194 Goodall RM. Views of UNICEF and WHO on ORT III [editorial perspective]. J Diarrhoeal Dis Res 1985 Dec;3(4):197 – 8

195 Goyo – Rivas JJ, Rendon F. Biochemical composition of oral rehydration solutions and their combinations suggested for use in Venezuela. Bol Med Hosp Infant Mex 1989 Mar;46(3):179 – 84

"We studied the electrolyte composition, pH and osmolality of six solutions for oral rehydration available in drug stores in Venezuela, and also their combinations with whole milk in a dilution of 6.6%. The solutions such as Pedialyte, Hidramilac and Hidramines showed an acid pH (4.30 – 5.10) in direct relationship to the concentration of carbohydrates (5% or more). Also, Pedialyte and Hidramilac had greater osmolalities (360 – 365 mOsm/kg) than plasma. Some of the levels of sodium and potassium in the solutions were found to be under the concentrations given by the producers. The combination of whole milk with

oral solutions diminishes the concentrations of sodium and potassium in the mixture, changing the sodium – glucose relationship, pH and osmolality. The therapeutic implications for the use of oral rehydration solutions with low concentrations of sodium, acid pH, large content of glucose and elevated osmolality are discussed. It is concluded that the combination of whole milk with Sueroral (WHO) is not adequate for the optimum absorption of sodium and therefore to prevent dehydration. Therefore, except for the WHO solution and Oralite, other solutions are not adequate for the correction of the electrolytic and acid – base alterations present in infants with dehydration secondary to acute diarrhea." (Authors' abstract)

196 Gracey M, Santoso H, Peterson D. Prevention of contamination of oral rehydration fluids. Ann Trop Paediatr 1987 Mar;7(1):15 – 7

A treated city water supply and most waters tested from several tourist hotels in a popular international resort were found to be microbiologically safe for drinking, but untreated domestic water supplies and locally prepared soft drinks frequently had high levels of bacterial contamination and faecal pollution. A novel oral rehydration mixture, based on fruit juice cordial which kills intestinal bacteria *in vitro*, was effective for treating young children with diarrhoea and mild – to – moderate dehydration in the same environment.

197 Green EC. Diarrhea and the social marketing of oral rehydration salts in Bangladesh. Soc Sci Med 1986;23(4):357 – 66

"An anthropological study of knowledge, attitudes and practices relating to child diarrhea and specifically to ORS was carried out in Bangladesh. The purpose of the study was to help design a culturally – sensitive social marketing program. Information was gathered on indigenous classification of diarrheas, patterns of therapy recourse and diarrhea management, and understanding of dehydration symptoms as well as use and attitudes regarding ORS. Among the findings were that 58% of households sampled had tried ORS at least once; ORS was perceived as a medicine with several positive attributes; literacy was positively related to ORS use; and there were no significant cultural barriers to ORS adoption." (Author's abstract)

198 Greenough WB, Molla AM. Background paper for Symposium on Food – based Oral Rehydration Therapy, Karachi, on 12 – 14 November 1989. Karachi: The Aga Khan University, 1989. 9 p.

199 Greenough WB, III. Oral rehydration therapy: an epithelial transport success story. Arch Dis Child 1989 Mar;64(3):419 – 22

200 Greenough WB, III, Hirschhorn N. Oral rehydration therapy: the next generation [editorial]. J Diarrhoeal Dis Res 1987 Dec;5(4):245 – 6

201 Greenough WB, III, Molla AM. Oral rehydration therapy (ORT): present and future. In: Takeda Y, Kuwahara S, eds. *Vibrio cholerae* and cholera. Tokyo: KTK Scientific Publishers, 1988:117 – 27

202 Greenough WB, III. Status of cereal – based oral rehydration therapy. J Diarrhoeal Dis Res 1987 Dec;5(4):275 – 8

"This article discusses why oral rehydration therapy (ORT) works on a physiological level. Studies point to the likely importance of polymers of glucose and amino acids in optimal transport of sodium and water from the gut lumen into the blood stream. However, small molecules such as glucose, which may ultimately transport fluid from the lumen into the blood, will initially, by osmotic force, do the reverse and draw water out of the bloodstream into the gut lumen. This limits the efficacy of the current ORT solution. No additional small molecules can be added without paying the penalty of increasing shock and diarrhea. Starches from natural foods such as rice are long, elegantly branched

chains of chemically linked glucose molecules. Each starch molecule has the same osmotic activity for its hundreds of linked glucose molecules as does a single glucose molecule, and thus there is no osmotic penalty incurred if higher concentrations of starch are employed. For all these reasons the use of cereal-based ORT solutions looks promising. The advantage of using cereal-based solutions in developing countries is that they may have no glucose industry. But, except under famine conditions, every household in the world has the necessary ingredients for providing effective cereal-based solutions." (POPLINE)

203 Greenough WB, III. Why is rice water effective for diarrhoea? [letter]. Lancet 1989 Apr 29;1(8644):966

204 Guandalini S. Current controversies in oral rehydration solution formulation. Clin Therap 1990;12(suppl A):38-46

"Although the importance of oral rehydration therapy for acute diarrhea is unquestioned, controversy remains about the preparation and formulation of the oral rehydration solutions (ORS). There is disagreement about whether the ORS should be homemade or commercially prepared, what constitutes the optimal sodium content, what base (if any) should be present in the ORS, and whether other nutrients can be substituted entirely or in part for glucose. These issues are discussed and recommendations for the ideal ORS are presented." (Author's abstract)

205 Guandalini S. Overview of childhood acute diarrhoea in Europe: implications for oral rehydration therapy. Acta Paediatr Scand 1989;(suppl 364):5-12

"Infant mortality from acute diarrhoea has sharply declined in the last few decades throughout Europe. However, acute diarrhoea is still a very common occurrence in European children, who experience, in their first 3 years of life, approximately 1 episode/year. The commonest agent responsible for infectious diarrhoea appears to be rotavirus, followed by *Campylobacter*. Although water loss may be high, the mean sodium loss is close to 40 mmol/l of stool in rotaviral diarrhoea, and to 60 mmol/l in diarrhoeas due to invasive pathogens such as *Campylobacter* and *Salmonella*. Larger fluid losses but a somewhat lower sodium loss accompanies non-cholera secretory diarrhoeas, which appear to be commoner in infants than in older children. This evidence indicates that an ORS for European children should have a sodium concentration lower than 90 mmol/l which was primarily intended for use in developing countries. Clearly, the glucose concentration is crucial, as it is now evident that concentrations higher than the recommended 110 mmol/l may lead, particularly in rotaviral enteritis, to worsening of diarrhoea and development of hypernatraemia. Finally, it appears that in Europe the use of commercially available ORS is strikingly low, so that infants and children are often given a variety of "clear fluids", generally inadequate to ensure proper rehydration or maintenance of hydration. Thus an effort should be made not only to devise the "ideal" solution, but also to effectively implement its use." (Author's abstract)

206 Gulscafre H, Munoz O, Padilla G, Reyes RM, Gonzalez E, Bronfman M, Gutierrez G. Strategies for improving the therapeutic patterns used in acute diarrhea in primary medical care units. VI. Evaluation of the strategy aimed at family physicians for increasing the use of oral rehydration and decreasing that of antibiotics and restrictive diets. Arch Invest Med (Mex) 1988 Oct-Dec;19(4):395-407

207 Guzman C, Pizarro D, Castillo B, Posada G. Hypernatremic diarrheal dehydration treated with oral glucose-electrolyte solution containing 90 or 75 mEq/L of sodium. J Pediatr Gastroenterol Nutr 1988 Sep-Oct;7(5):694-8

"Of 33 infants with hypernatremic dehydration (serum Na^+ of $\geq$ 150 mEq/L) 7 were excluded, 6 because severe alteration of the level of consciousness or shock precluded oral rehydration and 1 because he was given glucose-electrolyte solution plus water.

We studied the remaining 27 infants. Twenty (group A) were treated with the World Health Organization-recommended oral rehydration solution (90 mEq/L Na^+) and seven (group B) were treated with pedialyte-RS (Abbott Laboratories Ltd.; 75 mEq/L Na^+). The rehydrating solutions were administered in a volume equivalent to twice the clinically estimated fluid deficit. Initial serum sodium was 156.7+0.9 mEq/L for group A and 155.8+1.8 mEq/L for group B (mean + SEM). The mean time to achieve rehydration was 14.3 and 16.6 h for groups A and B, respectively. Twenty-four hours after commencing oral rehydration, serum Na^+ had decreased to 144.8+1.8 mEq/L for group A and 144.5+0.9 mEq/L for group B. In two patients in group A, the serum Na^+, which, had not decreased to <150 mEq/L at 24 h, did so at 48 h. Only in one case (group A) did the serum Na^+ increase. This patient had high stool output and failed to become rehydrated after 24 h of unsuccessful oral rehydration. None of the patients had seizures or persistent CNS dysfunction. We conclude that the slow administration of oral rehydration solutions containing either 90 or 75 mEq/L Na^+ is a safe and effective treatment of hypernatremic dehydration." (Authors' abstract)

208 Haffejee IE, Moosa A. Honey in the treatment of infantile gastroenteritis. Br Med J [Clin Res] 1985 Jun 22;290(6485):1866-7

"A clinical study was undertaken using honey in oral rehydration solution in infants and children with gastroenteritis. The aim was to evaluate the influence of honey on the duration of acute diarrhoea and its value as a glucose substitute in oral rehydration. The results showed that honey shortens the duration of bacterial diarrhoea, does not prolong the duration of non-bacterial diarrhoea, and may safely be used as a substitute for glucose in an oral rehydration solution containing electrolytes. The correct dilution of honey, as well as the presence of electrolytes in the oral rehydration solution, however, must be maintained." (Authors' abstract)

209 Haquani AH, Shams S. Oral rehydration in diarrhoeal disease: a comparative study of Orolyte and Lactade. J Pak Med Assoc 1985 Aug;35(8):255-64

"Oral rehydration therapy with electrolytes and glucose has been generally accepted in the treatment of cholera and non-cholera diarrhoeas with less than 10% dehydration. Oral fluid for cholera patients contained 90 mmol/L of sodium because of high fecal excretion rate of sodium in cholera. The same formula has been introduced by the World Health Organisation in developing countries for non-cholera diarrhoeas where fecal excretion rates of sodium are much less compared to cholera. There has been some concern about its use in children specially infants and malnourished children. We conducted a comparative study of Orolyte (WHO formula) and Lactade, a low solute formula with glycine, the latter was found to be more effective. Reasons are discussed for recommending a low solute formula in this country." (Authors' abstract)

210 Harig JM, Ramaswamy K. Acute diarrhea in adults. Management, with emphasis on oral rehydration therapy. Postgrad Med 1989 Dec;86(8):131-3,137,140

211 Heath SE, Naylor JM, Guedo BL, Petrie L, Rousseaux CG, Radostits OM. The effects of feeding milk to diarrheic calves supplemented with oral electrolytes. Can J Vet Res 1989 Oct;53(4):477-85

"The effects of feeding different levels of milk to diarrheic calves (n = 19) supplemented with oral electrolytes were investigated. In the early stages of the disease the calves were fed either enough milk to maintain normal growth in a healthy calf, one half that volume or no milk. The three groups were further subdivided according to whether or not the electrolyte solution contained bicarbonate. A full milk ration allowed uninterrupted weight gains of 1% body weight/day (p = 0.003), but caused greater inappetence (p = 0.003 to 0.037) at the beginning of the trial than lower levels of milk intake. Electrolyte solutions with bicarbonate reduced growth rates in milk fed calves (p = 0.014). The density of fat stores increased with the level of milk feeding (p = 0.04 to 0.053). The mitotic

index of the duodenal mucosa increased with milk feeding (p = 0.08), indicating a superior mucosal regeneration potential. Thymic atrophy was pronounced in those calves fed no milk (p = 0.001). It was concluded that the continued feeding of milk to diarrheic calves was beneficial. Electrolyte solutions containing bicarbonate should be avoided when milk is fed to diarrheic calves." (Authors' abstract)

212 Hefelfinger DC. More on cola drinks and rehydration in acute diarrhea [letter]. N Engl J Med 1987 Jan 29;316(5):280-1

213 Hegazy MI, Galal OM, El-Mougy MT, Wallace-Cabin S, Harrison GG. Composition of Egyptian home remedies for diarrhea. Ecol Food Nutr 1987;19(3):247-55

"Diarrhea is a major cause of morbidity and mortality in Egypt, as in many developing countries. Oral rehydration therapy (ORT) has been shown to be effective for the treatment of dehydration which often occurs during diarrhea. However, malnutrition, a common side effect of diarrheal illness, cannot be prevented or treated by ORT alone; the food and fluids which the child receives during and following diarrhea will determine to a large extent the nutritional consequences of the illness. This study investigated the types of traditional foods given to children ill with diarrhea, and their composition, in order to identify foods which are in traditional use which could be modified for use as an enriched ORT product. Between August and October, 1984, mothers of 3,130 children were interviewed while seeking medical care for their children's diarrheal illnesses at health centers in several locations in Egypt. Information collected included age and sex of the child, type of water supply and drainage system in the home, and the type of traditional foods used during and after diarrhea. These foods, were then prepared using recipes given by the mothers and analyzed for proximate composition, sodium and potassium. Although none of the traditional foods given were adequate as a source of protein or electrolytes, several of the popular ones could be modified by addition of salt to be appropriate enriched ORT sources." (Authors' abstract)

214 Helmy N, Abdalla S, El Essally M, Nasser S, Hirschhorn N. Oral rehydration therapy for low birth weight neonates suffering from diarrhea in the intensive care unit. J Pediatr Gastroenterol Nutr 1988 May-Jun;7(3):417-23

"A total of 62 low birth weight (LBW) neonates (29 boys and 33 girls) suffering from diarrhea in our neonatal intensive care unit were included in this period of intense observation. The mean age was 13.89 +/- 13.22 days and average body weight was 1,500.49 +/- 281.45 g. Severity of dehydration was assessed by the Fortin-Parent score. When the score was less than 8 (mild to moderate hypovolemia), oral rehydration therapy (ORT) was administered by feeding bottle or nasogastric tube hourly. Severely hypovolemic neonates needed intravenous rehydration; 52 neonates received ORT only using the World Health Organisation (WHO) formula; 58 neonates received either cow's milk-based or soy-based formula within 12 h after ORT began, and the rest within 24 h. Diarrhea lasted less than 1 day in 92% of cases. The regimen corrected hyponatremia and hypernatremia. Only two neonates developed mild asymptomatic hypernatremia. No child became edematous. Using the WHO solution, ORT was safely given to LBW neonates, sparing painful and potentially hazardous invasive techniques, and resulted in excellent outcomes." (Authors' abstract)

215 Hernandez A, Jaramillo C, Ramirez R, Gomez G, Francs D. [Treatment of acute diarrhea in children. Comparative study of 3 oral rehydration solutions and venoclysis in Colombia]. Bol Of Sanit Panam 1987 Jun; 102(6):606-16

216 Hernandez FM. Oral rehydration in Mexico. In: Prather CJ, ed. ICORT III; proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:36-40

217 Herzog LW, Bithoney WG, Grand RJ. High sodium rehydration solutions in well-nourished outpatients. Acta Paediatr Scand 1987 Mar;76(2):306-10

"We studied the safety and efficacy of high-sodium oral rehydration solution in the outpatient management of children with diarrhea, with or without dehydration. We studied 68 outpatients with acute diarrhea; 32% had mild-to-moderate dehydration; the rest were not dehydrated. They were treated at home for 24 h with either high-sodium (90 mmol/l) or low-sodium (30 mmol/l) solution. None of the patients given high-sodium solution became hypernatremic. Of those patients who were dehydrated, 55% did not take enough fluid at home to repair their dehydration. We conclude that patients must be closely supervised for the initial rehydration period, but that high-sodium rehydration solutions can be safely given to outpatients for up to 24 hours." (Authors' abstract)

218 Heymann DL, Mbvundula M, Macheso A, McFarland DA, Hawkins RV. Oral rehydration therapy in Malawi: Impact on the severity of disease and on hospital admissions, treatment practices, and recurrent costs. Bull WHO 1990;68(2):193-7

"In the first 2 years following refresher training of paediatric staff in oral rehydration therapy (ORT) and the establishment of an oral rehydration unit at the Kamuzu Central Hospital, Lilongwe, Malawi, there was a 50% decrease in the number of children admitted to the paediatric ward with the diagnosis of diarrhoeal diseases, a 56% decrease in the use of intravenous fluid to rehydrate such children, a threefold increase in the use of oral rehydration salts (ORS) exclusively to rehydrate children with mild or moderate dehydration, and a 39% decrease in the number of paediatric deaths associated with diarrhoeal diseases. Over the same period, there was a 32% decrease in recurrent hospital costs attributable to paediatric diarrhoeal diseases. As use of ORT continues to increase in Malawi, where diarrhoeal diseases account for 9% of paediatric hospital admissions, there should be considerable decreases in mortality from such diseases and concomitant increases in cost savings attributable to them." (Authors' abstract)

219 Hidayat S, Srie-Enggar KD, Pardede N, Ismail R. Nasogastric drip rehydration therapy in acute diarrhea with severe dehydration. Paediatr Indones 1988 Mar-Apr;28(3-4):79-84

"WHO recommended severe dehydration without shock in acute diarrhea to be rehydrated by nasogastric drips (NGD) of oral rehydration solution (oralit). In this respect the criteria of a still palpable and countable pulse, the absence of meteorism and absence of complication, the reverse warranting iv fluid therapy, can be used as practical guidelines to identify the patient "without shock". A clinical trial comparing the result of NGD oralit rehydration therapy to that of intravenous Ringer-lactate on small children with diarrhea and severe dehydration was conducted. Seventy five patients admitted to the Department of Child Health Palembang General Hospital from January up to July 1986, aged 1 to 59 months, suffering from acute diarrhea with severe dehydration fulfilled to above mentioned criteria. Randomly 36 were assigned to NGD rehydration therapy using WHO standard ORS (in Indonesia is named as oralit) and 39 were rehydrated with iv Ringer lactate solution, given in four hours consisting of 40 ml/kg.BW, 30 ml/kg.BW, 20 ml/kg.BW and 20 ml/kg.BW in the first, second, third and fourth hours respectively. Based on the failure rate of rehydration in the first four hours, the recurrence of dehydration after rehydration and the side effects of fluid therapy, it was concluded that acute diarrhea cases with severe dehydration who fulfilled the above mentioned criteria can be rehydrated by NGD oralit as effective and safe as by iv Ringer lactate." (Authors' abstract)

220 Hill GW. Oral rehydration without chloride [letter]. Lancet 1988 Mar 26;1(8587):705

221 Hirschhorn N. New understanding of the diarrheal disease process and new therapies. Indian J Med Sci 1988 Feb;42(2):37-44

222 Hirschhorn N. A sense of the symposium. In: Elliott K, Attawell K, Wilson R,

Hirschhorn N, Snow J, Jr., Greenough WB, III, Khin-Maung-U, eds. Cereal based oral rehydration therapy for diarrhoea: report of the International Symposium on Cereal Based Oral Rehydration Therapy, Karachi, 12-14 Nov 1989. Karachi: Aga Khan Foundation, 1990:65-70

223 Ho TF, Yip WCL, Tay JSH, Wong HB. Osmolality of rice water, dextrose-saline solution and formula milk--implication in the management of infantile gastroenteritis. J Trop Pediatr 1985 Apr;31(2):89-92

"Rice water has recently been found to be an effective oral rehydration therapy for the acute phase of infantile gastroenteritis. We studied the osmolality of rice water as compared to dextrose-saline (D/S) and formula milk. We also examined the effect of doubling the dilution on the osmolalities of these solutions. Our results show that rice water has a very low osmolality (mean ±SD=8.9±3.4 mOsm/kg), almost 36 times lower than that of D/S (mean ±SD=317.5±77.2 mOsm/kg) and formula milk (mean ±SD=322.5±7.5 mOsm/kg). Furthermore, the osmolality of D/S was found to vary widely from 131.0 mOsm/kg to 473.6 mOsm/kg. Doubling dilution does not result in much reduction in the osmolality of rice water which is suggestive of the fact that it may be a supersaturated solution. The ease of its preparation and its low osmolality seem to suggest that rice water may be a preferable form of oral rehydration therapy for infantile diarrhoea compared to D/S and formula milk, especially for outpatient use." (Author's abstract)

224 Ho TF, Yip WCL, Tay JSH, Wong HB. Variability in osmolality of home prepared formula milk samples. J Trop Pediatr 1985 Apr;31(2):92-4

"The variability of osmolality in home-prepared formula milk samples compared to laboratory-prepared samples was studied. One hundred home-prepared formula milk samples were collected and their osmolalities were measured by the Advanced Osmometer based on freezing point depression. The osmolalities of 40 samples of laboratory-prepared formula milk were similarly measured. Our results show that although the mean osmolality of the laboratory-prepared samples was significantly higher than that of the home-prepared ones (298.3 vs 250.7 mOsm/kg, $p<0.001$), a comparison of variances shows that the latter had a significantly wider variation in osmolality ($F=5.16$, $p<0.0001$). Furthermore, the osmolality of 5 per cent of the home-prepared samples was above the mean +2 SD value (358 mOsm/kg) of the laboratory-prepared samples. Errors arising from poor techniques of reconstituting formula milk feeds may give rise to wide fluctuations in osmolality. These may lead to risks like hypernatraemic dehydration, disturbances in gastrointestinal motility and necrotising enterocolitis." (Authors' abstract)

225 Hoffman SL, Moechtar MA, Simanjuntak CH, Punjabi NH, Kumala S, Sutoto, Sila-lahi P, Sutopo B, Kuncoro YS, Soriano M, Plowe C, Paleologo FP, Edman DC, Laughlin LW. Rehydration and maintenance therapy of cholera patients in Jakarta: citrate-based versus bicarbonate-based oral rehydration salt solution. J Infect Dis 1985 Dec;152(6):1159-65

"We compared the therapeutic efficacy of a World Health Organization standard bicarbonate-based oral rehydration salt solution (BBORS) with a citrate-based oral rehydration solution (CBORS) in a randomized, double-blind, controlled trial in 130 dehydrated patients with cholera aged three to 82 years. On admission the 70 patients who received CBORS and the 60 who received BBORS were similar except that the serum CO2 content (mmol/liter) was significantly lower in the CBORS group (10.8 ± 3.6 vs. 12.5 ± 5.3). The incidence of vomiting postadmission (41% vs. 62%, respectively), the stool output during the first 24 hr (4,252 ± 3,900 ml vs. 6,025 ± 4,389 ml, respectively), and the time until the patients' conditions were considered normal (38.9 ± 14.5 hr vs. 46.3 ± 22.7 hr, respectively) were all significantly less in the CBORS group. The serum CO2 content increased more rapidly during the first 48 hr in the CBORS group (87% ± 74% vs. 61% ± 68% for the BBORS group); 23% of the patients receiving CBORS and 35%

of the patients receiving BBORS were considered oral-therapy treatment failures. The results indicate that CBORS was superior to BBORS for rehydration and maintenance therapy of hospitalized cholera patients in Jakarta." (Authors' abstract)

226 Household KC. Oral rehydration therapy for gastro-enteritis [letter]. S Afr Med J 1987 Aug 15;72(4):293-4

227 Household KC. Scheduling of potassium chloride in oral rehydration solutions [letter]. S Afr Med J 1987 Sep;72(5):362

228 Hull TH. ORT III: a dilemma for policy makers, a confusion for parents. J Diarrhoeal Dis Res 1985 Mar;3(1):1-6

"UNICEF announced a new initiative to assist in the effort to reduce high infant and child mortality rates. The program, GOBI-FF, advocates emphasis on 6 components: growth charts to enable early detection of problems; oral rehydration therapy (ORT) for childhood diarrhea; breast feeding for long durations; immunization of children against major diseases; food supplements for nutritionally-deprived children; and family spacing. The most dramatic effects have been achieved with the use of ORT. Worldwide, there are 3 types of ORT. ORT I is based on a traditional diarrhea treatment concept involving the use of herbal mixtures or gruels. ORT I was supplanted by early scientific teachings based on an erroneous belief that diarrhea patients should not eat or drink. For years, the only recourse had been immediate hospitalization and use of intravenous saline/glucose. A great breakthrough came in the late 1960s when researchers in Bangladesh discovered that a carefully balanced oral solution of glucose/salt which maximized fluid absorption and replaced lost salts could achieve the same level of rehydration provided by I.V. As the importance of this formula (ORT II) was recognized, developing world governments began promoting its use by widespread distribution of prepackaged mixes and by training campaigns directed at mothers to teach them to prepare home-made ORS. Indonesia provides a good example of a country with active campaigns on ORT. ORT III is a thick gruel made of about 50 grams of rice powder boiled in a liter of water with a pinch of salt. The ingredients are therefore available readily in every household. ORT promotion has been handicapped by opposition from medical personnel rejecting it as unscientific. A suggestion to overcome this has been to develop a tablet for addition to the rice gruel. However, such a tablet is unnecessary and would only add to the mystique of ORT. Policy makers are thus faced with a dilemma in considering how best to structure antidiarrheal campaigns. Additional information on the 3 types of ORT is provided in the Appendix." (POPLINE)

229 Iatsyk GV, Bondarev VN, Zakharova NI. [Use of glucose-saline solutions for oral rehydration of newborn infants in tropical climates]. Pediatriia 1986 Jul;(7):36-8

230 Increasing oral rehydration therapy in rural Haiti through community participation. Chevy Chase, MD: Center for Human Services, Primary Health Care Operations Research, 1987. 13 p. (PRICOR study summary)

231 Islam A, Thaver IH. Food-based oral rehydration therapy for management of diarrhoea. Karachi: Aga Khan University, 1989. 13 p.

232 Islam MR. Can potassium citrate replace sodium bicarbonate and potassium chloride of oral rehydration solution? Arch Dis Child 1985 Sep;60(9):852-5

"Ninety four children aged less than 5 years with diarrhoeal dehydration and acidosis were treated randomly with either World Health Organization (WHO) oral rehydration solution containing sodium chloride, potassium chloride, sodium bicarbonate and glucose or an oral solution with tripotassium citrate monohydrate replacing the sodium bicarbonate and potassium chloride in the WHO solution. Fifty five children (58%) were hypokalaemic (potassium less than 3.5 mmol/l) on admission. All but two in the citrate group were

successfully treated. There were no significant differences in rehydration solution intake, stool output, gain in body weight, and fall in plasma specific gravity and haematocrit between the two treatment groups after 48 hours' treatment. Significant improvement in the serum potassium concentration was observed in the hypokalaemic children receiving potassium citrate solution compared with children receiving WHO solution after 24 and 48 hours' treatment. None developed hyperkalaemia. Although children receiving potassium citrate solution corrected their acidosis at a slower rate than the WHO solution group during the first 24 hours, by 48 hours satisfactory correction was observed in all. Tripotassium citrate can safely replace sodium bicarbonate and potassium chloride and may be the most useful and beneficial treatment for diarrhoea and associated hypokalaemia." (Author's abstract)

233 Islam MR. Citrate can effectively replace bicarbonate in oral rehydration salts for cholera and infantile diarrhoea. Bull WHO 1986;64(1):145-50

"The therapeutic effectiveness of oral rehydration salt (ORS) solutions containing trisodium citrate (ORS-citrate) in place of sodium bicarbonate (ORS-bicarbonate) was evaluated in a double-blind, randomized clinical trial on 74 children with cholera and 34 infants and young children (<2 years) with infantile diarrhoea. All patients had moderate-to-severe dehydration. Patients with severe dehydration were initially rehydrated with intravenous fluid followed by maintenance therapy with ORS solution (either ORS-bicarbonate or ORS-citrate). Children who had moderate dehydration received either ORS-bicarbonate or ORS-citrate solution during both the initial and the maintenance phase of therapy. The results of the study suggest that ORS-citrate, which has the advantage of a longer shelf-life in hot and humid climates, can safely and effectively be used instead of ORS-bicarbonate for hydration and correction of acidosis in cases of cholera and infantile diarrhoea." (Author's abstract)

234 Islam MR. Citrate in oral rehydration therapy [reply]. Gut 1985 Apr;26(4):429

235 Ismail R, Nazir M, Djamil H, Bakri A, Pardede N. Community practices in managing diarrhoeal diseases in a rural area of South Sumatra, Indonesia. Paediatr Indones 1986 Sep-Oct;26(9-10):185-94

One of 4 mothers in 11 villages in a plain, low land swampy area of south Sumatra was interviewed in September 1984 concerning practices in managing diarrhoea in the past and any diarrhoeal attack which had occurred during the last 2 weeks in their children aged less than 5 years. There were 140 children suffering from diarrhoea during that period; 954 mothers were interviewed. Nurses were the main providers of diarrhoeal disease care in the area. Of the 140 cases, 35 (25%) were self-treated, 72 were aided by health workers, and 60.7% received treatment from nurses in private practice. Decocts was the main medicine used by the family and traditional healer. Most of the health workers gave the injections, all of them prescribed drugs, and 49.2% practised oral rehydration therapy (ORT). 35.6% of the mothers had known about ORT and 26.5% used this method. Of the 35 self-treated cases, 17.1% were given ORS. Gradual semi-starvation was not the common practice in the area. Breast-feeding was stopped during the diarrhoeal attack in 14.1% of the cases, while 37.6% stopped formula feeding and 9.1% stopped the weaning diet. The appreciation of the health worker toward ORT was satisfactory, but it may be that these workers were still occupied with the "fixed idea" of stopping diarrhoea as soon as possible. Thus, they were more likely to overuse drugs and the diet regimen. Clearly then there is a great need to train health workers, especially nurses, to understand the more comprehensive management of diarrhoeal diseases. (Modified authors' abstract)

236 Ismail R, Pardede N, Darwin S, Nazir M, Mukti S. Home-made rice water salt solution for oral rehydration therapy--a field trial. J Diarrhoeal Dis Res 1986 Mar;4(1):20-5

"This paper reports the field trial result of a 3-part study designed to evaluate the effectiveness, safety, and community acceptance of rice water salt solution (RWSS) as a home-made oral rehydration therapy (ORT); it also explored the possibility of adding a RWSS component in Indonesia's national diarrhoeal diseases control program. RWSS was prepared either directly by cooking rice or by adding extra water during rice-cooking to obtain a supernate. An ORT campaign using prepacked oral rehydration solutions (ORS; "Oralit"), sugar/salt solution (SSS) and RWSS was carried out from May 1983 to April 1984 in 5 Indonesian villages with a total of 6,329 residents. During the program, 890 diarrhoeal episodes were recorded. ORS usage was: 19.7% RWSS, 48.3% Oralit, 2.8% SSS, 18.7% RWSS+Oralit, 2.6% SSS+Oralit, and 4.2% treatment without ORT. The proportion of those not treated at home (referrals) according to ORT used, did not differ significantly. In a total of 890 diarrhoeal episodes, there were 4 deaths. Of these, one had received no ORT and 3 had been given Oralit. Fatality rates according to ORT used did not differ significantly. Overall, respondents regarded Oralit as "medicine" and considered it to be a more potent ORT and found them easier to prepare. Compared to SSS, RWSS was more acceptable as an Oralit substitute. The only constraint in using a RWSS supernate was its limited availability in terms of quantity. It was concluded that RWSS was an effective and safe home-made solution for treatment of diarrhoeal dehydration. (Authors' abstract)

237 Isolauri E, Jalonen T, Maeki M. Acute gastroenteritis: changing pattern of clinical features and management. Acta Paediatr Scand 1989;78(5):685-91

238 Isolauri E, Vahasarja V, Vesikari T. Effect of cholestyramine on acute diarrhoea in children receiving rapid oral rehydration and full feedings. Ann Clin Res 1986;18(2):99-102

"Cholestyramine 2 g twice daily for 3 days was compared to an equivalent placebo in a randomized double-blind study of infants hospitalized for acute diarrhoea. All the patients received oral rehydration with the WHO solution, and full feedings were reintroduced after 6-10 hours' rehydration. Cholestyramine therapy, initiated at the time of feedings, significantly shortened the duration of watery diarrhoea (0.8 ± 0.6 vs. 2.3 ± 1.6 days, $p<0.005$), although it did not significantly reduce the total stool volume. No adverse effects were associated with cholestyramine treatment. It is concluded that diarrhoea patients treated according to the present WHO guidelines may benefit from short adjunct therapy with cholestyramine." (Authors' abstract)

239 Isolauri E. Evaluation of an oral rehydration solution with Na^+ 60 mmol/l in infants hospitalized for acute diarrhoea or treated as outpatients. Acta Paediatr Scand 1985 Sep;74(5):643-9

"An oral rehydration solution (ORS) containing 60 mmol/l of Na^+ (ORS_{60}) was compared in a randomized trial with the ORS of WHO formula (Na^+ 90 mmol/l = ORS_{90}) for the treatment of diarrhoeal dehydration in 66 hospitalized infants aged 3 to 34 months. The infants had a 5±3% dehydration, and received within 6-10 hours 76±32 ml/kg of ORS^{60} or 74±41 ml/kg of ORS_{90} corresponding to a sodium input of 4.6±1.9 mmol/kg and 6.6±3.7 mmol/kg, respectively. Both treatments were found adequate and equally effective for the correction of dehydration and sodium deficit. The same ORS_{60} was also compared to a commercial low sodium glucose-electrolyte solution (sodium 35 mmol/l, glucose 3.5 milligrams) for ambulatory treatment of acute diarrhoea in infants. Satisfactory rehydration was achieved within 6 hours in 19 of 23 infants receiving ORS_{60} as opposed to 6 of 18 infants receiving the commercial solution ($p<0.001$); the poor result with the latter was in most cases attributed to a refusal by the infant to consume the sweetish solution. It is concluded that ORS_{60} is suitable for the treatment of isotonic diarrhoeal dehydration in hospitalized children as well as outpatients." (Author's abstract)

240 Isolauri E, Vesikari T. Oral rehydration, rapid feeding, and cholestyramine for treatment of acute diarrhea. J Pediatr Gastroenterol Nutr 1985 Jun;4(3):366-74

"Different combinations of fluid therapy, feeding regimen, and cholestyramine were compared in search for optimal treatment of infants hospitalized for acute diarrhea. The infants (n = 81) received either rapid oral rehydration using the oral rehydration solution - World Health Organization formula (sodium 90 mmol/L, ORS - WHO) or traditional oral fluid replacement using a commercial glucose - electrolyte solution (sodium 35 mmol/L). One - half of the infants in both groups received full feedings at 24 h of hospitalization; in the remaining infants, feedings were gradually introduced over a period of 5 days. In addition, all the children were randomized to receive either cholestyramine 2 g four times daily or an equivalent amount of placebo. Rehydration with ORS - WHO, but not traditional fluid replacement therapy, led to correction of initial metabolic acidosis after 6 - 10 h; no cases of hypernatremia were observed with the use of ORS - WHO. Rapid return to full feedings appropriate for age, including milk products, was associated with better weight gain and significantly shorter duration of diarrhea compared with gradual introduction of feedings. Cholestyramine treatment further shortened the duration of diarrhea without adverse effects in those children who had received ORS - WHO and thus were properly rehydrated. In contrast, in children with poor initial hydration, cholestyramine treatment was associated with prolonged metabolic acidosis. We conclude that treatment of acute diarrhea by rehydration with ORS - WHO and rapid introduction of full feedings is effective and safe, and this combination forms a therapy of choice for typical hospitalized cases of acute infantile diarrhea in Finland. Cholestyramine may be of value as an adjunct therapy after adequate rehydration." (Authors' abstract)

241 Isolauri E, Holmberg C, Perheentupa J. [Oral treatment of infantile diarrhea]. Duodecim 1988;104(2):141 - 6

242 Ittiravivongs A, Masdoeki RS, Pattara - arechachal J. The household management of childhood diarrhea in an urban area, Central Thailand. Southeast Asian J Trop Med Public Health 1990 Sep;21(3):495 - 7

243 Jadhav MA. Trends in oral rehydration. Pediatr Bull 1986 Jul;8(1):6 - 13

244 Jansen AA, Ebangit ML. District focus: oral rehydration, primary health care and the scientist. East Afr Med J 1986 Sep;63(9):622 - 5

245 Jinadu MK, Olusi SO, Alade OM, Ominiyi CL. Effectiveness of primary health - care nurses in the promotion of oral rehydration therapy in a rural area of Nigeria. Int J Nurs Stud 1988;25(3):185 - 90

"Using a pre - and post - intervention method, this study evaluates the effects of verbal instructions and demonstration by the primary health - care nurses on knowledge, attitude and practice of home management of childhood diarrhoea by mothers in a rural area of Nigeria. Although the proportion of mothers that knew how to prepare and give oral rehydration therapy (ORT) increased significantly from 6.2. to 47.0%, few (9.5%) were practising it during subsequent episodes of diarrhoea. The use of starvation by the mothers also decreased significantly from 43.0 to 8.2% however the use of traditional medicines and medicines from chemists did not show any significant change. The beliefs that sugar worsens diarrhoea, that home - made ORT was not a medicine, and continued reliance of the mothers on traditional healers and medicine dealers for advice were factors constraining adoption of the ORT by the mothers. For effectiveness, therefore, the educational programmes of the nurses should also be directed at the traditional healers and the medicine dealers." (Authors' abstract)

246 Jintaganont P, Stoeckel J, Butaras S. The impact of an oral rehydration therapy program in southern Thailand. Am J Public Health 1988 Oct;78(10):1302 - 4

247 Kabeya - Kupa B, Senterre J. [Oral rehydration in acute infantile diarrheas]. Rev Med Liege 1985 Oct 1;40(19):645 - 51

248 Karki BB. Efforts, successes, and failures. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14 - 16 Dec 1988. Washington, DC: Creative Associates International, 1989:37 - 9

249 Kenya PR, Odongo HW, Oundo G, Waswa K, Muttunga J, Molla AM, Nath SK, Molla A, Greenough WB, Juma R, Were BN. Cereal based oral rehydration solutions. Arch Dis Child 1989 Jul;64(7):1032 - 5

"A total of 257 boys (age range 4 - 55 months), who had acute diarrhoea with moderate to severe dehydration, were randomly assigned to treatment with either the World Health Organization/United Nations Childrens Fund (WHO/UNICEF) recommended oral rehydration solution or cereal based oral rehydration solution made either of maize, millet, sorghum, or rice. After the initial rehydration was achieved patients were offered traditional weaning foods. Treatment with oral rehydration solution continued until diarrhoea stopped. Accurate intake and output was maintained throughout the study period. Efficacy of the treatment was compared between the different treatment groups in terms of intake of the solution, stool output, duration of diarrhoea after admission, and weight gain after 24, 48, and 72 hours, and after resolution of diarrhoea. Results suggest that all the cereal based solutions were as effective as glucose based standard oral rehydration solution in the treatment of diarrhoea." (Authors' abstract)

250 Kenya PR, Ondongo HW, Molla AM, Muttunga JN, Nato JN, Juma R, Were BN. Maize - salt solution in the treatment of diarrhoea. Trans R Soc Trop Med Hyg 1990 Jul - Aug;84(4):595 - 8

"In a block - randomized trial we compared the efficacy of citrate - containing glucose electrolyte solution (GES) versus maize - salt solution (MSS) in the treatment of children with mild and moderate diarrhoeal dehydration and acidosis. One hundred and fifteen children aged 3 - 59 months were entered in the study; 56 received GES and 59 MSS. Fifty - one (91%) of the 56 children given GES and 52 (88%) of the 59 children given MSS were successfully rehydrated with improvement in metabolic acidosis within 24 h. Initial hypokalaemia in children treated with maize - salt solution was not corrected during the first 24 h of therapy. The children were, however, clinically asymptomatic after treatment. Carefully prepared maize - salt solution may be used successfully in mild and moderate dehydration in the home, as an alternative to the preferred glucose electrolyte formula." (Authors' abstract)

251 Kenya PR, Gatiti S, Muthami LN, Agwanda R, Mwenesi HA, Katsivo MN, Omondi - Odhiambo, Surrow A, Juma R, Ellison RH, Cooper G, van Andel FG. Oral rehydration therapy and social marketing in rural Kenya. Soc Sci Med 1990;31(9):979 - 87

"In just a few years, oral rehydration therapy (ORT) has become the standard treatment to reduce infant diarrhoeal disease mortality in the developing world. The paper describes an ORT intervention campaign in a rural area in Western Kenya (Kakamega District). After about a year of careful preparation, the campaign was launched in January 1986 and compared the use of a value - added product (flavoured sachets) sold through private outlets in addition to primary care distribution of an unflavoured sachet in an experimental cell (Bukura Division). In a control cell (Novakholo Division), only unflavoured sachets were distributed free of charge through primary health care facilities. Using local perceptions of diarrhoeal disease management, the campaign in the experimental cell was carefully designed and mass communication techniques employed and adapted accordingly. Outcome assessments of the campaign, which lasted until March 1987, included the overall ORT utilisation over time. Changes in perceptions towards diarrhoeal disease management, direct assessments of mixing a 'safe and effective' solution accurately and other relevant process parameters were evaluated. Comparing several recent ORT intervention projects, the paper concludes that a combination of a commer -

cial approach and mass communication techniques can further ORS use. If a proper incentive system for shopkeepers is installed and message design and ORS product are fully tailored to the perception and preferences of the target population, the commercial availability of ORS will create an extra demand of the product. However, this will not replace distribution of ORS salts delivered free of charge through primary care sources." (Authors' abstract)

252 Kheroua O, Tome D, Hautefeuille M, Desjeux J-F. Water absorption in rat jejunal loops is only transiently stimulated by ORS. J Diarrhoeal Dis Res 1986 Sep;4(3):149-52

"The effect of glucose on water secretion stimulated by cholera enterotoxin was studied as a function of time in rat jejunal loops, by a polyethylene glycol dilution method. Results showed that: (1) in the absence of luminal glucose, net water secretion occurred and remained stable throughout the study period; 2) initially, the presence of 111 mmol of glucose produced an absorptive effect on water transport, but this effect was transitory and after an hour secretion occurred in the same manner as in the absence of glucose; 3) this absorptive effect of glucose was related to the glucose concentration in the intestinal lumen. The effect was restored by addition of more glucose into the lumen and was inhibited by phloridzin. The findings showed that the antisecretory effect of glucose on cholera enterotoxin-stimulated intestinal water secretion depended on the amount of glucose remaining in the intestinal lumen. The polyethylene glycol dilution method could assist in studying the duration of the action of an improved-formula oral rehydration solution and of various antisecretory drugs, prior to their use in clinical trials." (Authors' abstract)

253 Khin-Maung U, Tin-Aye, Myo-Khin, Nyunt-Nyunt-Wai, Thane-Toe. Composition and contamination of oral rehydration solutions prepared with well water by village mothers in Burma. Trans R Soc Trop Med Hyg 1986;80(2):329-32

"A field study was carried out at Htaukkyant village in Burma to assess whether village mothers could use condensed milk tins to measure one litre of water with reasonable accuracy for the preparation of oral rehydration solutions (ORS) and whether the extent of bacterial contamination of well water was serious and if this affected the bicarbonate content of the ORS solution. Empty condensed milk tins have a fairly uniform volume around 330 ml and using three condensed milk tins full of water mothers made up one litre quite consistently. Mothers also proved capable of preparing ORS solution by dissolving one packet of oral rehydration salt (ORS) in three condensed milk tins full of water to obtain solutions which contained acceptable and safe concentrations of sodium and potassium. Contamination of well water with faecal coliforms was present. Both storing water in domestic vessels and boiling water reduced the coliform count. Storing could be a good way of reducing the risk of infection if repeated contamination from dipping into the water could be avoided. The counts on coliforms and faecal coliforms in ORS both increased by about 1 log per day over the first and second 24 hours after the preparation with contaminated well water. Despite this the bicarbonate content of ORS remained stable. In the absence of boiled water, ORS solution can be made using the cleanest available water and using it within 24 hours." (Authors' abstract)

254 Khin-Maung-U, Nyunt-Nyunt-Wai, Myo-Khin, Mu-Mu-Khin, Tin-U, Thane-Toe. Effect of boiled-rice feeding in childhood cholera on clinical outcome. Hum Nutr Clin Nutr 1986 Jul;40C(4):249-54

"Forty-eight children, aged 2-5 years, presenting with watery diarrhoea of less than 48 h duration at home prior to hospitalization, were admitted into a randomized controlled clinical trial, 24 children being treated during the first 24 h of admission with oral rehydration solution (ORS) alone and 24 children being given `ORS plus boiled-rice feeding'. The latter group received boiled-rice to supply at least 55 kcal/kg/d (about 150 g boiled-rice per feed, given four times daily). *Vibrio cholerae* were isolated by stool

culture on admission from all children. No antibiotics were given. Clinical characteristics of children in the two treatment groups were comparable. Among children given 'ORS plus boiled rice', there was a significant increase in volume of diarrhoea stools ($P < 0.05$), duration of diarrhoea in hospital ($P < 0.01$), and more frequent diarrhoea motions (not significant statistically). However, the children fed boiled rice absorbed and retained 176 ml more fluid, and had gain in body weight comparable to that observed in children who were not fed during the first 24 h of hospitalization." (Authors' abstract)

255 Khin-Maung-U, Nyunt-Nyunt-Wai, Myo-Khin, Mu-Mu-Khin, Tin-U, Thane-Toe. Effect on clinical outcome of breast feeding during acute diarrhoea. Br Med J [Clin Res] 1985 Feb 23;290(6468):587-9

"The effects of oral rehydration fluid alone and of oral rehydration fluid plus breast feeding on the course and outcome of acute diarrhoea were assessed in two groups of 26 children aged under 2 years. Children who continued to be breast fed during treatment with oral rehydration solutions passed significantly fewer diarrhoeal stools. They also passed, on average, a smaller volume of diarrhoeal stools and recovered from diarrhoea sooner after the start of treatment. Their requirement for oral rehydration fluid was significantly reduced. Breast feeding exerts a beneficial effect on the course and outcome of acute diarrhoea by reducing the number and volume of diarrhoeal stools." (Authors' abstract)

256 Khin-Maung-U. *In vitro* determination of intestinal amino acid (14C-L-glycine) absorption during cholera. Am J Gastroenterol 1986 Jul;81(7):536-9

"*In vitro* uptake of ^{14}C-L-glycine was studied in jejunal mucosa biopsy specimens from 27 patients with cholera (proven by stool culture) presenting within 48 h of onset of watery diarrhea. In time series experiments, ^{14}C+L-glycine uptake was found to follow saturation kinetics (being saturated at 5½ min), to be blocked by uncouplers of oxidative phosphorylation (sodium fluoride and 2:4-dinitrophenol), and that ^{14}C-L-glycine uptake by both amino acid transport system 1) and amino acid transport system 4) were active during the active purging stage of cholera. Concentration series experiments were carried out to determine the V_{max} and K_t of these transport systems, which were not significantly different. This study demonstrates continued absorption of amino acids (glycine) by two amino acid transport systems, provides scientific basis for use of glycine in "improved" oral rehydration solutions in the treatment of acute diarrhea, and emphasizes the importance of maintaining feeding during acute diarrhea in order to prevent development of malnutrition." (Author's abstarct)

257 Khosla D. Oral rehydration therapy [letter]. J Indian Med Assoc 1987 Nov;85(11):346-7

258 Kielmann AA, Mobarak AB, Hammamy MT, Gomaa AI, Abou-el-Saad S, Lotfi RK, Mazen I, Nagaty A. Control of deaths from diarrheal disease in rural communities. I. Design of an intervention study and effects on child mortality. Trop Med Parasitol 1985 Dec;36(4):191-8

"A study design consisting of 2 control and 4 treatment cells was used to compare the effectiveness of different compositions of oral rehydration fluids and preventing dehydration and ultimately child deaths from diarrheal disease. Specifically, the extent of reduction in child mortality among 3 groups was compared: 1 group used a combination of oral rehydration therapy (ORT) prepared from the home ingredients of sugar and salt and administered by the mother and ("Oralyte") placed in the hands of the health care providers only; and 1 group used "Oralyte" only administered by both mothers and health care providers. Several data collection processes were employed to collect data on both baseline, intermediate (process), and impact (outcome) variables, including household surveys on demographic composition, sources of (drinking) water, incidence of diarrheal disease, knowledge and practice (KP) of mothers on diarrheal disease (DD) recognition

and treatment regimen, availability of utensils and supplies necessary for the preparation of rehydration fluid, sodium concentration of randomly selected samples of home prepared rehydration fluids. In all study villages, the clerk in each health station maintained a regular count of the number of preschool children who had died within the preceding week. Age, sex, house number, and father's name were reported for each death. 2760 children (12.1%) of the total population under care in Egypt's "Strengthening Rural Health Delivery" project were seen in the course of outpatient clinics during the 6 months of the program, May through October 1980. Overall, the rate of referral to secondary levels of care was almost 11 times higher in the control than treatment villages. From an initial level of about 22/1000 children per 6 months (May through October) in 1976–77, mortality dropped significantly to a mean of 17.5/1000 in 1978–79 and to a mean of 10.5 by 1980 in the 3 treatment cells. A most important finding was the demonstration that ordinary household sugar and salt together with potassium containing fruits and vegetables or, in their absence, tea, may serve as the basic ingredients of an alternative to, and temporary replacement of, the more costly and less readily available prepackaged ORS. This is not to suggest that a simple oral rehydration solution made from sugar and salt is as effective as the balanced "Oralyte", yet this simple solution when backed with adequate supplies of "Oralyte" in the hands of the health care provider becomes a more cost effective means of reducing high child mortality from diarrheal disease than the "Oralyte" alone." (POPLINE)

259 Kielmann AA, Nagaty A, Ajello CA. Control of deaths from diarrheal disease in rural communities: II. Motivating and monitoring the community. Trop Med Parasitol 1986 Mar;37(1):15–21

"In 1980 the Ministry of Health of Egypt undertook a short term investigation into means and methods to reduce the annually excessive number of preschool child deaths from diarrheal disease. This investigation sought to identify ways to overcome constraints related to logistics, supplies, and community participation. The unifying theme of this study was to examine the feasibility of stressing oral rehydration therapy (ORT) instead of the then conventional parenteral treatment and heavy use of antibiotics. Study cells were arranged to test feasibility of placing responsibility for the intervention primarily with rural mothers, secondly with itinerant nurses. Appropriate health education programs, revised supervision and data collection systems were developed and implemented. Results limited to mortality indicators demonstrating that mothers could affect a significant decrease in the diarrhea-specific death rate were reported in an earlier paper. In this paper a more comprehensive presentation of various survey data associated with the investigation are presented. These data show that mothers were indeed able to recognize diarrheal disease and institute early and effective treatment, and that they developed remarkable skills of preparing safe oral rehydration fluids from home supplies of sugar and salt. In addition, the data show that health service staff increasingly gained confidence in ORT as demonstrated by increasing rates of utilization of the method, and as mothers indicated ORT to be the preferred method of treatment of diarrheal disease." (Authors' abstract)

260 Kinoti SN, Wasunna A, Turkish J, Gateere R, Desai M, Agwanda R, Juma R. A comparison of the efficacy of maize-based ORS and standard W.H.O. ORS in the treatment of acute childhood diarrhoea at Kenyatta National Hospital, Nairobi, Kenya: results of a pilot study. East Afr Med J 1986 Mar;63(3):168–75

"A study comparing the efficacy of maize-based oral rehydration solution (ORS) and the standard WHO ORS in the treatment of dehydration due to acute infantile diarrhoea at Kenyatta National Hospital, Nairobi, Kenya, was undertaken between July 1984 and February 1985. Male children aged between 4–24 months, with moderate to severe dehydration were randomly allocated to the two treatments, and followed up until recovery. Primary response variables were weight gain in grams; stool output in grams; duration of intervention in hours, total ORS given in millilitres. Two concentrations of maize-based ORS were used: 50 gms/litre and 25 gms/litre. Electrolyte concentrations of the maize-ORS were brought close to those of the standard WHO solution by addition of 3.5

gms/litre of sodium bicarbonate and 1.5 gms/litre of potassium chloride, and giving softened foods with sodium chloride added to taste. Breast feeding was continued in those on the breast and amounts of food given was as tolerated by the infant. Special problems associated with the preparation, storage, feeding with maize ORS, and clinical data collection are discussed. More definitive use of comparable electrolyte concentrations is being planned. Preliminary results presented are those of 36 infants on maize-based ORS and 33 on WHO ORS. There was significant correlation between the amount of ORS consumed and time taken to reach complete rehydration for both groups, and the amount of maize ORS consumed to stool output. There was no significant difference between the two groups with respect to stool output. The mean quantity (mls) of WHO-ORS consumed to complete hydration was higher than that of maize-based ORS. Duration to total rehydration for the two groups was not significantly different. The preliminary conclusion is that, although the two treatments were not exactly comparable in electrolyte concentrations maize-based ORS is as efficacious as but not better than, the standard WHO ORS for treatment of dehydration due to acute infantile diarrhoea." (Authors' abstract)

261 Kinoti SN, Maggwa ABN, Turkish J, Wasunna A. Management of acute childhood diarrhoea with oral rehydration therapy at Kenyatta National Hospital, Nairobi, Kenya. East Afr Med J 1985 Jan;62(1):5-11

"A study of 125 children aged 0-6 months who were seen at Kenyatta National Hospital for acute diarrhea was conducted between 1982-1983 to determine the benefits of oral rehydration therapy (ORT) in treatment of diarrheal illness. At admission, specimens of stool, blood and urine were collected and examined for bacterial, parasitic, and viral agents (including malaria), serum electrolytes, urea, white cell counts and hematocrit. Children were started on oral rehydration solution (ORS) unless severely dehydrated, in which case intravenous therapy was initiated. 84% of the children were successfully treated with ORS alone regardless of etiological agent found; 15% required IV therapy initially, then were placed on ORS. Average hospital stay was 56.2 hours. Cost of treatment by ORT is less than 20% the cost of IV therapy. When investigators surveyed other health institutions, they found that ORT was used alone in less than 10% of all children seen with diarrhea. A side benefit of ORT is the utilization of mothers in preparation and administration of solution, reducing the demand on hospital staff. Since 20% of all pediatric admissions at Kenyatta are due to acute diarrheal disease, use of ORT would reduce costs tremendously. Initiation of ORT at home may prevent development of dehydration altogether." (POPLINE)

262 Klish WJ. Use of oral fluids in treatment of diarrhea. Pediatr Rev 1985 Jul;7(1):27-30

"This article begins with a brief historical overview of the use of oral rehydration therapy, then discusses the following: mechanisms of diarrhea; absorption of oral electrolyte solutions; composition of oral fluids; contraindications in the use of oral electrolyte solutions; oral rehydration therapy; and concludes with a short case report. The pediatrician should be able to recognize that oral rehydration is effective, safe, and inexpensive in children with dehydration. It has been estimated that the intestine of a healthy adult secretes approximately 100L of fluid daily, nearly all of which is reabsorbed by the villi. Only about 200 to 500 mL of this fluid are lost in the stool of adults and are easily compensated for by daily fluid intake. In North America, the most common cause of secretory diarrhea is enterotoxigenic *Escherichia coli*. Normal absorption of sodium across the intestinal mucosa is achieved by passive abosorption, active absorption, or glucose-coupled transport of sodium which is most active in the jejunum. Oral electrolyte solutions can be divided into 2 groups based on their sodium content. Those with a sodium content that ranges between 60 to 90 mEg/L should be used for rehydration only, whereas solutions with a sodium content that ranges from 30 to 50 mEg/L should be used for maintenance of hydration. The use of oral rehydration therapy is contraindicated in cases of vomiting significant dehydration with cardiovascular instability. If the level

of rehydration is more than 5% of body weight and the patient is stable (not in shock or impending shock) oral rehydration solutions should be started. Fluid deficits based on % of dehydration or, preferably loss of weight, if known, should be calculated and added to the amount estimated to be the amount of fluid needed for maintenance. Fluid replacement should be done over a period of 6 to 12 hours. 60 to 90 mEg/L of sodium should be used. Exclusive use of oral electrolyte solutions for infants for over 24 hours should not be done. Feeding should continue. Glucose is added to oral electrolyte solutions to enhance sodium absorption. When glucose concentrations in oral electrolyte solutions are greater than 3%, sodium and water absorption may be impaired." (POPLINE)

263 Kromah EB. Household behavior and community participation. In: Prather CJ, ed. ICORT III; proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:96-8

264 Kuhn L, Zwarenstein MF, Thomas GC, Yach D, Conradie HH, Hoogendoorn L, Katzenellenbogen J. Village health-workers and GOBI-FFF. An evaluation of a rural programme. S Afr Med J 1990 May 5;77(9):471-5

"Growth monitoring, oral rehydration, breast-feeding and immunisation -- female education, family spacing and food supplementation (GOBI-FFF) are a selective package of World Health Organization primary health care strategies recommended by UNICEF. Changes over a 1-year period in the implementation of the components of GOBI-FFF were investigated in a rural village in Ciskei to detect any changes associated with a newly modified village health-worker (VHW) programme. A baseline survey was conducted before the introduction of a modified VHW programme and a second survey took place a year later. The principles of GOBI-FFF were already familiar to and have since been increasingly practised by the community and health personnel. Breast-feeding is widespread, most carers know how to make oral rehydration solution and most children have a 'Road to Health' card and are being weighed regularly. However, malnutrition remains a major problem and the food supplementation programme is operating poorly. The high coverage of the community by the village health-workers and the clinic suggest that these two channels should be used more intensively to strengthen the GOBI-FFF programme in the area." (Authors' abstract)

265 Kumar V, Kumar R, Khurana JL. Assessment of the effect of training on management of acute diarrhoea in a primary health care setting. J Diarrhoeal Dis Res 1989 Sep&Dec;7(3&4):70-6

"Health care providers were trained to treat patients with acute diarrhoea using WHO-recommended oral rehydration therapy (ORT) in a rural area of Haryana, India. One year after the completion of the training programme, the diarrhoea management practices of these trainees were observed while they were treating 240 children with acute diarrhoea. The patients were treated by 12 Multipurpose Health Workers (MPHW), 12 Community Health Guides (CHG), and 11 child-care volunteers, called *Anganwadi* Workers (AWW), in 12 randomly selected villages. In addition, 9 doctors practising in Primary Health Centres and in a 50-bed hospital were also studied. The assessment of patients on the basis of the history of illness taken and the results of physical examinations varied significantly between the various health functionaries. Doctors assessed dehydration in 80% of patients, MPHWs in 65%, CHGs in 60% and AWWs in only 45% of patients ($p<0.05$). Oral rehydration solution (ORS) was given to every case. However, anti-microbial and anti-diarrhoeal drugs were used at a significantly higher rate by doctors than by other functionaries ($p<0.05$). The method of ORS preparation was explained to most (85-90%) of the parents by all types of functionaries but the quantity to be given to the child was told by doctors to 67%, MPHWs to 60%, CHGs to 63% and AWWs to only 43% of patients. Advice on feeding normal food during diarrhoea was either not given or restrictions to food intake were suggested by all types of function-

aries. However, continuation of breast feeding during treatment was advised by all types of functionaries for the majority of patients." (Authors' abstract)

266 Kumar V, Clements C, Marwah K, Diwedi P. Beliefs and therapeutic preferences of mothers in management of acute diarrhoeal disease in children. J Trop Pediatr 1985 Apr;31(2):109 – 12

"The prevalent harmful beliefs amongst 800 mothers from rural and urban areas concerning the management of childhood diarrhoea were: (a) lack of concern for watery stools, (b) widespread restriction of fluids and foods, (c) preference for injections, and (d) use of opium and purgatives for treatment of diarrhoea. Irrational beliefs and inappropriate therapeutic preferences were common amongst mothers from rural areas, illiterate women and those interviewed in villages with no health center. Oral rehydration therapy and health education were well accepted and understood in the villages where they were introduced. This combined with appropriate health education (highlighting the correct practices and discouraging the wrong practices) could serve as important entry points in the treatment of diarrhoeal disease in the developing countries." (Authors' abstract)

267 Kumar V. Experiences in management of diarrhea, respiratory infections, and immunization delivery in primary health care programs. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14 – 16 Dec 1988. Washington, DC: Creative Associates International, 1989:135

268 Kumar V, Kumar R, Raina N. Impact of oral rehydration therapy on maternal beliefs and practices related to acute diarrhea. Indian J Pediatr 1989 Mar – Apr;56(2):219 – 25

"Maternal beliefs and practices related to acute diarrhea were evaluated in 69 villages of a district in Haryana. Oral rehydration therapy (ORT) programme was introduced in 47 villages; in 25 by health workers and in 22 by health volunteers. Twenty two villages served as control. Impact was assessed by interviewing 200 mothers initially and 210 each, one and two years after initiating the programme. Dehydration as a complication of diarrhea was perceived by 67.2% mothers in health worker and 71.4% in volunteer villages of intervention area as compared to only 32.8% in control area ($p < 0.01$). In intervention area, 88.6% mothers had tried ORT as compared to 22.8% in control area and 85% of the mothers found it to be useful. The restriction of breast feeding during acute diarrheal episode was favoured by only 15.7% mothers in intervention area and by 47.1% in control area ($p < 0.01$). The knowledge regarding use of home available fluids in increased amounts did not show an impressive change. There was no change as regards understanding of cause of diarrhea. Favourable change in beliefs and practices is possible by instituting ORT with culturally relevant health education." (Authors' abstract)

269 Kumar V, Monga OP, Walia IJ. Knowledge of community health volunteers regarding treatment of acute diarrhoea in children. J Trop Pediatr 1986 Oct;32(5):214 – 7

"In recent years a single formulation of oral rehydration salt solution (ORS) has been shown to be effective in the treatment of diarrhea irrespective of the age of the patient and the etiology of diarrhea. In 1977, the government of India launched the community health volunteers (CHV) scheme to increase the reaches of the health care delivery system. Various aspects of management of diarrhea have been taught to CHV's in selected community development blocks in Haryana State, India, since 1977. The knowledge and attitude of community health volunteers who were trained in the management of acute diarrhea were assessed by a pretested interview schedule. The knowledge of CHV's trained repeatedly was better than those who were not trained at all or those taught according to official training programs. In spite of repeated training, they could not enumerate signs of severe dehydration and malnutrition. 47% of CHV's continued to restrict food intake during diarrhea and 29% believed in restricting breastfeeds even after

1 year of training. The study stresses the need for repeated training of health workers and a greater emphasis on practical training in various skills needed for better implementation of programs for the control of diarrheal disease." (POPLINE)

270 Kumar V, Kumar R, Datta N. Oral rehydration therapy in reducing diarrhoea-related mortality in rural India. J Diarrhoeal Dis Res 1987 Sep;5(3):159-64

"The role of WHO-recommended oral rehydration solution (WHO-ORS) in reducing diarrhoea-related deaths amongst children below the age of six years was evaluated in a rural community of Haryana, North India. The WHO-ORS was implemented in 25 villages by the available state health workers (study area A), and in another 22 villages by the unpaid literate village volunteers (study area B). A group of 22 villages served as control area in which WHO-ORS was not provided from the project resources. Weekly surveillance for two years by trained field workers showed an overall incidence of 2.06 episodes of diarrhoea per child per year. The diarrhoea attack rates were similar in the study and control areas ($p > 0.05$). The ORS was utilised in 68% episodes of diarrhoea in study area A, 52% in study area B and 14% in the control area. Case-fatality rates were found to be significantly lower ($p < 0.01$) in study areas A & B (0.93 and 1.63/1000 episodes respectively) as compared with those in the control area (3.64/1000). The results show that the use of WHO-ORS in the community can lead to a substantial reduction in diarrhoea--related mortality amongst children." (Authors' abstract)

271 Lamikanra A, Ako-Nai AK, Ola O. Incidence of multiple antibiotic resistances in organisms isolated from cases of infantile diarrhoea in a Nigerian oral rehydration therapy clinic. Ann Trop Paediatr 1989 Dec;9(4):256-60

"A total of 247 bacterial isolates were obtained from diarrhoeal patients aged 0-60 months in an oral rehydration therapy clinic in Ibadan and tested for sensitivity to 11 antibiotics using the disc diffusion method. Fifty isolates obtained from apparently healthy age-matched controls were similarly tested. The results show that 6(2.4%) of the isolates obtained from the diarrhoeal children were resistant to all the 11 antibiotics used in the test and that most of the others were resistant to several antibiotics. Similarly, a very considerable percentage of isolates obtained from children in the control group were found to be resistant to several antibiotics. It is therefore apparent that there is a high incidence of multiply-antibiotic-resistant isolates within the sample environment." (Authors' abstract)

272 Larraclila-Alegre J. Past and present of oral rehydration in Mexico. Bol Med Hosp Infant Mex 1988 Dec;45(12):854-61

273 Lebenthal E, Lu R-B. Glucose polymers in diarrhea--high caloric density nutrients with low osmolality [editorial]. J Pediatr Gastroenterol Nutr 1990 Jul;11(1):1-4

274 Lebenthal E. Rice as a carbohydrate substrate in oral rehydration solutions (ORS) [editorial]. J Pediatr Gastroenterol Nutr 1990 Oct;11(3):293-6

275 Lee B. Starch-based oral rehydration therapy and its application. R I Med J 1989 Jun;72(6):203-6

276 Leiper JB, Maughan RJ. Absorption of water and solute from glucose—electrolyte solutions in the human jejunum: effect of citrate or betaine. Scand J Gastroenterol 1989 Nov;24(9):1089-94

"The inclusion in oral rehydration solutions of solutes that are actively co-transported with sodium has been suggested as a means of increasing the effect of glucose on water absorption by the small intestine. Using a modified perfusion system we have examined water and solute absorption in the normal human intestine from two effervescent glucose—electrolyte solutions, containing either citrate or betaine hydrochloride, and

compared the absorption rates with those from a commonly used bicarbonate-containing oral rehydration solution. Absorption of citrate (355±87 µmol/cm/h) and betaine (313±125 µmol/cm/h) occurred from the respective solutions. The inclusion of 46 mmol/l citrate or 36 mmol/l betaine in effervescent oral rehydration solutions had no effect on water or solute absorption." (Authors' abstract)

277 Leiper JB, Maughan RJ. Chloride-free oral rehydration solutions [letter]. Lancet 1988 Apr 23;1(8591):945

278 Leiper JB, Maughan RJ. Effect of bicarbonate or base precursor on water and solute absorption from a glucose-electrolyte solution in the human jejunum. Digestion 1988;41(1):39-45

"A modified perfusion technique was used to examine the effect on water and solute absorption in the healthy human jejunum of replacing bicarbonate (18 mmol/l) by equivalent amounts of different base precursors in a glucose-electrolyte solution. Acetate, citrate and lactate were absorbed from the perfusion solutions. Absorption of these base precursors appeared to have no effect on water uptake, but greater sodium ($p<0.05$) absorption occurred from solutions containing either acetate or lactate compared with the bicarbonate-containing solution. These data suggest that oral rehydration solutions with base precursors other than bicarbonate are as effective as bicarbonate-containing solutions in promoting absorption of water and electrolytes." (Authors' abstract)

279 Leiper JB, Maughan RJ. Experimental models for the investigation of water and solute transport in man. Implications for oral rehydration solutions. Drugs 1988;36(suppl 4):65-79

"For patients suffering from mild to moderate dehydration, oral rehydration therapy has proved a simple and efficacious treatment. There remains, however, a need to develop improved oral rehydration solutions (ORS), and suitable experimental models are required to develop and assess new formulations. The ideal model for such investigations would take into account rates of gastric emptying, influx and efflux of water and solutes in the intestine, and the consequent changes in body composition. As no such definitive model is currently available, a variety of techniques are used to examine parts of the process of intestinal absorption. Clinical studies which assess the recovery of dehydrated patients during therapy using different ORS will ultimately evaluate the efficacy of treatment. However, ethical considerations, the relative insensitivity of this technique and the exacting nature of such studies make this approach unsuitable for the development of specific ORS. Gastric emptying of solutions can be determined by a variety of techniques, among which the radioactive tracer method offers the advantage of having no direct effect on the emptying rate, giving almost continuous measurement and allowing the use of relatively small volumes of fluids. Perfusion techniques allow measurement of the net flux of water and solute in predetermined sections of the intact human intestine. Measurement of the rate of accumulation in the circulation of orally ingested tracer molecules for water and solutes can estimate unidirectional flux. This method allows for the rates of gastric emptying and intestinal absorption of the test substance, but the rate of efflux of the tracer from the vascular space must be known to calculate net uptake. Each of these models has limitations, and care must be taken in interpreting the results in a clinical context. However, their use in the development of improved formulations is well established." (Authors' abstract)

280 Lembong E. Issues of quality control in local ORS production: the P.T. Pharos Indonesia experience. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:71-4

281 Lennard-Jones JE. Oral rehydration solutions in short bowel syndrome. Clin Therap 1990;12(suppl A):129-37

"Patients with a reduced length of small intestine ending in a stoma experience loss of water and sodium, even when they take nothing by mouth. After food or drink, the loss from the stoma increases. Secretors are patients who lose more from the stoma than they take in by mouth. Absorbers are those whose output is less than their intake. In both groups, the sodium concentration of the effluent is about 90 mmol/L. The secretors are in constant negative sodium balance of up to 400 mmol/day and can only maintain balance with self-administered parenteral water and sodium. The absorbers may lose 200 mmol of sodium daily and need to take an oral sodium supplement to maintain balance. The optimal oral replacement solution has a concentration of at least 90 mmol/L of sodium. Lower sodium concentrations, or drinking water without sodium, lead to increased sodium losses and negative balance. The role of glucose, glucose polymers, or bicarbonate in promoting sodium absorption in the short bowel is unclear. Potassium losses from a small intestinal stoma are small. A modified glucose electrolyte solution, without potassium or bicarbonate and with a sodium concentration of 90 to 120 mmol/L, is appropriate for patients with an intestinal stomal output of 1 to 2 L daily. Once the output rises above 2 L daily, it is difficult to maintain sodium balance with an oral supplement." (Author's abstract)

282 Lepage P, Hitimana D-G, Goethem CV, Ntahorutaba M, Nsengumuremyi F. Food-based oral rehydration salt solution for acute childhood diarrhoea [letter]. Lancet 1989 Oct 7;2(8667):868

283 Lerman SJ, Shepard DS, Cash RA. Treatment of diarrhoea in Indonesian children: what it costs and who pays for it. Lancet 1985 Sep 21;2(8456):651-4

The annual economic burden of diarrhoea in 4 sub-districts in Indonesia averaged $2.27/child aged under 5 years when health centre, hospital, and private expenditure were all considered. The community itself spent $1.03/child or 46% of the total; 96% of community payments went to the private sector, and 4% were for fees at government health centres and hospitals. The widespread availability of oral rehydration therapy has led to only partial abandonment of ineffective or marginally effective medications; non-rehydration medications amounted to 44% of total treatment expenditures. Most medication costs were for antimicrobial agents, such as tetracycline in the government sector and iodochlorhydroxyquin in the private sector. If the use of tetracycline in health centres could be restricted to 10% of the episodes-treated instead of the present 88%, their costs could be reduced by 50%. (Modified authors' abstract)

284 LeSar J, Harrison P, Buxbaum A. Manual for assessment and planning of national ORT programs. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 285 p.

285 LeSar J. The planning of ORT programs. In: LeSar J, Harrison P, Buxbaum A, eds. Manual for assessment and planning of national ORT programs. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 16 p.

286 LeSar J. Policies, laws, and regulations that affect ORT programs. In: LeSar J, Harrison P, Buxbaum A, eds. Manual for assessment and planning of national ORT programs. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 14 p.

287 Leung AK, Robson WL. Acute diarrhea in children. What to do and what not to do? Postgrad Med 1989 Dec;86(8):161-4,167-74

"Acute diarrhea is a leading cause of childhood morbidity and mortality. Primary care physicians and pediatricians should be familiar with its clinical features and management. Rehydration and maintenance of proper fluid and electrolyte balance are the most impor-

tant aspects of treatment. While intravenous rehydration is the best form of treatment for children who are in shock or unable to drink, oral rehydration is the treatment of choice for the majority of children who have mild to moderate dehydration. Oral rehydration therapy is simple, practical, inexpensive, effective, and safe for children in developing as well as developed countries. We recommend the use of commercially available rather than homemade solutions. Antibiotic and antidiarrheal agents are usually not indicated. Early reintroduction of milk, formula, or solid food is important, as is instruction of parents in measures to minimize transmission of infectious agents." (Authors' abstract)

288 Leung AKC, Taylor PG, Geoffroy L, Darling P. Efficacy and safety of two oral solutions as maintenance therapy for acute diarrhea: a double-blind, randomized, multicenter trial. Clin Pediatr 1988 Aug;27(8):359-64

"There is continuing uncertainty about the appropriate level of sodium in oral fluid therapy for children with acute gastroenteritis in developed countries. The present study was undertaken in order to assess whether an oral glucose/electrolyte solution designed for fluid replacement (Na^+ concentration 75 mmol/l) and an oral glucose/electrolyte solution designed for maintenance of hydration (Na^+ concentration 45 mmol/l) would be safe and effective in the treatment of acute childhood diarrhea in a developed country. Children aged 3-24 months (n=54) with acute diarrhea and less than 5 percent dehydration were randomized to receive either maintenance (n=27) or rehydration (n=27) fluid. Outcome was assessed at 24 and 48 hours after entry to the study. Both solutions were found to be equally effective and safe. The fluid was refused by one child in each group. Analysis of efficacy showed that hydration status was maintained in all patients and 98 percent of children showed significant improvement in diarrheal status at 24 hours. We conclude that for well-nourished ambulatory children aged 3-24 months with acute diarrhea and minimal (<5%) or no dehydration, the use of an oral fluid containing 75 mmol/l of sodium is as safe and effective as the use of an oral fluid containing 45 mmol/l of sodium." (Authors' abstract)

289 Leung AK, Darling P, Auclair C. Oral rehydration therapy for gastro-enteritis [letter]. S Afr Med J 1988 Feb 20;73(4):256-8

290 Leung AK, Darling P, Auclair C. Oral rehydration therapy - a review. J R Soc Health 1987 Apr;107(2):64-7

291 Levine MM. Dehydration, metabolic and nutritional consequences of infant diarrhea, and oral rehydration. In: Tzipori S, *et al*, eds. Infectious diarrhoea in the young. New York: Elsevier, c1985:383-9

292 Lifshitz F, Wapnir RA. Oral hydration solutions: experimental optimization of water and sodium absorption. J Pediatr 1985 Mar;106(3):383-9

"Eight solutions of potential efficacy for hydration orally, which differed in composition, osmolality, and pH, were tested in an *in vivo* perfusion system on rat jejunum to assess the rate of water and sodium absorption or secretion. Optimal results were obtained with a preparation of the type recommended by the World Health Organization, containing 60 mEq/L sodium and 111 mM glucose; there was a maximum influx of both water and sodium, which may be ideal for rehydration. It appeared that the critical factor was the molar relationship between glucose and sodium at a 2:1 ratio. Sodium absorption was inversely correlated with glucose concentration in the perfusates. Osmolality and pH may also have a role in the regulation of fluxes across the mucosa. Citrate at concentrations up to 30 mEq/L did not interfere with water absorption. The data presented may thus contribute to a better rationale for the use of orally administered hydration solutions and guidelines for the preparation of more effective ready-to-use solutions." (Authors' abstract)

293 Listernick R, Zieserl E, Davis AT. Oral glucose-electrolyte solutions as mainte-

nance therapy of acute diarrhea. Am J Dis Child 1985 Jun;139(6):571 - 4

"Sixty well - nourished, well - hydrated infants, 3 to 24 months of age with uncomplicated acute gastroenteritis, were enrolled in a prospective, randomized, double - blind study that compared the safety and efficacy of two oral solutions. The solutions differed primarily in the sodium concentration (60 v 30 mEq/L) and glucose concentration (2% v 5%). The mean serum sodium concentrations of the two groups did not differ significantly from each other at entry or at the end of the study period. In addition, there were no signifi - cant changes in the mean serum sodium concentration within each group at the end of the study period. No child in either group became hypernatremic. Our results indicate that a solution with a high concentration of sodium initially designed for the rehydration of dehydrated children also can be safely and effectively used as a maintenance solution for the treatment of well - hydrated children older than 3 months of age with acute gas - troenteritis." (Authors' abstract)

294 Listernick R, Zieserl E, Davis AT. Outpatient oral rehydration in the United States. Am J Dis Child 1986 Mar;140(3):211 - 5

"Twenty - nine dehydrated, well - nourished infants, who were 3 to 24 months of age and had acute gastroenteritis, were enrolled in a prospective randomized study that compared the safety, efficacy, and costs of oral vs intravenous rehydration. The study was designed to assess the use of a holding room in the emergency room for the outpatient rehydra - tion of dehydrated infants. The oral solution that was used contained 60 mEq/L of sodi - um, 20 mEq/L of potassium, 50 mEq/L of chloride, 30 mEq/L of citrate, 20 g/L of glucose, and 5 g/L of fructose. Thirteen of 15 patients were successfully rehydrated oral - ly as outpatients; two patients, who were subsequently discovered to have urinary tract infections, required hospitalization due to persistent vomiting. Orally rehydrated outpatients spent a mean of 10.7 hours in the holding room, as compared with intravenously rehy - drated inpatients, who were hospitalized for a mean of 103.2 hours. Outpatient oral rehy - dration therapy was significantly less costly than inpatient intravenous therapy (+272.78 vs +2,299.50). Our results indicate that oral rehydration is a safe and cost - effective means of treating dehydrated children in an outpatient setting in the United States. The use of a holding room for observation in the emergency room can markedly decrease health care costs and unnecessary hospitalizations." (Authors' abstract)

295 Loeb H, Vandenplas Y, Wursch P, Guesry P. Tannin - rich carob pod for the treatment of acute - onset diarrhea. J Pediatr Gastroenterol Nutr 1989 May;8(4):480 - 5

"Infants aged 3 - 21 months with acute diarrhea of bacterial and viral origin were treated as inpatients with oral rehydration fluid and randomly received for up to 6 days either a tannin - rich carob pod powder (40% tannins or 21.2% polyphenols and 26.4% dietary fiber), 1.5 g/kg/day (n = 21) to a maximum of 15 g, or an equivalent placebo (n = 20). The duration of the diarrhea from admission was 2.0±0.27 days in the test group and 3.75±0.30 days in the placebo group (p less than 0.001). Normalized defecation, body temperature, and weight and cessation of vomiting were reached more quickly by the patients who received the test substance. The test substance was well accepted and tolerated." (Authors' abstract)

296 Lopez de Romana GA. The dietary management of diarrhea project in Peru. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Con - ference on Oral Rehydration Therapy, Washington, DC, 14 - 16 Dec 1988. Washington, DC: Creative Associates International, 1989:4 - 7

297 Lopez - Leon VM, Heredia - Moreno OC, Faure - Vilchis AE, Juarez - Juarez G, Fantini - Cardenas C. [1,144 children with acute diarrhea undergoing oral rehydration therapy with a solution containing 90 mmol/L of sodium]. Bol Med Hosp Infant Mex 1988 Jan;45(1):24 - 8

298 Lukmanji Z. Formulae of sugar-salt solutions recommended for treatment of diarrhoeal dehydration at home in African countries. Ann Trop Paediatr 1988 Mar;8(1):35-7

"During a conference on diarrhoeal diseases in Tanzania in 1984, 19 participants representing 16 countries in Africa gave the formulae for oral rehydration solutions therapy (ORS) which they recommended or instructed for home use in their own countries. There were gross variations in recommended quantities of sugar, salt and water. Theoretical calculations indicated that the glucose concentration ranged from 29 to 174 mmol/l (recommended 30-112 mmol/l) and that of sodium from 9 to 116 mmol/l (recommended 30-80 mmol/l). It is very important that countries should ensure that the recommendations for making up oral rehydration solutions be standardized, otherwise dangerous or ineffectual concentrations of salt and sugar solutions may be used for rehydrating children." (Author's abstract)

299 Lulseged S. The role of diarrheal training units: the example from Ethiopia. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:30-33

300 Luthman J, Jacobsson SO. The influence of feeding and oral rehydration on the bioavailability of oxytetracycline in calves. Acta Vet Scand 1987;28(3-4):343-8

301 Lyons J, Thompson M. Training of personnel for ORT programs. In: LeSar J, Harrison P, Buxbaum A, eds. Manual for assessment and planning of national ORT programs. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 26 p.

302 Mackenzie A, Barnes G. Oral rehydration in infantile diarrhoea in the developed world. Drugs 1988;36(suppl 4):48-60

"Acute diarrhoea is an important health problem in developed countries, particularly in young children. The attack rates for viral diarrhoea are similar in developed and developing countries. Rotavirus is the most common pathogen, followed by adenovirus. Bacterial diarrhoea is less common in developed than developing countries. The 2 most common bacterial pathogens are *Campylobacter jejuni* and *Salmonella*. The most serious consequence of diarrhoea is dehydration, and the treatment for this is the same whatever the pathogen. Recently, there have been major changes in the management of diarrhoea with emphasis on oral rehydration and early feeding. Two controversial areas are the sodium content of solutions designed for developed countries and the best route of administration of fluids to children with moderately severe dehydration. There have been 4 randomised controlled trials in developed countries comparing oral and intravenous rehydration. The findings have confirmed the experience in developing countries that most children without shock can be rehydrated orally, thus substantially reducing the need for intravenous fluids. It is important to give physiologically balanced solutions which contain 2% glucose and 50 to 90 mmol/L of sodium. Many of the commercially available oral solutions are appropriate for rehydration and maintenance of hydration in infants with diarrhoea of all types. They are recommended particularly for the prevention of dehydration in children of all ages with severe diarrhoea and for the treatment of dehydration. Children with mild diarrhoea and no dehydration can be given commercial clear fluids diluted with water, or homemade solutions made with table sugar and water. Salt must not be used. Babies should continue on breast milk or formula with extra water. Education is the key to successful oral rehydration, and the ultimate aim should be the prevention of dehydration." (Authors' abstract)

303 MacLean WC, Jr. Oral rehydration [letter]. J Pediatr 1986 Jan;108(1):159-60

304 Mahalanabis D. Advances in the composition of ORS. In: Proceedings of the

Indo-UK Workshop on Diarrhoeal Diseases, Calcutta, 9-13 Jan 1989. Calcutta: National Institute of Cholera and Enteric Diseases, 1989:182-8

305 Mahalanabis D. Improved ORS formulations. J Diarrhoeal Dis Res 1990 Mar&Jun;8(1&2):1-11

306 Mahalanabis D. New developments in oral rehydration. Trans R Soc Trop Med Hyg 1985;79(3):287-8

307 Mahalanabis D. Recent advances in the composition of ORS. In: Prather CJ, ed. ICORT III; proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:67-70

308 Mahalanabis D. Status summary: WHO key research activities in ORT. J Diarrhoeal Dis Res 1987 Dec;5(4):293-5

"The WHO Diarrheal Disease Control Program has 2 components to the program, intervention and research. In this article, the WHO-supported research projects are summarized. There are 6 studies ongoing based on a glucose and combination of amino acids and/or dipeptides for oral rehydration solution (ORS). 10 studies are underway of ORS containing maltodextrin in place of glucose. WHO is collaborating with other institutions in studies on cereal-based solutions. WHO is supporting studies on feeding during and following diarrhea with the hope of developing simple guidelines to prepare and provide optimally nutritious diets based on inexpensive, locally available ingredients. WHO is also studying antidiarrheal drugs. The most promising of these are chlorpromazine and cholestyramine. Finally, WHO is supporting research on the microflora in children with persistent diarrhea and effects of treatment with oral antibiotics." (POPLINE)

309 Maheshwari GC. Commercial oral rehydration therapy packets [letter]. J Indian Med Assoc 1987 Sep;85(9):278-9

310 Maleev VV, Chernikova Iulu, Chekalina KI, Golokhvastova EL, Brodov LE. [Effect of oral rehydration therapy on the function of the kidneys in food poisoning]. Sov Med 1988;(1):84-6

311 Maleev VV, Chekalina KI, Golokhvastova EL, Brodov LE. [Experience in using different oral rehydration solutions for treating acute intestinal infections]. Ter Arkh 1987;59(7):112-4

312 Mallet E, Guillot M, Le Luyer B, Morin C, Pollet F, De Meynard C. Comparison of two oral rehydration solutions in eutrophic infants with moderate acute diarrhea: results of an interim analysis. Clin Therap 1990;12(suppl A):104-11

"A randomized, multicenter clinical trial comparing two oral rehydration solutions (ORS) with different sugar content and total osmolality was carried out in France. Solution A had 168 mmol/L of sugar and a total osmolarity of 326 mosm/kg; solution D had 90 mmol/L of sugar and a total osmolarity of 240 mosm/kg. Weight gain, stool output, and biologic variables were analyzed. This interim analysis included 49 infants (27 in group A and 22 in group D). Patients in both groups gained weight without any significant difference between the two ORS. Between admission and day 4, the overall number of stools and the number of liquid stools decreased. Laboratory values were within the normal range on admission and remained unchanged. The weight increase during the first 24 hours and the reduced frequency of stools was similar in both groups." (Authors' abstract)

313 The management of acute diarrhea: guidelines for rural physicians. Cairo: Control of Diarrheal Diseases Project, Ministry of Health, Government of Egypt, 1985. 31 p.

314 Mantra IB, Davies J. In rural Indonesia social marketing of oral rehydration salts the mothers' perspective. Hygie 1989;8(4):26–31

315 Marin L, Günoz H, Sökücü S, Saner G, Aperia A, Neyzi O, Zetterström R. Oral rehydration therapy in malnourished infants with infectious diarrhoea. Acta Paediatr Scand 1986 May;75(3):477–82

"The clinical response and changes in water and salt homeostasis was studied for 36 hours during oral rehydration therapy with a rehydration solution containing 60 mmol sodium/l (ORS_{60}) in 14 malnourished 3– to 15–month–old Turkish infants with acute infectious diarrhoea. All patients were successfully rehydrated with this treatment. Sodium was efficiently absorbed from the gut and water balance was rapidly restored. Because of excess fluid retention following the initial rehydration period about 50% of the patients became oedematous. Urine volume and urinary sodium excretion were found to be much lower than in well–nourished patients of the same age with acute diarrhoea who were treated in the same way. In all of the malnourished infants the serum sodium level remained within the normal range during treatment. The results show that malnourished infants retain much more fluid and sodium than infants who are in a normal nutritional state. Excessive retention of water and salt seem to be due to an inability of the kidneys to control sodium and fluid homeostasis while orally administered sodium and fluid are being absorbed from the gut. The results show that ORT is safe and efficient in the treatment of malnourished infants with acute diarrhoea. But since these infants run a high risk of developing a severe retention of fluid and salt, and consequently may develop circulatory failure due to hypervolaemia during oral rehydration therapy, it is important to carefully monitor the volume of fluid that is given." (Authors' abstract)

316 Marin L, Saner G, Sokucu S, Gunoz H, Neyzi O, Zetterstrom R. Oral rehydration therapy in neonates and young infants with infectious diarrhoea. Acta Paediatr Scand 1987 May;76(3):431–7

The clinical response and changes in water and salt homeostasis during oral rehydration therapy (ORT) was studied in 15 infants aged under 2 months (range 2–50 days) with acute diarrhoea. Eight patients were neonates and 7 were 1–2 months old. The oral rehydration solution contained 60 mmol sodium per litre. All patients except one were successfully rehydrated. The fluid retention was significantly higher in neonates and young infants than in infants above 3 months of age treated in the same way. One patient in the group of neonates who had a normal sodium level on admission developed hypernatraemia with a sodium level of 162 mmol/l 36 hours after the start of ORT. The urinary sodium excretion was lower in the neonates than in the young infants. Results of the study showed that neonates and young infants had a lower capacity than older infants to excrete water and salt and therefore run a great risk of developing fluid and salt retention during ORT. The risk is most pronounced in neonates who, due to immaturity of the renal function, are unable to excrete excess fluid and salt. (Modified authors' abstract)

317 Marin L, Sokucu S, Gunoz H, Saner G, Neyzi O, Zetterstrom R. Salt and water homeostasis during oral rehydration therapy in neonates and young infants with acute diarrhoea. II. Rehydration with a solution containing 90 mmol sodium per litre (ORS_{90}). Acta Paediatr Scand 1988 Jan;77(1):37–41

"The clinical response and changes in water and salt homeostasis were studied during oral rehydration therapy (ORT) with a solution containing 90 mmol sodium per 1 (ORS_{90}) in 9 infants less than 2 months old (range 2–60 days). Two infants were still dehydrated 36 hours after starting ORT and were excluded from the study. Fluid was retained more rapidly and also to a larger extent than in infants of the same age treated with a solution with a sodium concentration of 60 mmol/l (ORS_{60}). The stool sodium output was higher than that found previously in infants of the same age treated with ORS_{60}. We conclude that during ORT the gut plays an active role in the regulation of salt homeo–

stasis. When the sodium intake is high the percentage of sodium remaining unabsorbed is higher than when the intake is low. This mechanism reduces the risk of hypernatremia in young infants treated with ORS_{90}. The study thus demonstrates that ORS_{90} is effective and also seems to be safe in the treatment of neonates and young infants with dehydration secondary to diarrhoea if fluid intake is kept around 200 ml/kg/day during the rehydration period." (Authors' abstract)

318 Marin L, Aperia A, Zetterström R, Günóz H, Sökücü S, Saner G, Neyzi O. Unsuccessful oral rehydration therapy in an infant with enteropathogenic *E. coli* diarrhoea: studies of fluid and electrolyte homeostasis. Acta Paediatr Scand 1985 May;74(3):477-9

"A 4-month-old male infant with severe hyponatremic dehydration due to an enteropathogenic *E. coli* $O_{125}:B_{15}$-induced diarrhoea had continued very high stool fluid output with a very elevated sodium concentration after hospitalization and the institution of oral rehydration therapy (ORT). Thirty-six hours after start of ORT intravenous therapy was required. The results of studies of fluid and salt homeostasis in this patient have been compared with those obtained in 3 other patients who had acute diarrhoea of the same severity but caused by another strain of enteropathogenic *E. coli* ($O_{111}:B_{14}$) and who were successfully treated with ORT. On ORT the patient with treatment failure had a stool volume which was almost 8 times larger and a stool sodium output which was about 5 times higher than in the successfully treated patients. During the 36-hour-period of ORT fluid losses were about the same as the fluid intake. The results as regards urinary fractional sodium excretion and the urinary potassium/sodium quotient indicate that the severe sodium depletion which was present on admission in the unsuccessfully treated patient persisted during ORT. The reason for ORT failure may be that the infectious *E. coli* strain had bacilli-adherent qualities that cause damage of microvilli." (Authors' abstract)

319 Marin-Bisquertt L. Oral rehydration in acute diarrhea--a problem not only in developing countries. Lakartidningen 1989 Feb 8;86(6):420-1

320 Martinez CA, Barua D, Merson MH. Control of diarrhoeal diseases. World Health Stat Q 1988;41(2):74-81

"This article traces the history of the worldwide struggle to control diarrheal diseases. When the 7th pandemic of cholera began in 1961, WHO responded with a greatly expanded program of activities which included cooperation with countries in training and control efforts, and research on treatment and prevention. In 1970, when the cholera pandemic spread to Africa, the emergency assistance program was reactivated, with increasing attention to the provision of appropriate treatment, especially oral rehydration therapy. Another public health problem of importance during the 1970s was the increase in antibiotic resistance of enteric bacteria. The demonstration of the effectiveness of a single formulation of oral rehydration salts (ORS) in the treatment of all diarrheas was instrumental in convincing public health administrators that diarrheal diseases control should become an essential component of primary health care and led to the creation of a global Diarrheal Diseases Control Program. The Program, which has the objective of reducing childhood mortality and morbidity due to diarrheal diseases and their associated ill effects, especially malnutrition, consists of 2 main components: a health services and control component and research component. If the targets set by the Program for 1989 can be attained, it is expected that by then at least 1.5 million childhood deaths due to diarrhea will be prevented annually." (POPLINE)

321 Martinez-Pantaleon O, Faure-Vilchis A, Gomez-Najera RI, Hernandez-Lopez M, Velasquez-Jones L. Comparative study of oral rehydration solutions containing 90 or 60 millimoles of sodium per liter. Bol Med Hosp Infant Mex 1988 Dec;45(12):817-22

322 Mauer AM, Dweck HS, Finberg L, Holmes F, Reynolds J, Suskind RM, Woodruff CW, Hellerstein S. American Academy of Pediatrics Committee on Nutrition: use of oral

fluid therapy and posttreatment feeding following enteritis in children in a developed country. Pediatrics 1985 Feb;75(2):358–61

323 Mbvundula MW. Cost savings in hospitals from the use of ORT. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14–16 Dec 1988. Washington, DC: Creative Associates International, 1989:88–92

324 Mehta MN, Subramaniam S. Comparison of rice water, rice electrolyte solution, and glucose electrolyte solution in the management of infantile diarrhoea. Lancet 1986 Apr 12;1(8485):843–5

"150 infants aged under 6 months and admitted to hospital with acute gastroenteritis were treated with rice water (RW), rice-based electrolyte solution (RES), and the glucose electrolyte solution (GES) recommended by the World Health Organization. Two-thirds of the patients were moderately dehydrated and only 8% had positive stool culture. Vomiting, present in 11%, did not interfere with successful oral rehydration. Before treatment serum electrolytes and other biochemical variables were similar in the three groups. After 48 h of treatment the blood urea nitrogen and serum creatinine were lower ($p < 0.05$) in the RW and RES group than in the GES group. Serum potassium was also lower in the RW than in the RES group. RW and RES were superior to GES in reducing the frequency and volume of stool output and in producing weight gain." (Authors' abstract)

325 Melent'ev IA. Experience with the mass use of an oral rehydration method in acute intestinal infections in children in a hot climate. Pediatriia 1988;(10):73–6

326 Merson MH. Oral rehydration therapy: from theory to practice. WHO Chron 1986;40(3):116–8

Different aspects of oral rehydration therapy (ORT) were examined in depth in 6 panel sessions at the Second International Conference on Oral Rehydration Therapy, held in Washington, DC, USA. The panel on communications and social marketing emphasised the importance of using standardised messages and media capable of reaching the target audience and focusing these messages on specific information requirements of target audiences. The panel devoted to distribution and logistics concluded that the government and private sectors will need to work cooperatively to develop uniform formulation and packet labelling and to estimate packet needs. The health personnel training panel recommended that ORT training at all levels needs to include sufficient first-hand experience. According to the supervision and monitoring panel, proper monitoring is possible only after precise determination of what should be monitored as well as how and when. The panel on evaluation and cost recommended the development of novel approaches to measuring programme impact and measuring effective ORT use. Finally, the panel covering the integration of ORT with other health activities suggested that the individual parts of a programme must be selected according to existing public health problems and the feasibility and costs of methods to combat them. The Conference identified several elements as characteristics of successful national diarrheal disease control (CDD) programmes; a strong political commitment; a clear strategy for the delivery and use of ORT both in the home and in health facilities; the availability of adequate supplies of oral rehydration solution (ORS) packets; special attention to information activities directed to the needs of consumers; recognition of the importance of supervision of programme activities; and a plan for programme evaluation. Additionally, the Conference reviewed prospects for the development of an ORT solution that can reduce stool volume, duration of diarrhoea, and fluid requirements.

327 Merson MKh, Lishnevskii MS, Oblapenko GP. [Oral rehydration in acute intestinal diseases]. Sov Med 1986;(3):60–3

328 Mestyan G. [Salt, water, sugar. Oral rehydration in infantile and childhood diarrhea]. Orv Hetil 1986 Jun 22;127(25):1491 - 4

329 Meyer GW. Glucose polymer solution for diarrhea in ileostomates [letter]. Am J Gastroenterol 1989 Aug;84(8):991

330 M'Henni H. [Feeding after diarrhea and oral rehydration therapy]. In: Omran AR, Martin J, Hamza B. High risk mothers and newborns: detection, management and Switzerland. Thun: Ott Publishers, 1987:179 - 87

331 Michalsen H. Treatment of diarrhea in children. Tidsskr Nor Laegeforen 1989 Feb 10;109(4):469

332 Michell AR. Composition of oral rehydration solutions [letter]. Vet Rec 1985 Nov 16;117(20):535

333 Miller JD. Other potential clinical uses of oral rehydration. Drugs 1988;36(suppl 4):91 - 8

"An increasing awareness that bowel absorptive function can be maintained or returned to normal soon after trauma or abdominal injury and the formulation of glucose/electrolyte solutions specifically designed to be rapidly absorbed from the small bowel are responsible for the current trend of early oral rehydration and decreasing use of intravenous fluids in surgical patients. Much of this article is devoted to observations and results of clinical trials on surgical patients in Aberdeen Royal Infirmary and Dr Gray's Hospital, Elgin. To date, the results of early oral rehydration after surgery have been sufficiently encouraging to create changes in the routine fluid resuscitation and management protocols in several areas of surgical practice at these centres." (Author's abstract)

334 Mittal SK. Oral rehydration: universal solution. Indian Pediatr 1986 Nov;23(11):895 - 7

335 Mobilizing traditional healers in Brazil to deliver ORT. Chevy Chase, MD: Center for Human Services, Primary Health Care Operations Research, 1987. 11 p. (PRICOR study summary)

336 Mohan M, Sethi JS, Daral TS, Sharma M, Bhargava SK, Sachdev HP. Controlled trial of rice powder and glucose rehydration solutions as oral therapy for acute dehydrating diarrhea in infants. J Pediatr Gastroenterol Nutr 1986 May - Jun;5(3):423 - 7

"A controlled, randomized trial was conducted in 50 infants (3 to 18 months old) hospitalized with acute noncholera dehydrating diarrhea to compare the safety, efficacy, and acceptability of the standard World Health Organization (WHO) recommended glucose oral rehydration solution (ORS) (Group A: 25 infants) with that of a rice powder ORS (Group B: 25 infants), containing 30 g/L of rice powder instead of glucose (20 g/L). The electrolyte composition of both solutions was identical. The proportion of successfully treated patients in each group was 92%, and the two rehydrating solutions proved comparable in correcting and maintaining the hydration status and the serum sodium and potassium levels. The mean rehydration time, stool output, stool frequency, ORS intake, weight gain, and urine output were comparable (p greater than 0.05) in both groups. It is concluded that rice powder ORS is safe, effective, and acceptable as the standard WHO glucose ORS for the treatment of acute noncholera dehydrating diarrhea in infants." (Authors' abstract)

337 Mohan M, Antony TJ, Malik S, Mathur M. Rice powder oral rehydration solution as an alternative to glucose electrolyte solution. Indian J Med Res 1988 Mar;87:234 - 9

"A controlled randomised trial was conducted in 50 male children to compare the effica-

cy, safety and acceptability of rice powder oral rehydration solution (ORS) with the standard WHO glucose-electrolyte solution. Both solutions had an identical electrolyte composition, rice powder (50 g/l) replacing glucose (20 g/l) of the standard WHO glucose electrolyte formula. The proportion of successfully treated patients was 95.8% with both solutions. Rice powder was found to be comparable to the glucose-electrolyte solutions in rehydrating and in maintaining the status of hydration. An additional advantage in the form of a significant reduction in stool frequency was also observed. It is concluded that rice powder ORS is safe, effective and an acceptable alternative to the standard WHO glucose-electrolyte solution for the treatment of acute watery diarrhoea in infants and children." (Authors' abstract)

338 Molla AM, Molla A. Cereal-based oral rehydration solution - a new horizon for diarrhoea management. Postgrad Doct Middle East 1986;9:740-51

339 Molla AM, Molla A, Khatun M. Does oral rehydration therapy alter food consumption and absorption of nutrients in children with cholera? J Trop Med Hyg 1986 Jun;89(3):113-7

"In order to estimate consumption of food and absorption of nutrients, a metabolic balance study was conducted in 47 children between 1 and 5 years old, suffering from acute cholera. Twenty-two of the children were treated by intravenous solution (IV) only and 25 others by oral rehydration along with intravenous solution (ORS/IV) when necessary. After initial rehydration a nonabsorbable charcoal marker was fed to the patients followed by a typical Bangladeshi home food of known composition offered *ad libitum*. Appearance of the first marker in the faeces was taken as zero hour (0 h); at 72 h a second marker was fed. Faeces, urine and vomitus were collected up to the appearance of the second marker. Intake of IV fluid, ORS and any other fluid or food were recorded accurately. Samples of faeces, urine and vomitus were analysed for energy, fat and nitrogen. Consumption of nutrients and absorption in both groups were calculated. There was no significant difference in the intake or absorption of energy or carbohydrate between the two groups. The consumption of fat and protein was slightly, but significantly, lower in the ORS/IV group during the acute stage of diarrhoea than in the IV group. Absorption of nitrogen was significantly lower in the ORS/IV group, but absorption of fat was not significantly impaired. Vomiting was significantly higher in the ORS/IV group. The differences in the consumption and absorption of nutrients between the two groups were transient and came to the same level within 2 weeks after recovery." (Authors' abstract)

340 Molla AM, Molla A, Nath SK, Khatun M. Food-based oral rehydration salt solution for acute childhood diarrhoea. Lancet 1989 Aug 19;2(8660):429-31

"The efficacy in acute childhood diarrhoea of oral rehydration therapy (ORT) based on staple foods (maize, millet, wheat, sorghum, rice, or potato) was compared with that of standard ORT based on glucose, 266 children aged 1-5 years, with a history of acute diarrhoea for 48 h or less, moderate to severe dehydration, and no complications, were assigned to treatment with one of the food-based oral rehydration salt solutions (ORS) or standard ORS. The mean stool output over the first 24 h of treatment in the group receiving standard ORS was significantly higher than that of any other treatment group, and the groups receiving food-based ORT showed substantial reductions in stool output compared with the standard ORT group. Abnormalities in electrolyte concentrations were corrected in all treatment groups with similar efficiency. The digestibility of the food-based ORS was assessed by the stool pH, glucose content before and after acid hydrolysis, and osmolality; there were no significant differences between the standard ORS and food-based ORS groups. Food-based ORT should be more acceptable to users in developing countries since the mixtures are similar to traditional weaning foods and since, unlike standard ORT, it reduces stool output substantially." (Authors' abstract)

341 Molla AM, Molla A, Sarker SA. The management of acute infectious diarrhoea. Baillieres Clin Gastroenterol 1987;1:377-95

342 Molla AM, Ahmed SM, Greenough WB, III. Rice-based oral rehydration solution decreases stool volume in acute diarrhoea. Bull WHO 1985;63(4):751-6

"A randomized trial using oral rehydration solutions (ORS) with rice or glucose was carried out in 342 patients with acute watery diarrhoea. On admission, 75% of these patients had severe dehydration and 70% were positive for *Vibrio cholerae*. There were 185 children aged under 10 years and 157 adults; 169 patients were treated with rice-ORS and 173 with glucose-ORS. Patients in both groups were comparable in age and body weight, as well as the duration and severity of illness. Patients with severe dehydration were first rehydrated intravenously, and then treated with ORS. Those with moderate dehydration received ORS from the beginning. The mean stool output in the first 24 hours in children treated with rice-ORS was less than that in those treated with glucose-ORS (155 vs 204 ml/kg/24 h; $P<0.01$). The same was true for the adult patients, the corresponding values for stool output being 115 vs 159 ml/kg/24h ($P<0.05$). The mean ORS intake in children was 263.5 vs 379.6 ml/kg/24 h, respectively, for rice-ORS and glucose-ORS ($P<0.05$); the corresponding intakes in adult patients were, respectively, 180.5 and 247 ml/kg/24 h. A gain of about 10% of the body weight on admission was observed in all the groups. Six cases (4 children and 2 adults), who failed to respond to oral rehydration after intravenous therapy, all belonged to the glucose-ORS group." (Authors' abstract)

343 Molla AM, Molla A, Bari A. Role of glucose polymer (cereal) in oral rehydration therapy. Clin Therap 1990;12(suppl A):113-20

"The standard packaged glucose-based oral rehydration solution (ORS) provides optimal rehydration of acute diarrhea from any cause, but it does not reduce the volume, frequency, or duration of diarrhea. A new ORS formulation has been developed in which glucose is replaced by 50 to 60 gm of cereal flours, such as rice, wheat, maize, sorghum, or millet, or equivalent amounts of non-cereal staples, such as boiled potatoes or plantain. In a clinical trial in children suffering from acute diarrhea, the staple-based or polymer-based ORS achieved a 40% to 60% reduction in the stool volume compared with the standard ORS. A three-cell longitudinal study in rural Bangladesh involving 2,000 children aged 1 to 4 years demonstrated the superior efficacy of rice ORS compared with glucose ORS or no ORS. The cumulative recovery rate on day 3 was 66%, 24%, and 11% in the rice ORS, glucose ORS, and comparison groups, respectively. The study suggests that staple-based or food-based ORS is the optimal treatment of diarrhea." (Authors' abstract)

344 Molla AM, Molla A, Rohde J, Greenough WB, III. Turning off the diarrhea: the role of food and ORS. J Pediatr Gastroenterol Nutr 1989 Jan;8(1):81-4

"Ninety-three boys aged 5 years or less who had diarrhea due to *Vibrio cholerae* were randomly assigned to treatment with glucose oral rehydration salt (ORS) or rice-based ORS. For the first 24 h, ORS only was given to all the patients. During the next 24 h, ORS and normal food were given. The efficacy of the two types of ORS was compared in terms of ORS intake, stool output, change in hematocrit reading, serum specific gravity, and increase in body weight. At the end of the first 24 h of treatment, a 50% reduction in ORS intake and stool output was observed in the 47 patients randomly assigned to receive rice ORS as compared with the 46 patients who received glucose ORS. During the second 24 h of treatment, a significant reduction in the stool output was noticed in the glucose ORS group, making the efficacy of glucose ORS equal to that of rice ORS. The study suggests that normal food can impart some of the superiority of "super" ORS to standard glucose ORS with regard to reduction of stool volume." (Authors' abstract)

345 Montero-Veitia BL, Dager-Haber A, Justiz-Hernandez S. Oral rehydration in patients with acute diarrheic diseases. Rev Cubana Enferm 1988 Jan-Aug;4(1-2):131-8

346 Moore M, Davachi F, Bongo L, Seruvugo H, Mushiya K, Roy JA, Mambu-ma-Disu. New parameters for evaluating oral rehydration therapy: one year's experience in a major urban hospital in Zaire. J Trop Pediatr 1989 Aug;35(4):179-84

"Oral rehydration therapy (ORT) is a simple treatment for diarrhoeal dehydration that must be administered correctly to be effective. In August 1984 an ORT service was established at Mama Yemo Hospital in Kinshasa, Zaire. During the first 12 months, 5530 children with diarrhoea were treated, and their clinical history and treatment evaluated. We used indicators traditionally used for individual case management as operational tools to monitor the quality of treatment on the ORT service as a whole. These included quantity of liquids prescribed and given, time spent at the centre, weight gained during rehydration, and discharge status. Analysis using these indicators showed that adverse outcome (death or hospitalization), when it did occur, was not associated with inadequate ORT treatment. Instead, it was associated with clinical antecedents fever, measles or 'other' complaint. We conclude that indicators reflecting quality of treatment are useful in identifying operational problems associated with oral rehydration services and that our frequent conferences with the pediatric personnel helped to rectify these problems. To our knowledge, this study represents the largest hospital-based ORT population yet reported, and the first of its kind from an African country." (Authors' abstract)

347 Mota-Hernandez F, Perez-Ricardez ML. Control of diarrheal diseases in Mexico and Latin America. Bol Med Hosp Infant Mex 1989 May;46(5):360-7

"Oral rehydration therapy (ORT) has been considered the major advance in the treatment of the diarrheal diseases, and has been the single most important factor in the decrease of mortality and decreased morbidity in childhood diarrhea. ORT is not limited to the administration of oral rehydration solution; it also includes feeding techniques and community education and participation. In order to promote ORT, national programs have been developed and promoted in educational centers in strategic areas of the Latin America countries, where medical and paramedical staff attend. In Mexico there have been two national surveys to evaluate the ORT program. This policy has allowed for participating countries to reduce the cost of treatment of diarrheal disease." (Authors' abstract)

348 Mota-Hernandez F, Perez-Capilla A, Velasquez-Jones L. [Impact of the oral hydration service on the hospitalization of children with diarrhea in a third level hospital]. Bol Med Hosp Infant Mex 1987 May;44(5):260-4

349 Mota-Hernandez F. [National program for oral hydration in diarrhea, 1983-1986. Evaluation and perspectives]. Salud Publica Mex 1987 Jul-Aug;29(4):268-74

350 Mota-Hernandez F. [Oral rehydration at a third-level service]. Bol Med Hosp Infat Mex 1990 Feb;47(2):103-7

"Oral rehydration therapy (ORT) has been shown to be useful in decreasing mortality, reducing treatment costs and diminishing the frequency of complications in children under the age of five with acute diarrhea. The current concept of ORT includes not only the increase in the intake of fluids and the administering of oral solution in order to prevent or treat dehydration, but also the continuance of everyday feeding, the teaching of the child's mother to detect signs of dehydration and other alarming changes, as well as the non-administering of medication, especially those considered as anti-diarrheal or anti-vomiting, and limiting the use of antimicrobials, only to be used in special cases. The theoretical know-how of these concepts has been seen to be insufficient in order to increase the use of community-wide oral rehydration therapy, being this the main purpose for the establishment of the oral rehydration ward in teaching hospitals of second and third level, where the majority of its' personnel must come into contact with and share the responsibility of treating children with diarrhea. Within these wards students obtain information, ability and assurance in the effective actual management of children

with diarrhea, including the correction of the state of dehydration through the administering of oral solutions. Another complementary benefit from the coming about of this ward is the decrease in the need to hospitalize the majority of the patient with diarrhea therefore reducing costs and any related complications." (Author's abstract)

351 Mota-Hernandez F, Velasquez-Jones L, Llausas-Magana E, Mendez-Tena E, Saiz-Calderon M, Filloy-Yague L, Ruiz-Bedolla E. [Oral rehydration with and without intermediate water, in children with acute diarrhea]. Bol Med Hosp Infant Mex 1985 Nov;42(11):650-6

352 Mota-Hernandez F, Morales-Barradas JA. [Sodium concentrations in solutions for oral rehydration in children with diarrhea]. Bol Med Hosp Infat Mex 1990 Apr;47(4):285-91

"Using the appropriate treatment for dehydration due to diarrhea, over a million deaths a year in children under five are being prevented. After analyzing the information related to the concentration of sodium in solutions used for oral rehydration, the following conclusions can be made: 1. Solutions with high glucose content, as well as hyperosmolar foods, favor the development of hypernatremia. Not so, sodium concentrations of up to 90 mmol/L, with glucose under 2.5%. 2. There are other factors which correlate with the presence of hypernatremia: abundant watery diarrhea, a good state of nutrition, under six months of age and the administration of solute loads, orally (boiled milk) as well as intravenously. 3. The WHO oral rehydration solution which contains, in mmol/L: sodium 90, glucose 111 (2%), chloride 80, potassium 20 and citrate 10, with a total osmolarity of 311 or 331 mOsm/L, is the one which more closely resembles the ideal concentration and has shown to be effective, not only in the treatment of dehydration due to diarrhea, but has also been to be useful in the prevention and maintenance of rehydration, independently from the etiology, the patient's age or the state of nutrition. 4. The use of oral serum with a sodium concentration of 90 mmol/L, reduces the natremia more slowly, therefore protecting the patient with hypernatremic dehydration from developing convulsions during treatment. This sodium concentration is also the best for cases of hyponatremic dehydration. 5. Using the recommended norms in cases of children with diarrhea, including continuing regular feeding habits and the adding of complementary liquids, no cases of hypernatremia have been recorded ...." (MEDLINE)

353 Mota-Hernandez F, Velasquez-Jones L. [Strategic aspects for the implementation of a National Program for Oral Rehydration in Diarrhea]. Bol Med Hosp Infant Mex 1985 Aug;42(8):463-5

354 Moy RJ, Booth IW. Acute diarrhoea: who needs potassium? [editorial]. J Trop Pediatr 1988 Feb;34(1):2-3

355 Mozumder AK, Gebre-Kristos T, Mozumder J. The effectiveness of wheatflour-based oral rehydration fluid in the early treatment of infantile diarrhoea. Ethiop Med J 1987 Apr;25(2):59-63

"An oral rehydration solution (ORS) in which glucose was replaced by wheatflour and boiled was used to treat 52 children with diarrhoea in two out-patient clinics in Wello, north-western Ethiopia. A control group of 42 children with diarrhoea received conventional ORS. The two groups were randomly allocated. Wheatflour ORS was found to be as effective as conventional ORS, and was superior in terms of weight gain in the first 4 hours. Mothers and children preferred this solution to conventional ORS. Materials to make incomplete wheatflour ORS were available in most homes. Further studies to show its effectiveness as an early home-therapy for diarrhoea are indicated. The use of a complete cereal-based ORS in moderate and severe dehydration in hospital trials in Africa is also suggested." (Authors' abstract)

356 Mtero SS, Dube N, Gwebu ET. Rural community management of diarrhoea in

Zimbabwe: the impact of health education message on oral rehydration therapy. Cent Afr J Med 1988 Oct;34(10):240 - 3

"This study was conducted in June/July 1984 to gather information on the management of diarrhoea in the home and hence the impact of health workers in their promotions of oral rehydration therapy (ORT) for the Diarrhoeal Diseases Control Programme. Eight rural areas were selected, one randomly chosen from each province. A total of 480 mothers/childminders, 141 Village Health Workers, 78 Medical and Health Assistants and 38 Community Sisters were interviewed. The majority (77.4 percent) of mothers/child - minders interviewed were aware of the seriousness of diarrhoea and its associated con - sequences leading to dehydration and death. Some mothers did not appreciate the value of breast milk as nourishment for children with diarrhoea, as indicated by the 22 percent who said that the breastfeeding actually caused the diarrhoea, while 12 percent completely stopped breastfeeding because of this belief. However, the majority of the health workers interviewed (97.4 percent) were advising mothers to continue breastfeeding during and after the diarrhoea episode. Seventy - two percent of the mothers/childmind - ers had been taught about the use of the sugar and salt solution (SSS) in the treatment of diarrhoea by the health workers, but only 21 percent could recall the recommended standard method (6 teaspoons sugar, half a teaspoon salt in 750 ml of clean water). The majority of health workers interviewed did recommend the SSS as the first line of action in the management of diarrhoea and 75 percent of them were able to give the standard formulation." (Authors' abstract)

357 Mull JD, Mull DS. Mothers' concepts of childhood diarrhea in rural Pakistan: what ORT program planners should know. Soc Sci Med 1988;27(1):53 - 67

"Diarrhea is the leading cause of infant and child death in Pakistan. Appropriately, the development of oral rehydration therapy (ORT) programs has become a major priority of the Pakistan Ministry of Health and of international funding agencies. Paradoxically, how - ever, there is virtually no published anthropological literature on diarrhea - related tradi - tional health beliefs and practices among the rural and illiterate people who make up 90% of the nation's population. The study reported on here focuses on these matters and suggests important implications for the multimillion - dollar ORT programs currently being launched. Mothers' ethnomedical models of diarrheal disease and concepts of appropriate treatment are discussed, as are practical problems relating to the effective implementation of ORT in such a setting. The results underline the need for anthropologi - cal studies as an adjunct to health interventions involving behavioral modification." (Au - thors' abstract)

358 Muraira - Gutierrez A, Moreno - Sanchez P, Mendez - Jara A, Vela - Staines A, Morales - Felix C. [New home - made formula for oral hydration]. Bol Med Hosp Infant Mex 1988 Apr;45(4):234 - 9

359 Murtaza A, Zulfiqar I, Khan SR, Lindblad BS, Sahlgren BA, Aperia A. The bene - fits of the very early introduction of powdered rice and dried edible seeds (Dal moong) in the oral rehydration solution during the treatment of acute infectious diarrhoea of in - fancy. Acta Paediatr Scand 1987 Nov;76(6):861 - 4

"We have examined whether the addition of powdered rice and pulses (Dal moong) to oral rehydration solution will decrease the purging rate and thereby increase the efficacy of the oral rehydration therapy. The study was carried out on 60 male infants, with acute watery diarrhoea, moderate dehydration but without the presence of fever, vomiting, or other conditions like septicaemia and meningitis. The infants were treated with either the standard WHO oral rehydration salt solution (ORS) or with a modified solution where glucose was removed and powdered rice and Dal moong were added. We found that the infants receiving ORS with powdered rice and Dal moong had significantly lower fluid losses in the stools, significantly more rapid weight gain, and needed significantly less intake of fluid than the infants receiving ORS only." (Authors' abstract)

360 Murtaza A, Zulfiqar I, Khan SR, Lindblad BS, Aperia A. Regulation of serum sodium in dehydrated and orally rehydrated infants: influence of age and of purging rates. Acta Paediatr Scand 1987 May;76(3):424-30

"We have examined the control of serum sodium concentration (S-Na) in 60 male infants with acute diarrheal disease, moderate dehydration, but without the presence of fever, vomiting or other conditions. The infants were studied on admission and during oral rehydration therapy (ORT). We examined the effect of rapid reduction of the purging rate on the control of S-Na by adding pulverized rice and pulses (dal moong) to the rehydration solution. On admission S-Na was significantly inversely related to age. This correlation could not only be attributed to difference in stool sodium losses. Changes in S-Na and urinary K/Na ratio during oral rehydration therapy (ORT), were analyzed separately in infants below and above 4 month of age. During the first six hours of ORT, there was an increase in S-Na in all groups. During the following 18 hours, S-Na tended to normalize around 138 mmol/l. Normalization occurred faster if purging rate was reduced. In all groups urinary K/Na ratio (index of aldosterone production and, inversely, of sodium balance), was high at admission and fell during ORT. In the youngest infants (below 4 month of age) the fall was significantly more pronounced if the purging was reduced. We conclude that it is important to consider age when prescribing ORT. The capacity to correct disturbances in S-Na becomes more efficient during maintenance stage of ORT. Correction of S-Na and sodium balance is enhanced by rapid reduction of abnormal intestinal losses." (Authors' abstract)

361 Nagarajan L, Ganguli NK, Natarajan U, Sapru S, Walia BNS. Bacterial contamination of reconstituted oral rehydration solution. Indian Pediatr 1990 Jan;27(1):21-6

"The extent and nature of bacterial contamination in oral rehydration solution reconstituted for use by individuals and for group of patients was studied. Twenty three volunteers (all qualified doctors) were asked to reconstitute a packet of prepackaged salt in half litre of clean unboiled water obtained from taps at their residence. Five ml aliquots of ORS were collected at 6, 12 and 24 hours after reconstitution for bacteriologic study. The water used by volunteers to reconstitute the ORS as well as throat swabs, peri-anal swabs and nail clippings of volunteers yielded pathogenic bacteria in all the subjects/samples. All the 23 specimens of ORS prepared by volunteers when cultured at 6 hours after reconstitution yielded pathogenic bacteria. The bacterial colony counts were found to be unacceptably high at 12 hours. Five ml samples of reconstituted ORS prepared in bulk in the children ward of PGIMER, Chandigarh were cultured at 12, and again at 24 hours after reconstitution on 10 different days. These yielded *Klebsiella pneumoniae* in 8 specimens (80%) and *E. coli* in 2 (20%). The bacterial colony count was unacceptably high, 12 hours after reconstitution." (Authors' abstract)

362 Nagarajan L, Majumdar S, Natarajan U, Ganguly NK, Walia BNS. A comparative study of different methods of training of rural subjects for reconstitution of oral rehydration solutions. Indian Pediatr 1989 Apr;26(4):323-9

"The efficacy of three methods of training rural women in reconstituting ORS was studied by analysing the sodium, potassium, and glucose contents of the ORS reconstituted by the three groups of rural women. The women in group I were verbally instructed in the regional language regarding how to reconstitute the entire contents of a sachet containing oral rehydration salts in half a litre of water. Women from group II, were given the same verbal instructions and in addition, were demonstrated the correct method of doing the same. Subjects from group III were provided with plastic bags containing oral rehydration salts, which when filled with water up to the printed line, was expected to accommodate half a litre of water, when the bag was hung from a hook or held by another person from its upper ends. The contents of ORS reconstituted by group II, who were demonstrated the actual procedure following verbal instructions, were near ideal followed by the ORS reconstituted by group III and by group I." (Authors' abstract)

363 Nalin D. Solutions for oral rehydration [letter]. J Pediatr 1987 Sep; 111(3):475 – 7

364 Nalin DR. Citrate in oral rehydration therapy [letter]. Gut 1985 Apr;26(4):429

365 Nalin DR. Comparison of oral rehydration solutions [letter]. J Pediatr Gastroenterol Nutr 1989 Feb;8(2):272 – 7

366 Nalin DR. Oral therapy for diarrheal diseases. J Diarrhoeal Dis Res 1987 Dec;5(4):283 – 92

"This article discusses the research activities concerning oral rehydration therapy (ORT). A major goal of research and development for ORT for diarrheal diseases is to devise ORT solutions or dietary regimens leading to absorptive efficiency exceeding that of current solutions, thereby diminishing the duration and volume of diarrhea while enhancing nutritional benefits. Balance studies are essential in testing for appropriate ingredients and selecting among regionally available foodstuffs, and large – scale field trials are essential to confirm practical applicability and to identify and overcome potential safety hazards. Adequate methods, exploration of new mechanisms, comparison groups matched across key variables and selection of appropriate new substrates can lead to significant future improvements in oral therapy, both in the rehydration and maintenance phases and the nutritional rehabilitation phase. Careful evaluation of new ingredients for therapy can serve to better integrate these goals, and should include study of the physiological interrelationships of electrolyte and nutritional deficits and their impact on the therapeutic responses and on the comparative safety of new formulas." (POPLINE)

367 Nastasi A, Massenti MF, Scarlata G, Mammina C, Alestra V, Botta G, Calco C, Cannova L, Polizzi MC. A study on oral rehydration therapy of diarrheal disease in western Sicily. Eur J Epidemiol 1987 Jun;3(2):151 – 4

"A longitudinal study to ascertain the most common therapeutic approach to diarrheal disease by general practitioners and pediatricians was carried out in Western Sicily. Data obtained showed that of 902 home – managed cases of diarrhea observed by 58 physicians during one year, 65.3% were treated with antibiotics, 8.0% with antimotility agents and 26.7% were not treated with any pharmacological agent (rehydration or diet). Although oral rehydration therapy was widely known by physicians in Western Sicily, only a few of them were willing to use it routinely as the principal and exclusive treatment." (Authors' abstract)

368 Nathoo KJ, Glyn – Jones R, Nhembe M. Serum electrolytes in children admitted with diarrhoeal dehydration managed with simple salt sugar solution. Cent Afr J Med 1987 Aug;33(8):200 – 4

"Diarrheal diseases constitute a major cause of childhood morbidity and mortality in Zimbabwe. Since 1982, it has been the policy in Zimbabwe to use home – based salt sugar solution (SSS) as standard oral rehydration solution (ORS) therapy for both prevention and management of dehydration. The recommended formula is incomplete, lacking both potassium and bicarbonate. It may not, therefore, be as efficacious as complete ORS for the prevention or correction of hypokalemia and acidosis during diarrhea. For this reason, a study was carried out at Harare Central Hospital to assess the type and prevalence of electrolyte abnormalities in dehydrated children who had previously been managed with oral salt sugar solution for acute gastroenteritis. 121 such referred patients had their serum urea and electrolytes estimated on admission prior to further management in the Unit; 38 (27.5%) cases of hypokalemia, 12 (8.9%) of hypernatremia, 52 (5.5%) of hyponatremia and 65 (45.7%) of severe acidosis (bicarbonate level 10 mmol/1) were documented. It is concluded that simple salt sugar solution is ideal for the prevention of dehydration but in cases of established dehydration the WHO complete formula is more appropriate for combating hypokalemia and severe metabolic acidosis." (POPLINE)

369 Nations MK, de Sousa MA, Correia LL, da Silva DMN. Brazilian popular healers as effective promoters of oral rehydration therapy (ORT) and related child survival strategies. Bull Pan Am Health Organ 1988;22(4):335-54

"In an effort to promote the use of oral rehydration therapy (ORT) against childhood diarrhea, 46 popular healers in the northeast Brazilian community of Pacatuba were trained in homemade oral rehydration salts (ORS) preparation and critical child survival strategies. A mixture of ORS and local medicinal tea was devised, and this combination, together with other appropriate features of the therapy, was integrated into the healers' rituals. Over the course of 1985, this activity caused a substantial increase in the percentage of mothers who were using cheap homemade ORS preparations. Some 72% of the mothers with children under five years old in Pacatuba became aware of the healers' ORS-tea, and 54.2% administered it to a child with diarrhea at least once. Significant increases also occurred in the percentage of mothers aware of free government (CEME) ORS packets and the percentages who said they would continue breast-feeding a child with diarrhea. In addition, significant declines were registered in the percentages of mothers withholding food or milk from their children during diarrheal episodes, buying costly ORS dry salts or prebottled "Pedialyte," and administering "antidiarrheal" drugs. Toward the end of 1985, a review of the healers' knowledge showed that all recalled the ORS-tea recipe and could accurately mix the ingredients. There is no evidence that these activities and results wrought any other substantial alterations in the healers' own folk medicine. No significant change was found in the percentage of mothers who believed they should take a child with diarrhea to a healer, nor did the percentage of mothers believing in various folk etiologies of diarrhea appear modified to any significant degree. In general, the Pacatuba program's impact on public awareness and use of ORT compares favorably to that achieved by many official medical ORT programs in other areas. Hence, the approach of skillfully integrating ORT and other child survival strategies into popular medicine is one that appears sensible and effective for northeast Brazil and quite possibly for other developing areas as well." (Authors' abstract)

370 Nations MK, Rebhun LA. Mystification of a simple solution: oral rehydration therapy in northeast Brazil. Soc Sci Med 1988;27(1):25-38

"Problems in the control of access to and administration of oral rehydration therapy (ORT) in Northeast Brazil are described and discussed. Administration of ORT is controlled by the medical establishment, which is in general opposed to the use of home made and home administered ORT. Reasons for this resistance are discussed in terms of anthropological theories on ritual, mystification, and the social construction of reality; the medical establishment is described as using ORT as a symbol and guarantor of social status and power. Finally, an innovative program to circumvent the medical establishment by teaching ORT to traditional healers is described; the healers' integration of ORT into religious healing ceremonies is analyzed." (Authors' abstract)

371 Naylor JM. Oral fluid therapy in neonatal ruminants and swine. Vet Clin North Am Food Anim Pract 1990 Mar;6(1):51-67

"Definitive recommendations regarding the best method to treat the diarrheic calf cannot be made at this time. The exact recommendation will probably depend on the situation. At the present time, I do not believe it is detrimental to withdraw milk from the diet for periods up to 24 to 36 hours, as long as the calf is in good condition and is returned to a full ration (maintenance plus) of milk within 3 to 5 days from the start of milk withdrawal. Milk withdrawal is most likely to be beneficial in those situations in which the calf is depressed and has lost its sucking reflex. Oral electrolyte solutions should be fed at the rate of 4-6 L/day if diarrhea is profuse or if the calf is depressed. As the calf feels better and the severity of diarrhea decreases, the amount of oral electrolyte solution can be reduced. It is sensible to continue feeding oral electrolyte solution, perhaps at the rate of 2 L/day, as long as the calf scours. Products containing 40-80 mEq/L of alkalizing

agent give the best results. The higher concentrations may be more effective in older calves. Products containing bicarbonate or metabolizable base can be used when the calf is held off milk, whereas only solutions that contain a metabolizable base should be used if the calf is fed milk that day. Milk withdrawal may only be beneficial in calves that are losing their interest in sucking. Early reintroduction to milk and avoidance of milk deprivation in bright calves will help maintain condition and may boost immune function and mucosal repair. Calves that are held off milk for more than 2 days and calves that are deprived of milk while in poor condition should be fed a high-energy electrolyte solution. Beef calves tend to be treated while they are still on the dam, and if they are separated from the cow, it is usually only for a short period. This maintains the cow's lactation and maternal instincts. Cow's milk is better digested than many milk replacers and is available at a steady rate because calves suck frequently. Calves maintained on cow's milk should be fed an oral electrolyte solution containing a metabolizable base. Gastric fill from the electrolyte solution will tend to reduce milk consumption. It is important to prevent the calf from gorging on milk, which sometimes happens when a calf that is depressed and not sucking regains its appetite and has access to a very full udder. Cows that have been separated from their calf or that have distended udders should be milked out." (Author's abstract)

372 Nayyar G, Ramzan A, Khan MA, Billoo AG. Comparative clinical trial of acceptability of flavoured vs non-flavoured ORS (WHO formula). J Pak Med Assoc 1987 Jul;37(7):167-70

"The acceptability and the efficacy of flavoured vs non-flavoured ORS was tested in 112 dehydrated children. The two solutions were equally effective in correcting the initial dehydration but non-flavoured ORS was a better and safer solution for the maintenance therapy." (Authors' abstract)

373 Neumann AK. Anthropology and oral rehydration therapy. Soc Sci Med 1988;27(1):117-8

374 Newman JS, Reyes PS, Johnson KE. Reaching mothers with ORT: a comparative analysis of Primary Health Care Operations Research-funded studies. Chevy Chase, MD: Center for Human Services, Primary Health Care Operations Research, 1987. 40, [47] p.

375 Ng'andu NH, Nkowane BM. The management of diarrhoea in young children in a rural community in Zambia. J Trop Med Hyg 1988 Aug;91(4):199-201

"Among 64 mothers in two villages in a rural Zambian population who reported childhood diarrhoea, 41 (64%) sought treatment from a health centre or clinic. Among these, 22 (54%) were given oral rehydration salts (ORS) and 19 (46%) were given medications other than ORS. Among the 23 who did not attend a health centre, 14 gave home remedies which included salt and sugar solution, of which, in five, the medicines used were from traditional healers. Overall, 43 (67.2%) of the mothers used some fluids as the first line of treatment. The fluids were infrequently given and in almost all instances, irrespective of the source of the fluid, no more than 15 ml were given over a 24 h period. Furthermore, among the mothers who used fluids, 28 (65.1%) reported stopping the fluids completely if the child vomited. None of the mothers however reported completely withdrawing food from the children. Age and educational level of the mother were not significant factors ($P > 0.05$). These findings suggest that education of mothers on home management of diarrhoea and the proper use of ORS needs to be re-emphasized and health care personnel need to be fully conversant with currently recommended methods for treatment of childhood diarrhoea." (Authors' abstract)

376 Nichter M. From aralu to ORS: Sinhalese perceptions of digestion, diarrhea, and dehydration. Soc Sci Med 1988;27(1):39-52

"This paper explores popular Sinhalese perceptions of diarrheal diseases and related

health care behavior. Also addressed are cultural interpretations of dehydration and perceptions of oral rehydration solution (ORS). The social marketing of ORS is considered. It is suggested that the marketing of ORS be more closely linked to education programs which promote appropriate conceptualization of dehydration. The need to more closely integrate nutrition education and diarrheal management programs is discussed." (Author's abstract)

377 Northrup R. The global implementation of ORT. J Diarrhoeal Dis Res 1987 Dec;5(4):265 - 9

"This article discusses oral rehydration therapy (ORT) programs in developing countries. The focus is on its use for children with diarrhea. Out of 125 target countries, 104 have Control of Diarrheal Disease (CDD) program plans. Of those 82 have actually operationalized their national programs. These programs are made up of 7 components: 1) a plan and some policies; 2) a major training effort aimed at better case management of diarrhea by health workers; 3) a communication and health education program; 4) logistics, manufacturing and distribution of ORS; 5) the information system for control of diarrheal disease, including monitoring and evaluation of activities; 6) management, the process of making it all work, setting policies, coordinating, trying to integrate the public sector and the various elements within private sector, and 7) is research, particularly operational research, which is required where data is needed to solve problems that arise. There are also 7 problems commonly encountered in the implementation of a national ORT program: 1) Every country is different and needs different approaches and different messages. 2) Mothers want something to stop the diarrhea, which ordinary standard ORT does not do. 3) There is a reluctance of physicians, health workers, and particularly pharmacists to accept ORT. 4) There is potentially more work needed to use the treatment compared with other forms of treatment. 5) There is no consensus as to what should be the mother's 1st response to diarrhea. 6) Many countries want to manufacture their own solutions. 7) There is severe nutritional damage caused by diarrhea. Possible solutions to these problems are discussed." (POPLINE)

378 Northrup R, Sanders D, Taylor C, Werner D, Baumslag N, Casazza L. Implementing ORT programmes at community and district levels: reaping the benefits of cereal based ORT. In: Elliott K, Attawell K, Wilson R, Hirschhorn N, Snow J, Jr., Greenough WB, III, Khin-Maung-U, eds. Cereal based oral rehydration therapy for diarrhoea; report of the International Symposium on Cereal Based Oral Rehydration Therapy, Karachi, 12-14 Nov 1989. Karachi: Aga Khan Foundation, 1990:43-52

379 Nose H, Mack GW, Shi XR, Nadel ER. Role of osmolality and plasma volume during rehydration in humans. J Appl Physiol 1988 Jul;65(1):325 - 31

"To determine how the sodium content of ingested fluids affects drinking and the restoration of the body fluid compartments after dehydration, we studied six subjects during 4 h of recovery from 90-110 min of a heat [36 degrees C, less than 30% relative humidity (rh)] and exercise (40% maximal aerobic power) exposure, which caused body weight to decrease by 2.3%. During the 1st h, subjects rested seated without any fluids in a thermoneutral environment (28 degrees C, less than 30% rh) to allow the body fluid compartments to stabilize. Over the next 3 h, subjects were rehydrated *ad libitum* using tap water and capsules containing either placebo (H_2O) or 0.45 g NaCl (Na^+R) per 100 ml water. During the 3-h rehydration period, subjects restored 68% of the lost water during H_2O, whereas they restored 82% during Na^+R (P less than 0.05). Urine volume was greater in H_2O than in Na^+R; thus only 51% of the lost water was retained during H_2O, whereas 71% was retained during Na^+R (P less than 0.05). Plasma osmolality was elevated throughout the rehydration period in Na^+R, whereas it returned to the control level by 30 min in H_2O (P less than 0.05). Changes in free water clearance followed changes in plasma osmolality. The restoration of plasma volume during Na^+R was 174% of that lost. During H_2O it was 78%, which seemed to be sufficient to diminish volume-dependent dipsogenic stimulation. These results suggest

that the poorer rehydration when drinking water is caused by both removal of the osmotic drive for drinking and a rise in free water clearance, primarily due to the loss of electrolytes during dehydration. In addition, the higher degree of recovery in plasma volume than in total body water during H_2O^-R and Na^-R delayed rehydration by removing the volume-dependent dipsogenic stimulation." (Authors' abstract)

380 Nwoye LO, Uwagboe PE, Madubuko GU. Evaluation of home-made salt-sugar oral rehydration solution in a rural Nigerian population. J Trop Med Hyg 1988 Feb;91(1):23-7

"Standardized local measures for preparing oral rehydration solution (ORS) in Nigeria were re-evaluated under laboratory conditions. Our results confirm those of the standardization team in respect of granulated and cube sugar. However, our mean weight of one salt measure (2.8155 ± 0.292 g) is about 20% greater than their value. Consequently, correct use of the measures in our study gave solutions of 211-297 $mmol^{-1}$ total concentration and 60-80 $mmol^{-1}$, Na^+ as against their values of 173-251 $mmol\ l^{-1}$ and 45-70 $mmol^{-1}$, respectively. This discrepancy is most likely due to differences in salt type. Analysis of home-made solutions prepared by 40 illiterate mothers showed that 60% of them made accurately composed solutions. All the rest made hypertonic solutions. Salt type, spoon size and levelling technique are all possible causes of their error. The tendency to error only on the side of greater rather than lower salt concentration may be culture based or simply due to natural maternal instinct. To combat this trend, health education programmes in Nigeria should emphasize the danger in feeding a hypernatremic solution to a dehydrated child." (Authors' abstract)

381 Ocampo PDS, Bravo LC, Rogacion JM, Gonzales G, Sanlei M, Battad G. Clinical trial on the efficacy and safety of added glycine and glycyl glycine to oral rehydration solution. J Philipp Med Assoc 1988 Jul-Sep;64(3):99-108

This study was undertaken to assess the efficacy and safety of using an oral rehydration solution (ORS) with added glycine and glycyl-glycine in an attempt to make full use of the independent absorptive mechanisms of these nutrients. The study's hypothesis was that increased quantities of organic solutes could enhance absorption of large quantities of sodium and, consequently, water. It was believed that such an ORS could reduce stool output, shorten the diarrhoeal episode and decrease the quantity of fluid required to achieve and maintain hydration. A double-blind controlled clinical trial was carried out in which patients at a hospital in the Philippines were given either the standard WHO-ORS or the ORS formulation with added glycine and glycyl-glycine. Criteria for trial size, mean duration of diarrhoea and the desired improvement of diarrhoeal duration were set up. The selected patients were divided into two groups. Sixty-six patients, all males aged 3 to 36 months, were seen over a 9-month period at a tertiary hospital. Diarrhoea was defined as 3 or more watery or loose stools in the 24 hours prior to hospitalisation. The degree of dehydration was also assessed and specific exclusion criteria were followed for the patients. Baseline laboratory procedures were carried out on admission, while the blood chemistries were repeated after 24 hours, and for severe cases, every 24 hours thereafter until the patients showed signs of normalisation. The hospital-based therapy was constituted with a rehydration phase and a maintenance phase. Records of progress and outcomes of the therapy were recorded in relation to the clinical parameters, laboratory parameters, and treatment failures. The results of the study showed that the patients given the glycyl-glycine ORS had significantly higher weight gain than those fed the WHO-ORS. However, the addition of glycyl-glycine provided no additional benefits in terms of reduction of stool volume and shortening the duration of diarrhoea. Higher stool output among those given the specially constituted ORS necessitated a much higher intake of ORS for maintenance therapy.

382 Ocampo PDS. Health professional school training. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates

International, 1989:33 – 6

383 Ocampo PDS, Gabriel EP. Maternal beliefs, attitudes, and practices in childhood diarrhea. J Philipp Med Assoc 1988 Jul – Sep;64(3):121 – 5

384 Okeahialam TC. Diarrhoeal diseases in children and oral rehydration in Nigeria. In: Eeckels RE, Ransome – Kuti O, Kroonberg CC, eds. Child health in the tropics: sixth Nutricia – Cow & Gate Symposium, Louvain, 18 – 21 Oct 1983. Dordrecht: Nijhoff, 1985:81 – 8

385 Okhuysen PC, DuPont HL, Flores Lopez JF, Perez Castell J, Mathewson JJ. A comparative study of furazolidone and placebo in addition to oral rehydration in the treatment of acute infantile diarrhea. Scand J Gastroenterol 1989;24(suppl 169):39 – 46

"Between July and October 1987 an outpatient study of 191 children with acute diarrhea was undertaken in two rural communities in Mexico. Through a double – blind randomization we compared the efficacy of a combination therapy of furazolidone, 7.5 mg/kg/day, plus standard oral rehydration therapy (ORT) (96 patients) versus a placebo plus ORT (95 patients), each given for 5 days. Diarrheal stool samples were collected from all patients before therapy. By means of a two – vial transport media system the samples were sent to a university laboratory and examined for viral, bacterial, and parasitic organisms. The most commonly isolated organisms were enterotoxigenic *Escherichia coli* (13%) and *Giardia lamblia* (13%). Patients who received furazolidone plus ORT showed a greater reduction in duration of diarrhea when compared with those receiving placebo plus ORT (63.4 h versus 71.44 h). There was also a trend toward shorter duration of diarrhea in patients with *Giardia* who were treated with furazolidone/ORT compared with *Giardia* patients in the placebo/ORT group. When fecal leukocytes were present in the stool, the furazolidone/ORT – treated patients had a significantly higher percentage of clinical cures (79% versus 54%, $p = 0.03$) and an overall shorter duration of diarrhea (62.0 h versus 80.6 h, $p = 0.055$) at the end of 5 days of therapy than did the placebo/ORT – treated group." (Authors' abstract)

386 Olivari F, Duffau G, Hormazabal J. [Preparation of oral rehydration solution at home]. Rev Chil Pediatr 1985 Mar – Apr;56(2):83 – 6

387 Oral rehydration therapy and related health issues: an annotated bibliography. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 216 p.

388 Oruamabo RS, Wari Toby CT, Okoji GO, Nembo Opuiyo GP. Early experiences in the treatment of acute diarrhoea with oral rehydration therapy at the University of Port Harcourt Teaching Hospital, Nigeria. Public Health 1987 Sep;101(5):375 – 81

389 Osundara Y. Oral rehydration therapy. New Era Nurs Image Int 1988 Aug;5:29 – 35

390 Overcoming barriers to marketing ORS in the private sector in Pakistan: a report on marketing and sales workshops. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1988. v.p.

391 Ozdemir K. [Diarrhea and oral liquid therapy]. Turk Hemsire Derg 1987; 37(1):21 – 5, 59

392 Pal SC. A simple solution for diarrhoea treatment. Adult Educ Dev 1988 Mar;(30):99 – 104

393 Palaclos – Trevino JL, Manjarrez – Gutierrez G, Dumois – Nunez R, Sicardi – Aragon E. [Correction of water – electrolyte imbalance in newborn infants using rehydration by

the oral route]. Bol Med Hosp Infant Mex 1985 Mar;42(3):188–91

394 Patra FC, Mahalanabis D, Jalan KN. Bicarbonate enhances sodium absorption from glucose and glycine rehydration solutions: an *in vivo* perfusion study of rat small intestine. Acta Paediatr Scand 1989 May;78(3):379–83

"Sodium, potassium and water absorption was studied over the whole length of rat jejunum and ileum by an *in vivo* marker perfusion technique. The composition of solutions were similar to the oral rehydration solution currently in use for the treatment of acute diarrhoeal diseases. The study shows that bicarbonate and chloride containing glucose or glycine electrolyte solutions induce a significantly greater absorption of sodium, potassium and water compared to those containing chloride only. The study also confirms that an amino acid such as glycine is as efficient as glucose in promoting the absorption of sodium, potassium and water from rat small intestine." (Authors' abstract)

395 Patra FC, Mahalanabis D, Jalan KN, Maitra TK, Sen A, Banerjee P. A controlled clinical trial of rice and glycine-containing oral rehydration solution in acute diarrhoea in children. J Diarrhoeal Dis Res 1986 Mar; 4(1):16–9

"In a controlled trial carried out in 2 groups of Indian children aged between 3 months and 5 years suffering from acute diarrhoeal dehydration, the study group received rice and glycine-based oral rehydration solution (ORS) and the control group received the WHO-recommended glucose-based ORS. The electrolyte composition of both solutions were identical, but the study solution contained 50 g of pop-rice powder and 8.3 g of glycine instead of 20 g of glucose per litre of solution. The study solution was found to diminish the oral solution intake significantly ($p < 0.05$). The diarrhoeal stool output was less in the study group but not significantly so. The duration of diarrhoea was similar in both groups. These results were no better than those obtained previously with rice-based ORS alone." (Authors' abstract)

396 Patra FC, Rahman ASMH, Wahed MA, Al-Mahmud KA. Enhanced sodium absorption by citrate: an *in vivo* perfusion study of rat small intestine. J Pediatr Gastroenterol Nutr 1990 Oct;11(3):385–8

"The effect of citrate on sodium, potassium, chloride, and water absorption in the presence of glucose from the whole rat small intestine was studied by an *in vivo* marker perfusion technique. The perfusion solutions contained glucose and were similar in their electrolyte composition to the currently recommended oral rehydration solution for the treatment and prevention of diarrheal dehydration. Significantly more sodium and water absorption occurred from the citrate-containing solution than from the one without citrate. It is concluded that citrate enhances net sodium absorption from a glucose electrolyte solution in the rat small intestine independent of glucose-stimulated absorption." (Authors' abstract)

397 Patra FC, Sack DA, Islam A, Alam AN, Mazumder RN. Oral rehydration formula containing alanine and glucose for treatment of diarrhoea: a controlled trial. Br Med J 1989 May 20;298(6684):1353–6

"*Objective* – To determine whether adding L-alanine to the glucose based oral rehydration solution recommended by the World Health Organisation would improve its efficacy in treating acute diarrhoea. *Design* – Randomised double blind controlled trial of oral rehydration solution containing L-alanine and glucose. *Setting* – Inpatient service of a hospital treating diarrhoea. *Patients* – 97 Male patients aged 6–59 years admitted to the hospital with acute and severe dehydration due to diarrhoea associated with *Vibrio cholerae* or enterotoxigenic *Escherichia coli*. Forty nine received the standard glucose based oral rehydration solution (control group) and 48 this solution with alanine added (study group). *Interventions* – All of the patients received rapid intravenous acetate solution for the initial four hours after admission, which fully corrected the signs of dehy-

dration. They were then admitted to the study and randomised. Immediately after the intravenous treatment oral rehydration treatment was started. All of the patients received oral tetracycline for 48 hours, starting 24 hours after start of the study. If signs of dehydration reappeared during oral treatment patients were given rapid intravenous acetate solution until they were fully corrected and then continued to take the assigned oral rehydration solution. *End point* – Passage of the last watery stool. *Measurements and main results* – The median stool output/kg body weight during the initial 24 hours of oral rehydration treatment and until diarrhoea stopped was reduced in the study group compared with the control group from 309 ml to 196 ml and from 393 ml to 236 ml respectively. Intake of oral rehydration solution and intravenous acetate solution was reduced from 455 ml to 308 ml and from 616 ml to 425 ml respectively. Two patients in the study group compared with 18 patients in the control group required unscheduled rapid intravenous acetate solution to correct signs of dehydration during oral rehydration treatment. *Conclusion* – Oral rehydration solution containing L-alanine was considerably better than standard oral rehydration solution at reducing the severity of symptoms and the need for fluid of male patients with diarrhoea associated with *V. cholerae* and enterotoxigenic *E. coli*." (Authors' abstract)

398 Pelleboer RAA, Felius A, Goje BS, van Gelderen HH. Sorghum-based oral rehydration solution in the treatment of acute diarrhoea. Trop Geogr Med 1990;42(1):63-8

"Sixty four children between 2.5 months and 5 years of age were randomly treated in a country hospital in Jos, Nigeria, with either the oral rehydration solution (ORS) as recommended by the World Health Organisation (WHO) or a cereal-based electrolyte solution, containing 60 g/l sorghum powder. Both groups were well comparable in many aspects, except for the nutritional status and the use of ORS before admission. In both aspects the sorghum-ORS group was at a disadvantage. During treatment there were no significant differences between the two groups in amount of fluid used, number of stools and duration of diarrhoea. Though weight gain in the two treatment groups was not significantly different, median weight gain in the sorghum-ORS group was 295 g, vs 155 in the WHO-ORS group. Seven children died, two (6%) in the sorghum-ORS group and five (17%) in the WHO-ORS group. Sorghum-ORS was well accepted and tolerated. This study suggests that sorghum-ORS can safely be used as an alternative in the treatment of diarrhoea." (Authors' abstract)

399 Phillips M, Kumate-Rodriguez J, Mota-Hernandez F. Costs of treating diarrhoea in a children's hospital in Mexico City. Bull WHO 1989;67(3):273-80

"The treatment received by children aged under 5 years with diarrhoea was studied in the Hospital Infantil de Mexico (Federico Gomez), Mexico City. The costs of treatment were calculated and estimates were made of how these had changed since the establishment of an oral rehydration unit in the hospital in 1985. The results indicate that drug treatment of outpatients was generally appropriate and inexpensive. In contrast, the cost of drugs for inpatients was considerably higher. The seriousness of the cases justified much of this additional expense for inpatients, but there is evidence that the costs could be reduced further without jeopardizing the quality of the care. Diagnostic tests were relatively expensive, frequently failed to identify diarrhoeal etiology, and their results correlated poorly with the treatment prescribed. The oral rehydration unit resulted in significant savings by causing a 25% fall in the number of inpatients with diarrhoea." (Authors' abstract)

400 Phillips MA, Feachem RG, Mills A. Options for diarrhoea control: the cost and cost-effectiveness of selected interventions for the prevention of diarrhoea. London: Evaluation and Planning Centre for Health Care, London School of Hygiene and Tropical Medicine, 1987. 145 p. (EPC publication, 13)

"Diarrhea is estimated to be responsible for the deaths of nearly 5 million children under 5 years of age annually. Oral rehydration therapy (ORT) was found to be effective, rela-

tively simple to administer, and inexpensive; it has rapidly become a key component of the activities of many agencies and governments concerned with child survival in developing countries. There are, however, limits to the extent to which ORT can be expected to provide the solution to the problem of diarrhea. The Division of Diarrheal Diseases Control (CDD) of the World Health Organization (WHO) initiated a research program in 1982 to study systematically non-clinical interventions that might play a role in diarrhea control. In this document, 6 interventions identified as promising are examined: measles vaccination; rotavirus vaccination; cholera vaccination; breastfeeding promotion; improved weaning practices; and personal hygiene and domestic hygiene promotion. The major focus in this document is on the demands these interventions make on resources. The primary objective is to estimate the implementation costs incurred by the provider. The costs are combined with effectiveness data to develop estimates of cost per diarrhea case or death averted. Such cost-effectiveness results are a potentially useful guide to decision-makers wishing to make the best use of limited resources by choosing approaches which will have maximum impact on diarrhea for a given level of investment. The final chapter brings together the results of the analyses of the 6 interventions, comments on these and their limitations, and identifies areas for further research." (POPLINE)

401 Pizarro D, Posada G, Mahalanabis D, Sandi L. Comparison of efficacy of a glucose/glycine/glycylglycine electrolyte solution versus the standard WHO/ORS in diarrheic dehydrated children. J Pediatr Gastroenterol Nutr 1988 Nov-Dec;7(6):882-8

"It was hypothesized that a mixture of glucose and amino acids enhances sodium and water absorption and therefore diminishes the volume of oral rehydration solution, stool output, and duration of diarrhea. To investigate this hypothesis, the efficacies of two oral rehydration solutions (ORS) were compared, one containing (mmol/L): Na^+ 90, K^+ 20, Cl^- 80, citrate 10, glucose 67, glycine 53, and glycylglycine 30, yielding an osmolality of 350 mosmol/kg H_2O, and the other, the standard ORS recommended by the World Health Organization, containing the same electrolyte concentrations and only glucose 110 mmol/L, yielding 310 mosmol/kg H_2O. The study group comprised 31 infants and small children for group A (receiving solution A, the glucose/glycine/glycylglycine-based ORS) and 31 patients for group B (receiving solution B, the standard WHO/ORS). There were no significant differences between the groups in age, fluid loss, or dehydration, or between the groups with respect to clinical outcome, mean time to achieve rehydration, mean percent body weight gain, and serum electrolyte composition. The only statistically significant difference was the mean time between admission and the last diarrheic stool. The glycylglycine/ glycine/glucose electrolyte solution was found to be suitable for rehydration, but not to have an advantage over the standard WHO/ORS." (Authors' abstract)

402 Pizarro DT, Posada GS, Levine MM, Nalin DR, Mohs EV. Comparison of efficacy of oral rehydration fluids administered at 37°C or 23°C. J Trop Pediatr 1987 Feb;33(1):48-51

"In order to assess the advantage, if any, of oral rehydration fluids warmed to 37°C (core body temperature), infants with diarrhoeal dehydration were randomly allocated to receive oral rehydration solutions at ambient temperature (23°C) or warmed to 37°C. One hundred children received glucose/electrolytes solution (GES) and water at the former temperature and another 100 received warmed fluids. Children were rehydrated by either the rotating 2:1 (every 400 ml of GES followed by 200 ml of plain water) or bolus 2:1 oral rehydration methods. There were no differences between the groups with respect to weight gain, rapidity of rehydration, frequency of vomiting, or overall efficacy. Nor were there differences between infants rehydrated using the rotating 2:1 (GES:water) or bolus 2:1 oral rehydration methods. Oral rehydration fluids can be administered at ambient temperatures and need not be warmed to 37°C." (Authors' abstract)

403 Pizarro D, Posada G, Segreda O, Mata L. [Comparison of the efficacy of 2 oral rehydration solutions: the conventional solution recommended by WHO containing sodium

bicarbonate and another containing sodium citrate]. Bol Med Hosp Infant Mex 1986 Jul;43(7):402 – 6

404 Pizarro D, Levine MM, Posada G, Sandi L. Comparison of glucose/electrolyte and glucose/glycine/electrolyte oral rehydration solutions in hospitalized children with diarrhea in Costa Rica. J Pediatr Gastroenterol Nutr 1988 May – Jun;7(3):411 – 6

"The experience of Nalin et al. and Patra et al. with a "super oral rehydration solution (ORS)" containing glucose plus glycine to enhance the intestinal absorption of sodium and water prompted us to investigate a similar ORS containing the standard World Health Organization (WHO/ORS) plus either 55 or 110 mmol/L glycine in infants and small children with noncholera diarrhea. We did not find a statistically significant difference between the glycine – fortified ORS and the standard WHO/ORS with respect to the clinical outcome and composition of serum electrolytes." (Authors' abstract)

405 Pizarro D, Castillo B, Posada G, Lizano C, Mata L. Efficacy comparison of oral rehydration solutions containing either 90 or 75 millimoles of sodium per liter. Pediatrics 1987 Feb;79(2):190 – 5

"In a randomized trial, 62 infants 2 to 35 months of age with dehydration due to acute watery diarrhea were allocated to one of two groups: group A received solution A (World Health Organization – recommended oral rehydration solution), which contained (mmol/L): Na^+ 90, K^+ 20, Cl^- 80, $citrate^{3-}$ 10, and glucose 110; group B received solution B (Pedialyte RS; Abbott Laboratories, North Chicago), which contained (in mmol/L): Na^+ 75, K^+ 20, Cl^- 65, $citrate^{3-}$ 10, and glucose 139. Oral therapy was given until clinical signs of hydration status were normal. During the 48 – hour trial, the following laboratory data were collected: blood gases, serum electrolytes, glucose, urea, and creatinine values and sodium and potassium concentrations in stool and urine; serial weights and clinical signs were also reported. Six of the 62 infants, three in each group, required intravenous fluids because of high stool output. Results of clinical outcome and normalization of altered serum electrolyte values were similar in both groups. During the 48 – hour trial, eight patients in group A and four in group B had mild, asymptomatic hypernatremia. Pedialyte RS was found to be a safe glucose/electrolyte solution for oral rehydration therapy." (Authors' abstract)

406 Pizarro D. Oral rehydration in infants in developing countries. Drugs 1988;36(suppl 4):39 – 47

"Diarrhoeal diseases are the major cause of infant mortality in developing countries. Dehydration is the most common complication of diarrhoea, and severe dehydration causes up to 80% of diarrhoeal fatalities. For more than 100 years, physicians focused the treatment of diarrhoeal diseases on the symptom diarrhoea, and there were many 'antidiarrhoeal' drugs, such as water adsorbents (kaolin and pectin) and antiperistaltics (opium, paregoric elixir, diphenoxylate hydrochloride with atropine sulphate and loperamide). This approach focused on a non – dangerous symptom and diverted attention from the real killer, dehydration. A few decades ago, only severely dehydrated patients were treated by intravenous therapy. This treatment was prescribed by a group of professional health workers, administered intravenously by skilled nurses, and reserved for the few patients resident near health facilities. Oral rehydration therapy (ORT), developed 20 years ago, has several advantages over intravenous therapy; it can be administered at home, at health clinics or in modern hospitals, by parents or by nurses or physicians. Most serum disturbances in dehydrated neonates, infants, children, adults and the elderly are resolved by this treatment." (Author's abstract)

407 Pizarro D. Oral rehydration therapy: its use in neonate and young infants. J Pediatr Gastroenterol Nutr 1986 Jan;5(1):6 – 8

408 Pizzaro TD. Comparison of oral rehydration solutions [reply]. J Pediatr Gastro –

enterol Nutr 1989 Feb;8(2):276

409 Pizarro-Torres D. [In search of the ideal solution for oral rehydration] Bol Med Hosp Infant Mex 1985 Jan;42(1):3-8

410 Posada G, Pizarro D, Mohs E. Mixed rehydration. Bull Pan Am Health Organ 1985;19(1):40-4

"A study was performed at the National Children's Hospital (San José, Costa Rica) in which 34 infants and young children with acute diarrheal disease and marked dehydration were rehydrated with mixed intravenous (IV) and oral rehydration treatments. That is, because of the severity of their illness the patients were given rehydration fluids intravenously. Some hours later, when they were alert and showed no signs of shock, nausea, or vomiting, the patients were switched over to oral rehydration. The subjects, most of whom appeared to have suffered roughly 10% dehydration by the time they were admitted, experienced an average weight gain of 8.51% during the course of their rehydration therapy. There were no complications. The overall time devoted to mixed rehydration therapy ranged from 2 to 25.75 hours per child, the average time being 9.56 hours. This was longer than the average times reported elsewhere for rapid oral or intravenous rehydration alone; but the cases treated were more severe than those treated in the other studies, and the time involved was far less than the 24 to 48 hours traditionally employed. Overall, the authors conclude that mixed rehydration therapy appears to offer an ideal course of treatment for many cases where initial IV rehydration, rather than oral rehydration, is advised." (Authors' abstract)

411 Posada G, Pizarro D, Mohs E. [Oral rehydration in children with *Cryptosporidium muris* diarrhea]. Bol Med Hosp Infant Mex 1987 Dec;44(12):740-4

412 Posada G, Pizarro D. [Rehydration by the rapid intravenous route using a solution similar to the one recommended by the World Health Organization for oral rehydration]. Bol Med Hosp Infant Mex 1986 Aug;43(8):463-9

413 PRITECH ORT Task Force, Harpers Ferry, September 22-23, 1986. Recommendations. ORT Tech Lit Update 1986 Oct;(suppl):1-6

414 Pugh A. Oral rehydration therapy in Zimbabwe. S Afr Med J 1989 Nov 4;76(9):511-2

"The Zimbabwe national campaign for home treatment of diarrhoea with sugar-and-salt solution (SSS), introduced in 1980, has reduced the number of dehydrated children presenting for treatment. Some key aspects of this successful programme are outlined, namely choosing a home-made rehydration solution in preference to satchets, getting the support of all health workers (including pharmacists, traditional midwives and village health workers), mobilising effective implementation at district level, and ensuring acceptance by the community. The paper describes how community acceptance was facilitated by avoiding misconceptions about the need for medicine at every visit to the health service, about SSS as a treatment only for rural people, about the method of action of SSS and about the use of suspect water." (Author's abstract)

415 Quint J, Barzilay Z. [Hypernatremia as a complication of oral rehydration]. Harefuah 1987 Jan 15;112(2):71-2

416 Rahaman MM. Diarrhoea in Bangladesh: an overview of research conducted between 1962-1984. In: Tzipori S, Barnes G, Bishop R, Holmes I, Robins-Browne R, eds. Infectious diarrhoea in the young: strategies for control in humans and animals; proceedings of an International Seminar on Diarrhoeal Disease in South East Asia and the Western Pacific Region, Geelong, 10-15 Feb 1985. Amsterdam: Elsevier, 1985:69-72

This paper presents an overview of diarrhoea-related research conducted in Bangladesh between 1962-1984 at the International Centre for Diarrhoeal Disease Research, Bangladesh. The development of oral rehydration therapy is discussed with the use of "Dhaka" solution containing physiologically-balanced electrolytes. The decline in the use of the whole-cell cholera vaccine is reported. The classical vaccines were found to be useless for all practical purposes in studies carried out at the Matlab Field station of the ICDDR,B. Findings of research show that *Shigella* species are a major cause of diarrhoea, while non-cholera *Vibrio*, enterotoxigenic *Escherichia coli* and rotavirus are considered as important causative agents of diarrhoea. Dehydration due to rotavirus could be corrected by oral rehydration solution. Some inexplicable phenomena of classical and El Tor cholera in Bangladesh are discussed. Tetracycline-resistant *Vibrio cholerae* infection was found to be rare either in the laboratory or in nature. Search for new and effective vaccines against cholera and other diarrhoeal pathogens are continuing through vaccine trials at field level and experimentation at the laboratories of the ICDDR,B. The "Dhaka" solution for oral rehydration therapy is recommended for use in cholera patients.

417 Rahman ASMM, Bari A. Feasibility of home treatment of diarrhoea with packaged rice-ORS. J Diarrhoeal Dis Res 1990 Mar&Jun;8(1&2):18-23

"Feasibility of home treatment of diarrhoea with packaged rice-based oral rehydration salts (R-ORS) was compared, in terms of cost, with that for glucose-based oral rehydration salts (G-ORS). Packets of G-ORS (World Health Organization-recommended composition) were distributed in two Bangladeshi villages (G-ORS area). Packets of R-ORS with similar composition, except that glucose was replaced with rice flour (50 g/l), were distributed in other two villages (R-ORS area). During the 7-month study period, 1061 and 1348 diarrhoeal episodes were detected among 409 under-five children in each of the study areas. R-ORS was used, either alone or in combination with drugs, to treat 662 (62%) episodes in the R-ORS area, compared to 1101 (82%) episodes in the G-ORS area. The treatment cost per episode was more with R-ORS than with G-ORS, though fewer R-ORS packets were used per episode. Among others, the main factor for the higher cost was found to be the higher production cost of R-ORS packets. Expected early recovery from diarrhoea with use of R-ORS was not observed in this study. Under the study situation, the feasibility of home treatment of diarrhoea with packaged R-ORS was not apparent." (Authors' abstract)

418 Rahman ASMM, Bari A, Molla AM, Greenough WB, III. Mothers can prepare and use rice-salt oral rehydration solution in rural Bangladesh. Lancet 1985 Sep 7;2(8454):539-40

A feasibility study of rice-salt oral rehydration solution (ORS) was conducted in a village at Chandpur in rural Bangladesh in 1983. Of the 358 mothers who had children aged 0-4 years, 305 were present and were interviewed with a pre-tested questionnaire designed to gather information on the availability of rice and rice products in the households. This survey showed that rice was always available in all households and ready-made rice powder was available in 30% of the households. The mothers were then trained and motivated to use rice-salt ORS to treat patients with diarrhoea at home. The impact of training was evaluated by means of field diarrhoea surveillance, case follow-up, rice-salt ORS sample analysis, and a post-training survey. During the period, rice-salt ORS by itself was used more frequently (30%) than sugar-salt ORS (6%). Rice-salt ORS was the commonest initial treatment (37%) and the commonest end treatment. The mean sodium concentration of 150 samples of home-made rice-salt ORS was 97 mmol/l. The results of the study showed that mothers in rural areas could prepare rice-salt ORS quite easily and could use it to treat diarrhoea patients. In the post-training survey, 82% of the mothers considered rice-salt ORS superior to sugar-salt ORS. Many mothers felt that the use of a rice-salt ORS could provide effective oral rehydration therapy in their homes.

419 Rahman W. Promoting the sale of ORS through pharmacists. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14 - 16 Dec 1988. Washington, DC: Creative Associates International, 1989:47 - 50

420 Rai V, Mohan M, Bhargava SK, Daral TS. W.H.O. recommended oral rehydration solution in acute diarrheal dehydration in infants. Indian Pediatr 1985 Jul;22(7):493 - 9

421 Rakhetla AM. Building a communication capacity to support CDD in Africa: the Lesotho experience. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14 - 16 Dec 1988. Washington, DC: Creative Associates International, 1989:50 - 4

422 Ramaboot S. Distribution of ORS: a case study in Thailand. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14 - 16 Dec 1988. Washington, DC: Creative Associates International, 1989:75 - 8

423 Ramadas D, Vamadevan S, Black K. Rice - flour - based oral rehydration solution for diarrhoeal diseases. Trop Doct 1988 Jul;18(3):127 - 9

Dehydration and electrolyte imbalance, the main causes of morbidity and mortality in diarrheal diseases, have been treated with glucose - based oral rehydration solutions (ORS). However, there have been difficulties due to unavailability, cost and unpalatable solutions. A total of 300 children, aged 4 weeks to 12 years, in Jaffna, Sri Lanka, were treated with rice - flour - based ORS. This solution was made by boiling 50 g of rice - flour with 1 litre of water and adding a pre - packaged salt packet. 50 g of rice flour is hydrolysed to produce 35 g of glucose, 4.35 g protein and 165 kilocalories. Three children required hospitalisation for intravenous therapy, but the rest responded well to the rice - flour - based ORS. Diarrhea resolved within 2 to 4 days. The rice - flour and salt packet together cost Sri Lanka Rs 1.50 (US $0.06), which is significantly less than the glucose - based ORS, which costs Sri Lanka Rs 5.00 (US $0.20). Rice - flour - based ORS was found to be an inexpensive, palatable, easily available, and an effective alternative to glucose - based formulas.

424 Ramage JK, Miller AR, Clarke PD. Acute diarrhoea in expatriates in Bangladesh [letter; comment]. Gut 1990 Jan;31(1):123

425 Rashad H. Measuring the demographic impact of oral rehydration therapy: learning from Egyptian experience. Giza: Population Council, 1988. 57 p. (Population Council regional papers: West Asia and North Africa)

"The demographic impact of an oral rehydration therapy intervention program is evaluated using an example from Egypt. The data are from vital statistics sources and two double - round surveys conducted between 1984 and 1986 by the National Control of Diarrhoeal Diseases Project concerning some 10,000 children. The results indicate a strong decline in infant and childhood mortality, including diarrhea - associated mortality; however problems with the data do not allow a specific allocation of the causes of this decline." (POPLINE)

426 Rashad H. Oral rehydration therapy and its effect on child mortality in Egypt. J Biosoc Sci 1989;10(suppl):105 - 13

427 Rasmuson M. Communications in support of ORT programs. In: LeSar J, Harrison P, Buxbaum A, eds. Manual for assessment and planning of national ORT programs. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 23 p.

428 Rawson IG. Oral rehydration therapy [letter]. N Engl J Med 1989 Jun 8;320(23):1562

429 Raynal AL. Treatment of diarrhoea by white child-carers in southern Johannesburg [letter]. S Afr Med J 1989 Nov 4;76(9):515

430 Reddy V, Raghuramulu N, Arunjyoti, Shivaprakash M, Underwood B. Absorption of vitamin A by children with diarrhoea during treatment with oral rehydration salt solution. Bull WHO 1986;64(5):721-4

"The results of a study of absorption by children of vitamin A indicate that absorption is lower in children with acute diarrhoea compared with normal children. The glucose or electrolytes present in solutions of oral rehydration salts had no effect on the absorption. Despite malabsorption, 70% of the administered dose of 100 000 IU of vitamin A in 500 ml of fluid was absorbed and retained." (Authors' abstract)

431 Reddy V, Krishnamachari KAVR, Naidu AN, Ravikumar. Long term effect of oral rehydration in diarrhoea on the nutritional status of children. Nutr Res 1985 Jul;5(7):715-22

"A total of 711 children below 5 years of age were followed up in 2 rural communities for a period of 1 year. In one community, ORS packets were supplied and feeding advice was given for children with diarrhoea, while there was no intervention in the other community which served as the control. At the end of 1 year, there was no difference in the growth of children in the 2 groups. When only children who had diarrhoea were compared, weight gain was similar in those who received ORS and those who did not. These observations indicate that oral rehydration does not have any long term effect on the nutritional status of children." (Authors' abstract)

432 Rezende MA, Jorge IM, Celeste MA, Figueira VL, Gushiken IF, Pereira EC. [Project G.O.B.I. (growth, oral rehydration, breast feeding, immunization)--a proposal of care for the institutionalized child]. Rev Esc Enferm USP 1985 Dec;19(3):239-45

433 Rhoads JM, MacLeod RJ, Hamilton JR. Alanine enhances jejunal sodium absorption in the presence of glucose: studies in piglet viral diarrhea. Pediatr Res 1986 Sep;20(9):879-83

"We measured the response of jejunal sodium (Na) absorption to neutral amino acid (L-alanine) and to dipeptides (L-alanyl-L-alanine, glycylsarcosine) in normal piglets and in piglets with acute viral diarrhea after experimental infection with transmissible gastroenteritis (TGE) virus. In the TGE jejunum villi were blunted, crypts were deepened, and the epithelium was composed of relatively undifferentiated cells with reduced disaccharidase, decreased sodium-potassium-stimulated ATPase, and elevated thymidine kinase activities. The response of Na absorption to a maximal concentration of L-alanine (20 mM) or D-glucose (30 mM) was significantly blunted in TGE jejunum in Ussing chambers. However, the addition of L-alanine together with D-glucose caused a significantly greater increment of Na absorption than either L-alanine or D-glucose alone in control and TGE tissue. The effect of Na absorption of the dipeptide L-alanyl-L-alanine (10 mM), which was rapidly hydrolyzed by control and TGE mucosa, was similar to that of L-alanine (20 mM), while glycylsarcosine, a poorly hydrolyzed dipeptide, did not change net Na absorption in the jejunum. Our data support the concept of separate carrier systems for neutral amino acid and hexose in the crypt-type intestinal epithelium characterizing viral enteritis. We speculate that a sodium-cotransporting amino acid, if added to oral glucose-electrolyte solutions, could benefit oral rehydration therapy in acute viral diarrhea; neither of the dipeptides tested here can be expected to enhance absorption to any greater extent than its constituent amino acids." (Authors' abstract)

434 Roberson LM, McLaughlin AJ, Lund JK. Promoting oral rehydration therapy for

acute diarrhea. J Am Diet Assoc 1987 Apr;87(4):496 – 7

435 Roesel C, Schaffter T. Rice water/salt solution for diarrhoea [letter]. Lancet 1989 Mar 18;1(8638):620 – 1

436 Rohde J, Northrup R. Education for physicians. In: LeSar J, Harrison PM, Buxbaum A, eds. Manual for assessment and planning of national ORT programs. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985. 11 p.

437 Rolston DD, Moriarty KJ, Farthing MJ, Kelly MJ, Clark ML, Dawson AM. Acetate and citrate stimulate water and sodium absorption in the human jejunum. Digestion 1986;34(2):101 – 4

"Using a standard perfusion technique, the organic anions acetate (50 mmol/l) and citrate (5 mmol/l) have been shown to stimulate absorption of water and sodium from the human jejunum. These observations may support further the rationale for including acetate or citrate in oral rehydration solutions for the treatment of acute diarrhoeal disease in humans." (Authors' abstract)

438 Rolston DD, Borodo MM, Farthing MJ. Bicarbonate loss from commercial oral rehydration solution [letter]. Lancet 1985 Mar 16;1(8429):638 – 9

439 Rolston DDK, Farthing MJG, Clark ML. Citrate in oral rehydration therapy [letter]. Gut 1985 Apr;26(4):429

440 Rolston DDK, Kelly MJ, Borodo MM, Dawson AM, Farthing MJG. Effect of bicarbonate, acetate, and citrate on water and sodium movement in normal and cholera toxin – treated rat small intestine. Scand J Gastroenterol 1989 Jan;24(1):1 – 8

"Bicarbonate, citrate, or acetate are commonly included in oral rehydration solutions to correct acidosis and possibly because of their ability to promote water and sodium absorption. We have investigated the effect of these anions on water and sodium transport in normal and also in secreting (cholera toxin – treated) rat small intestine using a single – pass perfusion technique. In normal jejunum bicarbonate and acetate produced net absorption, and citrate net secretion of both water and sodium. In normal ileum all anions produced net absorption of water and sodium. In the secreting jejunum, however, bicarbonate had no effect on water and sodium secretion, whereas acetate and citrate actually enhanced the secretory state for both water and sodium. None of these anions had any effect on water and sodium secretion in the ileum. These observations suggest that normal and secreting intestine are qualitatively different with regard to handling of these organic anions. The addition, therefore, of bicarbonate, acetate, or citrate to oral rehydration solutions may have no beneficial effect with regard to the promotion of water and sodium absorption in the secreting intestine during acute diarrhoeal states and could actually be deleterious." (Authors' abstract)

441 Rolston DDK, Borodo MM, Kelly MJ, Dawson AM, Farthing MJG. Efficacy of oral rehydration solutions in a rat model of secretory diarrhea. J Pediatr Gastroenterol Nutr 1987 Jul – Aug;6(4):624 – 30

Controversy continues regarding the ideal composition of glucose/electrolyte solutions used for oral rehydration of infants and children with acute diarrhoea. The authors used cholera toxin – treated rat small intestine as a model of secretory diarrhoea to assess the efficacy of some commercial and experimental oral rehydration solutions (ORS) by intestinal perfusion. All solutions tested reversed net water secretion but a hypotonic bicarbonate – free solution was more effective than other solutions, including the World Health Organization – recommended ORS ($p < 0.003$). Net sodium secretion persisted with all solutions tested, but there was a significant linear relationship between sodium concentration

of the solution perfused and net sodium transport ($r=0.75$, $p<0.05$). Cholera toxin treatment alone and in combination with perfusion of ORS significantly reduced plasma sodium concentration and osmolality ($p<0.05$), the effects being most marked with low sodium solutions. Although direct parallelism between observations in this animal model of secretory diarrhoea and human diarrhoeal disease has not been established as yet, the model may be useful in assessing clinical efficacy of new ORS and in systematic analysis of the relative benefits of their individual components. (Modified authors' abstract)

442 Rolston DDK, Zinzuvadia SN, Mathan VI. Evaluation of the efficacy of oral rehydration solutions using human whole gut perfusion. Gut 1990 Oct;31(10):1115-9

"Whole gut perfusion in humans was used to compare the effect on intestinal water and electrolyte transport of the World Health Organization oral rehydration solution (solution II, composition in mmol/l: glucose 111, sodium 90, bicarbonate 30, potassium 20; 308 mOsm/kg); a hypertonic commercial oral rehydration solution (solution III, glucose 188, sodium 50, bicarbonate 20, potassium 20 mmol/l; 335 mOsm/kg); and three experimental bicarbonate free, hypotonic oral rehydration solutions: solution IV (glucose 111, sodium 60, potassium 20 mmol/l; 260 mOsm/kg), solution V (glucose 80, sodium 60, potassium 20 mmol/l; 219 mOsm/kg), and solution VI (glucose 80, sodium 30, potassium 20 mmol/l; 177 mOsm/kg). Perfusion of the intestine with a standard cleansing solution (solution I, sodium 125, potassium 10, bicarbonate 20, sulphate 40, mannitol 80 mmol/l; 275 mOsm/kg) confirmed published data on minimal water and sodium absorption. Experimental solution VI produced maximum water absorption (mean (SE) +1660.0 (29.8) ml/h) significantly greater than solution II (+1195.3 (79.5) ml/h), III (+534.7 (140.3) ml/h), IV (+1498.0 (42.7) ml/h), and V (+1327.7 (24.4) ml/h; $p<0.05$). Sodium absorption was significantly greater with solution II (+97.4 (7.9) mmol/h) compared to VI (+43.3 (7.8) mmol/h; $p<0.01$) but not compared to IV (+67.2 (13.0) mmol/h). A hypotonic oral rehydration solution such as solution VI may provide optimal replacement treatment for patients with acute diarrhoea." (Authors' abstract)

443 Rolston DDK, Mathan VI. Evaluation of oral rehydration solution efficacy using human whole gut perfusion. Gastroenterology 1988;94:A383

444 Rolston DDK, Mathew P, Mathan VI. Food-based solutions are a viable alternative to glucose-electrolyte solutions for oral hydration in acute diarrhoea-studies in a rat model of secretory diarrhoea. Trans R Soc Trop Med Hyg 1990 Jan-Feb;84(1):156-9

"A survey of acute diarrhoea and its treatment, in 3 groups of villages in south India, revealed that use of the World Health Organization oral rehydration solution (WHO-ORS) was poor or virtually non-existent and that several liquid foods were given to children during acute diarrhoea. The effects of the most commonly used, boiled and cooled supernatants of these liquid foods [rice (*Oryza sativa*)-water, ragi (*Eleusine coracana*)-water, arrowroot (*Maranta arundinacea*)-water], and tender coconut-water, and of the bicarbonate- and citrate-WHO-ORS on intestinal water transport were evaluated using a rat model of secretory diarrhoea. All solutions either decreased cholera toxin-induced net water secretion (arrowroot-water) or reversed it to net absorption. Ragi-water produced maximum net water absorption, significantly greater than the WHO oral rehydration solutions. WHO-ORS utilization is poor in some developing countries, and locally used food-based solutions could be used for maintaining hydration or correcting the dehydration due to acute diarrhoea once their effectiveness has been proved by clinical trials." (Authors' abstract)

445 Rolston DDK. Oral rehydration therapy in the tropics. In: Lebenthal E, Duffey M, eds. Secretory diarrhoea. New York: Raven Press [In press]

446 Roman L, Azcarate MJ, Cerero J, Pocheville I, Vitoria JC. [Saline poisoning caused by the wrong use of an oral rehydration solution]. An Esp Pediatr 1987

Mar;26(3):223 – 4

447 Rosegger H, Sixl W. [Oral rehydration by nasogastric tube using continuously sterilized water in infants with diarrhea in South Sudan (the Upper Nile area, Melut)]. Padiatr Padol 1985;20(4):363 – 8

448 Rosen EU, Patidar JV, Shaik R. Oral rehydration therapy in a rehydration centre at a teaching hospital in southern Africa. S Afr Med J 1989 Nov 4;76(9):485 – 7

"A study was carried out to delineate the use of oral rehydration therapy (ORT) for gastro – enteritis in a unit that had previously used intravenous therapy (IVT) almost exclusively. Most children with dehydrating gastro – enteritis who were 5% or less dehydrated received ORT initially, while those who were more severely affected were given IVT. The success rate using ORT alone was 73%, which was much lower than that achieved in other studies. Possible factors associated with this poor outcome are discussed. It was concluded that with the exceptions of lactose intolerance and coexisting infection, lack of commitment to ORT and the easy access to IVT must have contributed significantly to the suboptimal outcome." (Authors' abstract)

449 Ross MH, Barron PM. Awareness of oral rehydration at well – baby clinics in Johannesburg. S Afr Med J 1989 Nov 4;76(9):492 – 5

"A questionnaire regarding knowledge about oral rehydration therapy (ORT) was administered to 1087 adults bringing Asian, black, coloured and white children to under – 5 clinics in Johannesburg. Although 54% had heard about ORT, misconceptions existed in this group and half thought that ORT stops diarrhoea. There were no significant differences in awareness of ORT between the different population groups. Awareness increased with age of the child, the birth order of the child and the educational level of the adult. These three factors were associated with statistically significant differences in awareness. Of these, educational level was the most important. The main first source of information about ORT was clinic sisters (54%), although when a child has diarrhoea a doctor is most commonly consulted (43%). Less – educated mothers of newborn first children appear to be in most need of health education, and recommendations to involve this group and health professionals in Johannesburg are discussed." (Authors' abstract)

450 Roy DK, Rao PSSNVP, Chaturvedi DK, Gupta B, Roy BK, Sarmukaddam SB. A control study with di – glycine containing oral rehydration solution in infantile diarrhoea. In: Majumder PP, ed. Proceedings of the Data Analysis Workshop for the Medical Sciences, Calcutta, 11 – 30 Nov 1985. Calcutta: Indian Statistical Institute, 1986:58 – 67

It has been hypothesised that a mixture of diglycine and glucose when absorbed would further enhance the absorption of sodium and water from oral rehydration solutions (ORS) by their additive effect. The efficacy of ORS with a combination of diglycine and glucose was evaluated in a clinical trial on 48 infants and young children with acute diarrhoea and signs of moderate – to – severe dehydration in India. Patients were randomly assigned to either of the two treatment groups. Patients in the control group (25) received the WHO – recommended ORS and those in the study group received an ORS with identical electrolyte composition in which 20 g of glucose was subsituted by 16.2 g of glucose and 11.9 g of diglycine. Three patients in the study group and 4 in control required intravenous (i.v.) fluid at the beginning of the study. Study and control groups received i.v. fluid in quantities of 58.7 ml/kg and 53.2 ml/kg respectively. One study patient and 4 controls who received unscheduled i.v. fluids were excluded from the analysis. The remaining patients recovered uneventfully. Mean weight gain as a percentage of recovery weight at 6, 24, 48 and 72 h was higher in the study group than in controls, but the difference was not significant. The study solution did not reduce stool output, duration of diarrhoea and consumption of ORS. A possible factor could be the intraluminal hydrolysis of glycyl – glycine which imposed a further osmotic penalty on the hyperosmolar study solution.

451 Ruz M, Solomons NW. Mineral excretion during acute, dehydrating diarrhea treated with oral rehydration therapy. Pediatr Res 1990 Feb;27(2):170-5

"Twenty-four male Guatemalan children, aged 7 to 23 mo, suffering dehydration due to acute diarrhea were studied to assess their fecal endogenous losses of trace minerals zinc, iron, and copper while treated with oral rehydration therapy, either with standard or glycine-added solutions. Sodium and potassium excretions (from endogenous and exogenous sources) were also monitored. No statistically significant effect of glycine was observed on any of the minerals studied, although a tendency to higher output was seen with zinc. Median rates of fecal excretion of zinc, iron, and copper were 6.08, 6.33, and 1.61 micrograms/kg/h, respectively, whereas those for sodium and potassium were 11.2 and 9.7 mg/kg/h. All of the minerals' excretion showed significant linear correlations with fecal volume, r values were 0.47 (Zn), 0.64 (Fe), 0.77 (Cu), 0.98 (Na), and 0.97 (K). Mineral-mineral interactions also were evident, with such correlations in fecal excretion rates as: Zn versus Cu, r = 0.75; Zn versus Fe, r = 0.62; Fe versus Cu, r = 0.76." (Authors' abstract)

452 Sachar RK, Javal GS, Cowan B, Grewal HNS. Home-based education of mothers in treatment of diarrhoea with oral rehydration solution [short communication]. J Diarrhoeal Dis Res 1985 Mar;3(1):29-31

"This study of 650 rural mothers of under-five children in India showed that field teams can effectively teach mothers in their homes about prompt preparation and use of oral rehydration solution (ORS) for children's diarrhoea. A questionnaire six months after such teaching showed that 68% knew about ORS; and 29.5% knew how to prepare it at home, with readily-available salt, sugar and water, and when to give it. During the six months, 145 of 197 (73.6%) children with diarrhoea had received such home-made ORS. Local private practitioners also had been contacted and asked to use and recommend ORS, but only 26 of 54 (48.1%) children taken to such practitioners for diarrhoea treatment had been given ORS. Although it may be difficult to influence local practitioners to use ORS, attempts to do so are worthwhile. At the same time, vigorous efforts should be made to make mothers self-reliant in early use of ORS, through repeated training." (Authors' abstract)

453 Sachdev HPS, Bhargava SK. Oral rehydration therapy of neonates. Indian J Pediatr 1985 Sep-Oct;52(418):469-74

This paper reviews the evolution of oral rehydration therapy (ORT) in an historical context. The efficacies of various oral rehydration solutions (ORS) are compared, and the advantages of different ORS formulations are outlined. The efficacies of the WHO-ORS (containing 90 mmol of sodium per litre) were compared with another glucose-electrolyte solution containing only 60 mmol of sodium per litre. Results suggest that the bicarbonate content of the WHO-ORS should be increased to promptly correct the acidosis in young infants. An increase in the bicarbonate and potassium content of the WHO-ORS for older children has been proposed. A rice-based and glycine-glucose solution is strongly recommended for use in rural households in developing countries.

454 Sack RB. Global view of ORT. J Diarrhoeal Dis Res 1987 Dec;5(4):262-4

455 Salazar-Lindo E, Sack RB, Chea-Woo E, Leon-Barua R, Kay BA, Yi A, Robertson AD. Bicarbonate versus citrate in oral rehydration therapy in infants with watery diarrhea: a controlled clinical trial. J Pediatr 1986 Jan;108(1):55-60
"In a double-blind, randomized trial, we compared the efficacy of bicarbonate-containing oral rehydration solution vs citrate-containing solution in the treatment of infantile diarrheal dehydration and acidosis. Ninety-seven infants 3 to 24 months of age were entered in the study; 49 received bicarbonate-containing solution and 48 citrate-containing solution. The two groups were similar in all respects at the beginning of the study.

Oral rehydration was successful (i.e., no intravenously administered fluids were required) in 85% of study patients; the success rate was similar in both treatment groups. Serum total CO_2 concentration increased in a similar fashion in both groups, reaching near normal values at 48 hours after admission. We conclude that sodium citrate can be substituted for sodium bicarbonate in the formulation of the orally administered rehydration solution recommended by the World Health Organization for treatment of diarrheal dehydration in infants." (Authors' abstract)

456 Samadi AR, Ahmed SM, Bardhan PK, Huq MI, Islam MR, Wahed MA. Treatment of infantile diarrhoea with standard oral rehydration solution and early introduction of milk feeds. J Trop Pediatr 1985 Jun;31(3):162 – 6

"Two groups of infants less than six months of age (one exclusively breast – fed and the other exclusively bottle – fed) suffering from diarrhoea with mild and moderate degrees of dehydration were hydrated with standard oral rehydration solution (ORS) supplemented by early introduction of breast milk or half strength formula milk instead of plain water. All these infants were successfully hydrated by clinical and biochemical criteria. There was no adverse effect of treatment with this regimen on the process of hydration or the serum sodium level during the phases of rehydration or maintenance. The results of this study indicate the safety of treatment of diarrhoea of young infants with mild/moderate degrees of dehydration by standard ORS supplemented by early milk feeds instead of plain water." (Authors' abstract)

457 Sanchez – Arenas PM, Palacios – Trevino JL, Villegas – Silva R, del Castillo – del – Moral HA. [Comparison between oral and parenteral rehydration in children with dehydration caused by gastroenteritis]. Bol Med Hosp Infant Mex 1985 Jan;42(1):16 – 20

458 Sanchez – Valverde – Visus F, Gonzalez – Echevarria F, del – Real – Sanchez – Puerta C. [Saline poisoning caused by wrong use of an oral rehydration solution (letter)]. An Esp Pediatr 1988 Feb;28(2):170 – 1

459 Sandhu BK, Christobal FL, Brueton MJ. Optimising oral rehydration solution composition in model systems: studies in normal Mammalian small intestine. Acta Paediatr Scand 1989;(suppl 364):17 – 22

"Small intestinal perfusion studies have been carried out in animals to evaluate the role of the individual constituents of oral rehydration solution (ORS), in order to draw some conclusions relating to the optimal composition of ORS. Two commercially available ORS, Dioralyte and Rehidrat have also been compared to the World Health Organization (WHO) standard solution. Maximum rate of water absorption occurred with the WHO solution and least with Rehidrat. The findings of the perfusion studies suggest that in the normal small intestine, optimal water absorption occurs from a solution containing 60 mmol/l of sodium and 8 – 120 mmol/l of glucose. The addition of bicarbonate and citrate at concentrations present in ORS does not appear to have a significant effect on water absorption. The addition of glycine and diglycine to the standard ORS reduced the net rate of absorption of sodium and water, probably because of the effect of increased osmolality." (Authors' abstract)

460 Santhanakrishnan BR, Sankaranarayanan VS. Oral rehydration therapy for childhood gastroenteritis. Pediatr Bull 1985 Jun;7(1):14 – 8

461 Santhanakrishnan BR, Sankaranarayanan VS. Rice water solution in diarrheal dehydration. Indian J Pediatr 1985 Sep – Oct;52(418):479 – 82

"Diarrheal disorders and complications related to diarrhea especially dehydration continue to be a major problem in developing countries like India. Though oral rehydration with salt, sugar and water is a well accepted mode of treatment in uncomplicated cases, still ORS packets (WHO formula) or sugar (sucrose ORS formula) are not readily available in

every house or hospital rice water with salt services as an equivalent with alternative substitute in the rehydration therapy with good results." (Authors' abstract)

462 Santoro MI, Hackmann ER, Magalhaes JF, Vernengo MJ. Stability-indicating assay methods for oral rehydration salts. Pharmazie 1986 Oct;41(10):740-1

463 Santosham M, Fayad IM, Hashem M, Goepp JG, Refat M, Sack RB. A comparison of rice-based oral rehydration solution and "early feeding" for the treatment of acute diarrhea in infants. J Pediatr 1990 Jun;116(6):868-75

"To compare the use of rice-based oral rehydration solution (R-ORS), with the introduction of food immediately after rehydration ("early feeding"), using standard glucose-based oral rehydration solution (G-ORS) in the management of acute diarrhea, we conducted a four-cell randomized, controlled trial among 200 hospitalized Egyptian infants between 3 and 18 months of age. During the rehydration phase (first 4 hours), three groups were given G-ORS and a fourth group was given R-ORS. During the subsequent maintenance phase, the control group was given a soy-based, lactose-free formula (G-ORS + SF), a second group (G-ORS + RF) was given a rice-based formula, and a third group (G-ORS + rice) was given boiled rice. The fourth group (R-ORS + SF) continued to receive R-ORS for the first 24 hours of the maintenance period, followed by a soy-based lactose-free formula. During the first and second 24 hours of the maintenance period, infants in the three treatment groups had a lower mean stool output in comparison with the control group ($p = 0.006$ and 0.03, respectively). The mean total stool output in the R-ORS + SF group was significantly lower than in the control group ($p = 0.02$). There were no statistically significant differences among the four groups in the mean duration of diarrhea. We conclude that (1) infants who were given R-ORS had reduced total stool output (by 35%) compared with the control group and (2) feeding of boiled rice or a rice-based formula immediately after rehydration therapy was as efficacious as treatment with R-ORS alone for 24 hours, followed by feeding with a soy-based, lactose-free formula." (Authors' abstract)

464 Santosham M, Burns BA, Reid R, Letson GW, Duncan B, Powlesland JA, Foster S, Garrett S, Croll L, Wai NN, Marshall WN, Almeldo-Hill J, Sack RB. Glycine-based oral rehydration solution: reassessment of safety and efficacy. J Pediatr 1986 Nov;109(5):795-801

"We evaluated the safety and efficacy of a glycine-based orally administered rehydration solution by comparing it with a standard oral rehydration solution (ORS) without glycine in a randomized double-blind trial in United States infants (age less than 15 months) given treatment for acute gastroenteritis as inpatients or outpatients. The response to therapy (stool volume and duration of illness) was similar in the two groups, except that in four (13%) of 31 hospitalized infants receiving glycine-ORS hypernatremia developed, (one had symptoms) compared with none of 35 receiving ORS ($P < 0.04$). Among the 77 outpatients there were no differences between the groups. This study demonstrates that glycine-ORS did not provide any therapeutic advantage over standard ORS, and hypernatremia developed in some patients receiving glycine-ORS. We suggest that caution be used with this type of solution until further safety studies have been done." (Authors' abstract)

465 Santosham M. Nutritional aspects of ORT. J Diarrhoeal Dis Res 1987 Dec;5(4):270-4

"This article discusses the nutritional aspects of oral rehydration therapy (ORT). With each diarrheal episode, the child loses weight and slowly recovers. Every time he catches up, he suffers another episode of diarrhea. A major goal of ORT should be that with each diarrheal episode the child does not drop weight, but can maintain it close to normal. Part of the reason for the weight loss is that the child is anorexic during the diarrheal episode, another is the vomiting during the diarrhea. Mothers in many countries

still incorrectly believe that food should be withheld during diarrhea, often because their doctors have told them that it is dangerous. Another reason for the weight loss is the catabolic losses due to tissue breakdown and diversion of nutrients. ORT in itself can help to reduce the weight loss. Several studies have shown that where ORT was introduced into 1 community and not in another, 6 months later the children in the community with the ORT intervention had significantly better weight gain compared to the infants in the community that did not receive ORT. Many studies recently have shown that weight loss is decreased and anthropometric measurements are improved in children who had feeding or breastfeeding introduced early in the course of ORT." (POPLINE)

466 Santosham M, Burns B, Nadkarni V, Foster S, Garrett S, Croll L, O'Donovan JC, Pathak R, Sack RB. Oral rehydration therapy for acute diarrhea in ambulatory children in the United States: a double-blind comparison of four different solutions. Pediatrics 1985 Aug;76(2):159-66

"Oral rehydration solutions containing 50 to 90 mmol/L of sodium have recently been recommended for the treatment of diarrhea in both hospitalized and ambulatory children in the United States. Few data are available, however, from ambulatory US children. Therefore, we conducted a randomized double-blind study comparing the use of four different oral rehydration solutions with differing concentrations of sodium, glucose, and base. Ambulatory children less than 2 years of age with acute diarrhea (N = 140) were randomly chosen to receive solutions containing sodium at 90 (solution A), 50 (solution B), and 30 mmol/L (solutions C and D). All oral rehydration solutions contained 20 g/L of glucose except solution D which contained 50 g/L of glucose. Solution A contained bicarbonate as its base source whereas the other three contained citrate. All but three (98%) children were treated uneventfully according to the study protocol, and there were no differences among groups in measurements of clinical outcome. It was concluded that in ambulatory US children, oral rehydration solutions containing 90, 50, or 30 mmol/L of sodium can be used safely for the treatment of mild acute diarrhea and that citrate is as efficacious as bicarbonate in the correction of acidosis." (Authors' abstract)

467 Santosham M, Brown KH, Sack RB. Oral rehydration therapy and dietary therapy for acute childhood diarrhea. Pediatr Rev 1987 Mar;8(9):273-8

468 Sarkar U. Community participation in the control of diarrhoea. J Indian Med Assoc 1987 Jul;85(7):210-2

469 Saunders DR, Sillery JK. Absorption of carbohydrate-electrolyte solutions in rat duodenojejunum: implications for the composition of oral electrolyte solutions in man. Dig Dis Sci 1985 Feb;30(2):154-60

"Commonly used oral electrolyte solutions are based on glucose, or sucrose, and 90 mM Na^+. We had been disappointed with the ability of such solutions to improve Na^+ absorption in patients with extensive resection of distal small bowel. Therefore, we tested the effect on net Na^+ and water transport of combinations of different carbohydrates (glucose, sucrose, and glucose polymers) and NaCl in the rat duodenojejunum. Absorption was measured under steady-state conditions in unanesthetized animals which were infused with a different combination every hour for up to 5 hr. Of the various combinations, 10 mM glucose polymer (equivalent to 56 mmol of glucose as glucose oligosaccharides), or 60 mM glucose promoted net Na^+ absorption from 120 mM NaCl and 20 mM KCl, but the glucose polymer infusate promoted more rapid water absorption than did the infusate containing glucose. The infusate of 10 mM glucose polymer in saline was initially hypotonic (276 mosmol/kg), but it became isotonic (298 mosmol/kg) as the glucose polymer was hydrolyzed during its passage through the duodenojejunum. In contrast, an infusate of 60 mM sucrose with 120 mM NaCl and 20mM KCl remained hypertonic (320 mosmol/kg), and it did not promote water and Na^+ absorption by the duodenojejunum. The efficacy of 10 mM glucose polymer with 120 mM NaCl should be tested in patients with short-bowel syndrome due to distal bowel resection." (Authors'

abstract)

470 Schedl HP. Scientific rationale for oral rehydration therapy. Clin Therap 1990;12(suppl A):14–20

"A scientific rationale for the use of oral rehydration therapy (ORT) in treating severe diarrhea is presented. Because diarrhea impairs the absorptive and secretory functions of the gastrointestinal tract, volume and solute deficits must be corrected through ORT. The composition of the ideal ORT solution– –one that maximizes absorption of water, electrolytes, and nutrients– –is discussed in relation to the digestive–absorptive mechanisms of the gut." (Author's abstract)

471 Sebhatu B. Mass treatment approach to acute diarrhoeal disease in Afabet Hospital, Northern Ethiopia. Ethiop Med J 1989;27:155–9

"During an outbreak of acute diarrhoeal disease in a military camp in Afabet region from August to October 1985, 416 cases were admitted to Afabet hospital. All were National Military Service recruitee males who developed signs of moderate to severe dehydration. Simplified methods of diagnosing and treating the disease were used so that mass rehydration therapy could be instituted early, using locally available manpower and material resources. The severity of dehydration was graded, and rehydration therapy given mainly with oral rehydration salt (ORS) solution (average 10–12 litres per patient), plus intravenous fluids (average 4–6 litres per patient) as necessary. The mortality rate was 0.7%. The average hospital stay was 2 days. We recommend that in any diarrhoeal epidemic, rehydration therapy should be instituted early by tailoring the working conditions to the locally available resources." (Author's abstract)

472 Seckl JR, Williams TD, Lightman SL. Oral hypertonic saline causes transient fall of vasopressin in humans. Am J Physiol 1986 Aug;251(2, pt 2):R214–7

"After dehydration, oral rehydration causes a fall in plasma arginine vasopressin (AVP) that precedes changes in plasma osmolality. To investigate further the stimulus for this effect, its specificity, and association with thirst, six volunteers were deprived of water for 24 h and given a salt load on two separate occasions. On each study day they then drank rapidly 10 ml/kg of either tap water or hypertonic saline (360 mosmol/kg). There was a significant fall in plasma AVP from 2.0 ± 0.3 to 1.2 ± 0.4 pmol/l ($p<0.05$) 5 min after drinking water and from 1.8 ± 0.3 to 0.9 ± 0.2 pmol/l ($p<0.05$) after hypertonic saline. Plasma osmolality fell 30–60 min after water and was unchanged after saline. Plasma renin activity, oxytocin, and total protein all remained unchanged. All subjects reported diminished thirst after hypertonic saline. Gargling with water reduced thirst but did not affect plasma AVP. There appears to be a drinking-mediated neuroendocrine reflex that decreases plasma AVP irrespective of the osmolality of the liquid consumed. The sensation of thirst did not correlate with plasma osmolality and was not always related to plasma AVP concentration." (Authors' abstract)

473 Sharifi J, Ghavami F, Nowrouzi Z, Fouladvand B, Malek M, Rezaeian M, Emami M. Oral versus intravenous rehydration therapy in severe gastroenteritis. Arch Dis Child 1985 Sep;60(9):856–60

"A controlled, randomised trial comparing the results of oral rehydration therapy with those of intravenous fluid treatment in 470 children with severe gastroenteritis was undertaken. The oral rehydration therapy was divided into two phases– –a rehydration phase that used high sodium isotonic fluid at 40 ml/kg per hour and a maintenance phase using low sodium isotonic fluid (sodium 40, potassium 30, bicarbonate 25, chloride 45, and dextrose 130 mmol/l). The results indicate that oral rehydration treatment, used according to this protocol, is successful in treating severe diarrhoea and dehydration, and has considerable advantages over intravenous fluid therapy in reducing complications associated with the treatment of hypernatraemia, in promoting rapid correction of hypoka-

laemia and acidosis, in decreasing the duration of diarrhoea, and in promoting a greater weight gain at hospital discharge." (Authors' abstract)

474 Sharifi J, Ghavami F, Nowruzi Z. Treatment of severe diarrhoeal dehydration in hospital and home by oral fluids. J Trop Med Hyg 1987 Feb;90(1):19–24.

This paper describes the symptoms, characteristics and treatment of 1,330 infants, from birth to 24 months old, suffering from diarrhoea and moderate-to-severe dehydration who were hospitalised in Tehran University Hospital over a period of 11 months. Fifteen per cent of them had signs of shock, and 36% had marasmus. All patients were treated orally in two phases: rehydration therapy and maintenance therapy. For rehydration, an isotonic fluid (sodium 80 mmol/l, potassium 20 mmol/l) was administered at a rate of 40 ml/kg.h until all signs of dehydration disappeared. Following complete hydration, the patients were discharged, and maintenance therapy was carried out at home by mothers, administering maintenance solution (sodium 40 mmol/l, potassium 30 mmol/l) given freely. Intravenous fluids were not used, even in severe dehydration. The efficacy and safety of this regimen were confirmed by the evidence of successful rehydration in 99.7% of the patients and correction of a wide variety of electrolyte abnormalities present on admission, though some relapsed. This study demonstrates that mothers can serve as effective health workers and can perform successful maintenance therapy. Nine per cent of treated children required re-admission to a hospital within 24 hours of discharge, and a further 8% were hospitalised elsewhere with recurrent symptoms. (Modified authors' abstract)

475 Shirole DB. Tartrazine in oral rehydration solutions [letter]. Indian Pediatr 1985 Jan;22(1):76–7

476 Sircar BK, Deb BC, Sengupta PG, Mondal S, Gupta DN, Sikder SN, Sarkar S, Ghosh S, Saha NC, Pal SC. An operational study on implementation of oral rehydration therapy. In: Proceedings of the Indo-UK Workshop on Diarrhoeal Diseases, Calcutta, 9–13 Jan 1989. Calcutta: National Institute of Cholera and Enteric Diseases, 1989:79–81

477 Sitaraman S. Oral rehydration solutions, use or misuse? Trop Gastroenterol 1985 Apr-Jun;6(2):113–5

478 Sloven DG, Jirapinyo P, Lebenthal E. Hydrolysis and absorption of glucose polymers from rice compared with corn in chronic diarrhea of infancy. J Pediatr 1990 Jun;116(6):876–81

"Because rice remains the most available carbohydrate in developing countries, where chronic diarrhea is most prevalent, we compared the *in vitro* hydrolysis and clinical tolerance of rice glucose polymer with those of corn glucose polymer. Rice glucose polymer hydrolysis to D-glucose and short-chain polymers (polymers with two to four glucose units and those with five or more units) was similar to that for corn glucose polymers during incubation with saliva or duodenal aspirates. However, rice glucose polymers yielded more short-chain products than corn glucose polymers during incubation with pooled mucosal homogenates ($p<0.01$). *In vivo* tolerance testing of 16 infants with chronic diarrhea confirmed that rice glucose polymers were well tolerated and, compared with corn glucose polymers, achieved a higher maximal increase of serum glucose concentration (36.6 ± 7.3 vs 27.6 ± 10.3 mg/dl; $p<0.02$), a shorter time to peak serum glucose concentration (34.0 ± 10.2 vs 52.5 ± 25.7 minutes; $p<0.02$), and a greater area under the serum glucose response curve at 30 minutes (538 ± 131 vs 1035 ± 501 cm; $p<0.02$). We conclude that rice glucose polymers are rapidly hydrolyzed *in vitro* and *in vivo* and are more rapidly absorbed than are corn glucose polymers in children with chronic diarrhea." (Authors' abstract)

479 Smith LG. Teaching treatment of mild, acute diarrhea and secondary dehydration

to homeless parents. Public Health Rep 1987 Sep – Oct;102(5):539 – 42

480 Snyder J. Global training needs: U.S. perspective. J Diarrhoeal Dis Res 1987 Dec;5(4):279 – 82

"This article defines the scope of the problem of diarrhea in the US, summarizes the practices that are in place to combat it, and suggests improvements which might be made. In the US, the risk of dying from diarrhea is much less than in developing countries. However, the morbidity of diarrheal diseases is considerable; currently 14/1000 children under 1 year of age are hospitalized each year in the US because of acute diarrhea and the average stay is 4.5 days. The average hospitalization costs between US $1000 and US $3000. There is no single, focused approach to the treatment of acute diarrhea in the US. Most pediatricians use fluids, but not the sugar – electrolyte solution that has been proven to be effective in many parts of the world. And the common practice for feeding is still to starve children for the 1st 24 to 48 hours in an acute episode of diarrhea. There are several things that can be done to change these attitudes and practices. The 1st is to create an awareness of both in the general public and in the medical community. The 2nd is to provide practical experience in using oral therapy. This involves getting health care workers at all levels involved in US hospitals." (POPLINE)

481 Social marketing of oral rehydration therapy. Popul Rep Series J 1985 Jul – Aug;(30):785 – 6

482 Sokucu S, Marin L, Gunoz H, Aperia A, Neyzi O, Zetterstrom R. Oral rehydration therapy in infectious diarrhoea: comparison of rehydration solutions with 60 and 90 mmol sodium per litre. Acta Paediatr Scand 1985 Jul;74(4):489 – 94

"The clinical response and changes in water and salt homeostatis as judged from serum sodium levels, salt and water retention, and renal handling of sodium was studied during 36 hours following the start of oral rehydration therapy (ORT) with a solution containing 60 mmol Na/l (ORS_{60}) in 17 well nourished, moderately dehydrated Turkish infants aged 3 – 15 months who had acute infectious diarrhea (7 with rotavirus, 3 with enteropathogenic *E. coli* 0 111:B 84, and one with enteropathogenic *E. coli* 0 125: B 15, one with *Salmonella* and 5 of unknown etiology. In the successfully treated patients sodium and water balance was normalized within 36 hours. In the cases with hypernatremic dehydration the serum sodium concentration rapidly became normal. The results were compared with those obtained in a previous study of the same type of patients who were rehydrated with a solution containing 90 mmol Na/l after ORS_{90}. The changes in the fractionary urinary sodium excretion and the potassium sodium quotient in the urine indicated a less rapid normalization after ORS_{60} than after ORS_{90}." (Authors' abstract)

483 Solar G, Infante JI, Ugarte F. Rehydration in acute diarrhea with sodium 60 oral solution. Rev Chil Pediatr 1988 Mar – Apr;59(2):93 – 5

484 Sood JJ. ORT programme and IMA. J Indian Med Assoc 1988 Dec;86(12):329 – 30

485 Spain PL, McDivitt JA. Continuous and non – continuous use of WSS solution for oral rehydration therapy among rural Gambian women. J Trop Pediatr 1988 Apr;34(2):88 – 90

"From 1981 to 1984, the US Agency for International Development (USAID) sponsored a health education project in the Gambia to promote changes in mothers' management of their children's diarrhea, specifically the promotion of an oral rehydration solution using water, sugar, and salt found in the home. The project used a strategy integrating radio broadcasts, pictorial flyers, and interpersonal channels to teach mothers how to mix a water – sugar – salt (WSS) solution correctly and how to administer it to their children.

This report describes a study of mothers who continued to use WSS therapy once they tried it for the 1st time, and develops a general profile of those mothers who did persevere with WSS vis-a-vis mothers who did not. The findings suggest that continuous users were isolated, unsupported women with relatively few resources, who tended to have greater knowledge or information about the WSS formula. The 35% of the women who stayed with the WSS solution did so against certain disadvantages; indeed, relative to noncontinuous WSS users, they were a disadvantaged group. They were generally farther away from a health center and without regular supplies of sugar and salt in their homes--they evidently has to make special efforts to acquire these ingredients when their children came down with diarrhea. They tended not to have a radio, an indication of less access to information and fewer resources. Although they did not have as many outside resources, continuous users did have correct knowledge or a copy of the WSS flyer to use as a reference. These mothers' loyalty to WSS may be explained as their grasping onto the only diarrhea therapy they could get. Discontinuity of use seems only rarely to be a phenomenon of total rejection of WSS solution. More common is sporadic use, suggesting that WSS has become 1 item in a larger armamentarium of diarrhea therapies--women who use WSS only sporadically are women with access to clinics and perhaps to other diarrhea drugs." (POPLINE)

486 Spiller RC, Jones BJM, Silk DBA. Jejunal water and electrolyte absorption from two proprietary enteral feeds in man: importance of sodium content. Gut 1987 Jun;28(6):681-7

"Jejunostomy losses of Na^+ and water during enteral nutrition after massive intestinal resection may be severe. We have attempted to analyse this practical problem by using an *in vivo* perfusion technique in healthy volunteers to study Na^+, water and nutrient absorption from a short (25 cm) segment of jejunum during perfusion of an isotonic solution of the elemental diet Vivonex. Further solutions made from the amino acid and carbohydrate components of Vivonex were also perfused in part I of the study in order to determine the causes of the marked Na^+ and water secretion seen during Vivonex perfusion. Low initial Na^+ concentration was found to be the major determinant of net Na^+ secretion, initial Na^+ concentration correlating significantly with Na^+ absorption ($r=0.95$, $n=7$, $p<0.001$). Water absorption correlated with net absorption of NaCl ($r=0.82$, $n=7$, $p<0.01$). There was, however, a better correlation with total absorption of NaCl plus amino acids ($r=0.99$, $n=7$, $p<0.01$). In part II of the study separate isotonic solutions of NaCl, glucose, and the polymeric diet, Ensure were also studied. Net sodium secretion occurred during glucose and Ensure perfusion, as predicted from their low Na^+ concentration. Owing to rapid sucrose absorption from Ensure there was substantial luminal disappearance of osmotically active particles and hence marked water absorption, which was accurately predicted using the regression equation for water absorption derived in part I, substituting sucrose absorption for amino acid absorption. We conclude that the marked Na^+ and water secretion observed during Vivonex perfusion is not a unique property of this amino acid based diet but is due to its low Na^+ content." (Authors' abstract)

487 Srivastava VK, Arya H, Uppal SS, Rath B, Laisram N. Comparison of oral and intravenous rehydration among hospitalized children with acute diarrhoea. J Diarrhoeal Dis Res 1985 Jun;3(2):92-5

"To compare the efficacy and cost of managing mildly or moderately dehydrated diarrhoea patients with oral rehydration solution (ORS) versus intravenous fluids (I.V.), hospitalized patients were analyzed retrospectively during two different pelrods. In 1981, 133 of 134 patinets, 110 of whom were mildly-moderately dehydrated, were managed only with I.V.; while in 1982, 126 mildly-moderately dehydrated patients received only ORS, 15 severely dehydrated patients were given initial short-term I.V. followed by ORS, and 29 mildly dehydrated patients were given I.V. before ORS, due to non-acceptance of ORS and/or persistent vomiting. The average hospital stay was 1.6 days in 1982, versus 3.6 days in 1981. The average per patient expenditure in 1982 was Rs. 99.61, compared

to Rs. 323.08 in 1981 ($1 US approximately Rs. 9). ORS was found useful for hospital-based management of acute diarrhoea patients, even when moderately dehydrated. ORS use considerably reduced hospital stay and costs." (Authors' abstract)

488 Stanton BF, Rowland MG, Clemens JD. Oral rehydration solution--too little or too much?. Lancet 1987 Jan 3;1(8523):33-4

"Data from studies on actual use of packaged oral rehydration solution (ORS) in Bangladesh are summarized and their impact evaluated. In 6 studies in clinic settings only 2 clinics used enough ORS to meet minimum recommendations, of 50 ml/kg for initial rehydration in mild cases and 100 ml/kg per day of continued diarrhea, plus 100 ml/kg per day for normal requirements. The consumption of ORS in home settings was reported as 1 liter pack in 73 and 77% of adults, and 87% of children; 15 and 23% received 2 packs; 3% received 3 packs. In the authors' survey infants received 0.95 liter per episode, and adults 1.2 liter per episode. In another survey the median daily consumption was 0.3 liters. The authors estimated that the maximum weight of a person given 1 liter of ORS, according to the recommended dose, would be 12.5 kg, or a child less than 2 years old, with moderate dehydration. Considering that there are an estimated 85 million episodes of diarrhea yearly in Bangladesh, and only 4-9% are associated with dehydration, it would be more efficient for the government to provide ORS packs to truly dehydrated patients, rather than to try to treat all cases of diarrhea. Treating 5 million episodes of potentially life-threatening diarrhea with an average of 4 liters, rather than many more cases with inadequate amounts as is being done currently, would cost 1/6 as much. It is necessary to define criteria for communities to distinguish life-threatening dehydration for intensive ORT treatment." (POPLINE)

489 Steinhoff MC, Srilatha VL, Thillaikarasi N, Abel R, Mukarji DS. Fingers or spoons to make oral rehydration solution? Trans R Soc Trop Med Hyg 1985;79(3):366-8

"The accuracy and variability of the composition of oral rehydration solution (ORS) prepared by village health workers using (i) a finger measurement technique and (ii) a special ORS measuring spoon were compared. The sodium and sucrose concentrations were measured in 130 ORSs prepared by each technique. All the spoon-measured ORSs had acceptable levels of sodium and sucrose, compared with 93% of the finger-measured ORSs. Only 2.3% of finger-measured ORSs had hypertonic sodium levels. The variability of sodium and sucrose levels was significantly greater with the finger measurement technique. This comparison should assist programme managers to decide which technique to adopt. Both techniques require careful instruction to ensure accuracy." (Authors' abstract)

490 Strelkova MR, Chaika NA, Zhukova EA, Ermolaeva Makovskaia MA. [Use of oral rehydration in diarrhea-related diseases]. Pediatriia 1987;(10):65-70

491 Sukkary-Stolba S. Oral rehydration therapy: the behavioral issues. Washington, D.C.: U.S. Agency for International Development, 1990. 88 p. (USAID monograph no. 1)

492 Sullesta EO. Effective use surveys in ORT programs: the Philippine experience. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:103-6

493 Sunoto. Home prepared oral rehydration solution. Paediatr Indones 1987 Nov-Dec;27(11-12):237-50

494 Sunoto, Suharyono, Budiarso AD, Wiharta AS. Oral rehydration therapy in young infants less than 3 months with acute diarrhoea and moderate dehydration. Paediatr Indones 1988 Mar-Apr;28(3-4):67-78

"Oral rehydration therapy (ORT) as an appropriate technology in the treatment of acute

diarrhoeal diseases (ADD) has been accepted throughout the world. It has been proved that besides lifesaving, ORT has reduced about 70 – 80% of the use of intravenous solution and average cost of the treatment of ADD. If there is still problem, question or doubtfulness, is the use of WHO ORS in full concentration for the neonates and young infants less than 3 months of age. During one – year period it has been treated 72 cases of ADD in young infants less than 3 months of age with moderate dehydration. They were divided into 3 groups. The first group was treated with 100 ml/kg.bw of fluid consisting of two – thirds as WHO ORS in full concentration for 4 hours period and the rest, one – third, was given as plain water for 2 hours period. The second group was treated with kristalyte with the Na concentration of 51 mEq/L and the third group was treated with intravenous Ringer's lactate for 6 hours period. After the end of the study only 18 patients in each group could be matched and evaluated. From clinical observation and laboratory examinations, the result of the treatment in general, statistically shows no significant difference. Diarrhoea and vomiting stopped in all groups on the second day of treatment. Hyponatremia which occurred in 3 patients in group I and 2 patients each in group II and III improved after 6 hours of treatment. Acidosis was corrected in all of the treatment groups in 6 hours period. Weight gain up to 6 – 9% of body weight on admission was achieved after 6 hours of treatment in all groups. No complication of hypernatremia, convulsion nor hypoglycaemia in all the treatment group. From this study it could be concluded that WHO ORS is quite safe and effective as ORS with low sodium concentration and intravenous treatment, as far as it is given slowly, little by little with a strict supervison." (Authors' abstract)

495 Suryanto M, Hariati R, Yati – Soenarto S, Moenginah PA. Comparison between 200 ml and 1 liter packages of oral rehydration solution prepared by mothers of patients with diarrhea in the oral rehydration room. Paediatr Indones 1988 Nov – Dec;28(11 – 12):231 – 7

"To have a comparison between the preparation of oral rehydration solution (ORS) of 200 ml and 1 liter packages, a study had been done in 30 mothers of children under five years of age suffering from diarrhea who treated their children in oral rehydration room (group I) and 30 mothers of non diarrheal children under five years sampled in the outpatient Department of Child Health, Dr. Sardjito General Hospital (group II). No significant difference was found ($p < 0.05$) concerning the sodium concentration in the ORS of 200 ml and in the 1 liter package (group I: 85.95±16.07, and 81.52±16.21, group II 98.11±24.67 and 97.02±21.87) (mEq/L, Mean±SD). Of 30 mothers group II, 5 mothers (19.23%) made mistakes in preparing the 1 liter packages of ORS and the sodium concentration in this package was higher compared to the concentration in the 200 ml package. There was no significant difference concerning diluted volume and the sodium concentration between group I and the recommended method, but there was a significant difference ($p < 0.005$) between group II and recommended method. A significant difference was also found ($p < 0.001$) between group I and group II about the mothers knowledge of the effect of diarrhea, the use of ORS, the amount of ORS that must be given to the patients and the indications to refer the patients to the heatlh center or hospital." (Authors' abstract)

496 . Suvedi BK. A report on knowledge, attitude, use – pattern and availability of jeevan jal (pre – packaged oral rehydration salts) in Baitadi. J Nepal Med Assoc 1988 Jan – Mar;26(1):19 – 28

"A study regarding the knowledge, attitude, use pattern and availability of jeevan jal JJ was undertaken in the remote hilly district of Baitadi of Far Western Development Region of Nepal. The study shows that the females are less aware (38.7%) about jeevan jal than the males (76%). 57.3% of the total respondents had knowledge about jeevan jal, 42% know the use of it and 28.3% consider it should be given in diarrhoea accordingly as recommended. 64.5% of those, who have seen JJ (116/172) had prepared its solution, but only 27.6% (32/116) can make it correctly, (and the males leading again – 17.3% versus 4% females, that is only 10.6% of the total) and 62.9% know that it must be used

within 24 hours of preparation of the solution. 98% of the respondents found it is not available in the villages and suggested that it should be placed in the village panchayat office or worker (31.2% and/or centrally located home in the village (29.5%)." (Author's abstract)

497 Tamer AM, Friedman LB, Maxwell SRW, Cynamon HA, Perez HN, Cleveland WW. Oral rehydration of infants in a large urban U.S. medical center [published erratum appears in: J Pediatr 1986 Jan;108(1):160]. J Pediatr 1985 Jul;107(1):14-9

"A prospective randomized study of 100 well-nourished infants with acute gastroenteritis resulting in dehydration and acidosis was carried out at the Jackson Memorial Hospital, Miami from 1981 to 1983. Patients were randomly assigned to receive either standard intravenous therapy or oral rehydration. Infants in the latter group first received solution A containing 75 mEq/L sodium, 30 mEq/L potassium, 75 mEq/L chloride [corrected], 30 mEq/L bicarbonate, and 2 gm/dL glucose [corrected]. After *ad libitum* feeding for six hours, solution B containing 50 mEq/L sodium, 30 mEq/L potassium, 50 mEq/L chlorine, 30 mEq/L bicarbonate, and 3 gm/dL [corrected] glucose was given. With three exceptions (6%), oral rehydration was comparable to the intravenous regimen in clinical estimates of improvement, although the oral group had more stools in the first day. The oral group had faster correction of acidosis and a sustained rise in serum potassium concentration, whereas in the intravenous group the potassium concentration showed first a drop with a later increase, but levels were at all times below those in the oral group. Although potassium was given from the beginning of oral rehydration, and at a higher concentration than recommended by the World Health Organization, no hyperkalemia occurred. We concluded that oral therapy is safe, less expensive for patients, and more convenient for the medical and nursing staffs." (Authors' abstract)

498 Tankari K. Oral rehydration policies in primary health care. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:82-5

499 Tay AH, Quak SH, Wong HB. Oral rehydration therapy in acute gastroenteritis--a clinical trial with 3 electrolyte solutions. J Singapore Paediatr Soc 1987;29(suppl 1):172-5

500 Taylor CE, Yu XZ. Oral rehydration in China. Am J Public Health 1986 Feb;76(2):187-9

"Oral rehydration with salt and sugar solution for diarrhea seems to have been widely used in China for more than 20 years. Surveys in five rural counties in widely distributed provinces have revealed that over 90 per cent of barefoot doctors and county doctors have been using a simple salt and sugar solution. Thirty-four per cent of mothers also said they used the oral solution. By contrast, most urban hospitals, especially teaching hospitals, continued to rely on intravenous (I-V) fluids. It had been previously observed that China has had high morbidity but low mortality from diarrheal diseases. Part of the explanation undoubtedly is the relatively good nutritional status of children and the widespread use of liquid traditional medicines. The finding that barefoot doctors have been using oral rehydration also may help explain the low mortality." (Authors' abstract)

501 Thillianayagam AV, Mourad FH, Dias JA, Carnaby S, Clark ML, Farthing MJG. Reversal of intestinal secretion by polymeric oral rehydration solutions (ORS) in a model of human cholera [letter]. Gut Oct;31(10):1089-92

502 Thomas E. Education for nursing personnel. In: LeSar J, Harrison P, Buxbaum A, eds. Manual for assessment and planning of national ORT programs. Arlington, Virginia: Technologies for Primary Health Care Project, Management Sciences for Health, 1985:13-9

503 Tolia VK, Dubois RS. Update on oral rehydration: its place in treatment of acute gastroenteritis. Pediatr Ann 1985 Apr;14(4):295,298 – 9,302 – 3

504 Torregrosa Ferraez L. [Recommendation on oral fluid therapy in diarrhea (letter)]. Bol Med Hosp Infant Mex 1987 Nov;44(11):721

505 Torun B. Nutritional and dietary considerations in acute diarrhea. In: Prather CJ, ed. ICORT III; proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14 – 16 Dec 1988. Washington, DC: Creative Associates International, 1989:70 – 8

506 Touchette PE, Elder J, Nagiel M. How much oral rehydration solution is actually administered during home – based therapy? J Trop Med Hyg 1990 Feb;93(1):28 – 34

"In some parts of the world up to one – half of all deaths in young children are attributable to dehydration associated with diarrhoea. As a countermeasure, mothers in underdeveloped countries are being successfully taught to give oral rehydration solution at home. There are, however, serious doubts as to whether mothers give their children enough. The focus of our investigation was a methodology capable of establishing the exact quantity of fluid administered by unsupervised mothers at home. Accurate quantitative data are essential for programme planning and evaluation. In our sample of 44 cases, only two children received more than 90 ml kg^{-1} day^{-1}. The mean observed value was 44 ml kg^{-1} day^{-1} (SD 28.4); well below the recommended dosage. Preliminary data were also gathered on natural consequences which may discourage use of ORS such as vomiting, increased frequency of watery stools, and distaste for the solution." (Authors' abstract)

507 Touhami M, Boudraa G, Adlaoui M, Telidji Z, Boltana R, Mary JY, Desjeux JF. Is the dilution of milk necessary in benign acute diarrhea in eutrophic infants? Arch Fr Pediatr 1989 Jan;46(1):25 – 30

"Early feeding is generally recommended for children with acute diarrhea. The concentration at which the milk should be given to children weaned at an early age remains a matter of debate. The aim of the study was therefore to evaluate the role of milk dilution in the first 24 hours on the outcome of diarrhea. Sixty – nine well nourished and weaned children, aged 1 to 9 months and with moderate watery acute diarrhea were included after oral rehydration therapy (ORT) in a randomised controlled study to receive either half – strength (diluted group) or full strength (undiluted group) milk. Both groups displayed the same clinical characteristics except for the weight. The outcome of the diarrhea until cessation was the same in the 2 groups. No failure requiring a specific treatment was observed. The duration of diarrhea and the total stool output were not statistically different in the 2 groups, i.e. 39 ± 7 hrs in diluted vs 47 ± 8 in undiluted, and 883 ± 205 g in diluted vs 924 ± 161 g in undiluted. These results are strengthened by the lack of significant differences in the weight gain, the number and volume of vomiting, the volume of ORT and milk intake. However, the energy intake was significantly higher in the group receiving full strength milk. These results suggest that there is no immediate clinical advantage to dilute the milk in the first 24 hours of feeding well nourished children with moderate acute watery diarrhea, if early feeding is associated with the ORT recommended by the WHO." (Authors' abstract)

508 Trach DD. Monitoring and evaluation in the CDD program implementatin: the Vietnam experience. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14 – 16 Dec 1988. Washington, DC: Creative Associates International, 1989:101 – 3

509 Training caretakers in rural Liberia to prepare and deliver ORT. Chevy Chase, MD: Center for Human Services, Primary Health Care Operations Research, 1987. 12 p.

(PRICOR study summary)

510 Tucker JA, Sussman Karten K. Treating acute diarrhea and dehydration with an oral rehydration solution. Pediatr Nurs 1987 May-Jun;13(3):169-74

511 Tulloch J, Burton P. Global access to oral rehydration salts and use of oral rehydration therapy. World Health Stat Q 1987;40(2):110-5

"Widespread use of oral rehydration therapy (ORT) for the prevention and treatment of dehydration due to diarrhea in children is a major aim of a global program sponsored by WHO. The treatment of choice once dehydration is present is a solution of oral rehydration salts (ORS) in water. Measurements of the access to ORS show a dramatic rise over the period 1982-1985. This trend is paralleled, though not necessarily confirmed, by an increase in global supply of ORS. Although the contribution of local production of ORS to the overall supply remained constant globally at about 50%, countries in the African region were dependent on external sources for over 95% of their ORS. In 1982, it was estimated that in all WHO regions perhaps less than 2% of childhood diarrhea episodes were treated with ORS. By 1985, the global ORS use rate had improved to an estimated 11%. The ORT use rate for 1985 is estimated at 18%. The impact of ORT use rates on mortality is very difficult to measure because of the lack of clarity regarding the relationships of dehydration, diarrhea, and mortality. Progress toward a 1989 target of 50% ORT use will continue to be assessed using the clear definition of a small number of variables and the acceptance of a certain amount of imprecision." (POPLINE)

512 Tuqa S, Pinto A, Scheer P, Ebrahim GJ, Abel R, Mukherjee D. Does health intervention ameliorate the effects of poverty-related diseases? - - III. Propagating the use of oral rehydration in diarrhoea. J Trop Pediatr 1986 Feb;32(1):14-6

"This paper reports on the effectiveness of an oral rehydration program in a disadvantaged rural community in South India. The program was launched in 1983 to educate parents about the causes of diarrhea, how it can be prevented and managed at home, and to promote a simple homemade oral rehydration solution (ORS) to replace traditional remedies. A structured questionnaire was administered to 210 mothers. 85% of the mothers said that they would opt for ORS as the treatment of choice in cases of diarrhea; 75% could demonstrate how to prepare ORS correctly. However, very few knew the total quantity of ORS that needs to be administered. Although 70% could give a valid reason for the administration of ORS, only 9% knew it was to replace salt and water loss. A great change has occurred in the traditional practice of starving the child who has diarrhea. However, the belief regarding causation seemed to be only marginally altered. Most of the mothers had received their new knowledge and skill from the family care volunteer and not the doctor in the service unit. Since the inception of the program there has been a drop in the number of cases of diarrhea being reported and in the number of deaths." (POPLINE)

513 Ugarte JM, Chavez E, Curotto D, Duran G, Toro C. Oral rehydration of infants with acute diarrhea in emergency services. Rev Chil Pediatr 1988 May-Jun;59(3):174-7

514 Upadhyay D, Pandit M. Experiences at oral rehydration therapy centre in Janakpur. J Nepal Med Assoc 1990 Apr-Jun;28(94):199-201

"The oral rehydration therapy (ORT) Centre in Janakpur was started in Poush, 2043. Analysis of data of the patients attending this centre from Chaitra, 2043 to Poush, 2044 was done. The number of patients suffering from diarrhoeal diseases that attended the centre was 708 during this period. Majority of the patients (65%) belonged to the paediatric age group. Most of the patients were treated with ORT. Only 4 patients (0.56%) died, out of whom 3 were children. ORT has drastically reduced mortality in patients with diarrhoea." (Authors' abstract)

515 Varavithya W, Vathanophas K, Punyaratabandha P, Sangchai R, Athipanyakom S, Wasi C, Echeverria P. Behavior of urban based child caretakers in the home treatment of diarrheal diseases. Southeast Asian J Trop Med Public Health 1990 Jun;21(2):307–11

"Behaviors of low income urban mothers and child caretakers in the treatment of childhood <5 year diarrhea were analysed from a surveillance study conducted between August 1988 and July 1989. Help seeking behaviors of mothers and caretakers for 412 episodes of child diarrhea were as follows: investigators 37.1%, drug stores 18.2%, wait and see or self treatment 17.0%, private clinics 12.6%, nearby hospital 10.2%, and local health center 4.9%. Major treatment practices included ORT alone (54%) and ORT plus antibiotics and/or antidiarrheal drug (22%). Overall ORT usage was 76%. For twelve percent of diarrheal episodes no treatment was given to the children. Antimicrobials were believed to be essential in addition to ORT especially when diarrhea was associated with fever, vomiting and bloody stools. Thirty-six percent of invasive diarrhea cases (*Shigella, Salmonella, Campylobacter*) were treated with antibiotics. Only 18.2% of noninvasive diarrhea received antibiotics, most of this antibiotic use being in rotavirus diarrhea where vomiting and some fever are prominent. Availability of oral rehydration salts (ORS) and good experience with ORT were the key to the extensive use of ORT in this study. A surprisingly small number of mothers and child caretakers (4.9%) sought help from the local health center when their children had diarrhea." (Authors' abstract)

516 Varavithya W, Pichaipat V, Mangklasiri R, Thanomsingh P, Pavabutara P. Early home oral rehydration therapy (ORT) in primary health care. J Med Assoc Thai 1986 Oct;69(suppl 2):137–43

"This is a detailed account and comparison of use of 3 types of home-prepared oral rehydration solution versus no early treatment in 4 Thai villages from March 1983 to February 1984. The solutions, prepared with boiling water in a standard 750 ml fish sauce bottle contained: 2 spoons sugar and 2 spoon handle tips salt; 2 spoons sugar and 2 spoon tips tea; or 2 spoon tips salt in rice water as opposed to boiling water. Amounts dispensed were specified by number of watery stools and age of sufferer. All treatment was followed by breast feeding or soft diet within 2–4 hours. There were 0.05 episodes of diarrhea per person yearly, 0.10 per child, 9.5% in infants under 1 year, and 20.1% per child aged 1–4. Recovery rates ranged from 91–99% with home treatment, the highest with the tea mixture. Acceptability was good except for the rice water mixture: rice water is used for pig and dog food in this culture. In the test villages, 6.6% of diarrhea episodes required rehydration at the health center, while the control village needed treatment for 25.9% of episodes at the local health center, provincial hospital or private clinics. The estimated cost of therapy for each diarrheal episode was over $2.00 US for purchased medication, or 30 times the expense of home mixed solution. Medicines used were oral rehydration solutions, sulfa, tetracycline, chloramphenicol, kaolin, loperamide, or herbs. Analysis of some home mixed solutions is reported. The tea mixture contained virtually no electrolytes, but was effective because it was used earlier than solution requiring mealtime rice water, for example. In this trial, where treatment was under control of villagers and fully integrated into the primary health care system, early home treatment was more effective than later care in the center." (POPLINE)

517 Varavithya W, Pichaipat V, Mangklasiri R, Thanomsingh P, Pavabutara P. Early home rehydration therapy. *In*: Tzipori S, Barnes G, Bishop R, Holmes I, Robins-Browne R, eds. Infectious diarrhoea in the young: strategies for control in humans and animals; proceedings of an International Seminar on Diarrhoeal Disease in South East Asia and the Western Pacific Region, Geelong, 10–15 Feb 1985. Amsterdam: Elsevier, 1985:390–5

The effectiveness of an early home oral rehydration therapy (ORT) with various home ingredients for cholera with diarrhoea was studied through an integrated effort with an existing primary health care system in 4 rural villages of Thailand. Village health officers visited the villages twice a week to obtain samples of home-prepared oral rehydration solutions (ORS) for culture and chemical analyses and to screen diarrhoeal cases for

treatment failure. From March 1983 to February 1984, village health volunteers recorded 0.096 diarrhoeal episodes per child per year. Fourteen of 20 cases received rice water plus salt with 13 cases recovering (92.8%); 20 to 22 cases received a sugar/salt mixture with 18 cases recovering (90%); 38 cases received tea water plus sugar with 37 recovering (97.4%). The mean success rate was 94.4%. All home treatment failures were successfully treated with ORS at the local health centers. There were no admissions for intravenous therapy. Recovery was seen within 2 days. The amount of fluid used in each home treatment was 750 - 1500 ml. In the control village, ORS packages were used in 21 of 54 episodes. Antibiotics were used in 14 of 54, and both antibiotic and antidiarrhoeal drugs were used in 5 episodes. Home - prepared fluids were low in potassium and bicarbonate and other electrolytes. The success of the treatment was due to early oral rehydration and early feeding. Breast feeding after oral rehydration shortened the duration of diarrhoea. Home - prepared fluids were found safe from enteropathogenic contamination. The expense of therapy for each diarrhoeal episode in the controls was computed at $ 3.00. The effectiveness of ORT was studied separately.

518 Varavithya W, Sangshaisirisak S, Ramaboot S, Ruangkanchanasetr S, Vivatwongkasem C. Oral rehydration therapy in a rural area, northern Thailand. J Med Assoc Thai 1989 Jan;72(Supp.1):159 - 63

"A cross - sectional sampling survey of mothers' practice of ORT in Amphoe Bunpotphesai in the northern part of Thailand included 1,619 children under five. Two hundred and six children were reported to have 223 diarrheal episodes. The incidence of diarrhea in children under five was 3.4 episodes per child per year. When children had diarrhea 65.5 per cent of mothers sought help from health providers, 25.2 per cent treated their children with drugs bought from stores, 2.3 per cent used herbal medicine and 6.1 per cent did not treat their children. 50.7 per cent of diarrheal episodes mother gave ORT, using ORS 19.7, commercial electrolytes mixture 16.6 and home available fluid 14.4 per cent. The accuracy of dilution of electrolytes powder from the packets was checked in 80 incidences. 31.8 and 27.8 per cent of mothers made correct dilution of ORS and commercial electrolytes products respectively. Health providers carried both ORS and commercial electrolytes packets. ORS added to a glass of water was found in 13.6 per cent which was 3 times concentrated. Commercial electrolytes products were too dilute in 72.2 per cent. 17.5 per cent of mothers divided electrolytes powder to add in one spoon of water to treat their children as one drug dose. Data showed that the ORT use rate was 50.7 per cent. Home available fluid was used by 14.4 per cent. ORT should be further promoted to control diarrheal diseases and health providers should give intructions to every mother or child minder on how to dispense ORS or electrolytes packets for appropriate dilution and use." (Authors' abstract)

519 Vathanophas K, Indrasukhsri T, Bunyaratabandhu P, Suthienkul O, Varavithya W. The study of knowledge, attitudes and practices of mothers concerning diarrhoea and oral rehydration salts in the Bangkok Metropolis. J Med Assoc Thai 1988 Apr;71(4):177 - 82

"Knowledge, attitudes and practices about diarrhoeal diseases and oral rehydration salts (ORS) of 799 mothers who had children under 5 years of age in 21 congested areas of Bangkok Metropolis are summarized. This study is the second part of a study about socioeconomics, behavioural and environmental factors, attitudes and practices related to diarrhoeal disease. Mothers perceived that food poisoning and unclean food were the most common causes of diarrhoea, followed by uncooked food and contamination from flies. Two - thirds of mothers considered watery and loose stools to be diarrhoea, one - third knew about vomiting and abdominal pain, but only 18.3 per cent considered mucous and bloody stools to be symptoms of diarrhoea. About 40 per cent of mothers thought that water and food should be omitted after diarrhoea. Most mothers reported that they did nothing when children developed loose stools 1 - 2 times per day but they sought hospital care when the children had bloody mucous stools, fever and signs of dehydration. Around 80 per cent mothers knew about ORS mostly from doctors and

nurses, but only 31.7 per cent had used it. It was found that mothers with diarrhoeal children knew about it and had used ORS more than mothers without diarrhoeal children. Only half of the mothers had faith in treatment of diarrhoea by ORS." (Authors' abstract)

520 Vega Franco L, Covarrubias Monarres M, Velasco Sanchez F. [Absorption of sodium and water in malnutrition using oral rehydration solutions. Experimental study]. Bol Med Hosp Infant Mex 1987 Mar;44(3):148–54

521 Vega–Franco L, Perez–Medina R, Gordon–Rodriguez O. [Gastric emptying of solutions for oral rehydration]. Bol Med Hosp Infant Mex 1988 Apr;45(4):221–5

522 Velasquez–Jones L, Becerra FC, Faure A, de Leon M, Moreno H, Maulen I, Abraham–Jalil A, Muraira A. Clinical experience in Mexico with a new oral rehydration solution with lower osmolality. Clin Therap 1990;12(suppl A):5–103

"A clinical trial was conducted to compare the safety and efficacy of a new oral rehydration solution (ORS) with that of the ORS recommended by the World Health Organization (WHO). One hundred thirty infants with dehydration due to acute diarrhea were randomized into two groups: 68 infants received the WHO ORS containing sodium and glucose in a concentration of 90 and 111 mmol/L, respectively, and an osmolality of 311 mosm/kg (ORS–90); 62 infants received an ORS containing sodium and glucose in a concentration of 60 and 90 mmol/L, respectively, with an osmolality of 240 mosm/kg (ORS–60). Treatment failure was noted in seven infants (10.3%) in the ORS–90 group; the causes of failure were high stool output (three cases), persistent vomiting (three cases), and ileus (one case). Only one patient in the ORS–60 group (1.6%) was considered a failure because of high stool output. No significant differences were noted in the serum sodium levels in either group of patients, both in relation to the natremia seen on admittance or that seen after rehydration. A trend was observed toward correction of hypernatremia or hyponatremia with both types of ORS. A similar situation was observed with respect to the variations seen in serum potassium levels. The results from this study suggest that there may be clinical advantages of using an ORS with concentrations of sodium and glucose and a total osmolality lower than that of ORS–90, because of the lower incidence of treatment failures." (Authors' abstract)

523 Velasquez–Jones L, Mota–Hernandez F, Llausas–Magana E, Puente–Tamayo M, Kane–Quiros J. [Current concepts on the formulation of oral rehydration solutions for children with acute diarrhea]. Bol Med Hosp Infant Mex 1986 Feb;43(2):126–36

524 Velasquez–Jones L, Mota–Hernandez F, Puente M, Kane J, Donnadieu I. Effect of an oral rehydration solution with glycine and glycilglycine in infants with acute diarrhoea [letter]. J Trop Pediatr 1989 Feb;35(1):47

525 Velasquez Jones L, Mota Hernandez F, Donnadieu Castellanos I. [Oral hydration of children with acute diarrhea]. Bol Med Hosp Infant Mex 1987 Oct;44(10):636–41

526 Velasquez Jones L, Mota Hernandez F, Kane Quiros J, Puente Tamayo M, Donnadieu Castellanos I. [Physiological bases of the composition of an oral rehydration solution in children with acute diarrhea]. Bol Med Hosp Infant Mex 1987 Dec;44(12):771–6

527 Velasquez Jones L, Kane Quiros J, Puente Tamayo M, Garcia Figueroa ML, Ruiz Bedolla E, Mota Hernandez F. [Usefulness of beverages of common use in the home for children with diarrhea (letter)]. Bol Med Hosp Infant Mex 1987 Dec;44(12):789–90

528 Vesikari T, Isolauri E, Baer M. A comparative trial of rapid oral and intravenous rehydration in acute diarrhoea. Acta Paediatr Scand 1987 Mar; 76(2):300–5

"37 children under the age of 5 years hospitalized for acute diarrhoea and dehydration

were randomized to receive oral or intravenous rehydration during 6 to 12 hours. Rehydration was satisfactory in both groups, with correction of dehydration, metabolic acidosis and sodium deficit at equal rates. The reintroduction of normal feedings was successful in most of the orally rehydrated children after 12 hours, but often unsuccessful in the i.v. therapy group. Consequently the orally rehydrated children showed a 2.9% weight gain by the time of discharge whereas the intravenously treated children did not gain weight in the hospital. The duration of diarrhoea was also shorter in the orally rehydrated children. Thus, oral rehydration therapy was equal or superior to even rapid intravenous rehydration therapy in the management of acute diarrhoea in children." (Authors' abstract)

529 Vesikari T, Isolauri E, Marnela K-M. Glycinuria following administration of glycine-supplemented oral rehydration solution in rotavirus diarrhoea. Acta Paediatr Scand 1988 Jan;77(1):165-6

Rehydration solutions having improved absorption properties over the commonly used (standard) oral rehydration solution (ORS) due to their glycine-supplementation have often been termed as the "super-ORS". A recent study, however, found contradictory results - use of the glycine-ORS resulted in poorer net rehydration with higher stool volume and increased urine excretion compared to the conventional ORS. Interestingly, mean weight gain in the group given the standard ORS was 59% of the initial estimated weight loss as compared to 39% in the glycine-ORS group. Acute weight loss in both groups, possibly caused by starvation during diarrhoea was not totally corrected by fluid therapy alone. Glycinuria in excess of the normal range was encountered in more cases in the group given the glycine-ORS than those fed the standard ORS, being more common in patients with rotavirus diarrhoea. It is concluded that the extent of glycinuria may be more conspicuous in those given an ORS containing more glycine. Glycinuria may be one of the factors responsible for poorer net rehydration.

530 Vesikari T, Isolauri E. Glycine supplemented oral rehydration solutions for diarrhoea. Arch Dis Child 1986 Apr;61(4):372-6

"Two glycine supplemented oral rehydration solutions (ORS) and a standard ORS with sodium 60 mmol/l were compared for treatment of diarrhoeal dehydration in children. The solutions contained glycine 110 mmol/l and glucose 110 mmol/l ($ORS_{60}-Gly_{110}$), glycine 60 mmol/l and glucose 80 mmol/l ($ORS_{60}-Gly_{60}$), and glucose 144 mmol/l only (ORS_{60}), respectively. The patients receiving $ORS_{60}-Gly_{110}$ had poor weight gain and increased stool and urine volumes after rehydration compared with the other two groups. The patients receiving $ORS_{60}-Gly_{60}$ had similar stool and urine volumes as those receiving standard ORS_{60}. It is concluded that excess glycine in relation to sodium in an ORS may lead to osmotic diarrhoea, and a high amount of absorbed glycine may result in osmotic diuresis with poor net rehydration. Altogether, the present study failed to find any improvement ('Super-ORS') by addition of glycine to an ORS containing 60 mmol/l of sodium." (Authors' abstract)

531 Vishwanathan H. Developing diarrheal disease control strategies and messages to reach mothers. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:16-20

532 Vorotyntseva NV, Maleev VV, Morunova AA, Mazankova LN, Dienko GI. [Experience with oral rehydration in the complex treatment of acute intestinal infections in children]. Pediatrila 1987;(10):60-5

533 Wagstaff LA, Mkhaslbe C. Infant diarrhoea in Soweto--how much oral rehydration therapy? S Afr Med J 1989 Nov 4;76(9):489-91

"In Soweto, infant morbidity and mortality from gastroenteritis have markedly declined.

Nevertheless, there were 1514 admissions to the Baragwanath Infant Gastro-enteritis Unit in a 12-month period (1985/6). Oral rehydration therapy (ORT) could be implemented with advantage not only as a life-saving strategy but for self-help management of milder diarrhoea. Surveys conducted in Soweto and at Baragwanath showed that 84 (22%) of 382 mothers/minders of children knew formulas for acceptable salt-and-sugar oral hydration solutions (OHS), although 203 (53%) claimed to have knowledge of ORT. One hundred and ten interviewees (29%) were aware of the desirability of giving extra fluid to a child with diarrhoea. A need exists for health educators to explain and ensure understanding of the basic concept of adequate fluid replacement that is fundamental to ORT. This important message may have been overshadowed by emphasis on choice of containers and different formulas with consequent confusion." (Authors' abstract)

534 Walia BNS, Singhi S, Gambhir SK, Sroa SR. Impact of acute diarrhoea & oral rehydration solution on nutritional status of preschool children. Indian J Med Res 1989 Dec;90:415-25

"A total of 838 children under 5 yr of age were followed up in 2 villages of Punjab for a period of one year for diarrhoea morbidity, oral rehydration solution (ORS) usage and nutritional status. Overall frequency of diarrhoea was 0.78 episode/child/year. Children weighing ≤ 70 per cent of reference weight for age had about 25 per cent higher incidence of diarrhoea (102 episodes/100 child/yr) as compared to those who weighed ≥ 71 per cent (75 episodes/100 children/yr; $p<0.05$). At the end of one year there was no significant difference in the weight and arm circumference growth of children who had diarrhoea and received ORS and those who did not. Prevalence of malnutrition (weight for age criteria) in children with and without diarrhoea at the beginning and end of the study also remained unchanged, irrespective of ORS usage. These observations indicate that in rural areas with low diarrhoea morbidity (i) pre-existing malnutrition (weight for age less than 70%) is associated with 25 per cent higher diarrhoea incidence; (ii) acute diarrhoea does not significantly affect weight and arm circumference growth and prevalence of malnutrition; and (iii) the long-term nutritional benefit of ORS if any, is doubtful." (Authors' abstract)

535 Walker-Smith JA. The role of oral rehydration solutions in the children of Europe: continuing controversies. Acta Paediatr Scand 1989;(suppl 364):13-6

"Controversy remains concerning ORS composition in Europe. This centres chiefly upon the sodium level. Solutions with a low sodium content continue to be widely used in Europe. ORS with Na 90 mmol/l when given correctly is safe and effective. However, when this solution is prepared incorrectly there is a risk of hypernatraemia. In most of Europe mortality and morbidity from gastroenteritis is now very low. Therefore, any change from current formulation must not carry any risk in this regard. The need for bicarbonate or indeed any base in ORS is also controversial. There is a clear need in Europe for controlled trials of ORS solutions of various composition to determine the ideal solution for the children of Europe who have acute diarrhoea." (Author's abstract)

536 Walker-Smith JA. Underutilisation of oral rehydration in the treatment of gastro-enteritis. Drugs 1988;36(suppl 4):61-4

"Oral rehydration therapy (ORT) has now been used successfully in many countries. The best indication of its effectiveness is a decrease in mortality, and this has been demonstrated in a number of studies in developing communities. In developed communities where mortality from acute diarrhoea is already low, ORT has been underutilised. Here, the general practitioner has a key role, and it is vitally important to appreciate that ORT is first-line treatment, with no place for drug therapy in most cases." (Author's abstract)

537 Walters EG. Chlorophyll in oral rehydration solution [letter]. Lancet 1987 Feb 14;1(8529):391

538 Wa Mutombo M. Solutions to the problems encountered in CDD programs: the Zairian model. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14–16 Dec 1988. Washington, DC: Creative Associates International, 1989:112–5

539 Wapnir RA, Zdanowicz MM, Teichberg S, Lifshitz F. Alanine stimulation of water and sodium absorption in a model of secretory diarrhea. J Pediatr Gastroenterol Nutr 1990 Feb;10(2):213–21

"We investigated the effectiveness of L–alanine (Ala) addition to oral rehydration solutions (OHSs) during secretory conditions induced by ileal instillation of 10 m*M* theophylline in anesthetized rats using a perfusion procedure, and monitoring water and sodium transport. Ala was added to two hypotonic OHSs in which the sodium:glucose ratio was 2:1, and compared with the OHS recommended by the World Health Organization (WHO), which has a sodium:glucose ratio of 0.81:1. Theophylline had the expected secretory effect on water and sodium absorption in the WHO–recommended OHS, and on sodium transport in a formula containing 60 m*M* sodium and 30 m*M* glucose. However, an OHS with 90 m*M* sodium and 45 m*M* glucose canceled the secretory effect of theophylline and yielded a greater rate of net water absorption than the WHO formula. Addition to this solution of either 15 or 30 m*M* Ala enhanced water and sodium absorption of both control and theophylline–treated rats. In the hypotonic OHS with 60 m*M* sodium and 30 m*M* glucose, Ala had little effect on both sodium and water transport. Therefore, the data support the view that Ala added to solutions with 90 m*M* sodium, containing sufficient glucose to maintain a sodium:glucose ratio of not less than 2:1, is most effective at compensating fluid and sodium losses under secretory conditions. Ala presumably exerts its sodium–sparing effect because of its cotransport with sodium and the consequent water influx into the intestinal cells." (Authors' abstract)

540 Wapnir RA, Zdanowicz MM, Teichberg S, Lifshitz F. Oral hydration solutions in experimental osmotic diarrhea: enhancement by alanine and other amino acids and oligopeptides. Am J Clin Nutr 1988 Jul;48(1):84–90

"Improvement of sodium absorption during the administration of oral hydration solutions (OHS) could increase the efficacy of formulations used in the treatment of infantile diarrhea. To test this hypothesis, selected protein breakdown products were evaluated as absorption enhancers in OHS of different osmolalities and Na–to–glucose ratios in an animal model of osmotic diarrhea induced by cathartics. A very significant increase in water and Na absorption occurred in rats with diarrhea when they were perfused with a 90–mmol/L–Na, 111–mmol/L–glucose OHS containing 30 mmol/L of L–alanine (Ala). The same effect on Na retention was observed with a protein hydrolysate (PrH) in rats with diarrhea. Glycine was not effective. Other experimental OHS were ineffective in rats with diarrhea. The data indicate that in this animal model of chronic diarrhea Na transport enhancers, such as Ala and a PrH, are most efficacious in the presence of higher Na concentration." (Authors' abstract)

541 Wapnir RA, Lifshitz F. Osmolality and solute concentration – – their relationship with oral hydration solution effectiveness: an experimental assessment. Pediatr Res 1985 Sep;19(9):894–8

"The role of electrolyte, carbohydrate, and base composition, as well as osmolality, of oral hydration solutions (OHS), was investigated using a nonabsorbable marker and tritiated water in an *in vivo* intestinal perfusion system in rats. The OHS tested were the World Health Organization recommended formula, containing 90 mEq/liter sodium and 111 mM glucose, which was taken as the reference solution; five variants of this solution with different sodium and glucose concentrations; and two solutions without sodium, i.e. isotonic glucose and deionized water. Also tested were one solution with acetate in lieu of bicarbonate, and two commercial preparations where citrate substituted for bicarbonate. The best water absorption rates were obtained with World Health Organization–type OHS

characterized by a combination of low osmolality and moderate sodium and glucose content. Hypotonic OHS (190, 220, and 155 mosmol/kg) in which the sodium:glucose ratios were 60:30, 60:60, and 30:55, respectively, produced mean jejunal water transport rates of 3.46, 3.20, and 2.91 µl/min/cm, respectively, whereas the standard World Health Organization OHS (330 mosmol/kg) resulted in a rate of 1.36 µl/min/cm ($p < 0.001$). Similar good water absorption was achieved when Ac was the base (270 mosmol/kg and 60:111 sodium:glucose ratio) and with one of the commercial solutions (245 mosmol/kg and 50:111 sodium:glucose ratio). The reference World Health Organization OHS allowed for sodium absorption, as did the OHS with sodium:glucose ratios of 90:45, 60:30, 60:60, and acetate-containing 60:111. Sodium at a concentration of 30 mEq/liter or less resulted in the efflux of this electrolyte. High glucose concentration and lower osmolality exacerbated this effect. The results obtained in this investigation may assist in better evaluating OHS and in selecting modified formulae geared to specific hydration needs and possible replacement of water and sodium losses." (Authors' abstract)

542 Wawer MJ. Oral rehydration therapy: implementation issues in community-based distribution programs. In: Wawer M, Huffman S, Cebula D, Osborn R, eds. Health and family planning in community-based distribution programs. Boulder, Colorado: Westview, 1985:145-58. (Westview special studies in social, political and economic development)

"Oral rehydration therapy (ORT) is an effective response to diarrhea, which, interacting with malnutrition, kills as many as 10% of children before age 5, and is caused by several types of infection. The extent of the diarrheal problem must be known for therapy to meet peak demands and to eliminate the need for retraining. Client perceptions of the problem are important to consider, since diarrhea is common, but less commonly life-threatening, and other types of treatment exist. The selection of manpower is not a serious problem; distributors may not even be literate but must be acceptable to the community. Successful training of manpower has entailed a full week of one-to-one intensive instruction, including field demonstration. Training of clients is similar and should include follow-up visits to make certain the training process is effective and long-lasting. Medical backup is important, since diarrheal dehydration is often complicated by sodium and potassium losses, problem addressed by addition of sodium and potassium to solutions, which in turn can cause medical problems. The fact that ORT is not 100% effective by itself is not sufficient motive to abandon efforts if medical backup is unavailable. The most effective of serveral water measurers is the use of a marked household container. There are methods for ensuring water cleanliness and a 24-hour solution shelf-life. ORT should, in general, be started early; this and other simple instructions will encourage proper implementation by the majority of mothers. In developing countries it is generally advised to continue regular feeding during treatment to enhance treatment effects, reduce malnutrition, and assure continued lactation, although some programs discontinue cow's milk. Specific standards are given for when children should be referred to a health facility, and for program implementation, process and outcome evaluation." (POPLINE)

543 Weiss MG. Cultural models of diarrheal illness: conceptual framework and review. Soc Sci Med 1988;27(1):5-16

"Health planning for diarrheal diseases must be responsive to both epidemiological patterns and local perceptions of health, illness and need. A conceptual framework that relates patterns of distress, explanatory models, help seeking and treatment practices to knowledge and use of oral rehydration therapy (ORT), dietary management, other specific treatments and health policy issues provides the basis for this review of research on diarrheal illness-related beliefs and practices. The ethnomedical model asserts that efforts to secure the compliance of target populations are likely to be inadequate without an alliance between health professionals and communities to identify and address mutually comprehensible objectives that are perceived locally as meaningful and relevant. An appreciation of local cultural models and the diversity of cultural contexts enables health professionals to: 1) recognize the significance of local perceptions of diarrheal illness

with respect to pertinent outcomes and perceived needs, 2) develop ways to introduce recommendations that communities will accept, and 3) make appropriate use of existing community resources representing local traditions. An agenda for needed research should include using ethnographic methods preceding formal hypothesis testing; and complementing quantitative survey research with subjective data from substantial field experience to distinguish what patients and healers say from what they do. Specific questions for research include effects of diarrheal illness beyond the acute presentation; links between diarrheal illness and childhood malnutrition; integrating professional and population objectives; conflicts between the culture of health professionals and planners and their stated objectives; factors distinguishing seeming acceptance and actual behavior with ORT; links between ecology and culture; private vs. public sector treatment; traditional medicine and local health centers; role of pharmacies; and view of ORT as a drug." (POPLINE)

544 Weiss MG, Omaa A, Mwafi M, Nagaty A, El-Rafie M, Nasser S, Kielmann A, Hirschhorn N. Impact of the National Control of Diarrhoeal Diseases Project on infant and child mortality in Dakahlia, Egypt. Lancet 1988 Jul 16;2(8603):145-8

The Egyptian National Control of Diarrhoeal Diseases Project (NCDDP) was started in 1983. A field trial done in Dakahlia Governorate in 1980 to promote oral rehydration therapy showed that the mortality rate for the under-5 children during the diarrhoea season was 18.1/1000 in control villages and 10.5/1000 in outreach villages ($p<0.001$). In 1986, mortality rates had become similar in the 2 areas and lower than in 1980 (6.5/1000 and 6.0/1000 respectively), even though there were no significant changes in diarrhoeal incidence. Virtually all the reduction in mortality was due to a decline in diarrhoea-associated deaths. The principal differences between 1986 and 1980 were better case-management by mothers and doctors, in both outreach and control villages, and far greater television ownership. Village civil registers showed slight changes in under-5 mortality from all causes after 1980, but an accelerating decline from 1983. Governorate-wide civil registration data showed slowly falling infant death rates from 1970 onward, accelerating after 1982, with most of the decline corresponding to the seasonal pattern of diarrhoea-associated mortality throughout the year. Thus NCDDP promotion of better treatment seems to have been responsible for the decline in mortality. (Modified authors' abstract)

545 Weitzman Z, Mozes S. [Electrolyte content and osmolality of Israel soft drinks and their unsuitability for oral rehydration in infantile diarrhea]. Harefuah 1987 Feb 15;112(4):174-5

546 Weizman Z. Cola drinks and rehydration in acute diarrhea [letter]. N Engl J Med 1986 Sep 18;315(12):768

547 Weizman Z, Moses SW. Evaluation of electrolytes and osmolar content of common beverages used by laymen as oral rehydration solutions in infantile diarrhea [abstract]. Isr J Med Sci 1986 Jan;22(1):61

548 Wibowo S. [Cholera treatment at the Rembang General Hospital using the "Rose" system in June 1984]. Medika 1987 Feb;13(2):146-8

549 Wijemanne H. Local ORS production, supply, and distribution: the Sri Lankan experience. In: Prather CJ, ed. ICORT III; addendum to the proceedings of the Third International Conference on Oral Rehydration Therapy, Washington, DC, 14-16 Dec 1988. Washington, DC: Creative Associates International, 1989:64-6

550 Williams G. A simple solution; how oral rehydration is averting child death from diarrhoeal dehydration. New York: UNICEF, 1987. 62 p. (UNICEF special report)

551 Wilson R, Greenough WB, III, Hirschhorn N, Elliott K, Dale C, Sanders D, Attawell

K. Meeting the challenge to improve oral rehydration therapy effectiveness, safety, access, acceptance and use. In: Elliott K, Attawell K, Wilson R, Hirschhorn N, Snow J, Jr., Greenough WB, III, Khin-Maung-U, eds. Cereal based oral rehydration therapy for diarrhoea; report of the International Symposium on Cereal Based Oral Rehydration Therapy, Karachi, 12-14 Nov 1989. Karachi: Aga Khan Foundation, 1990:13-9

552 Wong HB. Rice gruel in management of infantile diarrhoea. Singapore Med J 1985 Aug&Sep;26(4&5):329-36

Arising from the increasing prevalence of cow milk allergy in infants in Singapore as a result of the fall in breast feeding, rice water was utilized in treating these babies with gradual increase in solids being offered. The efficacy of rice water in controlling diarrhoea in cow milk allergy suggested that it may be useful in treating babies with diarrhoea from other causes. A total of 130 (84 males) consecutive cases of gastroenteritis admitted to the Department of Paediatrics, National University of Singapore, were studied. Alternative cases were put on rice water or the standard WHO-oralyte solution which were the only initial oral fluids used. There were 63 patients on WHO-oralyte solution and 67 on rice water, and the two groups were comparable. All recovered fully and there were no deaths nor any after effects from the episode of gastroenteritis. Babies on rice water passed less stools per day compared to those on WHO-oralyte solution. Although the amount of Na, K and Cl in rice water was extremely low, its use for 24 h and resumption of diluted milk on day 2 onwards produced an extracellular fluid solute content similar to those of babies fed on WHO-oralyte solution, which contained more electrolytes than the rice water. There is a lowered osmolality and volume in ileal fluid when fed rice water, and this holds the key to the success of rice water in the treatment of infantile diarrhoea. It is concluded that in the Singapore context, rice water can be effectively used in the treatment of infantile gastroenteritis.

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"In the predominantly rural Hewu district of Ciskei 54% of infant deaths are diarrhoea-related. The aim of this study was to determine whether village health workers (VHWs) could teach mothers to safely prepare homemade sugar-salt solutions (SSS). VHWs from 11 villages were selected for training while 11 randomly selected villages acted as controls. VHWs selected for training were taught to prepare SSSs and to teach mothers with children under 5 years about the use of such solutions. A card illustrating the main points was given to all mothers. Six weeks after training, randomly selected mothers in control villages (n = 320) and experimental villages (n = 327) were interviewed and asked to prepare SSS. Experimental and control villages had similar children's diarrhoeal disease rates (using a 2 week recall period). In experimental villages 81.5% of mothers compared to 29.7% in control villages had received SSS cards (i.e. been visited). Of recently occurring diarrhoeal-episodes 76.6% were initially treated with a SSS (correct formula used in 81% of cases) in experimental villages compared to 50.5% (correct formula used in 48% of cases) in control villages ($p<0.05$ for SSS use). Greater use of enemas and home remedies occurred in control villages ($p<0.05$). Of solutions made in experimental villages 7% had sodium concentrations over 100 mmol/litre compared to 36% in control villages. Results show that VHWs can effectively train mothers to safely prepare SSS and the VHW program has been expanded to other areas." (Authors' abstract)

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It remains undecided whether or not the oral rehydration solution (ORS) containing 90 mmol/l of sodium is the solution of choice for children with malnutrition and for maintenance therapy. Focussing on this issue, this work examined children at a Cairo hospital to assess the prevalence of hypernatraemia in children with diarrhoea. Of the 3,227 diarrhoea patients examined during the study period, about half showed no signs of dehydration. Of those retained for treatment, 48% responded to the oral rehydration therapy (ORT) administered by the mother. This work found that most of the mothers had previously used ORT at home and had reconstituted the mixture appropriately. Clinical characteristics of those with hypernatraemia was recorded - the mean serum sodium level tended to rise with the number of ORS packets given in the last four days of diarrhoea. The association of social status, the type of health care, and use of antibiotics/antidiarrhoeal agents with hypernatraemia were also carefully ascertained. Hypernatraemia was linked to the severity of dehydration, average intake of ORS, the duration of ORS intake, and the number of stools per day. ORT was found effective but not so when more than 800 ml of ORS was given to young infants. Proper reconstitution of the solutions was emphasised, with alternate feeds of water or breast-milk for infants aged less than six months. The risk of hypernatraemia had been found to increase with

the delay in beginning the ORT.

567 Zietsman J, Hay IT, Hansen JDL, Dauth J, Dreyer MJ. Comparison of the sodium contents of six commonly recommended oral rehydration solutions. S Afr Med J 1989 Nov 4;76(9):478-9

"The sodium contents of six differently prepared oral rehydration solutions (ORS) were measured. A total of 452 solutions were prepared in our gastro-enteritis unit. The finger-pinch-and-cup method produced sodium values that were too high and too variable. The most acceptable sodium level was achieved using half a 5 ml medicine teaspoon or 1 level common household teaspoon of salt in 1 litre of water. Half a commonly available household teaspoon of salt caused sodium levels to be low but still acceptable and safe. We recommend that half a teaspoon of salt in 1 litre of water be used when preparing an ORS." (Authors' abstract)

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