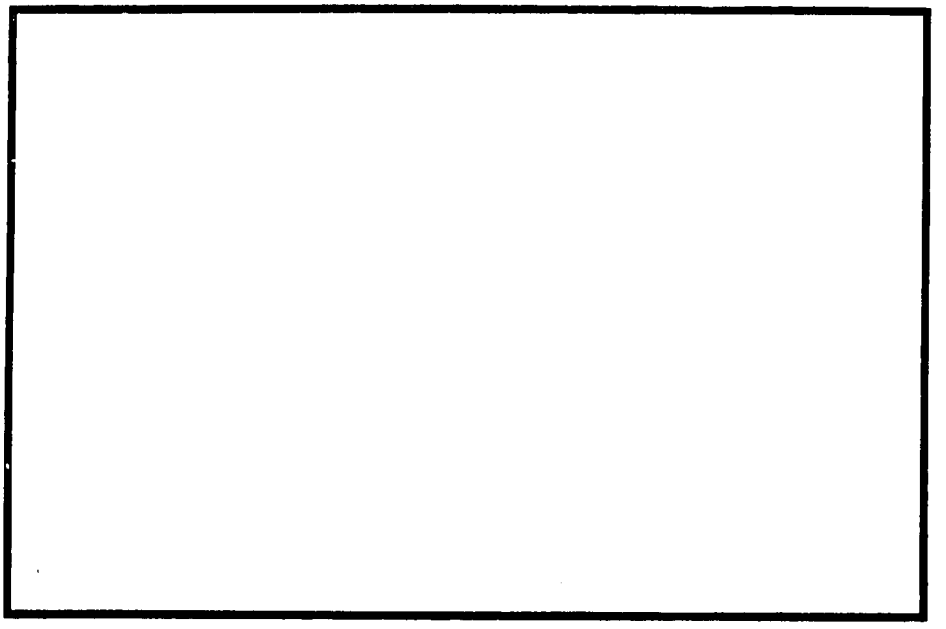

PRITECH

Technologies for Primary Health Care

Management Sciences for Health
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AN EVALUATION OF ALTERNATIVE PACKAGING FOR ORAL REHYDRATION SALTS (ORS)

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During The Period
August 1991

TECHNOLOGIES FOR PRIMARY HEALTH CARE (PRITECH) PROJECT
Supported By The:
U.S. Agency for International Development
CONTRACT NO: AID/DPE-5969-Z-00-7064-00
PROJECT NO: 936-5969

AUTHORIZATION:
AID/S&T/HEA: 4/14/92
ASSGN. NO: SUP 091-PA

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Background:

Diarrhea is the major killer of Pakistani children, killing over 200,000 of the 700,000 children under five who die each year. Dehydration can be prevented and treated with the correct administration of Oral Rehydration Salts (ORS) by the parents at home and/or at health facilities. Pakistan has made progress in the awareness and use of ORS, but while awareness is extremely high: according to the last national survey over 80%, the correct preparation and use are lower, and although there is no reliable national assessment, research in various areas of Pakistan show between 30-50% correct preparation and 20-30% correct use.

Oral rehydration therapy (ORT) is established as an essential intervention in the treatment of diarrhea. The successful use of oral rehydration salts/solution (ORS) is dependent on many factors any one of which if lacking can pose a barrier to effectiveness; some of these critical factors are:

Manufacture, distribution and storage, sale (available, affordable), awareness, motivation to use, correct preparation (access to water and implements), knowledge of diagnosis and rehydration feeding requirements, and timely follow through.

It was the intention of this research to isolate "improved ORS package convenience or utility" as the factor that may eliminate a barrier to correct use and possibly contribute to more effective rehydration practices in Pakistan.

Packaging innovation in the delivery of ORS was hypothesized to be a key element through which these improvements could be made. By providing measurement, mixing, storage, and or dispensing features, for example, some care givers may benefit in their efforts to correctly prepare and administer ORS.

Project objective:

Develop a variety of new and modified existing packaging designs (liquid and dry) uniquely suited to the differing needs of the end users and the conditions under which ORS is used. End users are defined as caretakers of children under five, mostly poor, low literacy and low socio economic status. The conditions under which ORS is used is often unsanitary and users lack resources to enable easy and hygienic preparation of the product. Emphasis will be placed on developing packaging designs to enable the correct reconstitution of ORS (mixing the powder with water) by people who are illiterate and poor. Criteria for assessment of design will be: package cost, product protection and shelf life, ease of use by low literacy/low socio economic status users.

Project "Rationale" (hypothesis)

The question which was addressed is whether the correct and convenient preparation of ORS can be facilitated by appropriately designed packaging. Most users of this product are caretakers of children under five, mostly illiterate and from low socio economic levels. It is difficult for them to correctly measure one liter of water, also they may lack clean containers in which to mix ORS. Another problem is the water itself which is often contaminated. Thus, if a package can be devised to solve one or more of these problems, the correct use and safety of ORS will be increased.

This project was intended to find solutions to the above problems through the development and small scale testing of prototype packaging which later can be further tested and used by ORS producers.

The geographically narrow scope of this project must be pointed out. The area for interviews was necessarily limited to rural areas surrounding Islamabad, rural villages within several miles of the main highway between Islamabad and Lahore, and urban slums in Lahore.

In preparation for this project a background literature search was conducted through Pritech and through the University of Minnesota Libraries (Bio Medical, Social Sciences, Asian studies among them). Journals searched and papers identified to have some relevance to this project are documented in appendix I with an annotated bibliography and conclusions drawn.

The following set of interviews and two focus groups were intended to establish a general understanding of current ORS preparation competency and to evoke opinions and reactions to a set of proposed alternative packaging prototype concepts described briefly here and in fuller detail in appendix II.

CONCEPT PROTOTYPES, ORS PACKAGING

Dry ORS concepts for discussion:

I. Bottles: A dispensing bottle sold with one sachet of dry ORS inside. There would be instructions and a "fill to here" measure line for the addition of water. The cap would be removed, salts poured in and water added to mix. The ORS solution could then be dripped into the child's mouth using the spout. Bottle is cleaned and saved for future use and sachets only are purchased.

II. Cups: A plastic cup sold with a spoon and one sachet of dry ORS inside. The top is romved, salts and water added to a "fill to here" measure line on the inside of the cup. ORS solution is spoon fed to child. Instructions are pictured on cup. Cup and spoon are cleaned and saved for future use.

III. Bags: A reclosable, square bottomed, plastic bag sold folded closed with a spoon and one sachet of dry ORS inside. Instructions and a "fill to here" line are clearly illustrated. The sachet is emptied into the opened bag, water added and ORS solution fed to child using a spoon. Bag is discarded after use.

Liquid concepts for discussion:

IV. Tetrapak: A 1 liter aseptic (shelf stable) tetra brick containing liquid ORS is dispensed into a bowl and fed to child using a spoon. Directions are clearly illustrated.

V. Pouch: A 1 liter aseptic (shelf stable) pouch containing liquid ORS is pierced with a straw (or opened with a knife and poured into a bowl) and dripped into the child's mouth. Directions are clearly illustrated on pouch.

Village Interviews methodology

Interviewees were asked to actually prepare dry ORS sachets in their customary way in the presence of two female Pakistani Anthropologists. This preparation was documented and the measurement of water checked for accuracy using a graduated measuring vessel.

Physical examples of the alternative packages I thru V were then shown and explained briefly, one at a time, to one or more household females present and their opinions solicited. The interview was concluded with gifts of bar soap, sachets of ORS, and pictorial information sheets on rehydration using ORS.

On two occasions this researcher was permitted into a compound to view utensils, hearths, and refresh himself from the well...an action which was later to bring him very near to his work. The "kitchens" were neat and well equipped with cooking pots, storage vessels, and measuring cups. These compounds conveyed vigilant care and a sense of order. The presence of livestock -tethered- and flies could confound any attempts at hygienic ORS preparation, storage and feeding.

A number of compound/village wells were viewed and found to have rotting plants and debris, and birds nesting on the inside. These wells were huge, magnificent, stone lined structures, but never covered and provided an obvious potential source of water born pathogens.

INTERVIEWS ON ORS PACKAGING CONCEPTS

- Interviewers: Naila Farooq
  Huma Masroor
- Total Interviews: 20
- Respondents: Mothers with children 3 years or under who were aware of ORS (all but three had used within last 6 months)*
- Area of Research: Rawalpindi Region and regions adjacent to highway between Islamabad and Lahore.
- All respondents had used ORS more than once. Out of 20, 16 respondents said that they always keep ORS packets in their house, because, their children often have diarrhoea. Only the mothers of a bit older children (more than 2 years), said that they bring ORS only when children have diarrhea. Women commonly reported that doctors have suggested they keep ORS packets in the house.

Total Number of Children

No. of Children	No. of Respondents
1	2
2	5
3	3
4	3
5	3
6	2
13	1
10	1
TOTAL	20

Mothers Ages	No.
21	1
25	4
26	1
23	1
28	2
30	4
32	2
35	2
36	2
40	1
TOTAL	20

INTERVIEWS

PREPARATION OF ORS: (ORS was prepared for interviewers.)

They used different measuring vessels for measurement. Measuring vessels used by them are as follows:

	Number Using
- 4 Pawa (1/4 liter)	6
- 4 Glasses	4
- Measuring Cup (1 liter usually used to measure milk)	4
- 2 Loha Chini Cup (Cup of 1/2 liter)	1
- 4 Mugs Loha Chini (China cup, each 1/4 liter)	1
- Measuring Cup (Garrvi = 1 liter)	2

* One woman measured 1 liter water in a steal jug, even though she did not use any measuring cup, but her measurement was accurate.
* One woman measured 1 1/4 liter water on doctor's advice. She measured it with Pawa (1/4 liter) measuring cup.
* One of these women used 4 glasses of water to measure 1 liter on her doctor's advice, and because she had heard it on T.V. and radio. The size of the glass was big, so that the amount of water was more than one liter.

CONCLUSION:

18 of the 20 respondents measured and prepared the ORS according to recommendations (with no prompting form interviewers). The women demonstrated a very clear understanding of measurement, which derives from:

A. Buying and selling of milk with measurement vessels for the same.

B. In the absence of dedicated measurement vessels, the fixed water quantities used in daily food preparation requires a (demonstrated) accuracy in volume measurement.

This was a pivotal finding for this project, because these interviews revealed an acceptable level of understanding and competence in the preparation of ORS. In essence, this disproves the hypothesis that packaging innovation is necessary to reduce barriers to correct use of ORS. This point is discussed further on.

UTENSILS USED FOR ORS PREPARATION

When people were asked in which pot they usually boil ORS water, 12 out of 20 women mentioned a "silver" cooking pot. 2 mentioned aluminum pans and 6 mentioned steel pans. One woman said that she bought a silver pan from the market just to prepare ORS, because the doctor suggested she do that. She said, that the doctor does not want her to use the other cooking pans, because they are already used for cooking other foods and for the preparation of tea, causing different germs to go into the child's mouth. She was the only woman who had a separate cooking pan for ORS preparation. Most of the women (8 out of 20) store the rest of the ORS in the same silver cooking pan, in which, they boil water, while 7 women stored the ORS in a grain jug. Some women, (2 out of 20) use a

steel jug to store ORS. Other utensils used for this purpose was an aluminum pan (1), plastic bowl (1), and steel pan.

* One woman said, that she usually uses a claypot, because the ORS remains cool in it.

USE OF ORS

When people were asked, why do/did they use ORS? Most of them (18 out of 20) said, that they use ORS during "loose motions", or diarrhea. One respondent also mentioned, that ORS is good during vomiting: One respondent added, "flu" with vomiting and that ORS is good for this condition. Almost all the respondents (18 out of 20) clearly understand that, ORS is to make up for loss of water. Only a few (2 out of 20) said, that ORS stops diarrhea. Other respondents said that ORS should be given to the child, otherwise, the child will loose energy and can become dehydrated. Here again, the doctor's role is very important. Almost all said, that this is recommended to them by their doctor. He tells them that it will make up for loss of water.

Where do you store ORS?

- At any cool place, in the house (bedroom, kitchen) - 19
- The sink in the floor, where people wash their utensils, or in the clay pot - 1

CONCLUSION:

Most of the respondents said, that they do not have a refrigerator but that they want to keep it cool. Otherwise, it will not be good for the child. Sometimes respondents said, they take a big clay pot full of water, mostly made of clay and keep the ORS container in it.

OPINIONS ABOUT ORS PREPARATION

Difficult to prepare: 2

Not difficult to prepare: 18

CONCLUSION

Most of the respondents said that ORS is not difficult to prepare, that measurement is not a problem for them. They do not mind boiling water for it. They said that they would do everything for their children's sake because, children's health is very important to them. Two respondents who said that they find it difficult to prepare ORS complained about the shortage of time. One of these mothers said that she is busy with the household activities and she can not spend much time in child rearing practices. The other women added that she works with her husband in the fields.

RESPONSES TO ORS PACKAGING PROTOTYPES

DRY PACKS

PROTOTYPE - PLASTIC TUB WITH LID (SPOON & ORS SACHET INSIDE)

NUMBER OF WOMEN WHO LIKE IT: 12

1. It is good for the child, because my child will take it easily. We often use a spoon to feed the child, but it is for a big child only - 7
2. We can easily wash it, so it is protected from germs - 3
3. It is covered, and flies can not go in it - 1
4. Child does not like bottle - 1

NUMBER OF WOMEN WHO DID NOT LIKE IT: 8

1. My children can not use the spoon, and they can not be forced to take ORS, with the spoon, it is not easy for me to manage - 1

2. It is good for big children only - 1

3. Mother has to hold it, otherwise, it would be difficult. The child can not hold it - 1

4. It is very difficult to hold it for a long time - 1

5. The child is so small, so with this more of water will go into the child's mouth - 1

6. Water will spill out with spoon - 2

7. The child is afraid of the spoon, he will not like it, because we have already given him so many medicines with a spoon, so he does not like the spoon - 1

WASH BOTTLE STYLE WITH DISPENSING TUBE

NUMBER OF WOMEN WHO LIKED THE ITEM: 10

1. It is a very easy method, the child can take ORS with it easily, because of the "straw." My child does not take the bottle, but from this bottle, ORS will go out easily in his mouth.

2. It is easy for the child, a small amount of ORS can be given to the child by this bottle - 2

3. It is good, because there would be no germs in it.

4. It is easy to manage, even if the child takes it himself.

5. The child can suck it easily, water will not spill out.

6. Although the child has to suck it, but still it is good for him, because he can probably understand that it is a juice.

7. It is a bit easier to suck with it.

NUMBER OF WOMEN WHO DID NOT LIKE THE ITEM: 10

1. My child does not like or take the bottle, so he will not take ORS in this bottle - 5

2. When the child moves, this "straw" can be dangerous for him. It can hurt the child's mouth as it can go into the child's throat - 2

3. It will get dirty soon. It is difficult to wash it - 1

4. It is always open, germs can go into it - 1

5. This will become like a toy for the child. Mothers have to handle it, otherwise, the child will start playing with it, so it is useless - 1

PLASTIC ZIPLOCK STYLE BAG (TRANSPARENT AND GOLD)

NUMBER OF WOMEN WHO LIKED PACKAGING: 19

1. ORS will be safe in it. It is durable and can be given into the child's hand. The child will not break it.

2. It is durable - 6

3. It looks beautiful - 1

4. Shining package. It can attract the child and the child will love to hold it. Normally children do not drink ORS happily, maybe this shining pack attracts them, and they will start feeding - 1

5. It is durable. ORS will not come out - 4

6. "Air" can not spoil this durable packing - 1

7. It is made of plastic, so material is good enough to keep for a long time - 7

8. We can close it's mouth, so it is safe. Flies can not go inside - 2

9. It is big. It may contain more quantity of ORS. We can use it for more days - 1

10. Beautiful. It can stand - 1

NUMBER OF WOMEN WHO DID NOT LIKE PACKAGING: 1

1. It is made of "wax", and germs can easily go into it.

CONCLUSION

Almost all women liked this transparent pack. They showed keen interest in it. It was noticed that without giving a second thought, they said that they prefer this bag and not the brown, paper/plastic one. The were very clear about it.

BROWN BAG (PAPER AND PLASTIC LINED)

NUMBER OF WOMEN WHO LIKED IT: 1

1. This is made of paper, so it is clean. Papers are always

clean.

NUMBER OF WOMEN WHO DID NOT LIKE IT: 19

1. It will leak. It is very thin. It's mouth is open, water can easily come out of it - 6

2. It is not beautiful - 1

3. It is not durable - 3

4. ORS will not remain fresh in it, after a few hours, because it is made of paper - 10

5. It is very light and cheeper, we can not even close it. Germs can easily go inside - 2

DRINK BOTTLE WITH PUSH/PULL SPOUT

NUMBER OF WOMEN WHO LIKED IT: 6

1. Some children do not use a spoon. It is good for them, because ORS will go drop by drop in the child's mouth. It is easy to manage for a mother - 1

2. It is good for younger child, because ORS will go into the child's mouth drop by drop and we can also use it for milk - 2

3. Bottle neck is short, so the child can take water easily - 1

4. It is good, because it is covered, germs will not go in it - 1

5. Even if the child does not take the bottle, or spoon, for drinks, even then we can drop ORS into the child's mouth - 1

NUMBER OF WOMEN WHO DID NOT LIKE IT: 16

1. If we will press it, more amount of ORS can go into the child's body, which can be dangerous - 2

2. My child does not like the bottle - 5

3. A mother has to take care for it, because she has to feed herself, otherwise, the child will take more amount of ORS in his mouth and mother does not have this much time.

4. ORS will spread, here and there - 1

5. It will get dirty soon and it is very difficult to clean it.

6. This will become a toy for the child and instead of taking ORS in, it will start playing with it - 1

LIQUID CONCEPTS

TETRA BRICK

NUMBER OF WOMEN WHO LIKE IT: 7

1. It is good, because it has fruits in it.

2. It is safely packed.

3. It looks good (beautiful), but it is not durable.

4. It is good, because it is pre-prepared. Sometimes we do not have much time to prepare ORS. It is good for that time. We can use it immediately.

5. It is good and it looks durable.

6. Packing is colorful and can attract the child.

NUMBER OF WOMEN WHO DID NOT LIKE IT: 13

1. It is for sensible children. Small children can break it - 1

2. It is packed. When we will open it, air will go in it and it will spoil it.

3. It is easily breakable.

4. It can leak anytime. Germs and flies can enter into it.

5. If it is opened once, it would be a problem to cover it again, because the child can not take all this amount in one time.

6. It is packed and not fresh, we do not like packed material. It is good to prepare fresh things and especially for children. We should always use fresh foods - 1

7. This pack is not durable - 1

GLASS BOTTLE (A GLASS SODA BOTTLE WITH CLEAR LIQUID)

NUMBER OF WOMEN WHO LIKED IT: 15

1. It is easy to manage, we can use it with nipple of baby bottle.

2. ORS will remain fresh in it, because it is glass. Air can go into it and it will not leak.

3. ORS is safe in it, because of glass, nothing can go into it, like germs and flies. We can also keep it for a long time, because it is glass. It is also covered.

4. Good, because it is pre-prepared.

5. It is covered, and can be used for 2 to 3 days - 1

6. We can prepare more Nimkol (ORS) and can store it in this bottle, after using it once.

7. ORS will remain cool in it - 1

8. We are familiar with it. We have seen such bottles of Coke and 7UP etc. We are sure that this bottle will be good like these bottles. We will use it the same way -1

NUMBER OF WOMEN WHO DID NOT LIKE IT: 5

1. We already have feeders for our children. There is no need to buy it.

2. It is easily breakable, especially smaller children can not handle it.

PLASTIC POUCH (YELLOW)

NUMBER OF WOMEN WHO LIKED IT: 1

1. It is good because it is a prepared liquid.

NUMBER OF WOMEN WHO DID NOT LIKE IT: 19

1. Only big and sensible children can handle it. Small children will tear it.

2. It is packed, if we open it, air will enter in it and it will spoil ORS.

3. It can start leaking soon, even if a sharp thing touches it, it is very difficult to handle, germs can easily go inside it. It can break anytime.

4. If we open it once, it will be a problem to cover it again.

5. It is packed and we do not like packaged material. A child should be given fresh food and drink.

6. We do not have electricity, so we do not have freezers. How can we keep it for a long time after we open it once? Of course, a child can not drink all this at one time and if we will not keep it at any cool place, it will be spoiled.

7. It is not good, because it is not durable.

LAHORE FOCUS GROUP DISCUSSIONS

PARTICIPANTS: GROUP I

PARTICIPANTS WERE SELECTED FOR LOW INCOME/EDUCATION AND RECRUITED FROM POOR AREAS OF LAHORE.

Respondent Number	Child's Age
1	15 months
2	6 months
3	6 months
4	3 months
5	2 months
6	1 month
7	3 months
8	1 1/2 months
9	2 1/2 months
10	2 1/2 months

Q. Did your child ever have diarrhea?

RESPONDENT #

3 - Yes, my child has diarrhea sometimes.

4 - Yes, but mine often has diarrhea.

2 - My child was taken to the hospital once because he had sever diarrhea and the doctors suggested drip (glucose).

5 - My child also had diarrhea 1 1/2 months back.

10 - Yes, children often have diarrhea. This is a common disease.

4 - And my child's diarrhea never stops.

Q. Why do these children get diarrhea?

3 - If the child eats something more like bread or takes more amount of water.

4 - Yes, sometimes milk (mother's) doesn't suit the child.

5 - It also depends on weather.

1 - No, I think it depends on mother's milk. Some mothers have good milk, some have bad.

7 - Sometimes mothers come from outside (on hot days) and they drink a lot of water because they feel thirsty, and this amount of water causes diarrhea.

Q. Any other reasons?

3 - Sometimes flies also cause it. If they sit on food and the child eats it, he will get diarrhea.

1 - Mosquitos also cause diarrhea. They are dirty, and the child gets a fever first and then due to fever, he gets diarrhea.

7 - Sometimes mothers feed the child with a feeder and does not give fresh milk to him. Sometimes they fill it in the morning, and the child takes it in the evening. Such type of milk also causes diarrhea.

10 - "Badi", foods like cauliflower, rice also causes it.

Q. What do you do when your children have diarrhea?

3 - I give my child a sugar/salt solution.

Q. How do you prepare it?

3 - I boil 1 glass of water and put 2 spoons of sugar and a very small amount of salt in it. Sometimes I also give Nimkol, but if somebody is not available to bring it from the market, I prepare S.S.S.

8 - I give my child egg white.

10 - Well, my doctor told me to give Nimkol to the child during diarrhea and I give it to him.

9 - I also give Nimkol. The doctor has suggested this.

5 - Doctor prescribes a syrup whenever my child has diarrhea.

Q. Which syrup?

8 - Sometimes it is pink and sometimes yellow.

3 - Mine gives yellow.

5 - Mine gives red.

10 - I got Hakim.

8 - My doctors gives Autox to me.

4 - Yes, doctor gave me some green tablets to me also.

Q. Have you ever seen these packets of Nimkol?

- One with logo?

All - yes we have seen.

5 - I always use it.

4 - Yes, doctors of government hospital give this Nimkol to us.

10 - Yes, this is known to us.

All - Yes.

- Flavored ORS?

2 - I have used it.

3 - I also used it once.

6 - I have seen it, but never used it.

All - Yes, we have seen it, but didn't use it.

- Golden packet of Nimkol?

All - We never saw it before.

5 - It looks like chocolate packet.

2 - Yes, I have seen such chocolate packets.

Q. How does ORS work?

3 - Child feels thirsty and ORS makes up for it.

4 - Child shouldn't be given water. Nimkol should be given, it makes up for it.

1 - Egg white is more effective.

2 - Egg white is good, but Nimkol should also be given to the child.

10 - Yes, and if child has more diarrhea, we should bring glucose from the hospital.

Q. How do you prepare Nimkol?

4 - We take 1 liter of water and measure it with 4 glasses and then boil it. After that keep it at a cool place and then mix ORS in it.

All - Repeated the same preparation.

5 - I sometimes mix salt or sugar in it just to give it a good flavor. Child drinks it happily.

3 - We should use it within 12 hours.

8 - No within 24 hours.

4 - Yes, it is effective for 24 hours.

2 - After this much time water changes its color.

5 - And taste also becomes different.

7 - We usually use the white packet (one with logo).

3 - I use flavored one sometimes. Child likes the fruits and doesn't like the one (logo) without any flavor.

2 - Yes (same).

5 - Yes, some children are very intelligent, they know all about the flavors.

Q. Is it difficult for you to prepare ORS?

All - No.

Q. Where do you store ORS?

8 - I don't keep it in a silver cook pan. I keep it in a glass jug. Doctors usually tell this on T.V.

3 - Yes, I also keep it in glass jug.

5 - Egg white preparation is rather difficult.

6 - Yes and we keep it in same cooking pan. It hardly makes any difference.

10 - I think to keep ORS in cooking pan is just fine.

1, 2, 8 - But Nimkol doesn't stop diarrhea.

3 - Nimkol is to make up for loss of water.

Q. What is the use of Nimkol then? Do you like something about it?

4 - Child can die, if we will not feed Nimkol to him. It is necessary to make up for loss of water.

5 - Well, doctor's suggestion is very important, no matter Nimkol effects or not we have to give it to the child.

2 - Well, I think it is effective.

Q. Do you have any problem with Nimkol?

4 - Sometimes it doesn't stop diarrhea, then doctors give glucose.

8 - Doctor himself suggests lemon water (salt and sugar).

1 - But egg white is more effective and eggs are always available at home, we have to go to market to buy Nimkol.

2 - Yes, this is the only problem that we need to go to market to get it.

6 - Sometimes it is a bother; If child is more sick, we need to wait for its preparation of course boiling takes time.

All - Yes.

Q. How do you feed Nimkol (ORS) to the child?

2 - If child is smaller, then with spoon, otherwise feeder ("baby bottle with nipple").

5 - With feeder to the small children and with cup to the older ones.

6, 7,10 - Feeder.

3 - Cup and spoon.

8 - Spoon.

1 - Cup and spoon and sometimes only cup.

Q. How much ORS does the child drink in one day.

5 - Whole 1 kg. child feels very thirsty.

1 - As much as child can take.

3 - Mine takes half liter in one day.

5 - Some children can drink all the amount.

9 - It depends on child's age.

4 - I feed 3/4 kg. to my child.

8 - I prefer to feed at least one cup after each stool.

2 - Yes, doctors suggest the same.

All - Yes.

Q. Opinion about packets - golden packet?

3 - White packet is best of all. Mother is sitting with a child it indicates that definitely child has some disease.

4 - Golden packet looks beautiful, but white (with logo) is best. We have used it and we have trust on it.

7 - Flavored one is also good.

10 - I don't believe in it, white (with logo) is best.

Q. From where do you get ORS?

3 - From medical stores if we want flavored - hospital (with logo).

2, 4, 6 - Hospital (with logo).

10 - I always take it from hospital, no matter they give which one.

#1

FOCUS GROUP REACTIONS
TO PACKAGE PROTOTYPES

A. Wash Bottle Style with Tube Dispenser ("Straw")

4 - It is easy for children to drink ORS with it. Especially for small children, he can suck it easily.

1,2,5, and 8,9,10 - Yes, it is good for young child to suck it. Small right amount of water comes out from the straw.

B. Plastic Tub with Lid and Spoon

2 - Only sensible child can handle it.

8 - Yes, it is like a glass and only elder children can drink ORS with it.

4 - My child loves to drink with glass, so he will like this one given.

8 - We can also use it for other purposes if once ORS is finished we can prepare it again in the same.

3 - It is covered we can prepare ORS in it and then store ORS in it child can take ORS with spoon and cup.

C. Drink Bottle with Push/Pull Dispenser Spout

6 - It's like medicine bottle or looks like spray. It may offend the child, especially it's black color.

4 - But it is durable.

2 - Yes, but child can't manage it himself, it may spoil his clothes.

All - Yes, it's true.

D. Liquid Packs - Glass Bottle

2 - It looks neat and clean.

4 - But amount of water is less than one liter. It's preparation method may be wrong.

1 - Yes and child can also break it.

6, 7, 9 - True, it is easily breakable.

E. Tetra Brick and Plastic Pouch of Liquid ORS

4 - It is one liter pack, but we can not say anything about its quality.

10 - In fact, we are nct sure about these packings.

6 - Its expiration date may pass quickly.

2 - Fresh ORS has its own fine quality.

5 - We should prefer to make fresh ORS for the child. We can not say anything about packed material.

7 - We should also be sure about the quality. If we buy it, it must be one liter.

F. Bags - Plastic and Brown Paper/Plastic

All - Agreed at once that this is better.

4 - Its mouth is closed.

2 - Yes, it saved from germs.

4 - Yes, other packet (light brown paper bag) is not safe. Flies can go into it.

8 - ORS is more safe and protected in transparent pack it is durable. Other bag is not durable.

All - Yes it's true.

LAHORE FOCUS GROUP DISCUSSIONS

PARTICIPANTS: GROUP II

Respondent Number	Child's Age
1	10 months
2	6 months
3	2 years
4	2 years
5	4 months
6	4 months
7	15 months
8	5 months

Q. What is the cause of the diarrhea?

RESPONDENT #

1 - Stomach upset, to eat something hard or heavy. To eat something which doesn't suite you.

2 - Over eating.

6 - Due to teething.

Q. What do you do during Diarrhea?

6, 7 - We give Nimkol or take to the doctor.

4 - To give the ghetti and during frequent motions give Nimkol.

3 - To give ORS that can cover the dehydration.

2 - To give the medicine of traditional healer or ORS, or give green tea with lemon.

Q. From where do you get ORS?

1 - I got the logo ORS from dispensary.

4 - From medical store.

5 - From hospital (logo).

Q. What is the use of ORS during diarrhea?

2, 5 - To make up for loss of water.

1 - To make up for loss of water, during heeling.

1 - Stops frequent motions. It also fulfills the deficiency of water.

All - The women said, that it stops diarrhea and makes up for loss of water.

Q. Preparation of ORS?

1 - One liter, or four glasses of water boiled in a sliver pan. When it becomes cold, mix one packet of ORS in it and pour it into a glass jug, and after use, put it at some cold place.

5 - Take four glasses of water, boil that water in big silver pan. When water becomes cold, pour it into the glass jug and mix one packet of ORS in it. Do not use big plastic jug, because things start smelling in plastic material and then put big jug at some cold place.

2 - Same as above, but she added that, if we will keep that prepared ORS at some cool place it will be spoiled.

3 - All other women told us no

Q. Is it a problem for you to prepare ORS?

2, 5, 7 - We have to prepare for the child.

All - Others said it was no problem to prepare ORS.

Q. Why do you use ORS?

1 - It cures our child so its good. If child is sick, we give him/her ORS, he gets alright, so we feel satisfaction.

6 - There is no bad thing in it.

Q. How do you feed ORS?

1, 2, 5 - Small child usually likes ORS with spoon and big child with cup.

3 - With feeder, as much as child can drink.

7 - During diarrhea give ORS frequently as much as child can drink with spoon or feeder.

2 - Child feel thirsty during diarrhea. It is up to the child age, small can drink with spoon or feeder, and big children can drink with cup.

1 - Small child, whenever he weeps during diarrhea, you give him ORS, because he does not ask for water or ORS.

Q. Which packet of ORS is good?

All - Said that, we usually use logo one, so that is good. It also cured our children. We did not use other ORS, so we can not say anything about others.

DRY ORS PREFERENCE

Q. Out of these feeders, which one is good?

2 - Bottle with straw. We have to squeeze it, then ORS will come out.

6 - Straw and bottle can hurt the child's mouth.

3 - It can hurt the child's eyes.

All - Said that, bottle with straw is best of all. What the child likes, can drink easily.

5 - Bottle with black cap, this water comes easily without pressing the bottle. Child can drink easily.

1 - Cup and lid is also good, because the child of every age can drink ORS easily. Secondly, you can properly cover the remaining ORS with the cap.

LIQUID

TETRA PAK

Q. After using it, we can come to know about it. Would it not be spoiled if we keep it for a long time?

7, 2 - It is good, because as much quantity we need can be poured into the feeder and remaining kept safely.

3 - We can take this packet somewhere if we travelled.

PLASTIC BAG

1 - We have to handle it carefully.

3 - We can not keep it for a long time.

5 - Children are naughty, they can play with it, it will break easily.

GLASS BOTTLE

1, 2, 3 - It can easily break.

5 - We can keep it safely, so it is good.

6 - If plastic pack opens, one can not cover with any cap, but in bottle, after using, we can again cover it with cap.

BAGS

BROWN BAG

1,2,3,4 - It is durable and will break easily.
5,6

PLASTIC

1 - It has a nice appearance and can be closed, which is good.

CONCLUSIONS & DISCUSSION:

For the purposes of this project the two most relevant areas of ORS practice were: 1) Awareness of and proficiency with the correct mixing of dry ORS with water. 2) Evidence of barriers to correct ORS use that could be overcome through packaging design.

What was discovered is that this population generally had a clear, demonstrable understanding of the preparation of ORS. Augmenting the delivery (packaging) of ORS with features that could contribute to correct measurement or dispensing would be, for most, an unnecessary convenience. Correct use would not necessarily be encouraged or improved upon as a result.

It must be pointed out that the prototype concepts presented were received favorably by interviewees and if viewed in isolation some could be expected to perform well. But in the larger context of performance requirements for any ORS package, i.e., one including cost and critical need, these specific interviews did not strongly support further concept development.

Here is a simplified model for critical elements of effective ORT using dry ORS:

Material		**Behavioral**	
I	**II**	**III**	**IV**
Dry ORS	**Preparation, Utensils**	**Knowledge**	**Practice**
• Available • Affordable	• Water • Fire • Pot • Measurement • Storage Vessel • Feeding (spoon, cup)	• Recognize symptoms of need • Understanding preparation instructions • Understanding feeding dose	• Timely diagnosis • Obtain ORS • Water boiling • Correct solution • Feeding schedule • Follow through

Reviewing this project's beginning hypothesis: "Packaging design that is tailored to the needs and capabilities of the users will overcome barriers to the correct and timely use of ORS." in light of information from this set of interviews, resulted in a shift in project direction toward a focus on prepared liquid versus dry ORS perceptions. This focus shift was made for the following reasons:

ORS packaging innovations could be expected to add to the utility and convenience of ORS preparation, storage, and feeding. But this will add cost to the product, complexity, and possibly risk to the education process among Pakistan's people. Novel packaging may also infuse vigor into the ORS manufacturing industry by stimulating competition through a boost in sales to Pakistani's with better incomes. But this in turn may encourage imitation by the very poor, taxing their meager incomes as they reach to give their sick child the "best" care. In short, a very effective new ORS packaging design could actually become a counterproductive instrument adding unnecessary utility and hence cost to ORT.

It is believed that a transient, displaced (e.g., refugee) population would benefit from some of these concepts (a square bottom, zip lock, plastic, 1 liter pouch containing a sachet of salts providing a measuring, dispensing, storage vessel). This type of population is not the subject of the present research, however.

Turning away from packaging alone as a means by which elements II through IV above may be improved and toward a prepared liquid ORS concept was decided on as a reasonable next step.

Many elements in the above use model are most appropriately and effectively addressed through either marketing and distribution practices, or education and advertising.

However, the benefit of the prepared liquid ORS concept is real and both acknowledged and desired by some interviewees. Some trade offs do exist:

ORT	
Prepared Liquid	**Dry Salts**
Pros	**Pros**
• Clean, sanitary • Correct solution • Variety of delivery vessels (pouch, tetra pak, glass bottle, plastic cup, soda can) • Convenient-no preparation	• Lowest cost • Ease of distribution and storage • Long shelf life • Manufacturing simplicity • Familiarity • "Freshness" perception
Cons	**Cons**
• More costly packaging • Distribution and storage space requirements • Shelf life constraints • 1 litre is heavy and bulky • Manufacturing cost and complexity	• Vulnerable to incorrect preparation and solution concentration • Inconvenient to prepare • Contaminated H_2O risk

Pakistan presently has seven pharmaceutical companies which produce dry ORS with an estimated capacity of over 50 million packets per year. Presently, due to government requirements, all ORS produced is in powder form, following the WHO formula and is to be reconstituted in one liter of water. Four dairy companies are exploring the possibility of producing liquid ORS and, with assistance of Land O'Lakes under contract with the Pritech project, USAID, have already produced liquid ORS packaged in tetra pak and in a plastic pouch.

It was toward an understanding of prepared liquid ORS perceptions that the second, following series of interviews was directed.

INTERVIEWS ON LIQUID AND DRY ORS

- Interviewer: Abida Aziz
- Total interviews conducted: 11
- Respondents: Mothers of young who had at least one child under two years of age.
- Areas of research: Northwest Frontier Province (NWFP) and Punjab provinces

  The Villages were: Shapure, Saeedan Di Ghari, Moran, Muradan, Chambe Sharif, Sama Khazro, Narri, Gul Raban, Shaidu.
- The ages of the children suffering from diarrhoea at the time of interview:

Age	Frequency
7 months	1
8 months	2
9 months	2
12 months	3
13 months	1
20 months	1
3 months	1
TOTAL	11

INTERVIEWS

- Have you ever heard of ORS?

  All the respondents were familiar with the product.
- What is it (ORS) used for?

  All the respondents knew that ORS was given during diarrhoea to make up for the loss of water. However, 4 respondents said that ORS not only rehydrates but also stops diarrhoea.

- The amount of money spent on medicine during last episode of diarrhoea:

Amount Spent	Frequency
10 Rs	1
20 Rs	1
22 Rs	1
25 Rs	1
35 Rs	1
36 Rs	1
60 Rs	1
90 Rs	1
107 Rs	1
136 Rs	1
150 Rs	1
TOTAL	11

- How do you prepare ORS?

  All the respondent knew correct preparation of ORS. However 3 respondents said that for convenience and economy they use a half packet of ORS into half Kilo water. Thus one packet can be used for two days. Another reason for the practice mentioned was "children usually do not take as much as one liter in a day, half a liter of the solution is more likely to be consumed without waste".

- All the respondents mentioned boiled water as a requirement (which is practiced) to prepare ORS.

- Where do you store prepared ORS?

Responses	Frequency
In a glass/silver jug, at a cool dry place *	6
In refrigerator	3
In a plastic jug, at a cool dry place.	2
TOTAL	11

* These women were of the opinion that the taste of ORS is spoiled if stored in a plastic container, though the other respondents did not believe this.

- For how long do you use the prepared ORS?

  All the respondents reported to use the prepared ORS for 24 hours or less. After that, the left over is thrown away and fresh solution is prepared.

- How much ORS do you give to the child in one day?

Response	Frequency
2 1/2 pao	2
1/2 Kilo	3
1 Kilo	3
1/4 glass	1
1 1/2 pao	1
3 pao	1
TOTAL	11

- What do you use to give ORS to the child?

Response	Frequency
Cup	5
Feeder	4
Glass	2
TOTAL	11

- Which color of liquid ORS will you prefer?

Response	Frequency
Pink	4
White	3
Can be any color does not matter	3
It should be sweet	1
TOTAL	11

- Which flavor of liquid ORS would you prefer?

Orange	Frequency	Negative Comments	Positive Comments
Orange	4	It is sour, bad for diarrhea	Children will love it
Mango	3		Children will love it
Lemon	2	Lemon is sour, bad for diarrhea	Good for stomach
Aniseed	2	Children will not like the taste	Aniseed will be great. Aniseed is good for stomach.
Apple	2		Children will love it It is healthy.
Chocolate	1		Children will love the taste
Banana	1		Children will love the taste
Mint	1	Children will dislike the taste	Good for Stomach

* Some respondents favored more than one flavor, so the sum does not add up.

- If liquid ORS is available which one would you prefer powder or liquid, why? (Tetrabrik Shown)

SUMMARY:

9 out of 13 respondents showed a willingness to use liquid ORS. However almost all the respondents mentioned low price as a condition to use liquid ORS. The affordable price for the new product was always mentioned in comparison to the price of powder ORS. Mothers are ready to pay 2 to 3 rupees more than powder because they believe liquid ORS will be convenient to use and more hygienic. Some respondent did not like the idea of liquid ORS.

Two more strong reasons against liquid ORS were:

-Liquid ORS will not be as fresh as dry ORS.

-Familiarity and experience with dry ORS will serve as hindrance to try a new liquid product.

- The price of the new product is a major concern mentioned by all the respondents.

To give a clear picture, of the exact responses to liquid ORS concept from the field are included here:

- I will buy liquid ORS, if it is prepared by the company. It must be better than the packet of ORS prepared at home. I think it will cost about 10 - 12 rupees.
- I will buy liquid ORS because it will be easy to use. Powder ORS is difficult to prepare. The approximate cost of liquid ORS will be 10 rupees, but I will still buy it as nothing is more important than the child's health. I want the best for my child.
- Prepared ORS will be convenient. I think it will also be more effective and healthful, but it will be expensive. I want cheap preparation. If liquid ORS costs 2 or 3 rupees more, then I will buy liquid ORS.
- Liquid ORS will be expensive. It will cost about 8 rupees per liter. If liquid and powder ORS both cost the same, then I will buy liquid because it is easy to use.
- I will prefer liquid ORS because I believe it will be good. As company doctors will prepare. If liquid ORS costs 10 rupees more than powder ORS, then I will buy powder ORS.
- I will prefer liquid ORS. I believe it will cost 10 - 15 rupees per liter. I think most of the mothers will buy it, because when a child gets sick, parents do not care about the price.

- We will prefer liquid. It will be easy, clean, and without doubt, as it will be prepared by the doctors. The approximate price will be 7 rupees. If the price is more than 7 rupees, then I will not buy it.
- I shall use liquid ORS if I come to know that it is good. If doctor or mothers of young children recommend. If the price is not more than 5 rupees. Liquid ORS should be available in cardboard packing not in plastic.

OPINIONS ON POWDER ORS

- I am familiar with the powder ORS. When I boil water and make it with my own hands I feel comfortable, I trust my own hands. I taste it, and I know it is fresh. I can not be sure about liquid ORS. Expense is another issue. I think liquid ORS should not be more expensive than 7 rupees.
- I will buy dry ORS because it is more economical. I use one packet for two days (half packet with half liter water).
- I will only buy the one that is less expensive, I can not afford liquid ORS, though I would like to buy it if I had money.
- I fear liquid ORS might be stale, but if the people start using it and say good things about it, only then, I will believe in it and start using it.
- I can form any opinion about liquid ORS only after I have tried. However, if it is available in the market I will definitely try it once. I will not buy liquid if it costs more than 6 rupees.

(The opinions listed above are from more than 11 respondents, as the other women present at the place of interview offered their opinion on the subject, which is recorded.)

Conclusions - Liquid Versus Dry ORS Interviews:

Mothers readily perceived the possible benefits of a prepared liquid ORS: convenience, safety, quality. At the same time, they also revealed what could be considered an experienced consumer's skepticism regarding the freshness and quality of a prepared liquid solution; liquid ORS must build its own credibility with users in this area. Doctor's recommendations appear pivotal to the use and acceptance of ORS and these could be expected to play a crucial role in the successful introduction of liquid ORS.

Price was deliberately excluded from the first series of interviews regarding alternative packaging concepts which were discussed earlier in this report. This was done so as not to distract from a balanced reaction to all packaging concepts based on utility and perceived benefit of the user.

For these interviews however, ORS price was carefully probed. Sachets are commonly purchased for 3 to 5 Rs. or the cost is buried in the charge for a visit to the Doctor who "gives" out a sachet.

Payment for other diarrhoeal medications may reach 10 to 20 times this amount for a single episode among some families. None the less, ORS even a prepared liquid, derives its value measure from the sachet price point of 3-5 Rs. and these Batan mothers reference this in projecting acceptable prices for a liquid ORS: "I will pay 2 or 3 Rs more than the sachet" for example. Requiring consumers to speculate about price is a notoriously imprecise prediction of marketplace behavior. And it is hard to say how fixed the liquid/dry ORS value association would remain. But it is reasonable to foresee how prepared liquid ORS may complicate the purchase decision.

The overall impression from these interviews is that a shelf stable, liquid ORS (fruit flavored preferred) has a definite place in ORT for some Pakistanis. The convenience, safety, and quality are recognized as providing substantial value justifying a cost increase. The liquid would enhance overall ORS use, but not replace dry salts.

APPENDIX I

ORS LITERATURE SEARCH

ANNOTATED BIBLIOGRAPHY

ORS Bibliography

Literature Search Sources

American Journal of Tropical Medicine and Hygiene
Central African Journal of Medicine
Clinical Therapeutics
Department of International Health
Dialogue on Diarrhoea
Environmental Child Health
Fluid and Electrolyte Therapy
Health Policy and Planning
Human Organization
Indian Pediatrics
International Journal of Epidemiology
Journal of Diarrhoeal Disease Research
Lancet
Nature
Pakistan Pediatric Journal
Presentation to the American Public Health Association
Pritech Information Center
Reviews of Infectious Diseases
Semiotica
Social Science & Medicine
Technologies for primary Health Care (Pritech) Project Report
UNICEF Reports
WHO/DAHO Scientific Publication
WHO/UNICEF Nutrition Support Programme
World Health Forum
World Health Organization
World Health Statistics Quarterly

ORS Annotated Bibliography

1. Agarwal, A., A cure for a killer-but how to deliver it?, *Nature*, 278:389-391, 1979.

   1979 INDIA, PUNJAB. ORS has not reached the people most in need. WHO & UNICEF are spearheading an international campaign to persuade third world governments to introduce ORT in their primary health care activities. How ORS should be delivered to the third world's million villages is a matter of controversy amongst child health experts. WHO believes in standardization & quality control: prepared packets with 1 litre water. UNICEF helps to distribute packets and also set up units to produce them in-country. Quality, cost, shelf life, production and packaging materials are discussed. Several critics argue packaging only adds to costs and makes ORS prohibitive for millions of mothers. **Problems with the 1 litre solution proprosed by WHO is that mothers will not find it easy to measure a litre.** An alternative approach suggests the mother make and administer the solution herself with readily available ingredients. It is difficult to recommend a single method to be used on a global scale, for each method will be viewed from a different perspective in different parts of the world.

2. Bentley, M.E., The household management of childhood diarrhea in rural north India, *Soc. Sci. Med.*, 27(1):75-85, 1988.

   1988 INDIA, HARYANA. A study of child diarrhea in three villages in rural North India investigated the variation in household management of child diarrhea. Areas of investigation included maternal knowledge, beliefs and practices during diarrhea, feeding and fluid intake, treatment choices and knowledge, and use of ORT. Almost all mothers continued to breast feed normally and did not decrease fluids during diarrhea. Rather than withholding food, the child's diet was altered toward "softer" and "cooler" foods. The use of anti-diarrhoeals 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 the mothers who had previously used ORT but who do not plan to use it again were dissatisfied because it did not stop the diarrhea.

3. Chen, L. C., et al., Village-based distribution of oral rehydration therapy packets in Bangladesh, *Am. J. Trop. Med. Hyg.*, 29(2):285-290, 1980.

1980 BANGLADESH, MATLAB THANA. The distribution of ORS products (1 litre) by community-based workers in rural Bangladesh was evaluated. Locally produced packets showed satisfactory chemical composition with a shelf-life of three months and cost of U.S. $0.05. The variability in the concentrations of electrolytes and the generally hypoconcentration solutions prepared by the mothers suggest a problem in the understanding of the correct preparation of the solution. **This was in spite of the provision of a 1-litre IV bottle which should have permitted precise measurements of water volume.**

4. Chowdhury, A.M.R., et al., Mothers learn how to save the lives of children, *World Health Forum*, 9:239-244, 1988.

1988 BANGLADESH, COMILLA. Mothers in over 5 million Bangladesh households were taught how to prepare and use an oral rehydration solution containing lobon (local salt) and gur (unrefined sugar). An evaluation of the results has demonstrated the value of the programme and has shown how improvements can be made in the teaching process as well as in the preparation and administration of the solution. Increased emphasis is now being placed on the danger of too much salt and on the importance of correctly measuring the ingredients. Because gur is not widely available at all times of the year, refined sugar is being promoted as an alternative.

5. Gadomski, A., et al., Constraints to the potential impact of child survival in developing countries, *Health Policy and Planning*, 5(3):235-245, 1990.

1990. The direct interventions (includes ORS) for child survival in developing countries have not had as great an impact on child mortality as was anticipated in the beginning of the 1980s. Effective in controlled settings, large-scale implementation in communities is fraught with problems of limited access, lack of effective targeting, inadequate training of health professionals, lack of co-ordination with other programs, poor community acceptance and lack of effective use of services. A multifaceted approach, such as control efforts targeted at the sources of diarrhoeal pathogens, personal hygiene, case management (ORT) and promoting female literacy, is likely to produce a broad sustained impact on childhood mortality in developing countries.

6. Green, E.C., Diarrhea and the social marketing of oral rehydration salts in Bangladesh, *Soc. Sci. Med.*, 23(4):357-366, 1986.

1986 BANGLADESH, 5 DISTRICTS. An anthropological study of knowledge, attitudes and practices relating to child diarrhea and especially to ORS was carried out in Bangladesh. The purpose was to design a culturally sensitive social marketing program. Respondent knowledge of ORS was high: 92% claimed to know what it is, however, 86% believe that ORS cures diarrhea. Only 3% believed ORS to be "hot", 67% believed ORS to be cool, 29% didn't know. Researchers conclude there are no problems with ORS in terms of hot/cold perceptions. Findings suggest that there are no significant cultural constraints to ORS use: ORS is not seen as incompatible with existing remedies or diets for diarrhea and there appears to be no substantial opposition to ORS from indigenous practitioners, religious leaders or local political leaders. Problems reported were related to availability, cost and small children refusing to swallow ORS.

7. Indian Market Research Bureau, KAP Study on Diarrhoea *A summary report by UNICEF.*

INDIA. Educating mothers on the correct management of diarrhea would be the first step to decrease the number of deaths due to diarrhea among infants and children in India. In order to design effective communication on this subject there is a need to understand current knowledge, attitude and practices with regard to diarrhea management. This study found that diarrhea was believed to be caused by a myriad of possible reasons: food, climatic conditions, dirty water, teething, etc. Rural mothers managed the diarrhea problem by waiting and watching, in hope that it would be self-curing; the next step was to modify the diet, try traditional remedies, approach the village practitioner, if none of these helped, go to the allopathic doctor. ORS, if widely known and available, would be likely to find trial and acceptance.

8. Jelliffe, Patrice E.F., et al, Traditional practices concerning dietary management during and after diarrhoea (With special reference to acute dehydrating diarrhoea in young children), *WHO/UNICEF Nutrition Support Programme*, 1986.

The most effective acceptance of modern treatment for diarrhea in developing countries can best be achieved by combining traditional practices and technical methods, based on current scientific knowledge. Thus, it is important to identify culturally-defined beliefs, attitudes and practices, regarding feeding in diarrhea. The information obtained in this study was analyzed into two main overlapping categories: (1) Dietary practices - foods believed to cause diarrhea, foods avoided, foods recommended for diarrhea; (2) Cultural considerations - concepts of body physiology in diarrhea, beliefs about non-dietary causes of diarrhea and other therapies for diarrhea.

9. Kumar, V., et al., The introdcution of oral rehydration in a rural community in India, *Wld Hlth Forum*, 2:364-366, 1981.

1981 INDIA. ORS was introduced to two villages in rural India. Initially, all ingredients for the solution were mixed together, but it was found that this made for a short shelf life especially during the rainy season. The problem was solved by packaging components separately in polythene bags. Contents of each packet were dissolved in 500 ml of water. Teaching materials were available outlining the danger signals in diarrhoea and vomiting, the method of making the ORS, safety precautions and the importance of continued feeding. Knowledge and attitudes of the rural mothers about diarrhoeal disease have improved. They accept ORT and continue breast feeding their infants when the latter are suffering from diarrhoea, whereas formerly they thought that fluids worsened the condition and that capsules and injection were the only effective forms of treatment.

10. Levine, N.E., The determinants of correct use of home - based oral rehydration therapy, *Thesis*, 1990.

1990. The purpose of this report is to delineate which of the various factors - cognitive, attitudinal and situational - seem to have imposed major constraints on correct use of ORT in the home. Cognitive factors such as problems in communicating the concept of dehydration and uncertainties about how to properly prepare ORS/SSS, impact upon the correct use of ORT. Attitudinal (diarrhea being considered normal or beneficial, a "hot" disease, etc.) and situational (seasonal factors, women's work obligations) also are constraints.

11. Lozoff, B., et al, Infection and disease in south indian families: beliefs about childhood diarrhea, *Human Organization*, 34(4):353-358, 1975.

1975 INDIA, VELLORE. Children with diarrhea who became severely dehydrated were often not brought for international medical treatment. In an investigation of this problem, 56 families were interviewed to understand their beliefs about childhood diarrhea. Diarrhea was considered an individual disturbance of function that international medicine could treat. In contrast, dehydration was believed to indicate a state of pollution that required ritual purification. An effective therapy would combine international medicine's requirement of rehydration and the families insistence on purification.

12. Mtero, SS, et al, Rural community management of diarrhoea in Zimbabwe: the impact of health education message on oral rehydration therapy, *Central African Journal of Medicine*, 34(10):240-243, 1988.

1988 ZIMBABWE. Information was gathered on the management of diarrhea in the home and the impact of health workers in their promotions of ORT. Understanding traditional beliefs and practices that relate to the causes, treatment and prevention of diarrhea were recognized as necessary to help control diarrhoeal disease. The Ministry of Health is promoting the use of the home-based SSS as the first step towards management of diarrhoea. 72% of mothers were taught about its preparation and administration by health workers. However, only 21% could correctly describe the "standard" method. It is important that a single formula be promoted so as to avoid mothers mixing various recipes which could be potentially dangerous.

13. Mull, J., Mull, D., Mothers' concepts of childhood diarrhea in rural Pakistan what ORT program planners should know, *Soc. Sci. Med.*, 27(1):53-67, 1988.

1988 PAKISTAN, KARACHI & CHITRAL. The development of ORT programs has become a major priority in Pakistan due to diarrhea being the number one cause of infant/child death. An understanding of the mother's beliefs and traditions are necessary as an adjunct to health interventions involving behavioral modification. Most of the mothers showed inadequate understanding of preparation and administration of ORS packets. ORS was administered to certain diarrheas whereas some diarrheas were attributed as a "natural" condition or an illness requiring folk treatment. Diarrhea is also believed to be "hot" and needs to be treated with "cool".

14. Mushtaque, A., et al, Perception of diarrhoea and the use of a homemade oral rehydration solution in rural Bangladesh, *J Diarrhoeal Dis Res*, 6(1):6-14, 1988.

1988 BANGLADESH, COMILLA. Perceptions of Bangladeshi villages are explored regarding diarrhea, its treatment and how this affects their use of homemade ORT solution. Initial program monitoring showed that most mothers could prepare a safe and effective solution, but that its use was less encouraging. Diarrhea is classified into four different categories with separate causes and treatment. Infrequent use of ORT was related to the treatment of only one of these diarrheas (cholera). Poor availability of "gar" (sugar) also limited use. There were also misconceptions on the part of the villagers that ORS cures purging.

15. Rahman, M., Village practitioners of Bangladesh: Their characteristics and role in an oral rehydration programme, *Thesis*, 1981.

1981 BANGLADESH, CHANDPUR & MATLAB. The International Centre for Diarrhoeal Disease Research in Bangladesh started a pilot project for community training and outreach activity on diarrhoea management. Village practitioners were trained in the following topics: (i) diarrhea and its management with emphasis on oral rehydration; (ii) nutritional aspects of diarrhea and (iii) some aspects of health education in general and diarrhea in particular. Of the 10,084 patients treated by the trained practitioners, overall cure rate was about 99%. This study, therefore, suggests that while training at least one family member in each family on the use of ORT is the best strategy and should be the long term goal for any national oral rehydration program, the training of village practitioners should be considered as an interim immediate strategy for a quicker and wider utilization of oral rehydration, at a minimum of cost and effort.

16. Ransome-Kuti, O., Dependence on commercial oral rehydration preparations (letter), *Lancet*, 2:1080, 1980.

1990. ORS can be prepared at negligible cost by the mother using materials available in the home. There is a growing concern with commercial ORS due to: dependency on the preparation for the treatment of diarrhoea, self reliance will be undermined, possible shortage of commercial preparation, cost and shelf life.

17. Sedgwick, J.R. et. al. Oral Rehydration in rural India, (letter) *Lancet*, 1:1194-1195, 1976.

1976 INDIA. Can poorly educated village mothers prepare ORS in their homes? Pre-packaged ORS was given to mothers in Southern India to treat children, under 5 years, with diarrhea resulting in some degree of dehydration. The main problem was to teach the mother to use the correct volume of water. **The volume of the local "standard" container varied, resulting in a wide range of concentrations. However, 83% of the mothers mixed the solution to within 40 millimoles/litre of the correct concentration.**

18. Srinivasa, D.K., Afonso, E., Community perception and practices in childhood diarrhea, *Indian Pediatrics*, 20:859-864, 1983.

1983 GOA, PANAJI. People's knowledge and beliefs of causes of diarrhea in children, feeding practices and treatment during diarrhea was studied among 100 families having a child below five years of age selected randomly in an urban community of Goa. It was believed that consumption of certain food items by child or mother was responsible for diarrhea. Feeding during diarrhea was stopped by 83% as it was believed to increase diarrhea. Initial treatment consisted of certain home made remedies. There was lack of knowledge concerning the role fluid loss, dehydration and oral rehydration.

19. White, A., et al, The private sector role in control of diarrheal diseases India, *Technologies for Primary Health Care (Pritech) Project*, 1990.

1990 INDIA. This study established that a large proportion of mothers seek and pay for consultation outside the home for diarrhea. Thus, diarrhea is seen as an illness to be treated with medicines obtained from the closest doctor. These doctors give or prescribe anti-diarrhoeals and antibiotics, using ORS in only 6% of the cases. ORS packets were generally not available. To increase usage, three facets were discussed: private providers, education and social mobilization, commercializing the supply, distribution and marketing of ORS. Included with this report is a preliminary evaluation of ORS commercialization in India.

20. Williams, G., A simple solution, How oral rehydration is averting child death from diarrhoeal dehydration, *A special report from UNICEF*, 1987.

1987. ORT claims only a modest niche in the market of treatments for diarrhea. This report focuses on oral rehydration as a solution to averting child death from diarrhoeal dehydration. The rationale behind ORS, progress, problems and challenges, communication, controversy/alternative solutions, future and the social marketing of ORT in Egypt is discussed in this UNICEF report.

Conclusion Based On Literature Review Pertaining To Packaging ORS

1. Packaging in general - of even the most minimal kind, e.g., sachets - is suspected by some to create a barrier to ORS use because of the added cost.

2. The accurate measurement of water has been shown to be a problem in India and Bangladesh even when a measuring bottle is provided. The accurate measuring of diluent for ORS is critical to efficacy and safety.

3. Education and training is effective in promoting the correct preparation and use of ORS if:

   a. It is sustained over time, i.e., there is follow up and repeated refresher training at intervals.

   b. The education pertains to all critical dimensions of ORT, e.g., symptoms recognition and ORS feeding as well as correct preparation.

4. ORS availability and cost may at times over-shadow preparation, as critical to the effective treatment of infant diarrhoeal related dehydration.

5. The careful training and education of village practitioners and "doctors" is a feasible and effective means of promoting the correct use of ORS.

6. Simplicity and consistency in ORS messages and methods is crucial to correct and efficacious use. When a variety of sizes (1 versus .5 litre), amounts, types - e.g., SSS versus dry ORS versus liquid ORS - are presented it appears to create misunderstanding.

7. No research was found that specifically targeted the role ORS packaging might play in the correct use of ORT. I surmise that this is because even though it has been shown that while some families of sick children will spend 20 or 30 times the price of a sachet of ORS on other anti-diarrhoeal medications, any incremental increase in the cost of ORS (from packaging) is assumed to present a significant barrier to ORS use.

8. Regional differences in cultural beliefs surrounding diarrhoea make it difficult to generalize about practices or courses of action to promote ORS. Commerce and economics add to the complexity as does population stability.

APPENDIX II

ORS PACKAGING CONCEPTS

SPECIFICATIONS

I. ORS MIXING AND DISPENSING BOTTLE

CONCEPT DESCRIPTION:

A mixing and dispensing bottle containing one sachet of dry ORS inside. There would be instructions and a "fill to here" measure line for the addition of water printed on the bottle. The cap would be removed, salts poured in and water added to mix. The ORS solution could then be dripped into the child's mouth using the spout. Bottle and cap are cleaned and saved for future use and sachets only are purchased.

PACKAGING COMPONENTS:

High density polyethylene (HDPE) squeeze bottle with a push/pull medium density polyethylene dispenser cap
alternative: squeeze bottle with wash bottle style dispensing tube

DESCRIPTION:

BOTTLE

Material:	HDPE
Forming process:	blow molded
Wall Thickness:	.381 mm
Capacity:	1 liter (1.2 overflow)
Weight:	30.42 grams
Decoration:	printed one color or pressure sensitive label

CAP

Material:	Medium density polyethylene
Weight:	14.84 grams
Style:	Push/pull dispenser spout
Alt. Style:	Wash bottle style dispensing tube and cap

Total package weight:	45.26 grams

PACKAGING MATERIAL COST ESTIMATE U.S. DOLLARS:

BOTTLE

Material costs:	$0.025
Blow molding:	$0.104
Cap:	$0.109
Total:	$0.238

SAMPLE DIRECTIONS FOR SQUEEZE BOTTLE

- Remove cap and sachet of dry ORS from bottle.
- Open sachet and pour entire contents into bottle.
- Add water to fill line.
- Cap the bottle and shake well until contents are dissolved.
- Pull spout to open and drip solution into child's mouth.
- Push spout in to close.
- Bottle and cap are cleaned and saved for future use.
- Store liquid for no more than 12 hours in a cool place.

These would also be illustrated with line drawings of each step for those who do not read.

ORS PACKAGING CONCEPTS ATTRIBUTES

I. **Dispensing Bottle**

A. **Function and Utility**: What obstacles are overcome?

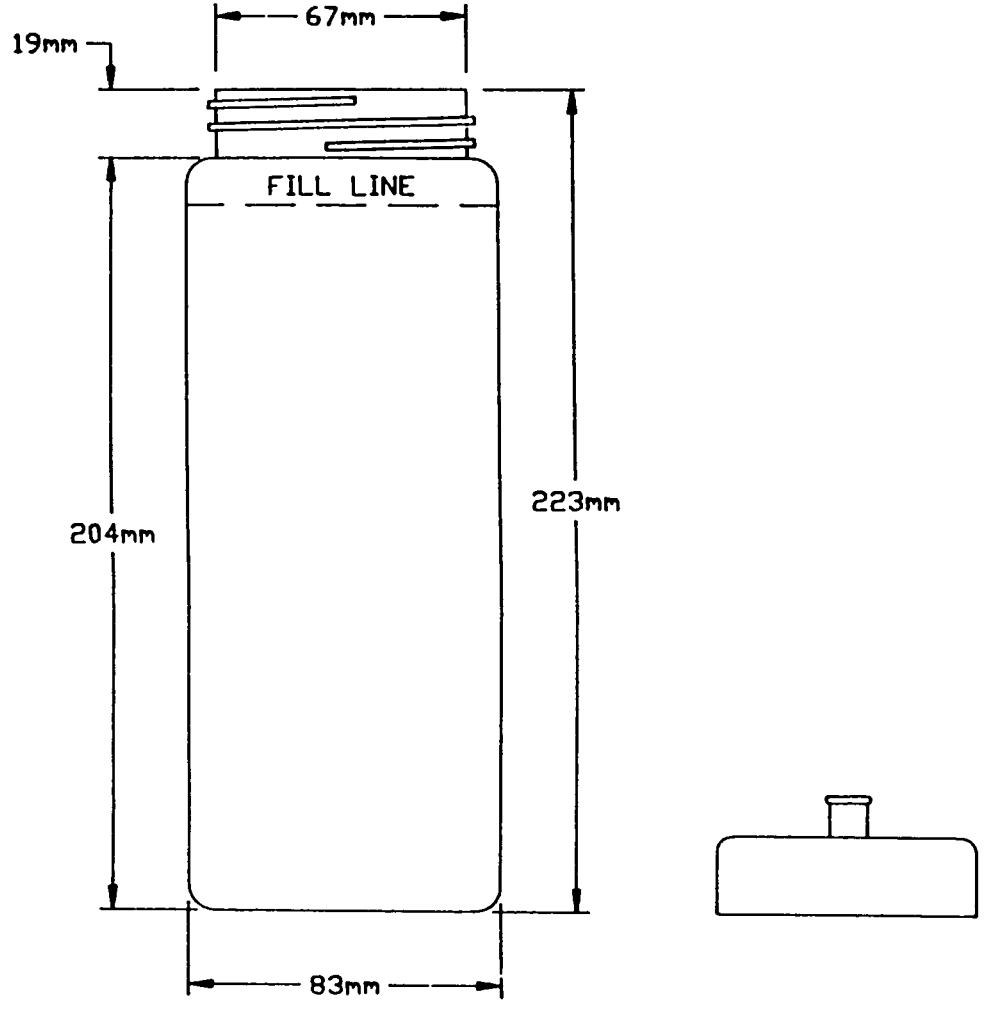
- **Measurement and Mixing** is facilitated through the use of a clean one litre capacity plastic bottle with a fill line clearly illustrated.
- The bottle becomes a covered **storage vessel** during intermittent feeding.
- **Dispensing** ports, either the push/pull or tube provide an effective means for drip feeding small amounts of ORS as required.
- Bottle and lid are **reusable** with the purchase of another separate sachet.

B. **Shelf Life**: Product shelf life would be equal to the dry sachet of ORS packed inside the bottle which is approximately two years. The bottle itself could continue in use for many years if reasonably cared for.

C. **Manufacture**: As noted, the dispensing lid would be injection molded. The bottle could be either injection molded or blow molded. These technologies currently exist in Pakistan. The bottle, lid and sachets could be purchased preformed and separate, shipped to a location and hand assembled. The container can be preprinted with use instructions or hand labeled using printed pressure sensitive labels.

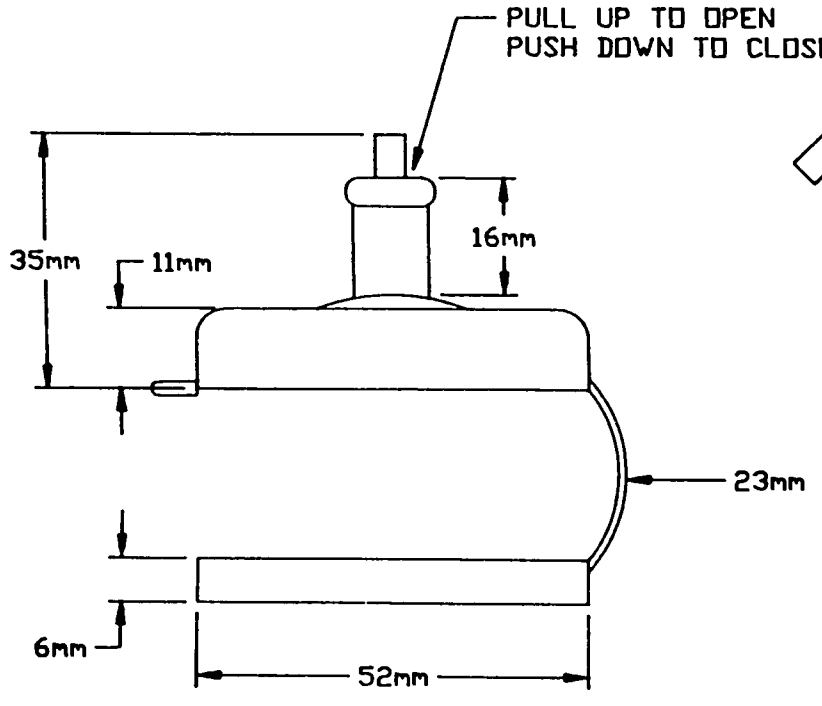
CONCEPT NEGATIVES

- **Cost** added to the **first** ORS purchase would be significant and a barrier to concept trial. Subsequent reuse would of course require no further investment.
- Cleaning could present hazards if not done carefully and was pointed out as a possible problem by some interviewees.

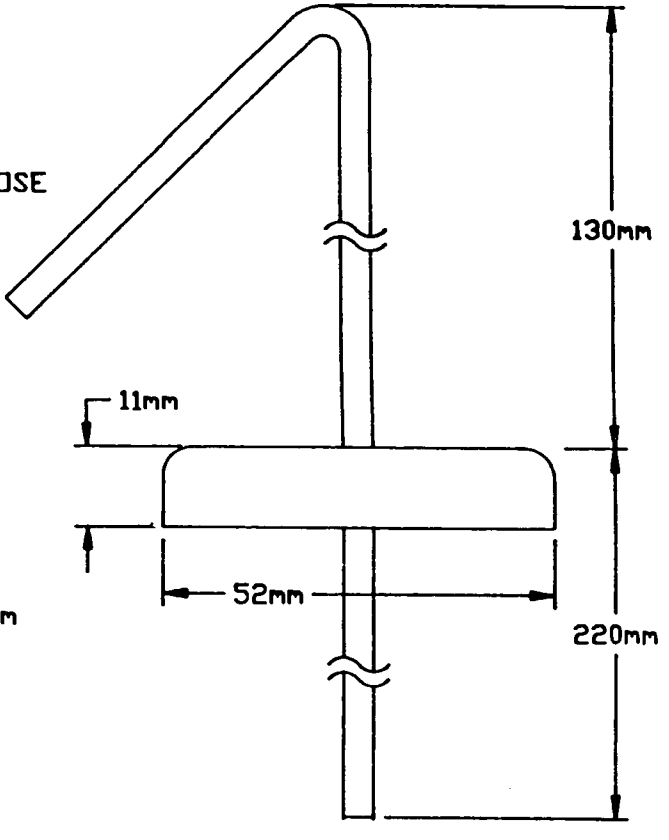


1 LITER ORS HDPE SQUEEZE BOTTLE & CAP

Land O' Lakes, Inc. 4001 LEXINGTON AVENUE NORTH, ARDEN HILLS, MINNESOTA		DRAWN BY: Frank K.
		SCALE: 1:2
PACKAGING ENGINEERING	1 LITER ORS HDPE SQUEEZE BOTTLE & CAP	DATE: 8/22/91
		DWG. NO. PG-008-A



ORS LDPE PUSH/PULL
DISPENSER SPOUT



ORS LDPE WASH BOTTLE
STYLE DISPENSING TUBE

Land O' Lakes, Inc. 4001 LEXINGTON AVENUE NORTH, ARDEN HILLS, MINNESOTA		DRAWN BY: Frank K.
		SCALE: 1:1
PACKAGING ENGINEERING	ORS LDPE PUSH/PULL DISPENSER SPOUT ORS LDPE WASH BOTTLE DISPENSING TUBE	DATE: 8/23/91
		DWG. NO. PG-007-A

II. ORS MIXING CUP

CONCEPT DESCRIPTION:

A plastic lidded cup containing a plastic mixing and feeding spoon and a sachet of dry ORS inside. The top is removed, salts and water added to a "fill to here" line printed on the inside of the cup. The ORS solution is spoon fed to child. Instructions are pictured on cup. Cup and spoon are cleaned and saved for future use.

PACKAGING COMPONENTS:

High density polyethylene (HDPE) cup with low density polyethylene lid

DESCRIPTION:

CUP

Material:	HDPE
Forming Process:	Injection molded
Wall Thickness:	.559 millimeters
Capacity:	1 liter (1.2 liter overflow)
Decoration:	1 color printed or pressure sensitive label
Weight:	36.49 grams

LID

Material:	Linear low density polyethylene
Thickness:	.559 millimeters
Weight:	12.59 grams

SPOON

Material:	Polypropylene
Thickness:	.671 millimeters
Capacity:	14.79 milliliters
Weight:	3.39 grams

Total package weight:	52.47 grams

PACKAGING MATERIAL COST ESTIMATE IN U.S. DOLLARS:

CUP

Material:	$0.027
Injection mold:	$0.086
Lid:	$0.043
Spoon:	$0.02
Total:	$0.176

II. **CUP**

A. **Function and Utility**: What obstacles are overcome?

- **Measurement and Mixing** is facilitated through the use of a 1 litre capacity plastic cup with a fill line clearly illustrated.
- The cup becomes a covered **storage** vessel during intermittent feeding.
- A spoon can be optionally provided for feeding.
- The cup and lid are **reusable.**

B. **Shelf Life**: Product shelf life would be equal to the dry sachet of ORS packed inside the bottle which is approximately 2 years. The cup itself could continue in use for many years, if reasonably cared for.

C. **Manufacture**: The cup and lid could be either injection molded or thermoformed which is currently being done in Pakistan. As with the bottle, these components could be purchased preformed and assembled for sale.

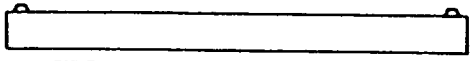
CONCEPT NEGATIVES

- **Cost** added to the **first** ORS purchase would be significant and a barrier to concept trial. Subsequent reuse would of course require no further investment.
- Cleaning could present hazards if not done carefully and was pointed out as a possible problem by some interviewees.

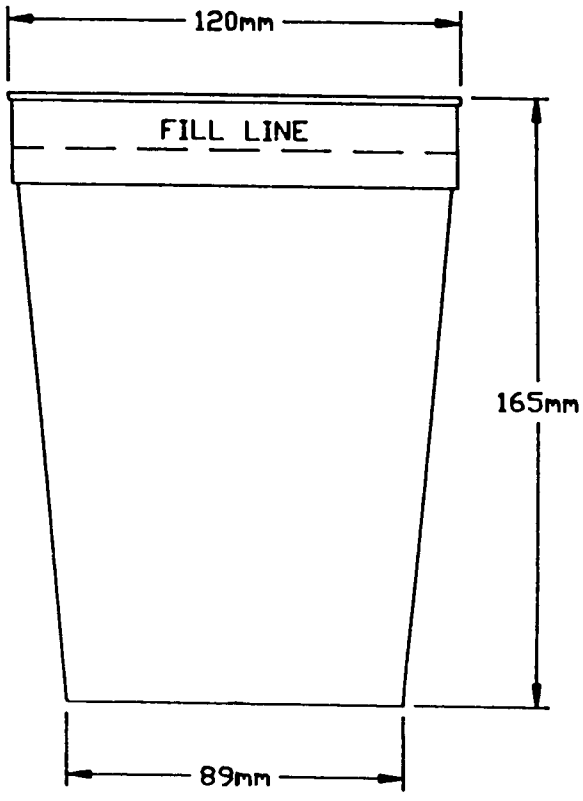
SAMPLE DIRECTIONS FOR CUP

- Remove lid, spoon, and sachet of dry ORS from cup.
- Open sachet and pour entire contents into cup.
- Add water to fill line.
- Replace lid on cup tightly and shake well until contents are dissolved.
- Remove lid and feed child solution using spoon.
- Cup, lid and spoon are cleaned and saved for future use.
- Store liquid for no more than 12 hours in a cool place.

These would also be illustrated with line drawings of each step for those who do not read.

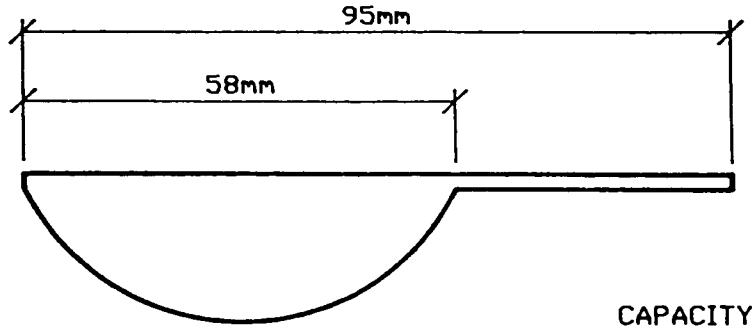


SNAP FIT LDPE LID
FOR 1 LITER ORS CUP



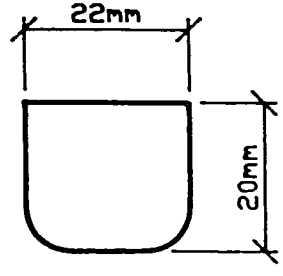
1 LITER ORS HDPE CUP

Land O' Lakes, Inc. 4001 LEXINGTON AVENUE NORTH, ARDEN HILLS, MINNESOTA		DRAWN BY: Frank K.
		SCALE: 1:2
PACKAGING ENGINEERING	1 LITER ORS HDPE CUP & LDPE LID	DATE: 8/22/91
		DWG. NO. PG-005-A



CAPACITY = 15 ML

SIDE VIEW
OF ORS SPOON



FRONT VIEW
OF ORS SPOON

Land O' Lakes, Inc. 4001 LEXINGTON AVENUE NORTH, ARDEN HILLS, MINNESOTA		DRAWN BY: Frank K. SCALE: 1 : 1
	SIDE & FRONT VIEWS OF ORS SPOON	DATE: 9/25/91 DWG. NO.

III. FLEXIBLE ORS MIXING BAG

CONCEPT DESCRIPTION:

A reclosable plastic bag sold folded closed with a spoon and one sachet of dry ORS inside. Instructions and a "fill to here" line are clearly illustrated. The sachet is emptied into the opened bag, water added and ORS solution fed using a spoon. Bag is discarded after use.

PACKAGING COMPONENTS:

A clear, "delta bottom" (bag will stand up when filled), plastic pouch with ziplock style re-closure.

DESCRIPTION:

POUCH

Material:	polyethylene
Thickness:	.0254 millimeters
Weight:	12.41 grams
Capacity:	1 liter (1.3 liter overflow)
Decoration:	1 color printed or pressure sensitive label
Dimensions:	255mm x 180mm

SPOON

Material:	Polypropylene
Thickness:	.671 millimeters
Weight:	3.36 grams
Capacity:	14.79 milliliters

Total piece weight:	15.77 grams

PACKAGING MATERIAL COST ESTIMATE IN U.S. DOLLARS:

Pouch:	$0.07
Spoon:	$0.02
Total:	$0.09

* Forming Process:

Pouches may be purchased preformed and hand filled with sachet and spoon or formed on line.

Forming Machine:	Bartelt model IM 714
Speed:	80 per minute
Cost:	$150,000.00
Manufacturer:	Klockner-Bartelt Sarasota, Florida, USA
Contact name:	John Whiting (612)435-6768

Good used machines are commonly available on the World and U.S. market for $50-80,000 U.S.

III. **Bags**

A. **Function and Utility**: What obstacles are overcome?

- **Correct measurement** and **mixing** is facilitated through the use of a clean one litre capacity flexible square bottom bag, with a "fill to" line clearly illustrated for the addition of water.
- The ziplock style closure provides for **reclosing** the bag during intermittent use, and storage.
- The bag is supplied, folded up with a packet of ORS inside and is thus, very **compact** for distribution and storage.

B. **Shelf Life**: ORS shelf life would be equal to that of the contained sachet or about 2 years.

C. **Manufacture**: Bags such as these can be preformed and purchased for filling or formed continuously and filled on a Bartelt pouch machine. Instructions can be printed on the bag, applied as a pressure sensitive label, or given out as a folded paper insert in the bag.

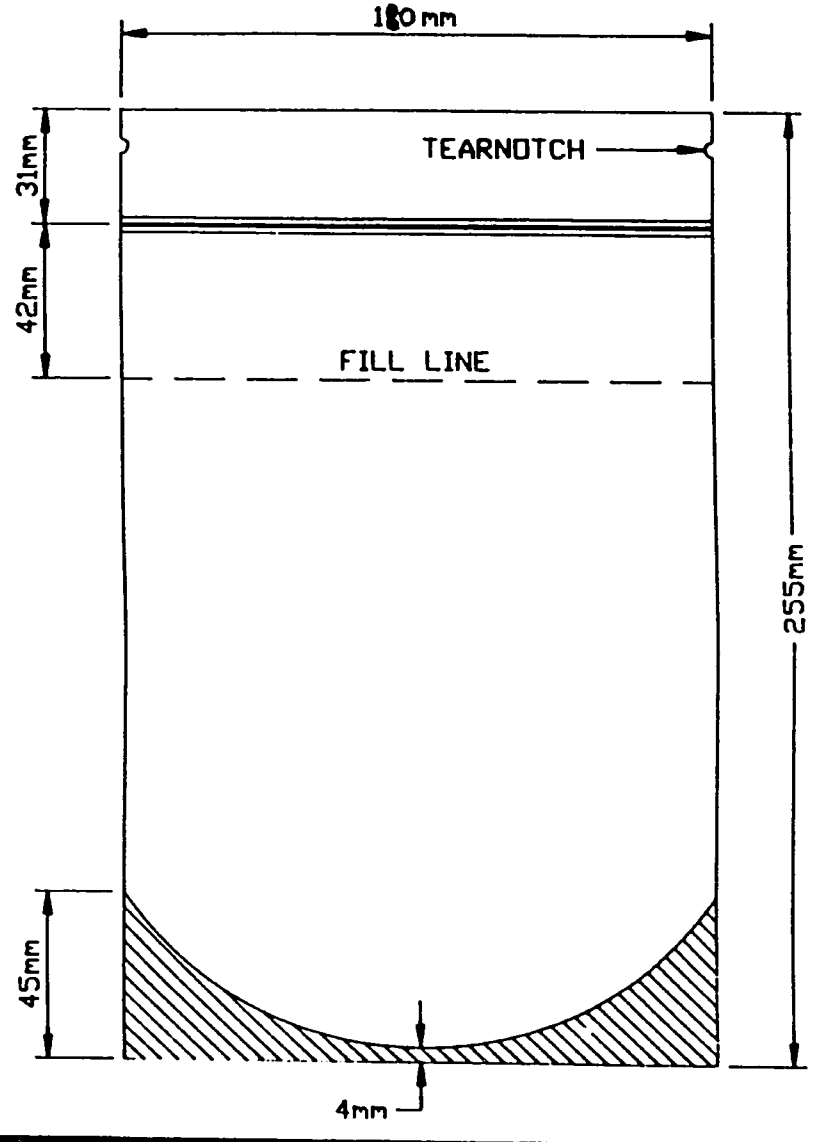
CONCEPT NEGATIVES

- This bag may present difficulties with stability, the filled bag could tip or spill and be hard to handle or pour from.
- If the bag is held wrong or squeezed during filling the fill measure would be inaccurate.
- It would become very hot to the touch if filled with uncooled boiled water.
- People unfamiliar with the ziplock style reclosure may have problems reclosing the bag.
- It may be more vulnerable to punctures and abrasion damage during distribution and sale.

SAMPLE DIRECTIONS FOR POUCH

- Unfold bag and tear across top to open.
- Pull apart zip lock and remove spoon and sachet of dry ORS from bag.
- Open sachet and pour entire contents into bag.
- Add water to fill line.
- Re-lock zipper tightly and shake well until contents are dissolved.
- Pull apart zip lock and feed child solution using spoon.
- Discard bag after use.
- Store liquid for no more than 12 hours in a cool place.

These would also be illustrated with line drawings of each step for those who do not read.



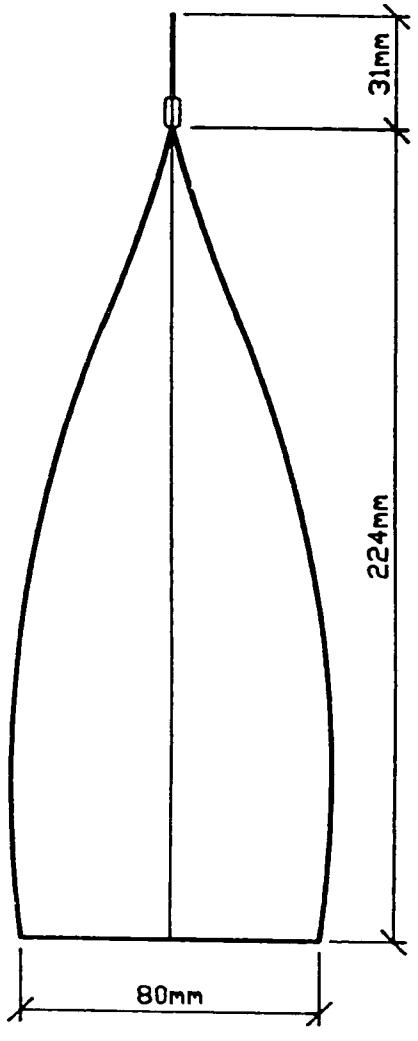
▨ - SEALED AREA

Land O' Lakes, Inc.

4001 LEXINGTON AVENUE NORTH, ARDEN HILLS, MINNESOTA

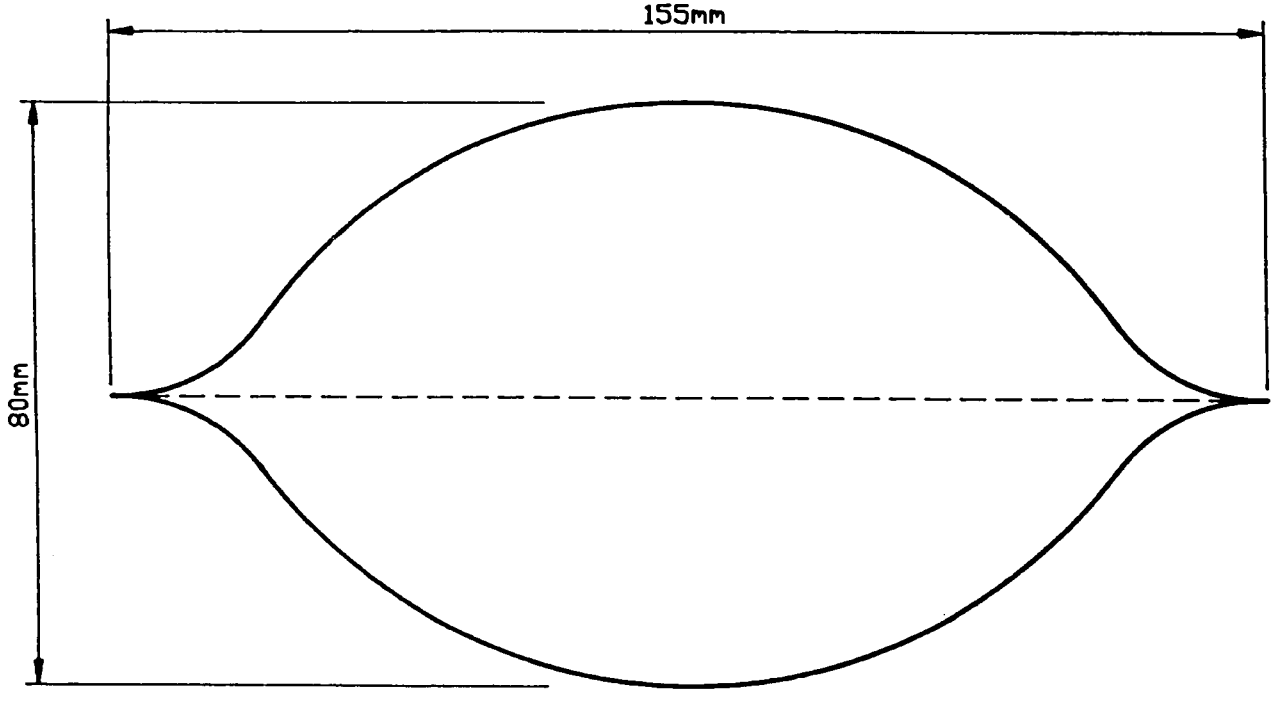
PACKAGING ENGINEERING	FRONT VIEW ORS DELTA BOTTOM POUCH

DRAWN BY:	Frank K.
SCALE:	1:2
DATE:	8/22/91
DWG. NO.	PG-004-A



SIDE VIEW

Land O' Lakes, Inc. 4001 LEXINGTON AVENUE NORTH, ARDEN HILLS, MINNESOTA	DRAWN BY: Frank K.
	SCALE: 1:2
SIDE VIEW OF ONE LITER DELTA BOTTOM STAND UP POUCH	DATE: 9/25/91
	DWG. NO. PG-011-A



Land O' Lakes, Inc. 4001 LEXINGTON AVENUE NORTH, ARDEN HILLS, MINNESOTA		DRAWN BY: Frank K.
		SCALE: 1:1
PACKAGING ENGINEERING	BOTTOM VIEW OF DELTA BOTTOM STAND UP ORS POUCH	DATE: 8/22/91
		DWG. NO. PG-003-A

IV. LIQUID ORS IN ASEPTICALLY FORMED AND FILLED TETRA BRICK

CONCEPT DESCRIPTION:
A 1 liter aseptic (shelf stable) tetra brick containing liquid ORS is dispensed into a bowl and fed to child using a spoon. Directions are clearly illustrated.

PACKAGING COMPONENTS: A shelf stable tetra brick

DESCRIPTION:

Material: (inside to outside)	Polyethylene Ionomer Aluminum Foil Polyethylene Tie Layer Base Paperboard Polyethylene
Forming Process:	Tetra Pak model TBA10
Wall thickness:	11.8 mils
Capacity:	1 liter
Decoration:	1 color print or pressure sensitive label
Weight:	31.93 grams

PACKAGING MATERIAL COST ESTIMATE IN U.S. DOLLARS:

Contact Tetra Pak Lahore, Pakistan for current pricing.

SAMPLE DIRECTIONS FOR TETRA BRICK

- Using knife or scissors, cut open into top of tetra brick.
- Dispense contents of package into bowl.
- Feed solution to child using spoon.
- Store opened package in cool place for no more than 12 hours.

These would also be illustrated with line drawings of each step for those who do not read.

IV. **Tetrabrik** of prepared aseptically packaged liquid.

A. **Function and Utility**: What obstacles are overcome?

- This quantum improvement in **convenience** and **safety** is delivered with a shelf stable pre-prepared liquid ORS. It eliminates the need for any measuring and preparation, and insures a safe water diluent for the ORS.

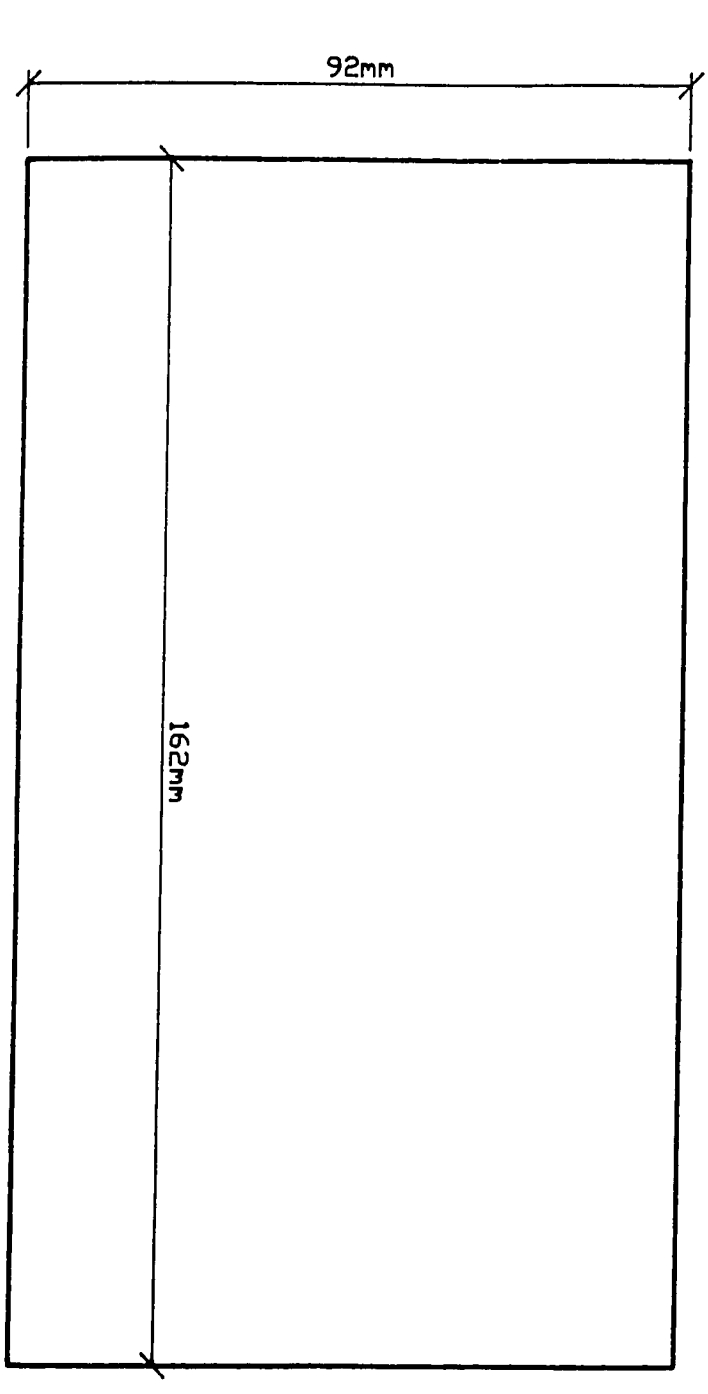
B. **Shelf Life**: One year ambient storage.

C. **Manufacture**: Requires a pharmaceutical licensed manufacturing facility, a TetraPak aseptic packaging line and an aseptic fluid processing system. See Pritech Report, "Liquid Oral Rehydration Solution (ORS) Packaged Aseptically in Tetra Paks in Pakistan" 1990 for a detailed manufacturing description.

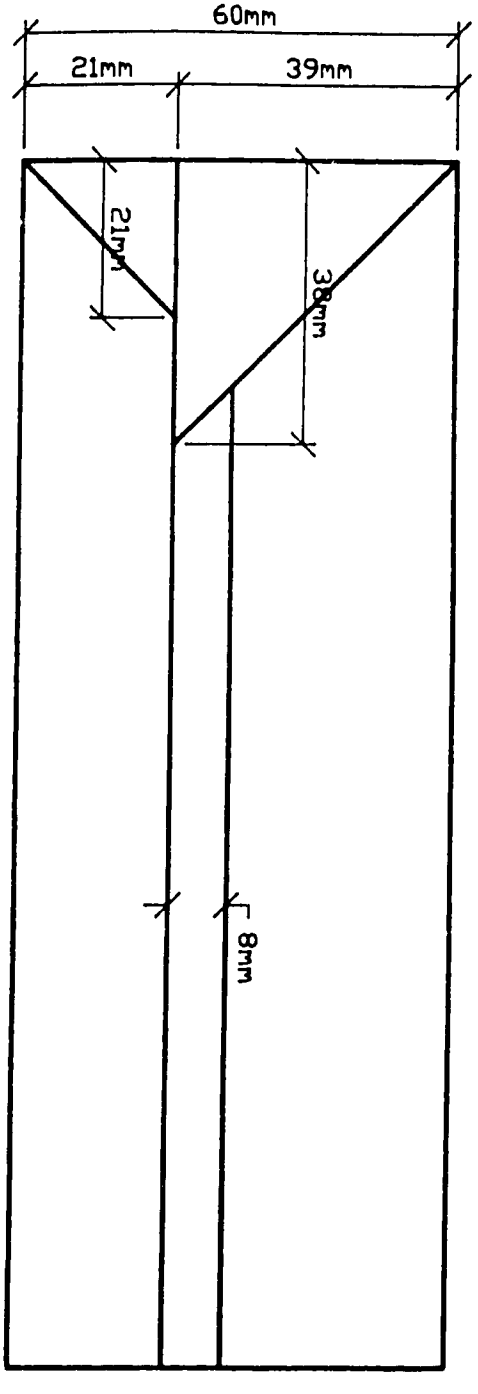
CONCEPT NEGATIVES

- The 1 litre Tetrabrik will be more costly than a dry sachet. Recent indications from Tetra Pak Pakistan are that this difference will not be great and would be well within the expected cost cited in these interviews.

- The Tetra Pak will be bulkier and heavier to distribute and store.

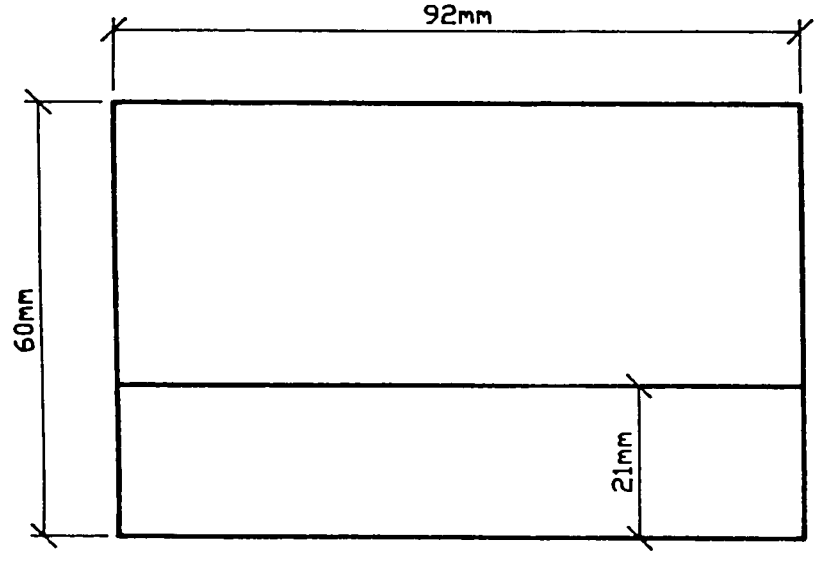


FRONT VIEW

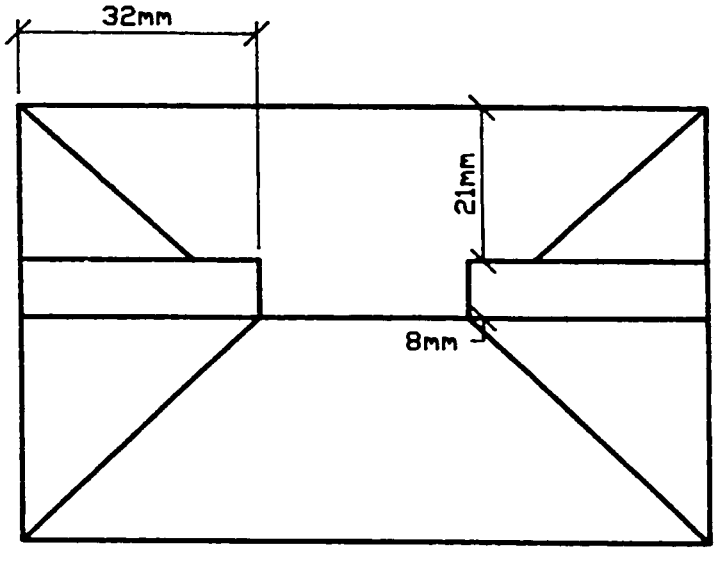


SIDE VIEW

Land O' Lakes, Inc. 4001 LEXINGTON AVENUE NORTH, ARDEN HILLS, MINNESOTA		DRAWN BY: Frank K. DATE: 10/19/90
	ONE LITER TETRA BRICK	SCALE: 1:1 DWG. NO. TB-2



TOP VIEW



BOTTOM VIEW

Land O' Lakes, Inc. 4001 LEXINGTON AVENUE NORTH, ARDEN HILLS, MINNESOTA		DRAWN BY: Frank K. SCALE: 1:1
	ONE LITER TETRA BRICK	DATE: 10/19/90 DWG. NO. TB-3

V. LIQUID ORS IN AN ASEPTIC FLEXIBLE POUCH

CONCEPT DESCRIPTION:
A 1 liter aseptic (shelf stable) pouch containing liquid ORS is pierced with a straw (or opened with a knife and poured into a bowl) for feeding. Directions are clearly illustrated on the pouch.

PACKAGING COMMPONENTS: A shelf stable flexible pouch

DESCRIPTION:

Material:	coextrusion (from outside in) of high density polyethylene/saran/high density polyethylene/ ethylene acrylic acid sealant
Forming Process:	Prepac 3-M aseptic form-fill-seal pouch machine
Thickness:	4.5 mils
Capacity:	1 liter
Decoration:	1 color print or pressure sensitive label

PACKAGING MATERIAL COST ESTIMATE IN U.S. DOLLARS:

Contact PREPAC Lahore, Pakistan.

SAMPLE DIRECTIONS FOR PILLOW POUCH

- Pierce pouch using sharp end of straw.
- Drip solution into child's mouth through straw.

  or
- Pierce pouch using knife.
- Empty contents of pouch into bowl.
- Feed child solution using spoon.

V. **Pouch** of prepared aseptically packaged liquid ORS.

A. **Function and Utility**: What obstacles are overcome?

- This quantum improvement in **convenience** and **safety** is delivered with a shelf stable pre-prepared liquid ORS. It eliminates the need for any measuring and preparation, and insures a safe water diluent for the ORS.

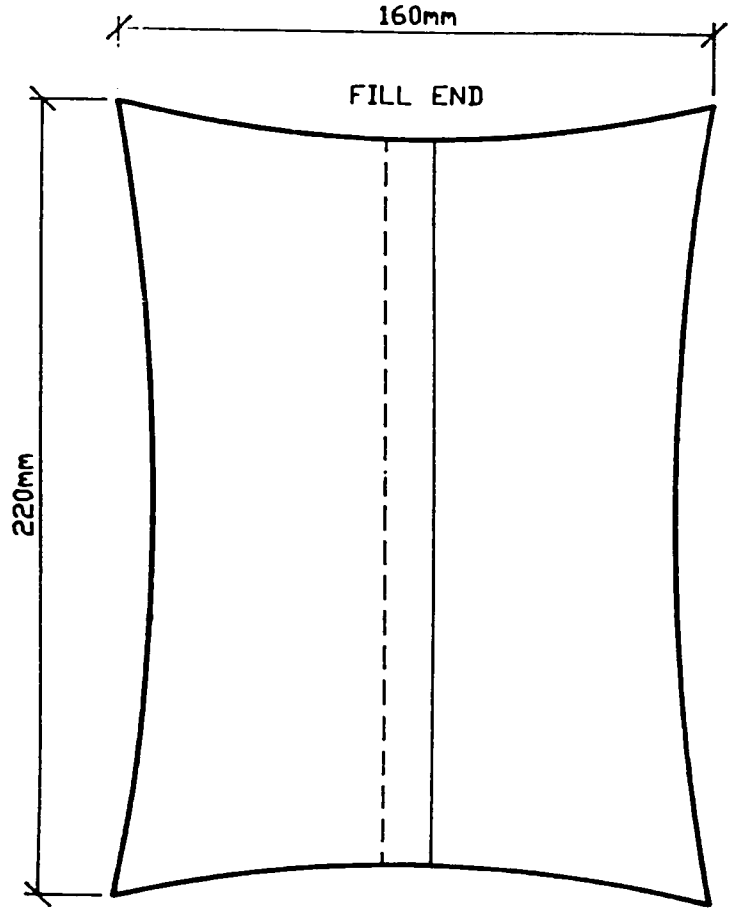
B. **Shelf Life**: 1 year assumed feasible, but not proven in field.

C. **Manufacture**: A French "Prepak" vertical aseptic pouch form, fill, seal machine would be used in conjunction with an aseptic liquid processing line. Systems such as this currently exist in Pakistan for aseptic milk packaging, but can also be employed for an aseptic ORS.

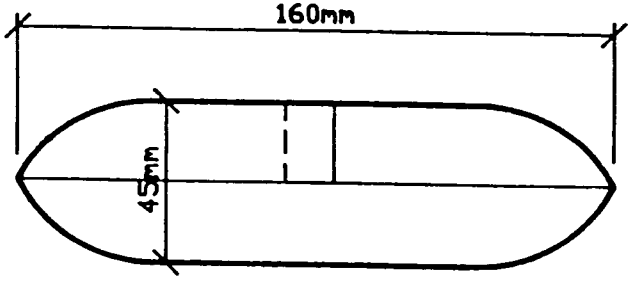
CONCEPT NEGATIVES

- The liquid pouch though a very strong package, none the less creates a **perception** of fragility in the minds of consumers and may inhibit trial. A 1 litre liquid pouch could be cumbersome to handle and once opened, would need to be emptied into another container. It would be difficult to reclose and store.

- For this concept, we would recommend 250 ML pouches. These can be consumed by piercing with a pointed straw, (No leakage occurs if the correct film is used in the pouch) and either dispensing through the straw or drinking directly from it.



POUCH BACK



END SEAL

Land O' Lakes, Inc. 4001 LEXINGTON AVENUE NORTH, ARDEN HILLS, MINNESOTA		DRAWN BY: Frank K.
		SCALE: 1:2
	ONE LITER PREPAC POUCH	DATE: 9/25/91
		DWG. NO. PP-1

INFORMATION SOURCES

Squeeze Bottle
Material cost information for estimated bottle from Plastics World Resin Price Chart, Plastics World, July 1991

Blow molding cost obtained from Empire Container, Kansas City, Missouri, (816)454-4000, contact: Roland Mayer, Jr.

Additional costs:

tooling	molding
1 cavity mold = $ 4,200	1 cavity = $416/M
2 cavity mold = $ 8,000	2 cavity = $208/M
4 cavity mold = $13,950	4 cavity = $104/M

Push/Pull cap costs from Berman Bros., Chicago, IL., (312)226-4035, contact: Wally Fredrick

Plastic Pouch
Preformed pouch costs obtained from Packaging Sales, Inc., 10700 Old County Rd. 15-#410, Plymouth, MN. 55441 (612) 546-1364 contact: John Charlton

Spoon information from Measurex, 2195 Elizabeth Ave., Rahway, N.J., (201)382-7700, contact: Helen Miller

Cup
Information gathered on injection molding costs and lid of cup from Landis Plastics, Inc., 10800 South Center Ave., Chicago Ridge, Ill., (312)239-2390, contact: Jim Landis

Additional costs:

tooling	molding
1 cavity mold = $10,000	1 cavity = $230.18/M
4 cavity mold = $55,000	4 cavity = $ 86.41/M

Material cost information for cup obtained from Plastics World Resin Price Chart, Plastics World, July 1991

Spoon information obtained from Measurex, 2195 Elizabeth Ave., Rahway, N.J., (201)382-7700, contact: Helen Miller

Tetra Brick
Information on material, forming process and wall thickness obtained from "Liquid Oral Rehydration Solution Packaged Aseptically in Tetra Paks in Pakistan", Dr. N. Liable and Mr. R Campbell, 1990

Pillow Pouch
Information on material, forming process and wall thickness obtained from "Liquid Oral Rehydration Solution Packaged Aseptically in Tetra Paks in Pakistan", Dr. N. Liable and Mr. R. Campbell, 1990