COMPARISON OF GLUCOSE AND SUCROSE - ELECTROLYTE SOLUTIONS FOR ORAL FLUID THERAPY OF SEVERE DIARRHEA

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INTRODUCTION.

This trial was prompted by the need for developing oral fluid diarrhea treatment solutions which could be concocted from materials available on the local market. In much of the world, glucose is not available or is too expensive for usage among the poorer classes, whereas sucrose, as table sugar, is both cheap and readily available. Use of sucrose, however, has not been advocated due to theoretical considerations of a presumed high prevalence of disaccharidase deficiency and to a previous uncontrolled trial from which unfavorable conclusions were drawn (Nalin, 1975). We proposed to compare (in an unbiased manner) sucrose to glucose in an oral electrolyte fluid in actively purging hospitalized diarrhea patients.

METHODS

In April through June 1975, both in Matlab and Dacca hospitals, severely volume depleted male children above age 4 and adults were admitted to a prospective study of test oral fluid solutions. Initial rehydration with intravenous Dacca solution was completed in 4-6 hours. If stool output was greater than 10 cc/kg/4 hr., the patient was assigned to a coded test solution by random table, his IV line was stopped, oral tetracycline was begun, and all oral intake was exclusively with the test solution. Each liter of solution contained 96 mEq Na, 25 mEq potassium, 72 mEq chloride, 24 mEq bicarbonate, 25 mEq citrate and either 2000 mg of glucose or 4000 mg. sucrose.

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Careful intakes and outputs were recorded every 4 hours. The patient was strongly encouraged to drink each 4 hours an amount equal to the total output of the previous 4 hours, plus a small amount to replace insensible losses. In patients who refused to drink due to fatique, an NG tube was passed to facilitate fluid replacement. Failure of the test solution was strictly defined as a negative fluid balance of 10 cc/kg/4 hr. period, plus a serum specific gravity equal to or greater than 1,030.

RESULTS

The first table compares the patients randomly entered into the study with either trial solution. The two groups were equivalent in all respects expecting more male subjects in the sucrose group. Thus, ages, nutritional status, admission specific gravity, weight gain after hydration, and bacteriology were comparable.

The second table compares the failure rates between the two groups. The frequency of failure was not significantly different, nor were the rates of stool output or number 4-hour intervals the purging continued. The rate of purging between the success and failure groups in either trial fluid was significantly different, reflecting the fact that severity of diarrhea was the principle determinant of success or failure. In fact, the majority of adult patients who purged more than a litre per hour in the first observation period were failures irregardless of the test oral solution used. Failure rates of 10-15% have been previously documented in hospitalized cholera cases treated with a glucose-electrolyte solution both in Calcutta and Dacca.

The third table compares the diarrheal severity of subjects in each group. If disaccharidase deficiency is prevalent and clinically significant, unhydrolyzed sugers in the gut lumen could be expected to induce an osomotic diarrhea, thus aggravating the current diarrhea. Sucrose-fed patients did have a higher volume of purging after onset of oral fluid therapy, but this was not stistically different from the glucose group. Stool sugar analysis

were performed on aliquota taken 24 hours after initiating oral therapy of each patient. Oral sucrose patients excreted more sucrose and glucose than did oral glucose patients,(Table 4). The standard durations were very large for each group. In view of the lack of significant difference clinically between the sucrose - glucose groups, both in terms of failure rates and purging rates, the data on stool sugars offers little meaningful interpretation.

CONCLUSIONS

Sucrose-electrolyte solution for oral fluid replacement therapy of severe hospitalized diarrhea has been shown in a randomized trial to be equally effective as glucose-electrolyte solution. The principle determinant of failure was the initial purging rate of the patient, not the subsequent oral solution employed. Oral sucrose patients did not experience a significant osmotic diarrhea, as was predicted by others. While small advantages may be conferred on glucose, sucrose should be recommended for general use. These results have import to the majority of the developing world where sucrose is more available than glucose for the home and community production of oral diarrhea rehydration fluid.

SUCROSE-GLUCOSE TRIAL - 1975

COMPARISON OF PATIENT GROUPS

		SUCROSE	GLUCOSE
Number		69	53
SEX:	Male	42*	26
	Female	27	27
AGE:	Median	35	30
	Range	6–80	6–80
Mean Percent of Std. Weight-for-height		75.4(9.6)	743(9.3)
Mean Initial Spec. Grav.		1.0381(.0043)	1.0374(.0048)
Mean Percent Weight Gain After Hydration kg.		8.6(3.2)	8.4(4.0)
Bacteriology:	Vibrio cholerae	29	27
Enterotox.	E.coli	14	7
	Shigella	3	-
Non-agglut.	vibrio	-	3

* P<0.05

COMPARISON OF FAILURE RATES IN TREATMENT GROUPS

			Diarrhea during treatment	
SUCROSE			Total rate (gg/kg/4 hr)	Duration (# 4 hr. intervals)
Failure (All)	10*	14.5%	69.2±52.2**	5.8±3.8
(Cholera)	9	32%		
(Non-cholera)	1	3%		
Success (All)	59		22.0±14.3	5.1±2.5
GLUCOSE				
Failure (All)	6	11.3%	57.3±22.2**	7.3±4.0
(Cholera)	5	19%		
(Non-cholera)	1	4%		
Success (All)	47		22.0±16.2	8.5±4.1

* $X^2 = 0.29$, not significant

** $P < 0.005$

HYDRATION SEVERITY AFTER STARTING ORAL SOLUTION

		Total Stool Rate (cc/kg/4 hr.)	Duration (#4 hr. intervals)
Sucrose Electrolyte Solution			
Cholera	N = 29	46.7±37.2•	5.9±3.0••
Non-cholera	N = 40	16.5±9.3	4.8±2.4
All	N = 69	28.8±28.7	5.2±2.7
Glucose Electrolyte Solution			
Cholera	N = 27	36.1±21.7•	5.9±3.0••
Non-cholera	N = 26	15.6±11.5	3.3±1.2
All	N = 53	26.0±20.2	4.6±2.6

±Differences between cholera and non-cholera

• $P<0.001$

•• P not significant