

Oral Rehydration Therapy

Oley Meeting
St Petersburg Florida
July 1, 2009

Rehydration Therapy

Ezra Steiger MD
Cleveland Clinic

**We are all
water creatures.**



It makes up:



50 % of your body
(Female)

**60% of your Body
(Male)**





70% of your brain



Coach: Gatorade not only quenches your thirst better, it tastes better too

Bobby: No, you people are drinkin the wrong water

Coach : Gatorade

Bobby: H2O

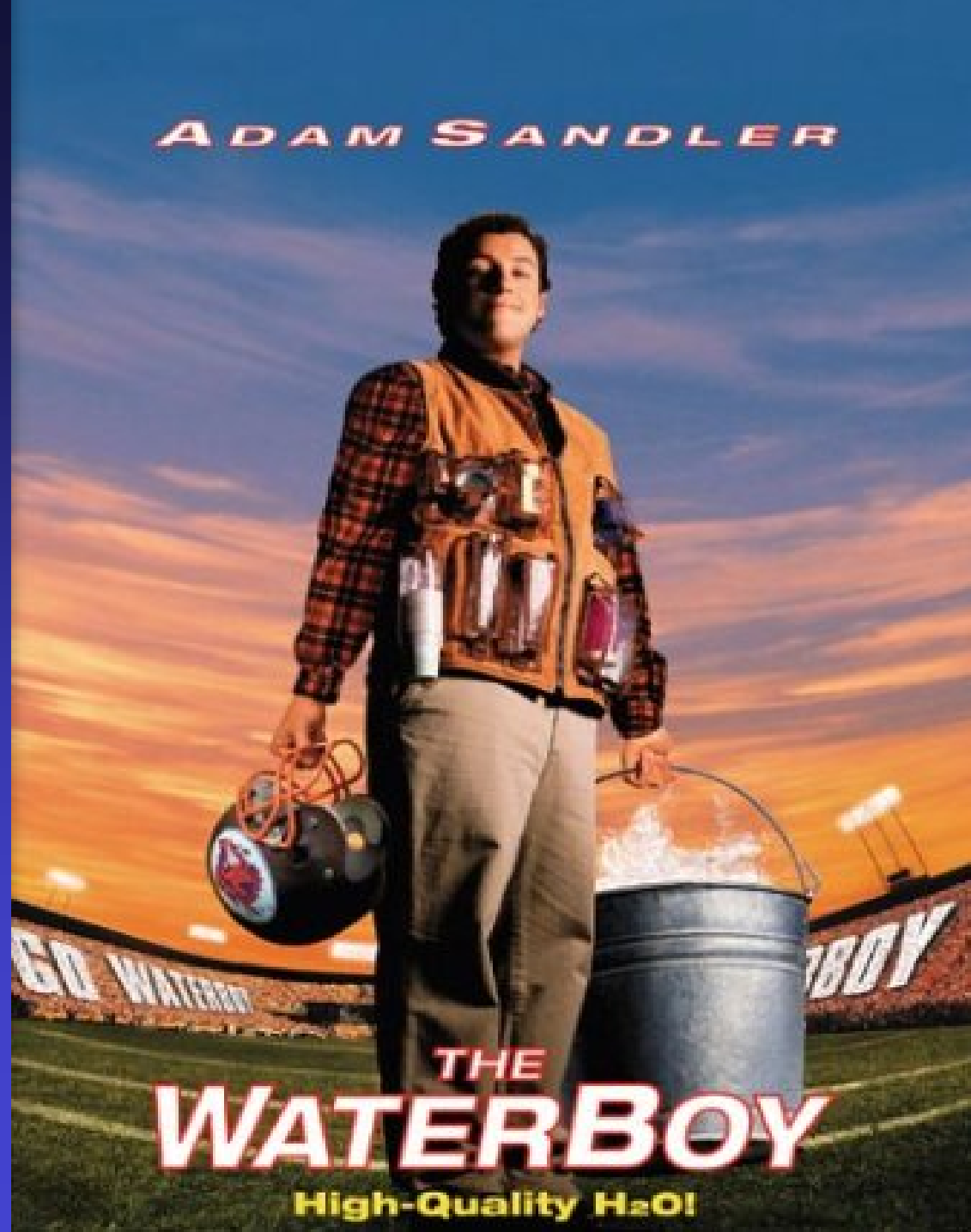
Coach : Gatorade

Bobby: H2O

Coach: (singing)

Water sucks, it really, really sucks!

Water sucks, it really, really sucks!



WATER ?

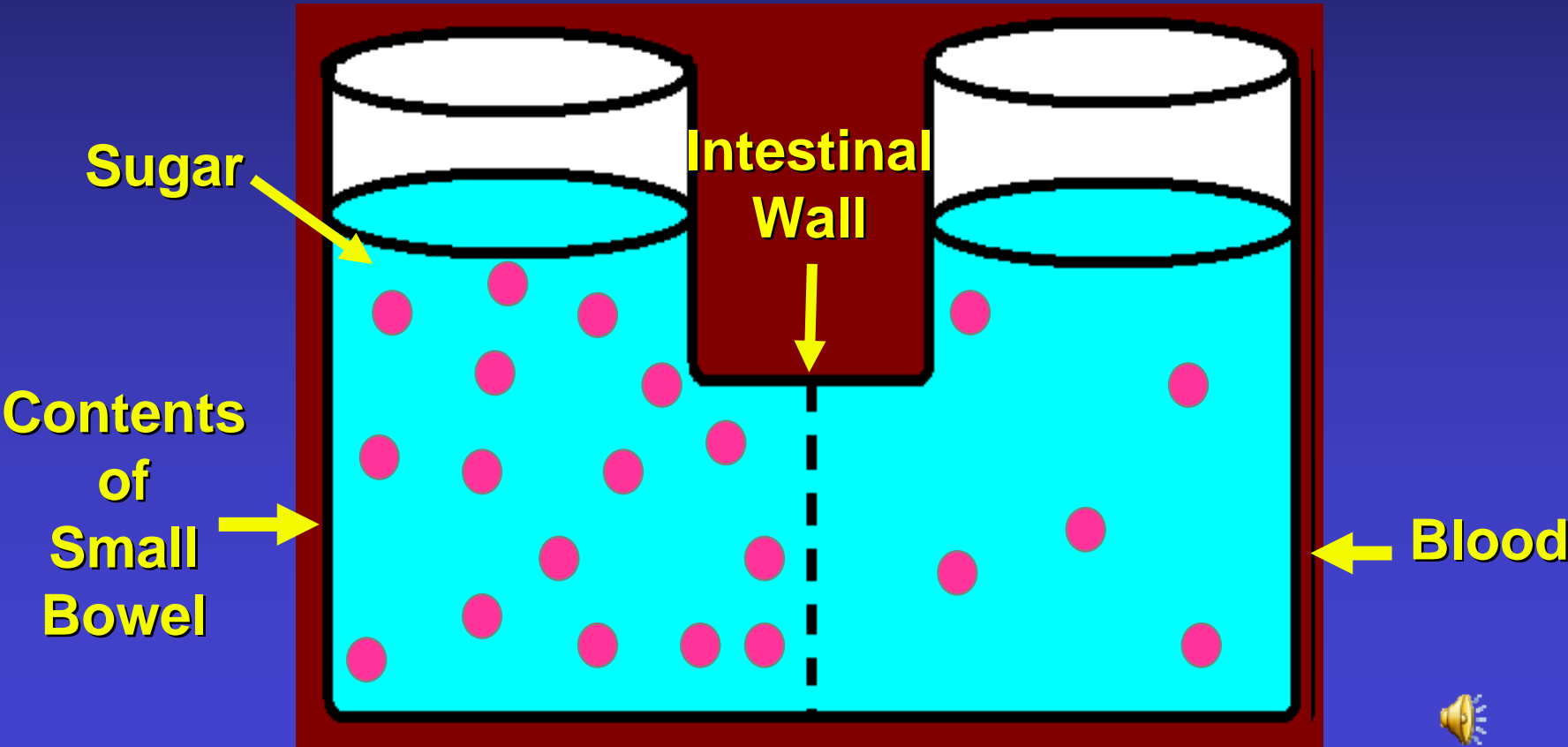
SPORTS DRINK ?

**ORAL REHYDRATION
SOLUTION ?**

Intestinal Fluid Dynamics

- Sodium
- Water
- Sugar
- Osmolality

Intestinal Fluid Dynamics

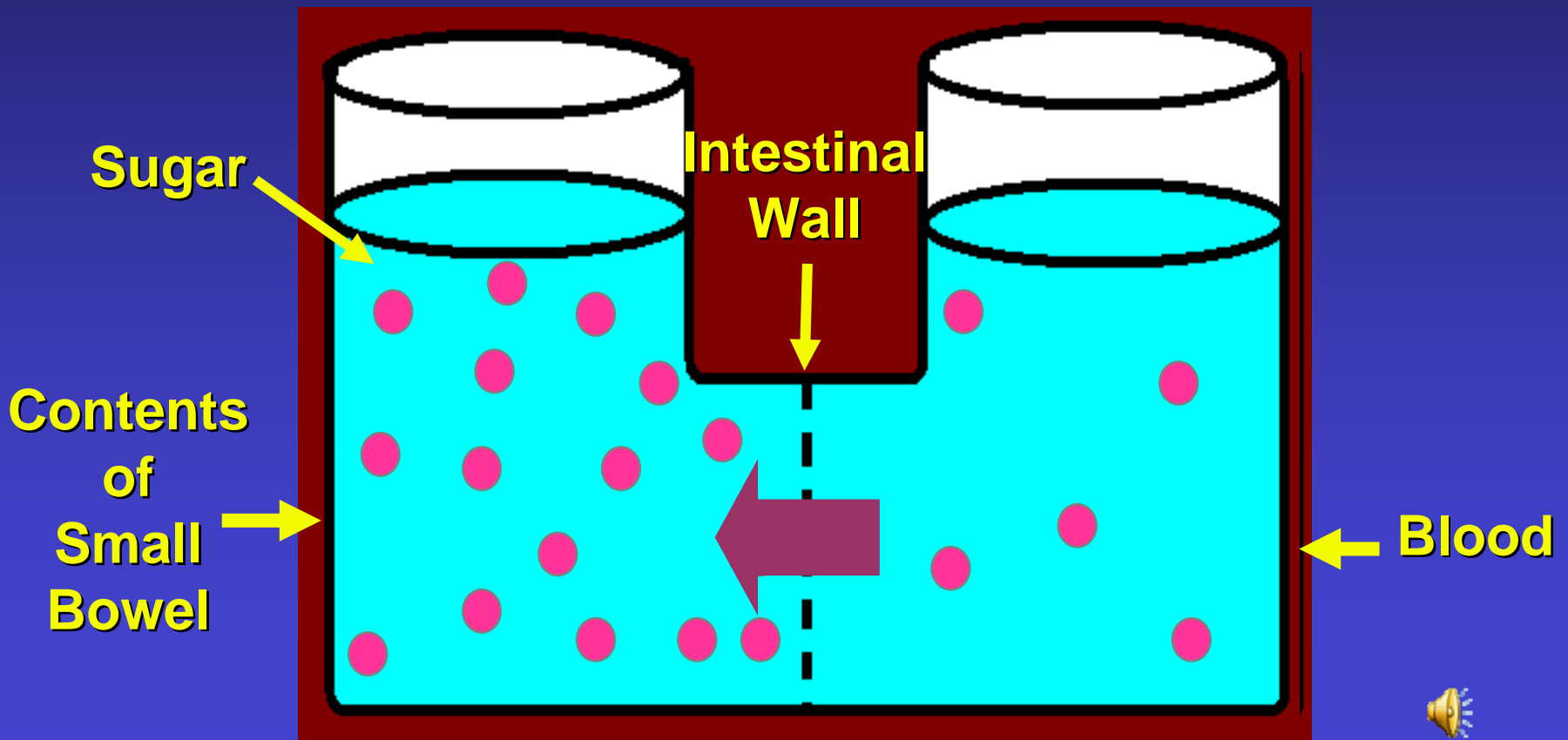


Courtesy of Darlene G Kelly MD, PhD



Intestinal Fluid Dynamics

= Diarrhea → Dehydration



Courtesy of Darlene G Kelly MD, PhD



Acute Fluid Volume Deficit

- BP low
- Heart Rate increased
- Urine output low
- Recussitate with isotonic solutions such as Ringers

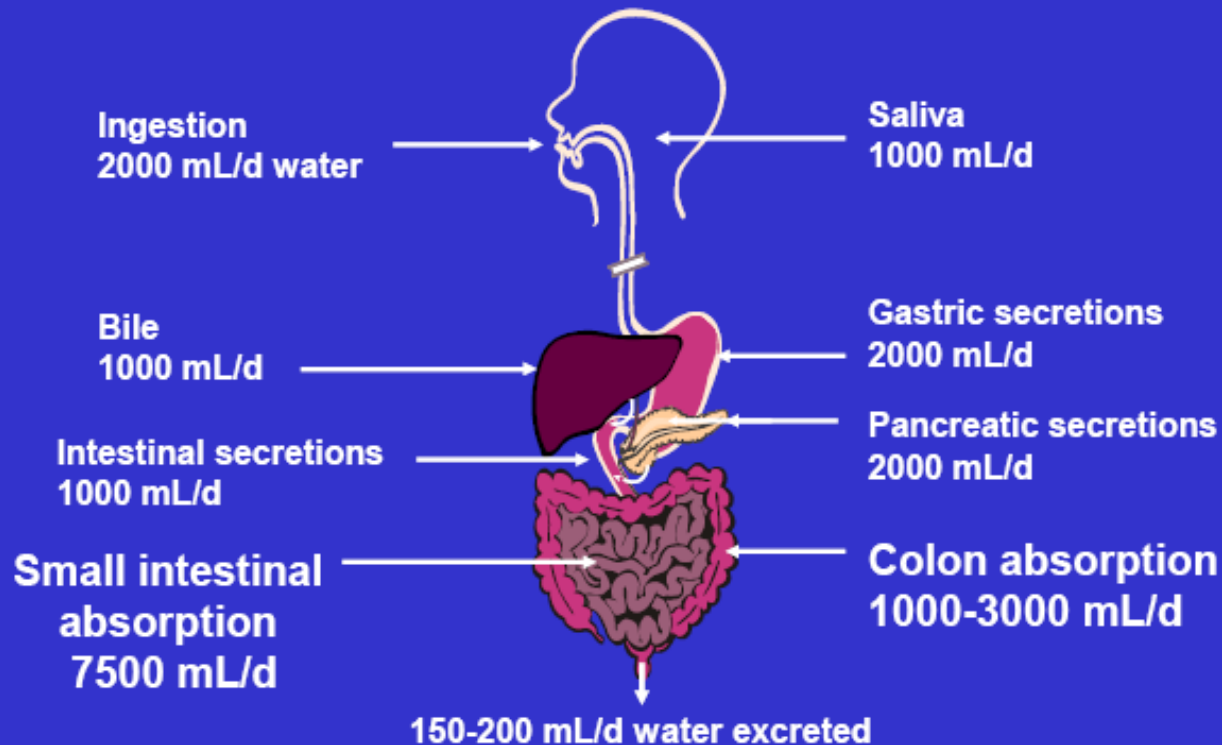
Consequences of Dehydration

- Each 1% of dehydration increases body temperature by 0.1-0.2 degrees C
- Heat loss by evaporation of sweat is decreased when a person is dehydrated
- Each 1% of dehydration increases the heart rate by 4 beats per minute
- When dehydration exceeds 2% work performance is decreased

Chronic Fluid Volume Deficit

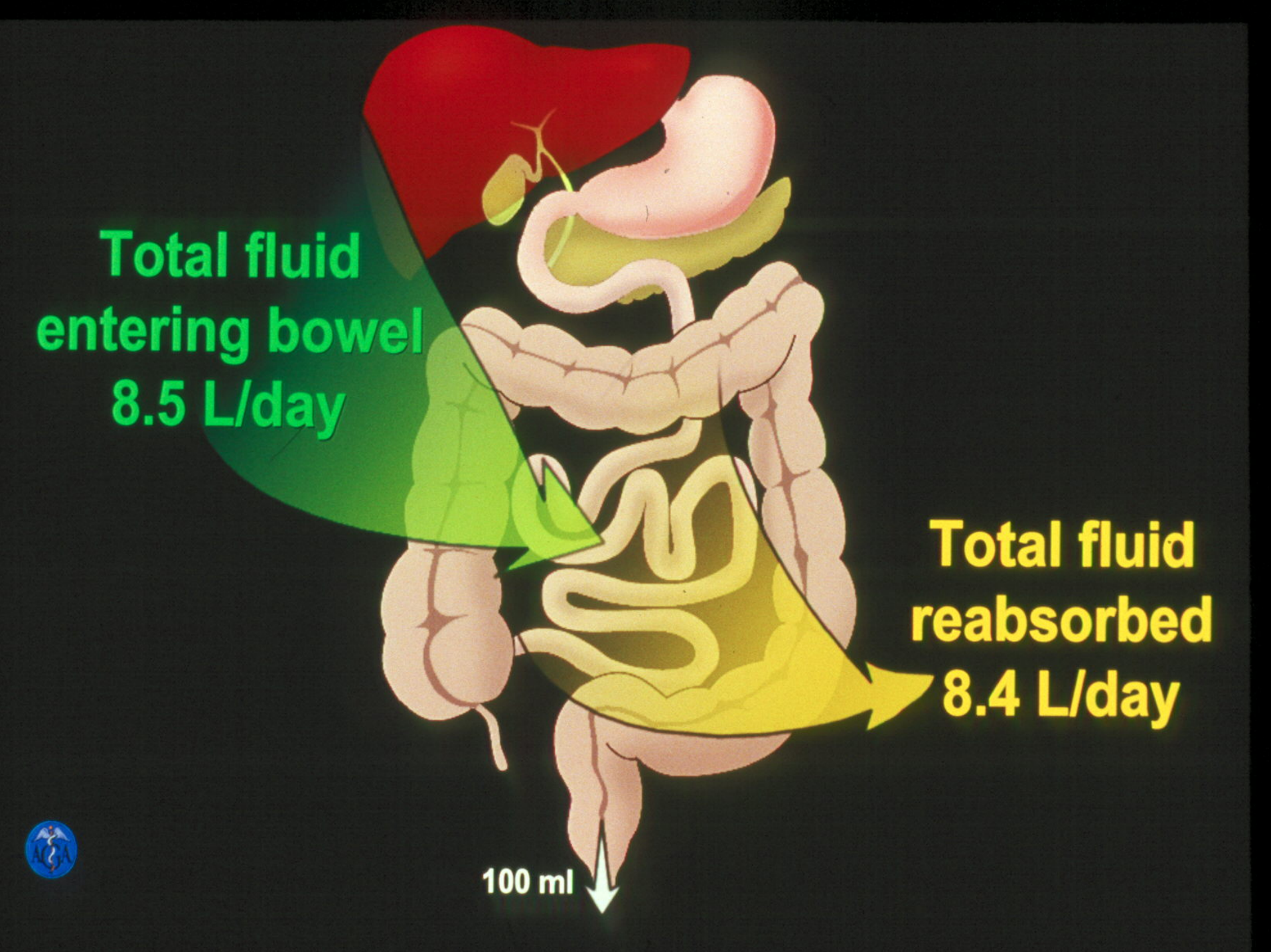
- Decreased skin turgor
- Weight loss
- Sunken eyes
- Hypothermia
- Oliguria
- Hypotension
- Tachycardia
- BUN/Cr >15
- Hematocrit elevated (6-8 points for each liter deficit)
- Urine sp gr high
- Urinary Na $<20\text{mEq/L}$

Fluid Secretion and Absorption



Ingestion + secretion = 9 L

Absorption = 8.8 L



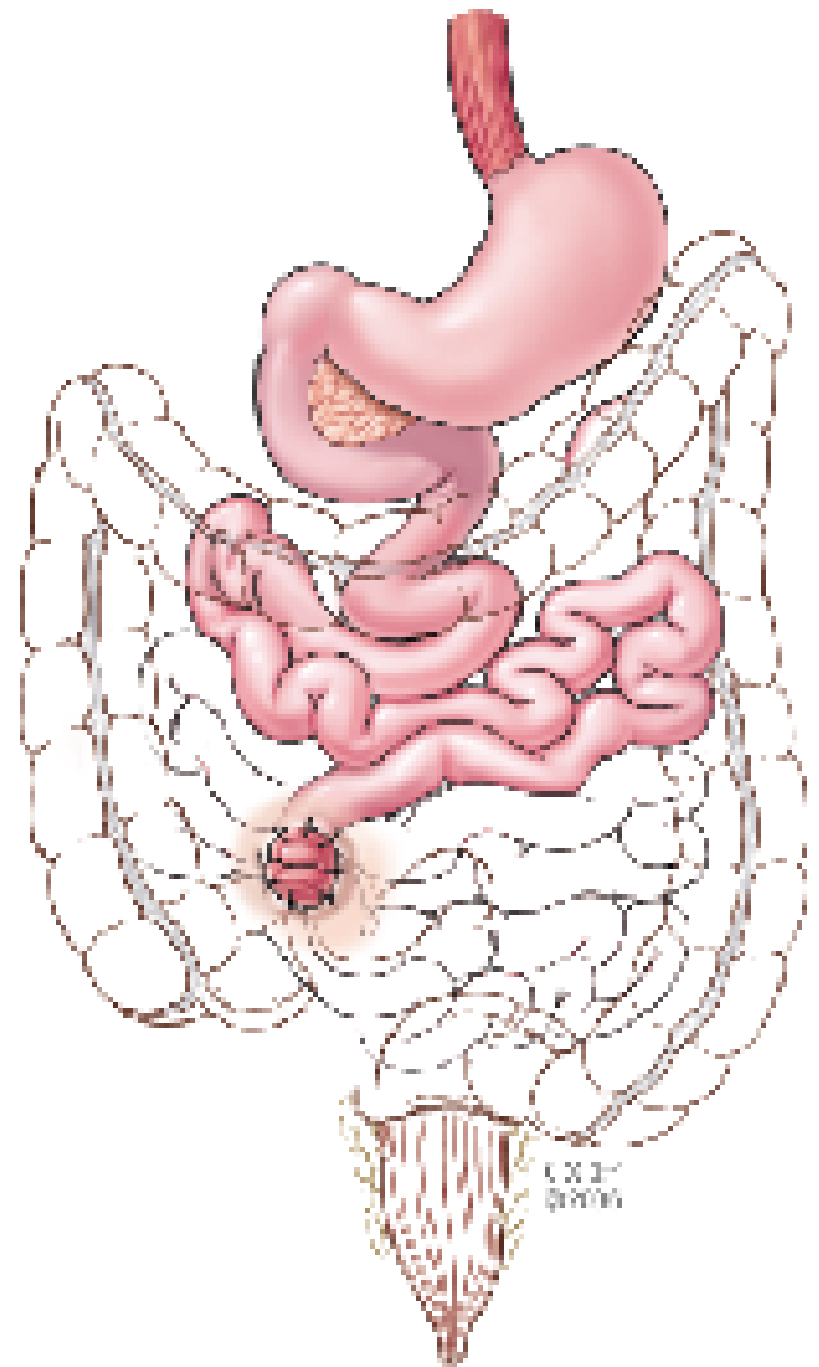
**Total fluid
entering bowel
8.5 L/day**

**Total fluid
reabsorbed
8.4 L/day**

100 ml



Short Bowel Jejunostomy



Composition of Body Fluids

	Na+	K+	Cl-	HCO ₃ ⁻
Plasma	135-150	3.5-5	98-106	22-30
Gastric	10-150	4-12	<u>120-160</u>	0
Bile	<u>120-170</u>	3-12	80-120	30-40
Sml Int	80-150	2-8	70-130	20-40
Diarrhea	25-130	<u>10-60</u>	20-90	20-50

Challenges in the Management of Diarrhea

- Replace Fluid Loss
- Replace Sodium (Na) Loss

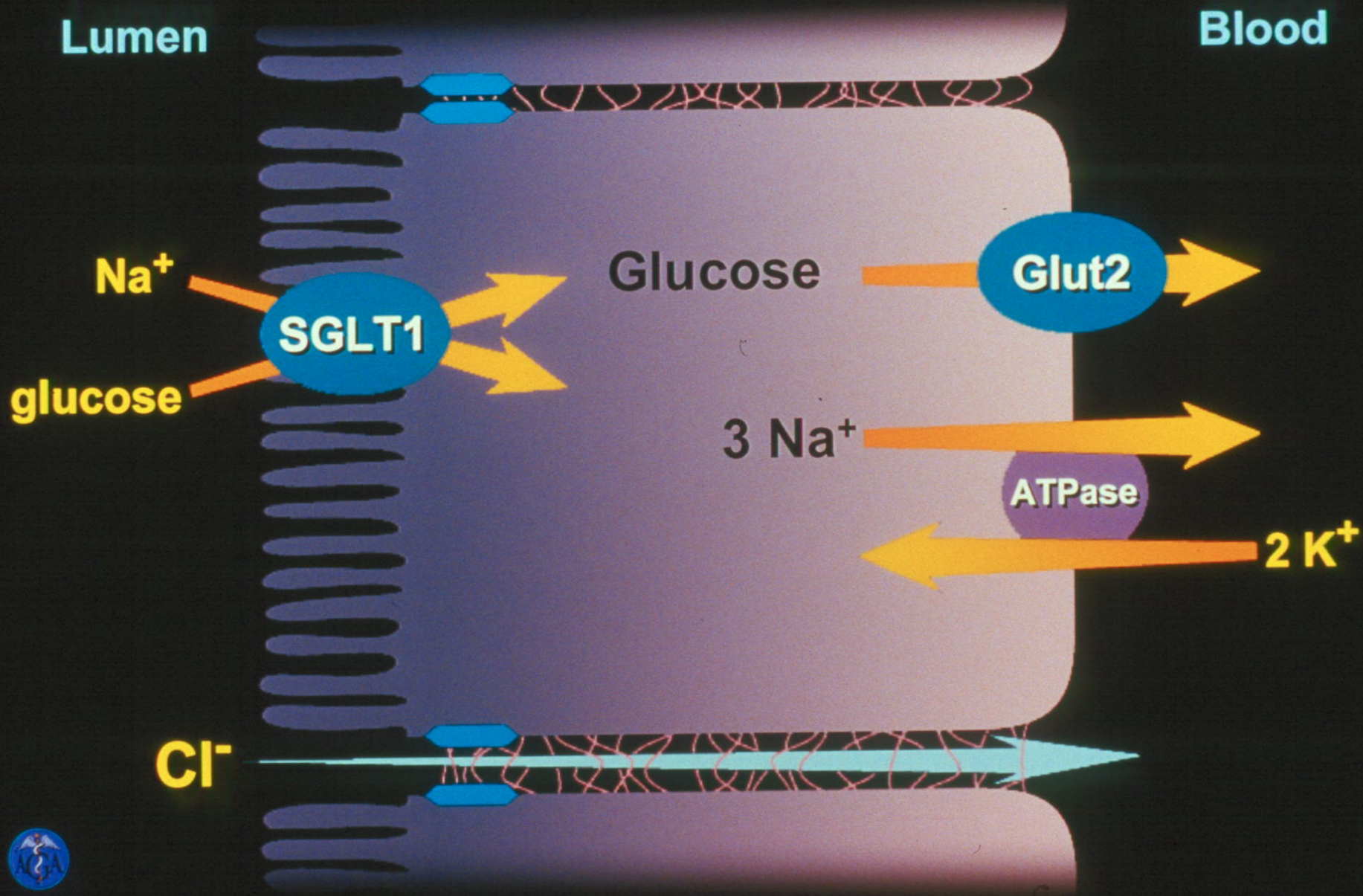
Oral Rehydration Therapy History

- Sushruta Indian physician – 1,000 BC
- Tepid water with rock salt and molasses

Oral Rehydration Therapy

History

- **Darrow** The retention of electrolyte during recovery from severe dehydration due to diarrhea **1946**
- **Chatterjee** Control of vomiting in cholera and oral replacement of fluid **1953**
- **Hirschhorn** Decrease in net stool output in cholera during intestinal perfusion with glucose containing solutions **1969**



Sodium/Glucose Co-Transport

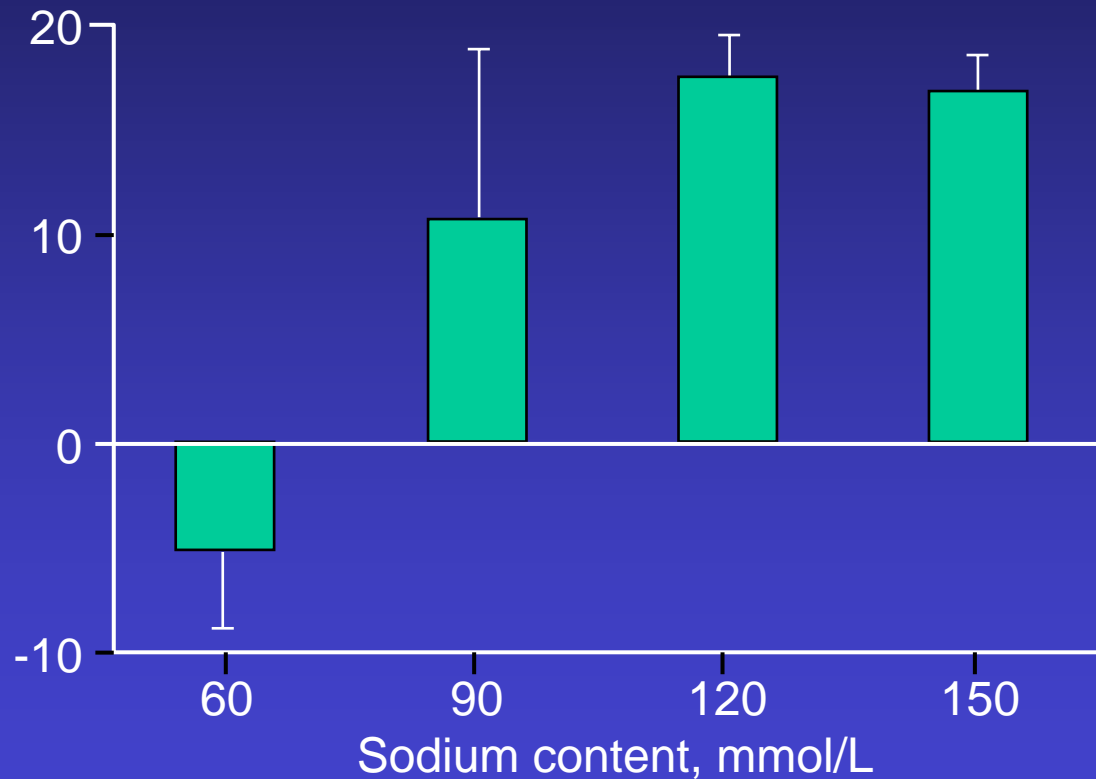


Oral Rehydration Therapy History

- **Mahalanabis** Oral fluid therapy of cholera among Bangladesh refugees **1973**
Mortality reduced from 30% to <4%
- **Journal Lancet** “The discovery that sodium transport and glucose transport are coupled in the small intestine, so that glucose accelerates the absorption of solute and water was potentially the most important medical advance this century.” **1978**

Oral Rehydration Solutions

Sodium balance in Short Bowel Syndrome



Rodriguez CA, et al. Clin Sci. 1988;74(suppl18):69.

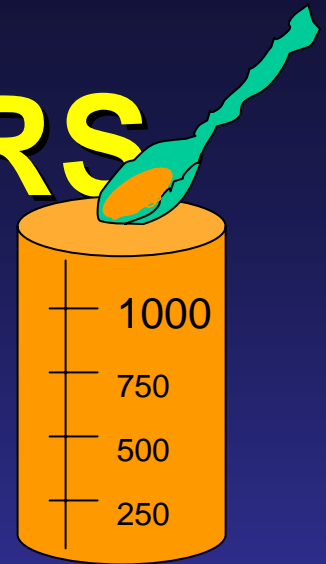
Oral Salt Supplements for Patients with a High Output Jejunostomy

- Extra sodium was absorbed with each form of supplement
- 2 patients receiving salt capsules vomited
- A sipped glucose salt solution seems to be the optimal mode of sodium replacement

Oral Rehydration(?) Solutions

	Na	Carbohydrate *	Osmolality
	mMol/L	gm/L	mOsm/kg
WHO-ORS	90	20	310
Rice-based	90	40	260
Pediatric solution	50	20	270
Sports drink	20	20	145
Ginger ale	3	90	540
Apple juice	3	124	730
Chicken broth	250	0	450

Home Recipe for ORS



1 liter water

$\frac{3}{4}$ teaspoon table salt

4 tablespoons sugar (sucrose)

1 teaspoon baking powder (or $\frac{1}{2}$ teaspoon baking soda)

$\frac{1}{2}$ teaspoon 20% potassium chloride (by prescription)

Sugar-free artificial flavoring/sweetener to taste

WHO/UNICEF Oral Rehydration Solutions vs Home Recipe (mmol/L)

	Standard ORS	Home Recipe
Sodium	90	98
Chloride	80	77
Glucose	111 (20.0 gm)	146 (50.2 gm) *
Potassium	20	As needed
Citrate	10	----
Osmolarity	311	321

* sucrose

WHO/UNICEF Oral Rehydration Solutions (mmol/L)

	Standard ORS	Reduced osmolarity ORS
Sodium	90	75
Chloride	80	65
Glucose	111 (20.0 gm)	75 (13.5 gm)
Potassium	20	20
Citrate	10	10
Osmolarity	311	245

Reduced Osmolarity ORS vs Standard ORS in Hospitalized Children

- Decreased stool output
- Less vomiting
- Less need for IV fluid
- No increase in hyponatremia

Pediatrics 107:613-618, 2001.

Cochrane Library Review Issue 2 , 2009

G2 + Salt vs WHO Reduced Osmolarity Oral Rehydration Solution (mmol/L)

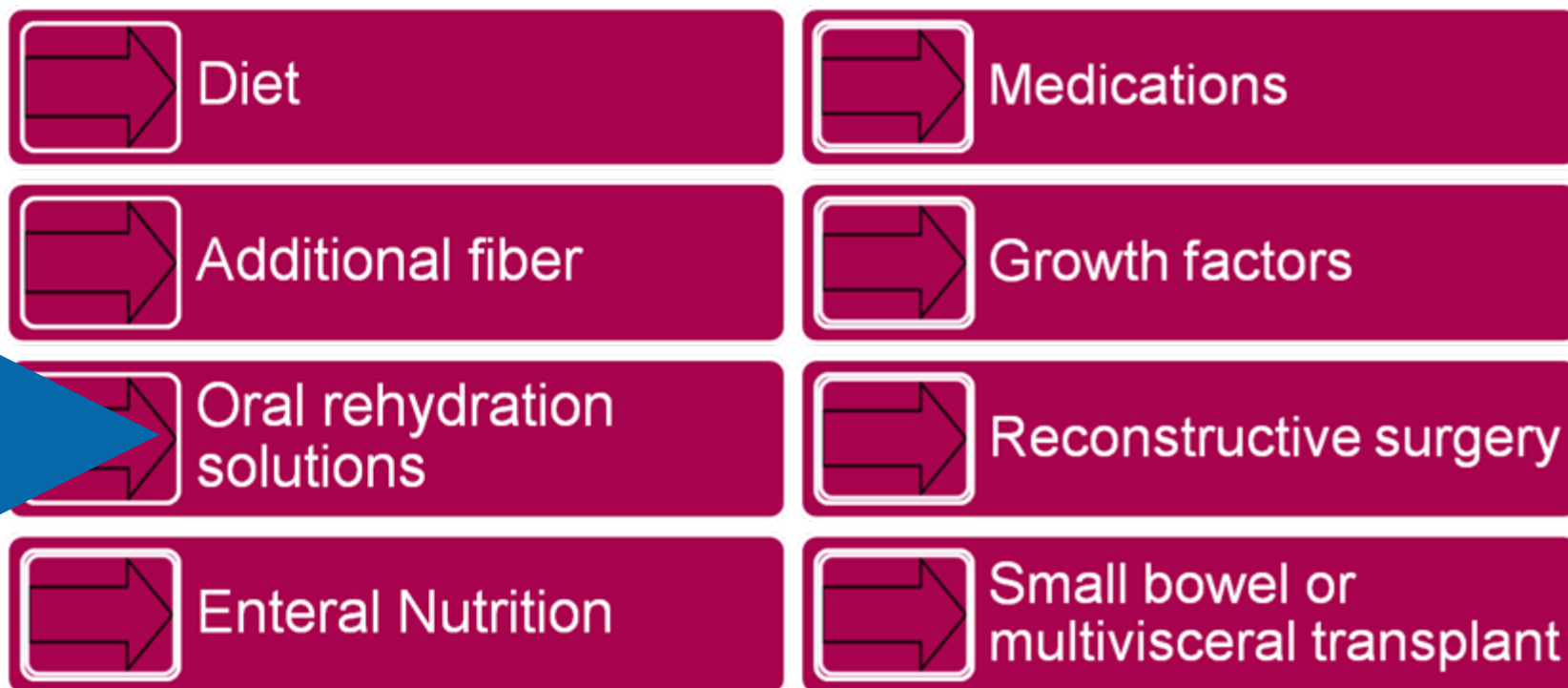
	Gatorade G2 + ½ tsp salt	Reduced osmolarity ORS
Sodium	63	75
Chloride	32	65
Glucose	156 (28 gm)	75 (13.5 gm)
Potassium	3	20
Citrate	---	10
Osmolarity	254	245

A close-up photograph of a clear glass, likely a water glass, with the word "THIRST" printed in a bold, blue, sans-serif font across its center. The glass is partially filled with water, and the background is a soft, light blue gradient. The lighting is bright, creating highlights on the rim and the surface of the glass.

THIRST

Intestinal Rehab & Transplant Program (IRTP)

To enhance absorptive capacity, improve nutritional status, and reduce need for PN through the use of:

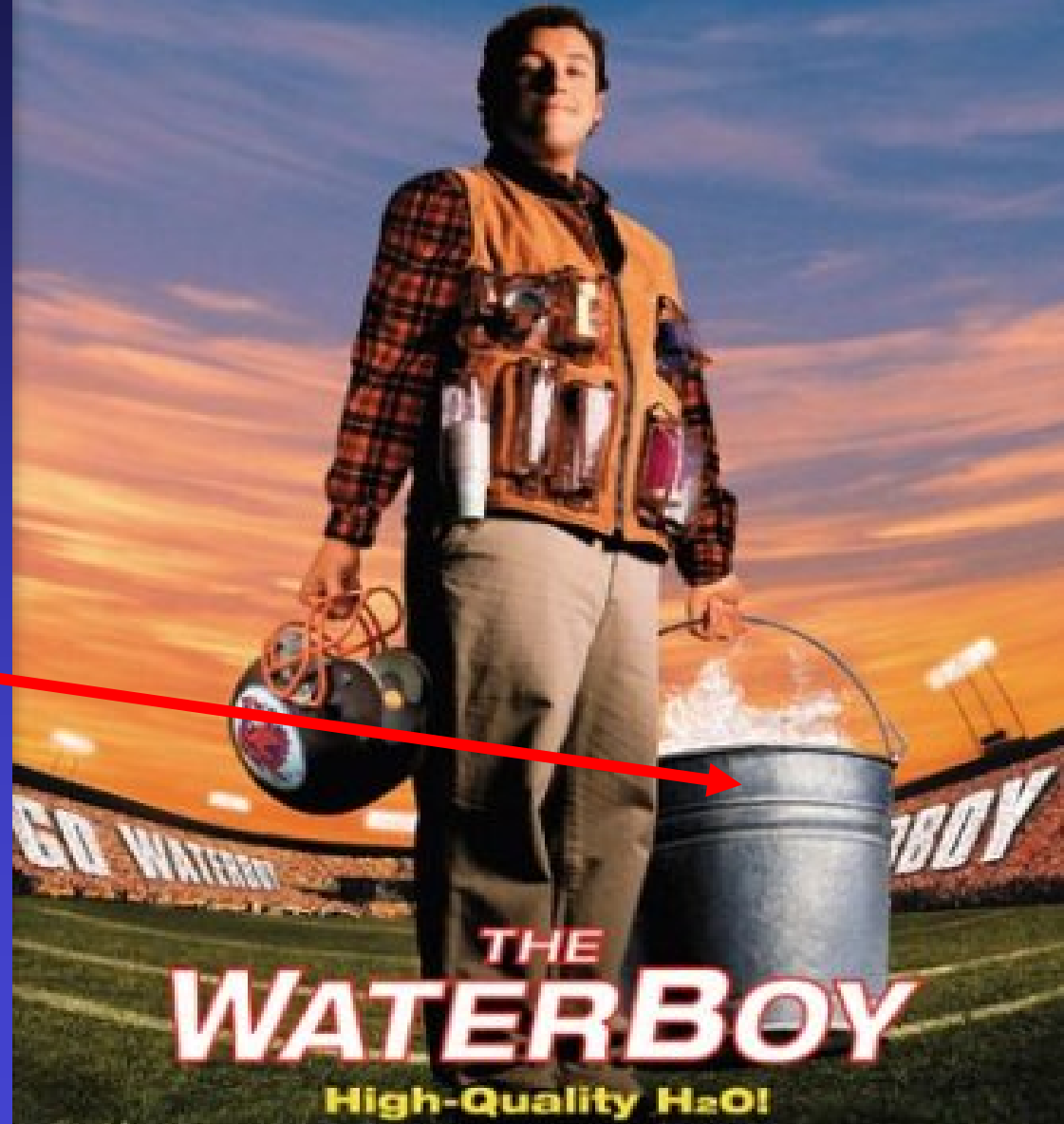


H₂O

Sport Drink

ORS

ADAM SANDLER



THE
WATERBOY

High-Quality H₂O!

The End