

# Short Bowel Syndrome – Diet, Hydration, and Treatment

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## Disclosures

- ▶ Shire Gattex publication advisory board
- ▶ The material presented is based on best known clinical evidence

## Learning Objectives

- ▶ Describe the physiological consequences of short bowel syndrome (SBS)
- ▶ Explain the functional changes associated with intestinal adaptation in SBS
- ▶ Describe the dietary strategies for reducing dependence on parenteral nutrition

## Short Bowel Syndrome (SBS): Most common form of intestinal failure

Anatomy >>

A debilitating, complex disorder that may be life-threatening<sup>1,2</sup>

Associated with either loss of portions of the intestine or loss of intestinal function<sup>2,3</sup>

Typically follows extensive surgical resection of the intestine due to disease, trauma, or congenital defects<sup>2,4</sup>

Results in the inability to maintain fluid and nutrient balances through a normal diet<sup>2</sup>


**Possible causes of resection<sup>3,5</sup>:**

- Vascular catastrophes (eg, embolism/thrombus)
- Complications of bariatric surgery
- Trauma
- Malignancy
- Radiation enteritis
- Volvulus
- Strangulated hernias
- Short bowel fistulas
- Crohn's disease

1. Hofstetter S, et al. *Curr Med Res Opin.* 2013;29(5):495-504; 2. O'Keefe SJ, et al. *Clin Gastroenterol Hepatol.* 2006;4(1):6-10; 3. Nightingale JMD. *Intestinal Failure.* 2001:177-198; 4. Buchman AL. *Nutrition.* 1997;13(10):907-913; 5. Parish CR. *Practical Gastroenterology.* 2005;31:67-106.


## Surgical Resections and Short Bowel Syndrome

**Jejunostomy (end jejunostomy)  
Type 1**




- Common reason for SBS
- Dehydration begins immediately postsurgery
- Jejunal output greatest after food and drink consumption

**Jejunocolic Anastomosis  
Type 2**



- Common reason for SBS
- Weight loss and severe undernutrition occur months

**Jejuno-ileal Anastomosis  
Type 3**




- Less common reason for SBS
- > 10 cm terminal ileum
- If seen, manage as for jejunocolic

Intestinal failure may result from severe intestinal injury or disease through loss of absorption, dysmotility, or obstruction even if the bowel length is normal.

Nightingale J, et al. *Gut.* 2006;55(suppl 4):iv1-iv12. O'Keefe S, et al. *Clin Gastroenterol Hepatol.* 2006;4:6-10.

## Diet Modification: The Foundation of Therapy

- ▶ Nutrition prescription must be based on the remnant GI anatomy
- ▶ Most potent stimulus to intestinal adaptation




### Comparison of Two Nutrition Prescriptions: Cornerstone of Diet Education

	Colon	No Colon
Carbohydrate	50-60% of total calories (limit simple sugars)	40-50% of total calories (restrict simple sugars)
Protein	20-30% of total calories	20-30% of total calories
Fat	20-30% of total calories (primarily essential fats)	30-40% of total calories (primarily essential fats)
Fluid	Isotonic fluids or Hypo-osmolar fluids	Isotonic, high sodium oral rehydration solution
Soluble Fiber	5-10 grams / day (if stool output is > 3L/day)	5-10 grams / day (if stool output is > 3L/day)
Oxalates	Limit intake	---
Meals	5-6 meals per day	4-6 meals per day


Byrne et al. NCP 15:306, 2000

### Simple vs. Complex CHO



**LIMIT**

- ▶ Sugar
- ▶ Candy
- ▶ Cakes, cookies, pies
- ▶ Regular soda pop
- ▶ Jelly, jam, syrup
- ▶ Ice cream, sherbet
- ▶ Sorbet



**INCLUDE**

- ▶ Pasta
- ▶ Potato
- ▶ Breads
- ▶ Cereals
- ▶ Whole grains as tolerated
- ▶ Fruits and vegetables as tolerated

Types of foods and the way the food is consumed affects absorption...

### 2400 kcal, 50% CHO, 20% Protein, 30% Fat

**Breakfast**

- ▶ 1 cup oatmeal
- ▶ 2 oz lactose-free milk
- ▶ 1 egg
- ▶ 1 English muffin
- ▶ 2 tsp margarine
- ▶ 1 tsp diet jelly
- ▶ 4 oz coffee

**Morning Snack**

- ▶ 1 bagel w/½ oz cheese
- ▶ 1 tsp margarine
- ▶ 1 small banana
- ▶ 4 oz water

**Breakfast**

- ▶ 8 oz orange juice
- ▶ 1 cheese and fruit-filled Danish

Byrne et al., NCP 15:309, 2000

### 2400 kcal, 50% CHO, 20% Protein, 30% Fat

**Lunch**

- ▶ 3 oz baked ham
- ▶ ½ cup cooked rice
- ▶ ½ cup carrots
- ▶ 2 small dinner rolls
- ▶ 2 tsp margarine
- ▶ 4 oz water or diet soda

**Lunch**

- ▶ 1 thin slice cheese pizza
- ▶ 12 oz regular soda

Byrne et al., NCP 15:309, 2000

### 2400 kcal, 50% CHO, 20% Protein, 30% Fat

**Dinner**

- ▶ 4 oz roasted chicken
- ▶ 1 large baked potato
- ▶ 2 dinner rolls
- ▶ 2 tsp margarine
- ▶ 4 oz water or diet soda

**Evening Snack**

- ▶ 1 roast beef sandwich
- ▶ 2 slices bread, 1 oz meat, 1 tsp mayo
- ▶ 1 tsp mustard
- ▶ 1 oz pretzels
- ▶ 4 oz water or diet soda

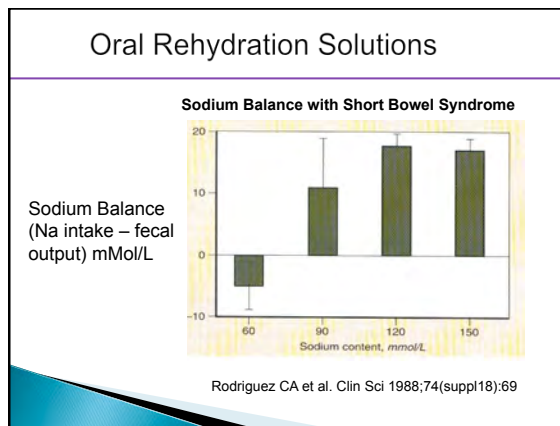
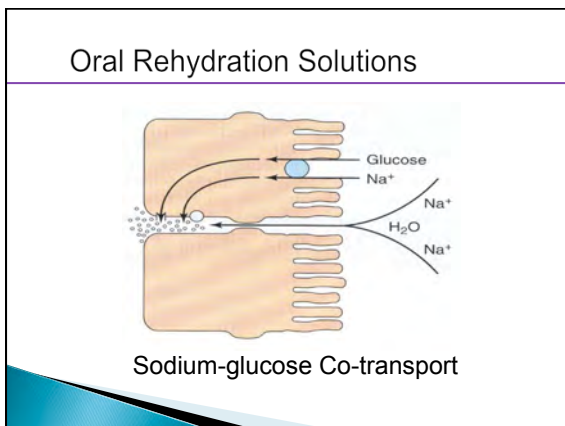
**Dinner**

- ▶ 12 oz T-bone steak
- ▶ 1 large baked potato
- ▶ 1 cup spinach
- ▶ 12 oz beer

**Evening Snack**

- ▶ 3-4 cups popcorn
- ▶ 1 cup raspberry sorbet
- ▶ 12 oz diet soda

Byrne et al., NCP 15:309, 2000



### Oral Rehydration Solutions

	CHO g/L	Na <sup>+</sup> mEq/L	K <sup>+</sup> mEq/L	HCO <sub>3</sub> mEq/L	Osmo mOsm/L
<b>ORS</b>					
WHO Standard Formula	20	90	20	30	310
WHO Reduced-Osmolality Formula	13.5	75	20	30	245
CeraLyte 70	40	70	20	30	235
CeraLyte 90	40	90	20	30	260
CVS Adult Electrolyte Solution	25	45	20		
DripDrop	25	60	20	160 (citrate)	215
Jianas Brothers	20	90	20	10	300
Pedialyte (Abbott)	25	45	20	30	300
Speedlyte (Einosof Biohealth)	75	45	20	9 (citrate)	188
Trioral Rehydration Salts (Trifecta)	13.5	20	20	10 (citrate)	245
<b>Sports Drinks</b>					
Gatorade	60	20	3		340
Gatorade 2 + ½ tsp salt	29	63	3		254

### Prescription for ORS<sup>+</sup>

Rx

No Potassium		Low Potassium	
Water	1 liter	Water	1 liter
Sodium Chloride	½ tsp	Sodium Chloride	½ tsp
Bicitra solution* TBSP	2	Polycitra solution* tsp	3
Glucose polymer powder* (polycose) 4 TBSP		Glucose polymer powder* (polycose) 4 TBSP	

\*By prescription  
#Sugar-free artificial flavoring or sweetener  
\*UPMC protocol

### Recipe for ORS

1 liter water  
 ¾ teaspoon table salt  
 3 tablespoons sugar (sucrose)  
 1 teaspoon baking powder (or ½ teaspoon baking soda)  
 ½ teaspoon 20% potassium chloride\* or salt substitute#  
 Sugar-free artificial flavoring or sweetener

\* By prescription  
 # Concentration: 7-14 mEq potassium per gram; one teaspoon: 5 grams (1/6 oz) = 35-70 mEq potassium

Mayo Clin Proc, 1992; 67:755-760.

### Recipe for ORS

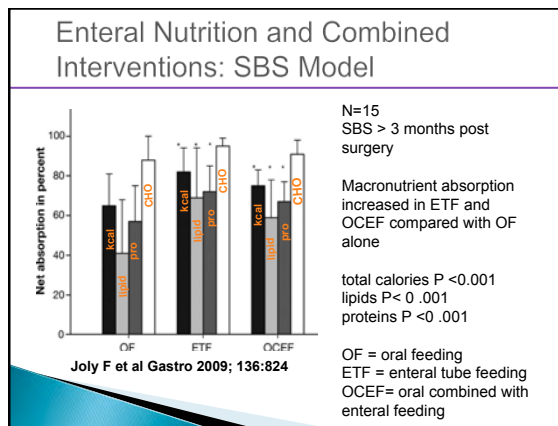
- Gatorade Base  
 2 cups Gatorade  
 2 cups water  
 ½ teaspoon salt
- Grape or Cranberry Juice  
 ½ cup juice  
 3 ½ cups water  
 ½ teaspoon salt
- Apple Juice  
 1 cup juice  
 3 cups water  
 ½ teaspoon salt

Parrish, C. Pract Gastroenterol 2005; 14:67

### Oral Supplements

Nutrient	Strength	Dose
Vitamin A-D-E	25,000 IU of A 1,000 IU of D 400 IU of E	1 tablet PO daily
Calcium citrate	500 - 600 mg tablet	1 to 2 tablets PO TID
Magnesium lactate	84 mg tablet	1 to 2 tablets PO TID
Magnesium gluconate	1000 mg tab (or liquid)	1 to 3 tablets PO TID
Potassium chloride	20 mg tablet	1 to 2 tablets PO daily
Phos (NeutraPhos)	250 mg pkg	1 pkg PO TID
Sodium bicarbonate	650 mg tablet	1 tablet PO TID
Chromium	100 µg tablet	1 to 2 tablets PO TID
Copper	3 mg tablet	1 to 2 tablets PO daily
Selenium	200 mcg tablets	1 tablet PO daily
Zinc sulfate	220 mg tablet	1 to 3 tablets PO daily

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### Summary

WHAT'S YOUR TAKEAWAY?

Takeaway " message:

- ▶ There are a variety of techniques available to treat intestinal failure including diet, medications, hormonal therapy, surgical reconstruction and transplantation
- ▶ Goal: restore intestinal health in the safest most efficacious manner consistent with the patient's lifestyle and wishes
- ▶ Diet is the foundation of therapy

Thank You