Eating Matters: Food and Fluids for SBS and more!

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The information in this presentation is not meant to substitute for medical/nutrition care.
you are what you eat
If you are what you eat, then my dog is a calculator.
Sites of Digestion and Absorption

- Mouth
- Esophagus
- Stomach
- Small Intestine
  - Duodenum
  - Jejunum
  - Ileum
- Large intestine
  - Colon
Function of the SB

• Duodenum
  • Break down and absorption of 50% CHOs, Pro and 90% fat; Absorption of Vits - A, D, E, B-vits, Ca, phos, mg, iron, Cu, Se, folate

• Jejunum
  • Continued digestion and absorption of CHO (not fiber), fat and pro proximally; Absorption of H2O-soluble vitamins, Zn, Cr, Mn

• Ileum
  • Bile acids absorbed and transported back to liver via portal vein, B12, C, folate, Mg; Ileocelecal valve at terminal end slows emptying
Function of Colon

- Ascending, transverse and sigmoid
- Absorption of sodium, potassium, chloride and 1,500 ml of fluid (20% - 80% absorbed in SB), Vitamin K, biotin
- Undigested starches (cellulose, hemicellulose, pectin) fermented into short-chain fatty acids
What do you have?

• Determine the absorption capability of the remaining GI tract for macro and micronutrients

• Fluid needs
Duodenum
absorption of amino acids, iron, mono and disaccharides

Jejunum
absorption of Ca, folate, D, E, A, K, H$_2$O & Na, FFA, monoglycerides

Ileum
absorption of larger amts of H$_2$O & Na, B$_{12}$, intrinsic factor, and bile acids

Colon
absorption small amounts of H$_2$O, lytes, and bile acids
What do you need?

- **Weight** - indicator of nutrition status
  - Usual weight/% usual weight/goal weight

- **Determining calorie need:**
  - ht, weight, age, gender
  - Calories - ~20-30 calories per kg
  - Protein - ~1 gm/kg
  - But........how much do you absorb???
Fluid

- 30 ml/kg – Adults +
  - Other fluid losses (ostomy and d/v
- Is urine output >1 liter/day

Keeping up with daily I and O is vital!

Dehydration can cause fatigue and effects kidney function
Other key questions?

– any nutrient deficiencies present due to missing absorption site?
– diet history and recall with an evaluation not only of intake but also of output related to foods consumed
– review of current medications that could affect GI status or output
Optimize HPN

- Dextrose - ~50-55% of total calories
- Lipids – what kind?? (individualize)
- Amino Acids - adequate protein
- Adequate/optimized vitamins, trace elements
- Fluids – avoid dehydration
- Minimize infusion cycle – day vs night, days/week
- Balance with oral intake
Putting it all together

• Calories/protein/fat (lipid)
• Vitamins/Minerals
• Fluid
• Diet + PN
I ate 38 inches of ribbon & I had to have it surgically removed. I don't know why I ate it?
Diet for SBS

• **Calories/Protein** - ↑ “normal” to account for malabsorption

• **Fluid** - ↑ “normal” to account for output: urine, ostomy, D/V, ileocecal valve? – goal is 1.2 liters of UO/day

• **GI Anatomy** –
  with colon or no colon
Goal for Diet with SBS

- Increase oral intake – small meals 4-6/d
- Weight and strength maintenance
- Fluid maintenance (I=O)
- Decrease symptoms – D, N, V, output
- Adequate multi-vitamins, trace, electrolyte (measure!!)

Diet & HPN
Carbohydrates – Energy Source

- Support growth – 4 kcal/gm
- Role in immunity
- Main energy source for the body
- Enhance intestinal health
- Small amount stored in muscles & tissues for energy
- IV- dextrose 3.4 kcal/gm
Carbohydrate rules!

- Carbohydrates
  - Minimize simple sugars
    - Sugar, Candy, Cakes, cookies, pies
    - Regular soda pop, Jelly, jam, syrup
    - Ice cream, sherbet, sorbet
    - Avoid fluids with added sugar - dilute juices such as OJ and grape juice until sure they are tolerated
  - Maximize complex carbohydrates
    - Pasta, Potato, Breads, cereals
    - Whole grains as tolerated
    - Fruits and vegetables as tolerated
Fermentable Oligo-, Di- and Mono-saccharides and Polyols

- Family of poorly absorbed, short-chain carbohydrates
- Highly fermentable in the presence of gut bacteria
  - Oligosaccharides: Fructans/Galactans
  - Disaccharides: Lactose
- Monosaccharides: Fructose
- Polyols
Careful with these Carbs!

- **Lactose**: occurs in milk from cows, sheep, goats
  - Lactase deficient? milk (16 gm); cottage cheese, yogurts, ice cream & American cheese (4-6 gm)

- **Fructose**: found in every fruit, some vegetables, honey & HFCS, Apple(polyol), pears (polyol), honey, molasses, agave, high fructose corn syrup, guava, mango, dried fruit, watermelon
  - Sucrose–granulated sugar = 1/2 fructose & ½ glucose = OK!

- **Polyols** – sugar alcohols - fruits (apples, apricots, pears, blackberries, nectarines, peaches, plums, prunes, watermelon)/veggies (cauliflower, >1/2 c mushrooms, snow peas)
  - **Sweeteners** - sorbitol, mannitol, maltitol, xylitol, isomalt (aspartame, saccharine, stevia – ok)
Careful with these Carbs!

• **Fructans – chains of fructose – indigestible**
  - Artichokes, asparagus, beets, cauliflower, sweet corn (>1/2 cob), celery, nectarines, watermelon, Garlic, leeks, onions, onion or garlic powder; Pistachios, cashews - All other nuts <2T/svg is OK
  - Wheat products (also barley, rye)– breads, cereals, pasta, prepared products and vegetables
    - try wheat free foods - not gluten-free necessarily but wheat free

• **Fiber supplements containing fructooligosaccharides, (FOS), inulin**

• **Galactans - galactose chain with fructose and glucose at the end – indigestible**
  - mostly legumes, Brussels sprouts, cabbage, chickpeas/hummus, kidney beans, black beans, lentils, Soy products such as soy milk    Tofu and soybean oil OK
**Protein**

- 4 kcal/gm
- Required daily
- Amount 0.8 to 2 gm/kg
- IV Amino Acids
- Diet sources

**Fat**

- 9 kcal/gm
- Essential Fatty acids
- Intravenous lipid emulsion (ILE) lipid – source EFA & kcals
- 2 options for ILE that are FDA approved!
  - 100% soybean oil
  - 30% soybean/30%MCT/25%olive oil/15% fish oil
Full or partial colon

✓ Restrict oxalate - ileum removed with full or partial colon. Prevents kidney stones from forming.

✓ Foods that are high in oxalates include:

- beets
- rhubarb
- spinach
- rhubarb
- berries, tangerines
- nuts
- chocolate
- tea/coffee/cola
- wheat germ
- all dry beans (fresh, canned, cooked) – except lima beans and green beans
- Soy products
- Sweet potatoes
- celery

✓ Extra calcium – bind oxalate and excreted
Fat

• With Colon
  • 20-30% fat, may be malabsorbed with significant ileal resection (steatorrhea)-short-chain fatty acids from carbohydrates fermented by bacteria in colon = energy.

• Without colon
  • Higher fat may be tolerated
  • May supplement with medium chain triglycerides
Fiber

- **Soluble fiber (5-10 g/day)**
  - Slows digestion
  - oatmeal, oat cereal, lentils, apples, oranges, pears, oat bran, strawberries, nuts, ground flaxseed, beans, dried peas, blueberries, psyllium, cucumbers, celery, and carrots.

- **Low fiber foods**
  - Puffed wheat, puffed rice, corn flakes, Special K®, and other cereals containing 1 gram or less of fiber per serving
  - Cream of wheat or rice, White rice, White bread, matzoh, and Italian bread without seeds

- **Insoluble Fiber**
  - Whole-wheat and whole-grain breads, crackers, cereals, and other products, Wheat bran
  - Whole nuts, seeds, and coconut, Fruit skins,
  - Dried fruits
Oral Rehydration Solutions

to prevent/treat dehydration
Must have:
✓ sodium 70-90 mEq (~3/4 tsp - 7/8 tsp)
✓ Glucose (simple carbohydrate in the right amounts)
✓ Isotonic/hypo-osmolar fluids (diluted and easily absorbed by a compromised gut)

New WHO ORS Formula

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Total:</th>
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<tbody>
<tr>
<td>NaCl</td>
<td>2.6 g/L</td>
</tr>
<tr>
<td>Glucose, anhydrous</td>
<td>13.5 g/L</td>
</tr>
<tr>
<td>KCL</td>
<td>1.5 g/L</td>
</tr>
<tr>
<td>Trisodium citrate, dihydrate</td>
<td>2.9 g/L</td>
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</tbody>
</table>

• Use oral rehydration solutions and sip during the day.
• Better chilled
You are not the only ones who need to re-hydrate!!
Calculations

**Sodium (NaCl)**

- 1/8 tsp = 12.5 mEq
- 1/4 tsp = 25 mEq
- 3/8 tsp = 37.5 mEq
- 1/2 tsp = 50 mEq
- 5/8 tsp = 62.5 mEq
- 3/4 tsp = 75 mEq
- 7/8 tsp = 87.5 mEq
- 1.0 tsp =~ 100 mEq

**Sugar**

- ~4.2 g/tsp = 16 kcal

**K**

- 39 mEq/gm
# ORS Products that meet WHO Recommendations

<table>
<thead>
<tr>
<th>ORS</th>
<th>Carbohydrate g/L</th>
<th>Na mEq/L</th>
<th>K mEq/L</th>
<th>citrate mEq/L</th>
<th>mOsm/L</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHO ORS packet (AGS Brands, USA)</td>
<td>13.5g – anhydrous dextrose</td>
<td>75</td>
<td>20</td>
<td>10</td>
<td>245</td>
</tr>
<tr>
<td>TRIORAL (Trifecta Pharmaceuticals, USA)</td>
<td>13.5g - anhydrous dextrose</td>
<td>75</td>
<td>20</td>
<td>10</td>
<td>245</td>
</tr>
<tr>
<td>WHO (new) home-made (<a href="http://www.oley.org">www.oley.org</a>)</td>
<td>27 gm (sugar)</td>
<td>70</td>
<td>20</td>
<td></td>
<td>245</td>
</tr>
</tbody>
</table>
WHO ORS Homemade formula

Make it Yourself Recipes (www.oley.org website)

World Health Organization Recipe

½ teaspoon salt  2 tablespoons plus ¾ teaspoon sugar
½ teaspoon salt substitute (Morton’s)  1 ¼ teaspoons trisodium citrate dihydrate*
Water (to make 1 liter)

To a one liter container, add about 1/2 the needed water. Add the dry ingredients, stir well, then add the remaining water to make a final volume of one liter.

Add Nutrasweet or Splenda-based flavoring of choice if desired.

Total sodium = 70 mEq  Total potassium = 20 mEq  Total carbohydrate = 27 g
Osmolarity: 245 mOsm/L

*Available from Amazon or Prescribed For Life at $12.95 a pound.
Nutrition for IF
What you eat matters!!
What you drink matters!!
WHAT ARE YOU EATING!?