The Renal Diet: A Tough Pill to Swallow

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Role of Nutrition During Renal Replacement Therapy

- Achieve or maintain
  - Ideal nutritional status and balanced diet
  - Acceptable biochemical parameters
  - Prevent long term complications

Focus Nutrients

- Sodium
- Potassium
- Phosphorus
- Fluids
- Calories
- Protein

Renal Diet Prescription

May look something like this…

- 2g Sodium/day
- 2g Potassium/day
- 800mg Phosphorus/day
- 500 – 1000ml fluid/day (2-4cups/day)
- Moderate Protein

SODIUM

- Adequate but not excessive sodium is essential for normal growth and development
- High sodium intake leads to
  - Thirst
  - Fluid Retention
  - Edema
  - Hypertension exacerbation

SODIUM

- Range for healthy adults 1500 to 2300mg/day
- American Men on average 3,100 to 4,700 mg of sodium per day
- American Women on average 2,300 to 3,100 mg
### SODIUM

- **Label Reading**
- Choose unprocessed foods
- Choose lower-sodium processed foods
- "no salt added" canned foods
- Salt-free seasonings (garlic, onion, peppers, herbs, spices)
- No added salt in cooking or at the table
  - ¼ tsp of salt = ~500mg sodium
- Avoid restaurants that do not have low sodium menu options

#### Sodium Content in Foods

<table>
<thead>
<tr>
<th>Food Description</th>
<th>Sodium (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicken Nuggets, McDonald's</td>
<td>350</td>
</tr>
<tr>
<td>Unprocessed Chicken Breast</td>
<td>63</td>
</tr>
<tr>
<td>Macaroni and Cheese (box)</td>
<td>366</td>
</tr>
<tr>
<td>Homemade Mac &amp; cheese</td>
<td>107</td>
</tr>
<tr>
<td>McDonald’s small French fries</td>
<td>70</td>
</tr>
<tr>
<td>Mashed potato, unsalted</td>
<td>2</td>
</tr>
</tbody>
</table>

### POTASSIUM

- Excreted by the kidneys
- Elevated potassium levels leads to arrhythmia and heart attack
- **Recommendation**
  - Limit intake of high potassium foods
  - High potassium vegetables can be leached
  - Avoid 100% fruit juices
  - Follow serving sizes
  - Dialysis treatment very important for removal of potassium

#### Common High Potassium Foods

- Banana
- Dried fruit/raisins
- Oranges/orange juice
- Chocolate
- Milk/yogurt
- Potato white/sweet
- Carrots
- Squash
- Peanut Butter

#### Alternatives (low potassium options)

- Apples/apple juice/applesauce
- Grapes/grape juice
- Peaches
- Pears
- Pineapple
- Asparagus
- Cauliflower
- Rice/Pasta
- Cookies without chocolate
- Yellow cake

#### Low Potassium Content in Foods

<table>
<thead>
<tr>
<th>Food Description</th>
<th>Sodium (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potato, no salt, unsoaked</td>
<td>260</td>
</tr>
<tr>
<td>Rice, white, no salt</td>
<td>31</td>
</tr>
<tr>
<td>Orange Juice</td>
<td>240</td>
</tr>
<tr>
<td>Cranberry Juice Cocktail</td>
<td>23</td>
</tr>
<tr>
<td>Banana</td>
<td>450</td>
</tr>
<tr>
<td>Apple</td>
<td>160</td>
</tr>
</tbody>
</table>
Phosphorus is excreted in the urine of healthy individuals. In CKD, Phosphorus control can be obtained with:

- Decreased phosphorus intake from foods
- Decreased GI phosphorus absorption by phosphorus binders
- Increased elimination via dialysis

### PHOSPHORUS

**High Phosphorus foods**
- Milk and Milk Products
- Egg, whole
- Lunch meats or sausages containing milk solids or cheese
- Ham, salami
- Tofu, soy
- Beans, Lentils, Nuts, Seeds

**Hidden Sources of Phosphorus**
- Flavored Waters
- Ice Teas
- Cola Beverages
- Enhanced meat & chicken
- Non dairy creamsers
- Bottled coffee beverages
- Hawaiian Punch®
- Sunny Delight®
- Code Red Mountain Dew®
- Hire’s® Root Beer
- Hormel® Always Tender products

**Hawaiian Punch’s ingredients are:**
- Water, high fructose corn syrup and 2% or less of each of the following: Concentrated juices (apple, pineapple, passionfruit, orange), fruit purees (apricot, papaya, guava), citric acid, natural and artificial flavors, pectin, natural gum, sour gum, sodium hexametaphosphate, red dye, blue 1, caramel color, sodium benzoate and potassium sorbate (preservatives), ascorbic acid (vitamin C), and flavor.

**Aquafina Flavor Splash Water Ingredients:**
- Filtered water, natural flavor, citric acid, sodium hexametaphosphate (to protect flavor), phosphoric acid, sodium benzoate (preserves freshness), sodium chloride, sucralose, calcium disodium EDTA (to protect flavor).

**Non dairy Creamer ingredients:**

### PHOSPHORUS ABSORPTION
DINING OUT

Fast Food, Phosphorus-Containing Additives, and the Renal Diet

16 Fast-food chain restaurants
804 Entrees
- 52% had limited sodium, potassium and naturally occurring phosphorus
- 10% were also free of phosphorus containing additives

163 side dishes
- 23% had limited sodium, potassium and naturally occurring phosphorus
- 17% were also free of phosphorus containing additives

3 chains had no acceptable entrees, 5 chains no acceptable side dishes


PHOSPHORUS

- Chicken nuggets, McDonalds (3oz) 282mg
  (sodium phosphates, sodium acid pyrophosphate, sodium aluminum phosphate)
- Unprocessed chicken breast (3oz) 194mg
- Cow’s Milk (8oz) 225-280mg
- Soy Dream© unenriched (8oz) 100mg
- Turkey Breast, Oscar Mayer (3oz) 222mg
  Ingredients: TURKEY BREAST, WATER, CULTURED CORN SUGAR*, MODIFIED CORNSTARCH, CONTAINS LESS THEN 2% OF SALT, CULTURED CELERY JUICE*, VINEGAR*, SODIUM PHOSPHATES, CHERRY POWDER, CAMEL MILK*, INGREDIENTS TO PRESERVE QUALITY
- Turkey Breast, roasted (3oz) 179mg

PHOSPHATE BINDERS

- Phosphate binders can be a “pill burden”
- Calcium based binders (tums)
- Noncalcium based binders
- Most effective if given just before a meal

FLUIDS

Visible fluid
- All beverages
- Alcoholic drinks
- Coffee, tea
- Juice, juice drinks, lemonade
- Milk, milk substitutes, liquid creamer
- Nutrition drinks
- Soup
- Soft drinks
- Sports drinks
- Water

Hidden fluid
- Gelatin
- Gravy
- Ice chips or cubes
- Ice cream
- Popsicle
- Sherbet
- Sorbet
- Watermelon also contains lots of fluid

FLUIDS

Tips for managing your thirst
- Avoid spicy/salty foods
- Sip your beverages
- Try ice
- Take your medicines with your meal
- Hard candy or a wedge of lemon or lime to avoid dry mouth

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Your tests reveal that you are retaining fluids!
PROTEIN
- Healthy children eat more than 200% of DRI for protein
- CKD – 100 to 140% of the DRI
- Hemodialysis DRI + 0.1g/kg/day
- Peritoneal Dialysis DRI + (0.15 – 0.3g/kg/day)
- Normalized Protein Catabolic Rate (nPCR) is used to predict nutritional status and is more useful than albumin in children/adolescents

Nutrition Education for Compliance
- Patients forget up to 80% of what they are told
- ~50% of what they recall is incorrect
- Written information – better adherence
- Use plain language, less medical jargon
- Lifestyle behavior changes – often more critical but more difficult

Motivating Patients : Phosphorus Challenge
- Adherence to the renal diet is difficult
- Incentive based program in conjunction with nutrition education was attempted to encourage compliance
- Rewarded for best outcome (improved or best serum phosphorus)

Journal of Renal Nutrition, July 2011

PEDIATRIC DIALYSIS UNIT QUALITY IMPROVEMENT PROJECTS
- ONGOING ASSESSMENT OF PATIENT INDICES TO DIRECT MANAGEMENT STRATEGIES
- PRIOR PROJECTS
  - ALBUMIN IMPROVEMENT
  - 5 DIAMOND CERTIFICATION
  - PHOSPHORUS CHALLENGE

PDSA CYCLE

Plan
- Define the System
- Analyze Causes
- Improvemed Improvement

Do
- Study the Results
- Try Out Improvement Theory
- Assess Current Situation

Act
- Plan Continuous Improvement
- Study

"ALBUMIN IMPROVEMENT"
"PHOSHORUS CHALLENGE"
CAUSES OF MORTALITY FOR CHILDREN ON DIALYSIS


- Overall mortality rate is 30 times that expected for age
- Cardiovascular deaths account for 35-50% of all deaths
- Infections account for 20% of all deaths

Cardiovascular Morbidity

- Important potential determinants of cardiovascular disease in ESRD
  - Chronic hypertension
  - A high calcium phosphate product
  - Chronic state of inflammation
- Calcium Phosphate product <55mg/dL in adolescents >12 years, and <65 mg/dL in younger children.

Dialysis Outcomes and Practice Patterns Study

Phosphate Binder Use and Mortality Among Hemodialysis Patients in the Dialysis Outcomes and Practice Patterns Study (DOPPS): Evaluation of Possible Confounding by Nutritional Status

- Antonio A. Lopez, Lin Tang, Jyothi Thumma, Yan Li; Douglas S. Fuller; Hal Morgenstern; Jürgen Boerner; Peter G. Kerr; Francesco Tonotto; Takashi Akiba; Brenda W. Gillespie; Bruce M. Robinson; Friedlisch; K. Foit; Ronald L. Pissell
- American Journal of Kidney Diseases 2012; 59(7):106-115

PHOSPHORUS CHALLENGE

- Intervention
  - Monthly report cards
  - One-on-one education session
  - Games and puzzles
  - Incentive based, interactive, visual – across the country map

PHOSPHORUS CHALLENGE

- Data
  - Number of patients is too low to use standard statistical analysis
  - Improvement from previous number used as a yardstick
  - Goal was to have 40% patients on target for phosphorus levels
  - At the end of 6 months, each patient had shown improvement, but overall only 25% of patients were at goal. Patient population had also changed.
PHOSPHORUS CHALLENGE

Lessons learnt
- Repetition is key - frequent and ongoing counseling
- Inclusion - when families participate, outcomes are better
- We have incorporated report cards and frequent dietary counseling as part of our care plan.