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What Can My Patients Eat?
Nutrition Basics for Chronic Kidney Disease

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About Me

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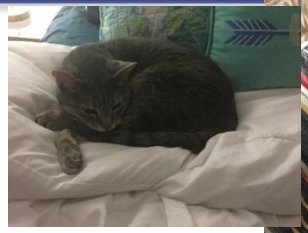

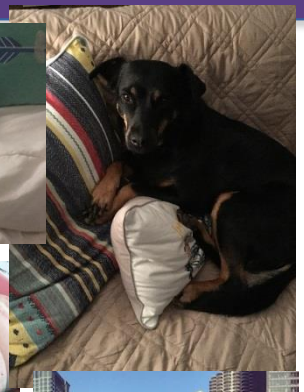

Disclosures

- Honorarium provided by Nutricia

None pose any conflict of interest for this presentation

The opinions reflected in this presentation are those of the speaker and independent of Nutricia North America

Learning Objectives

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1. Distinguish nutrition recommendations and medical nutrition therapy through each stage of chronic kidney disease.
2. Explain nutritional considerations for special populations with chronic kidney disease.
3. Identify common nutrition interventions used in chronic kidney disease patients.

Focus on the Patient

Quality of Life

Quality of Life

- Quality of life (QOL) – subjective evaluation of a person's perception about his or her happiness and satisfaction with his or her life and environment

- Health-related quality of life (HR-QoL) – a person's physical health, psychological state, independence, and social relationships

1. Zabel R, et al. *Appetite*. 2012; 59:194-199
2. Buckner S, Dwyer J. *J Ren Nutr*. 2003;13(4):295-302

Quality of Life

- Compared to healthy counterparts, patients treated with maintenance hemodialysis (MHD) have lower reported scores on HR-QoL tools
- HR-QoL is often decreased in any patient dealing with the burden of chronic illness
- Decreases in HR-QoL is associated with increased rates of morbidity and mortality

1. Zabel R, et al. *Appetite*. 2012; 59:194-199
3. Iyasere O, Brown E. *Postgrad Med J*. 2014;90:340-347
4. Han H, et al. *J Ren Nutr*. 2012;22(2):237-243

Determinants of HR-QoL

- Determinants of HR-QoL in patients on MHD include:
  - Disease
  - Symptom burden
    - medications, dialysis, fatigue, comorbidities
  - Other non-renal factors affect HR-QoL

3. Iyasere O, Brown E. *Postgrad Med J*. 2014;90:340-347

Factors affecting Survival

Factors that affect HR-QoL and Survival

- Decreased cognition
- Depression more common
- Physical function poorer
- Caregiver burden increased
- Work status disrupted
- **Nutrition/diet restricted**

3. Iyasere O, Brown E. *Postgrad Med J*. 2014;90:340-347

Depression and HR-QoL

- Depression is an independent risk factor for mortality and common in chronic illness due to high symptom burden
- In patients treated with MHD, depression often leads to **poor dietary intake and poor adherence to treatment prescription**
- Depression has also been reported to be associated with increased hospitalization, sexual dysfunction, increased infection rates, sleep disturbance, disease progression, and treatment withdrawal

3. Iyasere O, Brown E. *Postgrad Med J*. 2014;90:340-347

Nutrition and Quality of Life

- Patients on MHD with poor nutritional status often report decreased HR-QoL, reported changes that lead to poorer nutrition status include:
  - Altered food preferences
  - Gastrointestinal symptoms
  - Decreased dietary intake
  - Sensory changes
  - Psychosocial concerns

Decreases in HR-QoL usually occur before negative changes in nutritional status are present

1. Zabel R, et al. *Appetite*. 2012 2. Buckner S, Dwyer J. *J Ren Nutr*. 2003 4. Han H, et al. *J Ren Nutr*. 2012 5. Burrows J, et al. *J Ren Nutr*. 2002
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10. Mazairac A, et al. *J Ren Nutr*. 2011 11. Feroze U, et al. *Clin J Am Soc Nephrol*. 2011

What is in the Literature?

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Author	Subjects	Measure	Result
Dwyer et al. *J Ren Nutr*. 2002.	1,387 MHD patients from the Hemodialysis (HEMO) Study	HR-QoL physical component scores (PCS) to nutritional status	Nutrition markers (albumin, creatinine) highly correlated with PCS
Allen et al. *J Ren Nutr*. 2002.	1,545 MHD patients from HEMO study	Nutrition factors compared to Short Form-36 (SF-36)	Serum albumin, creatinine, and calf circumference were independently associated with the PCS score ($P \leq .001$)
Vero et al. *J Ren Nutr*. 2013.	94 MHD patients	Cross-sectional secondary analysis using the SF-36 and 7-point scale subjective global assessment (SGA)	A statistically significant relationship was reported between SGA and PCS score ($\beta = 0.275$, $t = 2.57$, $P = .012$)

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Chronic Kidney Disease

Introduction to CKD and Inflammation

WHAT DO THE KIDNEYS DO?

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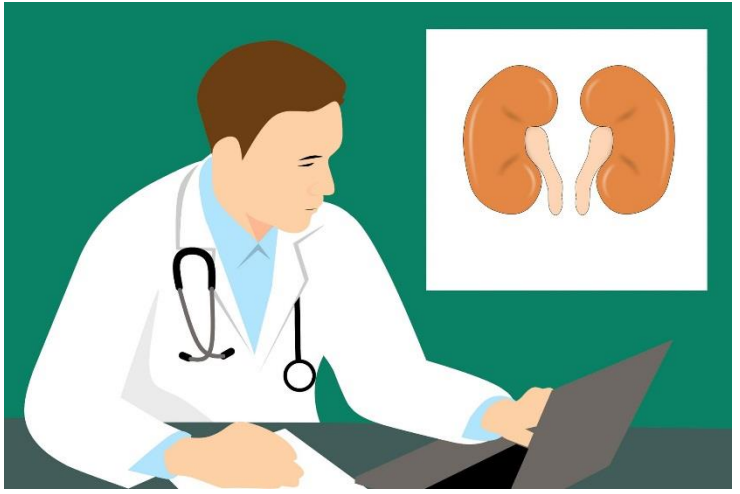
- Remove waste products from the blood
- Balance chemicals in the body
- Regulate the building of bones
- Regulate blood pressure
- Control red blood cell production
- Regulate water



What happens when Your Kidneys Fail

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- Increase in uremic toxins
- Difficulty to control blood pressure
- Dysregulation of bone mineral metabolism
- Decreased red blood cell production leading to anemia
- Fluid retention and reduced urine production
- Acid base disorders

Causes of CKD

- Causes - hypertension, Diabetes, Peripheral vascular disease (small vessels), glomerulonephritis, Polycystic kidney disease, Alports Disease
- Acute - drug induced, dehydration, overdoses, hydronephrosis
- Diabetes - long history of diets/medications/illness

- Is patient very early?
  - Microalbuminemia or traces of protein without increased creatinine or farther advanced
- Not interested/able to make drastic diet changes?
  - Be specific about changes desired - consider effects on BS with changes of compostion - early patients - obtain optimal control of BS and BP

Stages of CKD

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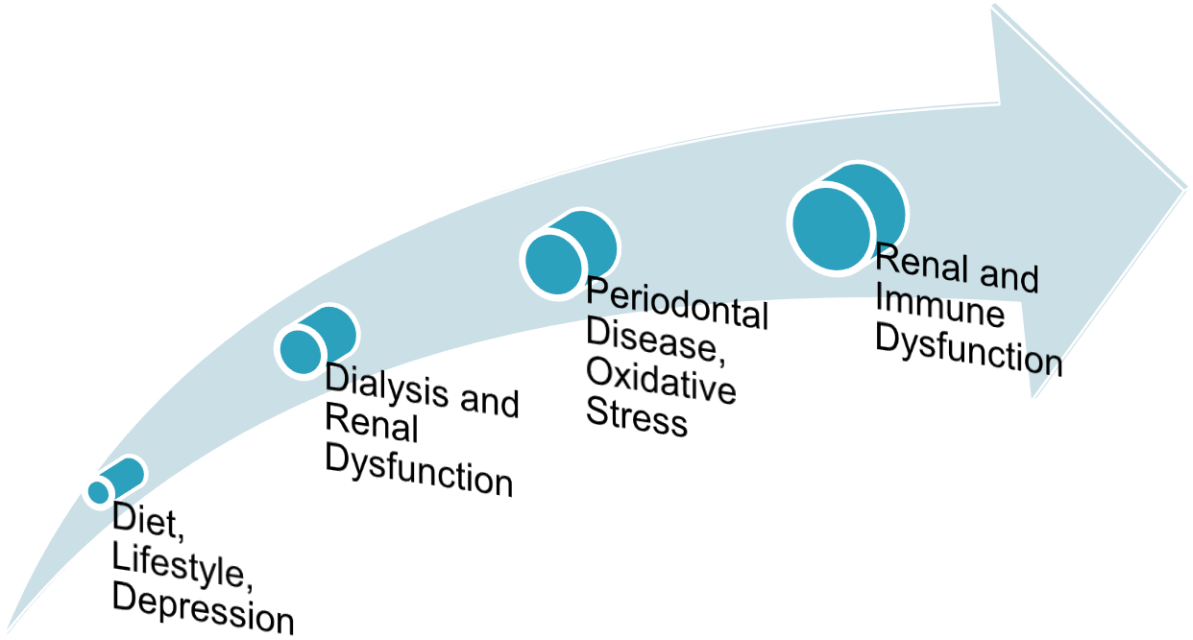
CKD stage	Description	Possible signs & symptoms	eGFR
Stage 1	Kidney damage with normal kidney function	High blood pressure, swelling in legs, urinary tract infections or abnormal urine test	90 or higher
Stage 2	Kidney damage with mild loss of kidney function		89-60
Stage 3	3a: Mild to moderate loss of kidney function; 3b: Moderate to severe loss of kidney function	Low blood count, malnutrition, bone pain, unusual pain, numbness or tingling, decreased mental sharpness or feeling unwell.	3a: 59-45 3b: 44-30
Stage 4	Severe loss of kidney function	Anemia, decreased appetite, bone disease or abnormal blood levels of phosphorus, calcium or vitamin D	29-15
Stage 5 **End stage renal disease (ESRD)**	Kidney failure and need for transplant or dialysis	Uremia, fatigue, shortness of breath, nausea, vomiting, abnormal thyroid levels, swelling in hands/legs/eyes/ lower back or lower back pain	Less than 15

Inflammation in CKD

- Low grade, systemic inflammation common in advanced stages of CKD
- Linked to acquired immune dysfunction, metabolic and nutritional derangements, and Protein Energy Wasting (PEW)
- Persistent inflammation associated with premature general and vascular aging

16. Machowska A, et al. *Transl Res*. 2016;167(1):204-213
17. Akchurin O, Kaskel F. *Blood Purif*. 2015;39:84-92

Causes of Inflammation in CKD



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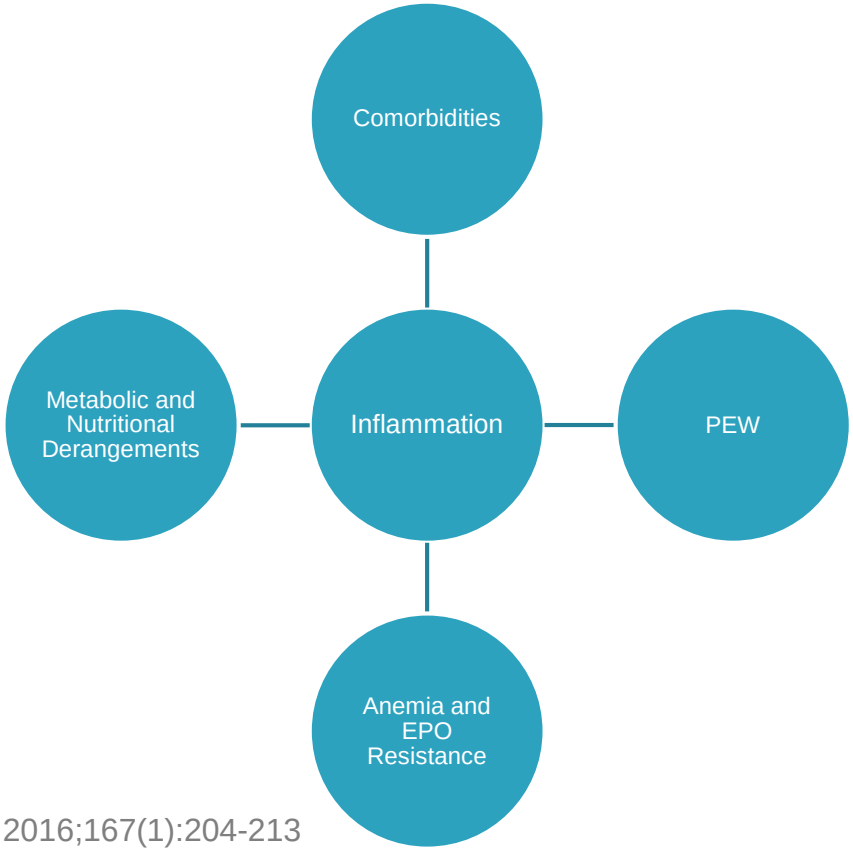
17. Akchurin O, Kaskel F. *Blood Purif*. 2015;39:84-92

Consequences of Inflammation



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Medical Nutrition Therapy

Goals and Application

Medical Nutrition Therapy Goals

- Slow or stop the rate of progression of the kidney disease
- Maintain good nutritional status
- Prevent or minimize the side effects of uremia or chemical imbalances

Factors that can cause or exacerbate malnutrition in patients with kidney disease

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- Increased needs for calories and protein
- Protein losses in treatments
- Inadequate dialysis treatment
- Anorexia/ decreased oral intake
- Excessive dietary restrictions
- Psychosocial problems
- Other illness (CA, HIV, DM)

Nutrition Assessment

- Nutritional screening to identify nutrition related problems
- Use a team approach – nurses may be the first to notice signs of malnutrition (Comprehensive Interdisciplinary Patient Assessment)

Parts of the Interdisciplinary Assessment

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- Co-Morbid Conditions
- Dialysis Prescription
- Blood Pressure
- Fluid Management
- Laboratory Profile
- Medication History
- Anemia
- Renal bone disease
- Nutritional Status
- Psychosocial Needs
- Access Type
- Patient participation
- Transplant status
- Family Support
- Activity Level

Nutrition Assessment

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- Nutritional Status
- Hydration Status
- Metabolic Parameters (diabetes)
- Anthropometrics
- Appetite and intake
- Gastrointestinal Issues
- Prescribed and over the counter meds
- Previous diets or nutrition education
- Route of Nutrition
- Self Management skills
- Attitude and Motivation

Core Components to Renal Diet

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- Adequate calories
- Adequate protein
- Reduced sodium
- Phosphorus control (high or low)
- Potassium control (high or low)
- Fluid management
- Micronutrients

Recommendations

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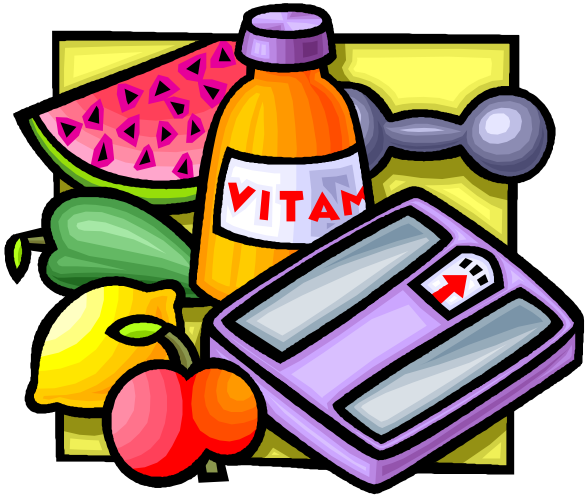
	HD	PD	Pre-Dialysis/ CKD
Protein:	Moderate to High Needs	High Needs	Restricted
K+:	Restricted	Unrestricted	May be restricted
Na:	Restricted	Mild Restriction	May be restricted
Fluid:	Restricted	Usually not restricted	May be restricted
Phosphorus	Restricted	Restricted	Usually Restricted

Energy/Calories



Needs for calories differ for each stage of renal failure and age

Calories

- Provides energy for body functions
- Present in
  - carbohydrates
  - fats
  - protein
- Caloric needs
  - 30 - 35 kcal/kg/day of lean body weight

Protein

- Necessary to make and repair cells
- Essential for growth and maintenance of body tissue
- Provides energy
- Essential to maintain osmotic pressure and fluid balance in blood

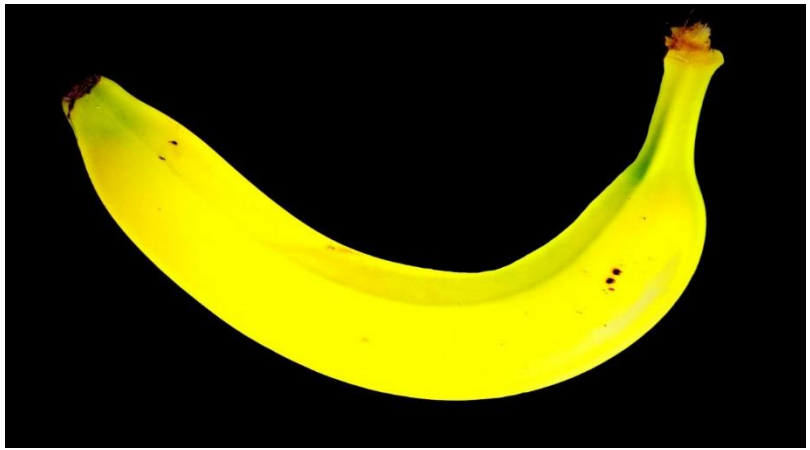
Protein

- Needs
  - **Acute - 0.6 - 0.8 g/kg**
  - **CKD - 0.6 - 0.75 g/kg**
  - **HD – 1.2 g/kg**
  - **PD – 1.2 – 1.3 g/kg**
  - **Transplant**
    - **1.3 – 2.0 post op**
    - **0.8 – 1.0 chronic**

Protein/Albumin

- Protein food sources
  - Meat, poultry, fish, eggs, cottage cheese
  - Plant based protein sources
- Protein supplements
  - Protein Powders
  - High Protein snack bars
  - High Calorie Renal Liquid ONS
  - Lower Calorie Non-Renal Liquid ONS
  - Hydrolyzed Concentrated protein
- Tips to increase protein in diet
  - Mini-meals 4-6 per day
  - Protein at every meal

Potassium



- Needs
  - **Acute 2 g**
  - **CKD – unrestricted unless high**
  - **HD – 2 – 3 g**
  - **PD – 3 – 4 g**
  - **Transplant – Unrestricted unless high**

Food sources of Potassium

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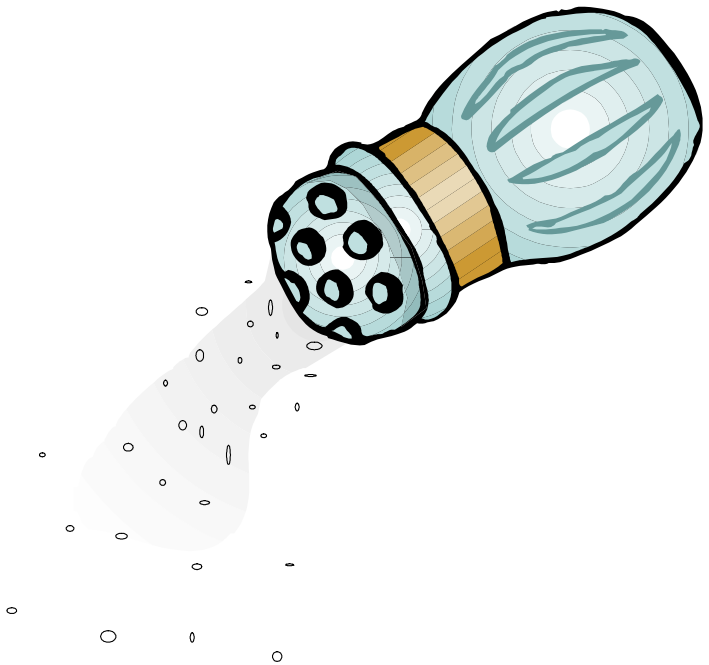
- Banana
- Cantaloupe / Melon
- Tomato
- Potato / French Fries
- Pear
- Gatorade
- Potato Chips
- Processed Foods
- Orange Juice
- V8
- Prunes
- Raisins
- Mango
- Avocado
- Milk (also soy milk)
- Nuts

Sodium



- Needs
  - Acute 1 – 2 g
  - CKD 1 – 3 g
  - HD 1 – 3 g
  - PD 2 – 4 g
  - Transplant 2 – 4 g
- Excessive salt restricted
  - Recommend ~2,000 mg.
  - Recommendation for average American is 2300 mg
  - Average intake is 4000 mg

The vast majority of the sodium consumed is from processed and restaurant foods; only a small portion is used in cooking or added at the table.

Fluid

- Needs
  - **Acute – Output plus 500 cc**
  - **CKD – no restriction**
  - **HD – Output plus 1000 cc**
  - **PD – Maintain balance**
  - **Transplant – unrestricted unless overloaded**

Phosphorus

- Needs
  - **Acute – maintain WNL**
  - **CKD – 10 mg/kg/day**
  - **HD – 17 mg/kg or 10-12 mg/gm protein**
  - **PD – Same as HD**
  - **Transplant - RDA**

Phosphorus

- Phosphorus is restricted in HD and PD.
- Phosphorus is not well dialyzed.
- Phosphorus found naturally in many foods and is added to almost EVERYTHING in food processing!
- Organic (naturally occurring sources) better than inorganic (food additives) for phosphorus control
- Diet, dialysis, binders for control

Quick Guide to Food Labels: For those with kidney disease

SERVING SIZE:
Look here first. Make sure you calculate how much you're getting based on the serving size

SODIUM:
Look at the "mg" and NOT the "%"
Less thank 2000mg/day
Less than 600 mg/meal
Less than 100-200 mg/snack

POTASSIUM:
This listing is not required. No listing doesn't mean no potassium.

Low Potassium: < 100mg or <3%
Medium: 101-200mg or 3-6%
High: 201-300mg or 6-9%
Very High: >300mg or >9%

Quick Guide to Food Labels: For those with kidney disease

PHOSPHORUS:
Low phosphorus: < 50mg or <5%
Medium: 51-150mg or 5-15%
High: >150mg or >15%

Phosphorus usually is not on the label, so you will have to read the ingredient list. Look for words with "phos" in them.

Phosphoric Acid
Hexametaphosphate
Monocalcium Phosphate
Tricalcium Phosphate

Stay away from added phosphorus. It can easily add up to 1000mg phosphorus per day.

Nutrition Facts

About 12 servings per container
Serving size **26 Crackers (30g)**

Amount per serving
Calories **150**

	% Daily Value*
Total Fat 7g	**9%**
Saturated Fat 1.5g	**8%**
Trans Fat 0g	
Polyunsaturated Fat 3.5g	
Monounsaturated Fat 2g	
Cholesterol 0mg	**0%**
Sodium 210mg	**9%**
Total Carbohydrate 18g	**7%**
Dietary Fiber <1g	**2%**
Total Sugars 0g	
Includes 0g Added Sugars	**0%**
Protein 3g	

Vitamin D 0mcg 0% • Calcium 20mg 0%
Iron 1.2mg 6% • Potassium 35mg 0%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Calcium

- Needs
  - **Acute – maintain serum levels WNL**
  - **CKD – 1.0 – 1.5 g <2 – 2.5 including binder load**
  - **HD and PD - <2 – 2.5 including binder load**
  - **Transplant - 0.8 – 1.5g**

Vitamins and other minerals

- Vitamins
  - **Water Soluble**
  - **Vitamin D**
- Minerals
  - **Iron**
  - **Zinc**

Micronutrient Deficiencies in Dialysis

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- Chronic HD pts have been documented as substantially protein-energy malnourished
- Kcal and protein intake shown to be significantly lower than recommended levels for maintenance of body weight, lean body mass and fat stores in HD pts
- Chronic HD population at risk for reduced intake of vitamins, minerals, trace elements associated with adequate energy, protein

Possibly deficient micronutrients

- Pyridoxine (Vitamin B6)
- Cyanocobalamin (Vitamin B12)
- Folic Acid
- Vitamin C
- Iron
- Zinc

Causes for micronutrient deficiencies

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- Uremia
  - alters disposition and metabolism of all aforementioned vitamins and minerals
- Losses of essential vitamins, minerals during processes of HD
  - water-soluble vitamins easily cross HD membranes, lost in dialysate
  - more pronounced in high-flux than in high efficiency dialysis

Causes for deficiencies (cont.)

- Poor dietary intake
  - excessive dietary restriction (K+, phos)
  - suboptimal intake of HBV protein, carbohydrate, fat, overall calories
- Medications
  - anti-neoplastic, anti-convulsant
  - birth control, amino acid, or ethanol medications
  - anti-hypertensives i.e. hydralazine (B6)
  - most likely to impact B6, B12, folate status

Guidelines to Supplementation

- **Prevention and Maintenance**
- Generally, all HD pts benefit from supplementation of water-soluble vitamins
- Several products containing B-complex vitamins and Vitamin C exist for use in HD population

Guidelines to Supplementation (Cont.)

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- **Prevention and Maintenance**
- Conduct nutrition physical exam quarterly
- Document and follow up areas of particular concerns
- Monitor serum levels of nutrients for which deficiency is suspected as indicated
- Adjust supplementation PRN

Anti-inflammatory Interventions

1. Increasing Fiber
2. Increasing Omega-3 Fatty Acids
3. Soy Intake
4. Pomegranate Juice
5. Decaffeinated Green Tea Extracts (catechins)
6. Decreasing Fructose Intake
7. Addition of Nuts and Seeds (gamma-tocopherol)
8. Adding Probiotics/Prebiotics

16. Machowska A, et al. *Transl Res*. 2016;167(1):204-213

Intestinal Microbiota

- Progression of CKD associated with metabolic alterations that change the balance of healthy and unhealthy bacteria in the gut
- Cause bacterial overgrowth, loss of barrier integrity, and increase in bacterial translocation
- May contribute to CKD progression, accelerated atherogenesis, and PEW

16. Machowska A, et al. *Transl Res*. 2016;167(1):204-213
18. Rossi M, et al. *J Ren Nutr*. 2015;25(5):399-403
19. Ramezani A, Raj D. *J Am Soc Nephrol*. 2014;25(4):657-670

Modulation of Gut Microbiota

- Prebiotics
- Probiotics
- Dietary Fiber

19. Ramezani A, Raj D. *J Am Soc Nephrol*. 2014;25(4):657-670

Dietary Fiber

- Fiber adds a benefit in CKD patients to the integrity of the intestinal wall and reducing uremic toxins
  - Soluble Fiber
  - Insoluble Fiber
  - Resistant Starch

16. Machowska A, et al. *Transl Res*. 2016;167(1):204-213
19. Ramezani A, Raj D. *J Am Soc Nephrol*. 2014;25(4):657-670
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Pre- and Probiotics

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- Live, beneficial bacteria (probiotics)
- Have been consumed for thousands of years
- Selectively fermented ingredient (prebiotic)
- Available in foods, commercial supplements, and fortified foods
- Used to re-establish microbial balance
- Other benefits from non-CKD clinical trials suggest improvement in blood glucose control, hypertension, weight management, and urinary tract infections
- Fundamental principle of dietetic practice is to recommend nutrients from food sources first, followed by supplements

18. Rossi M, et al. *J Ren Nutr*. 2015;25(5):399-403
19. Ramezani A, Raj D. *J Am Soc Nephrol*. 2014;25(4):657-670
21. Moraes C, et al. *Eur J Nutr*. 2016

Prebiotic

- Non-digestible food ingredient that has a beneficial effect through its selective stimulation of the growth or activity of one or a limited number of bacteria in the colon
- Inulin, fructo-oligosaccharides, galacto-oligosaccharides, soya-oligosaccharides, xylo-oligosaccharides, and pryodextrins
- Possibly promotes Bifidobacteria species, mediates weight loss, reduces inflammation, and improves metabolic function
- High fiber intake associated with lower risk of inflammation and reduced mortality in CKD patients

19. Ramezani A, Raj D. *J Am Soc Nephrol*. 2014;25(4):657-670

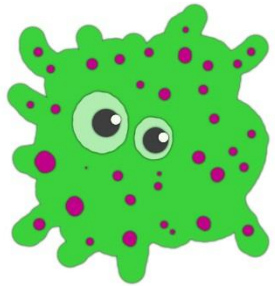
Prebiotic Food Sources

- Asparagus: inulin
- Rye Bread: inulin
- Canned Beans: galacto-oligosaccharide
- Lentils: galacto-oligosaccharide
- Nectarines: fructo-oligosaccharides
- *resistant starches

18. Rossi M, et al. *J Ren Nutr*. 2015;25(5):399-403
21. Moraes C, et al. *Eur J Nutr*. 2016

Probiotic

- Live organisms which offer a health benefit
- Bifidobacteria species, lactobacilli, and streptococci
- Can alter gut microbiota and affect the inflammatory state
- Animal studies shows prolonged life in CKD with probiotics
- Human studies shows decreases in uremic toxin



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Probiotic Food Sources

- Yogurt (fermented milk product): Lactobacillus bulgaricus and Streptococcus thermophilus
- Kefir (fermented milk beverage): Lactobacillus and Lactobobbus genera, and yeast
- Kombucha (tea): Gluconacetobacter, Lactobacillus and Zygosaccharomyces (yeast)
- Kimchi and Sauerkraut: Leuconostoc, Lactobacillus, Pediococcus and Streptococcus genera
- Natto (fermented soy beans): Bacillus subtilis specie

18. Rossi M, et al. *J Ren Nutr*. 2015;25(5):399-403

Summary

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