



Plant-Based Diets in Dialysis? Kale Yeah!

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**ACORN
Dietetics, LLC**
Advancing Clinical Outcomes
with Renal Nutrition



About Me

- Renal Dietitian for DaVita 2009-2015
- Facility Administrator for DaVita 2015-2018
- 2019: Owner of ACORN Dietetics, LLC, a renal-specific private practice
- 2019: Renal Dietitian for Fresenius in Dodgeville and Madison, WI

Financial
disclosure

I have nothing to disclose

Learning Objectives



Apply evidence-based findings to improve the practice, service-delivery, and health and nutrition of dialysis patients (6.3.11)



Assess the current knowledge and skills of your patient population to adopt a plant-based diet (9.4)



Implement an individualized teaching plan that facilitates integration of plant-based eating (9.4)

Overview



KEY ELEMENTS OF A PLANT-BASED
DIET



CLINICAL CONSIDERATIONS IN PLANT-
BASED EATING FOR ESRD PATIENTS

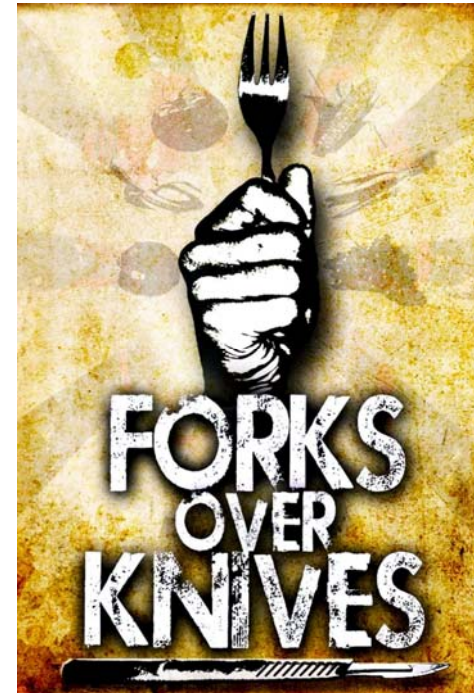
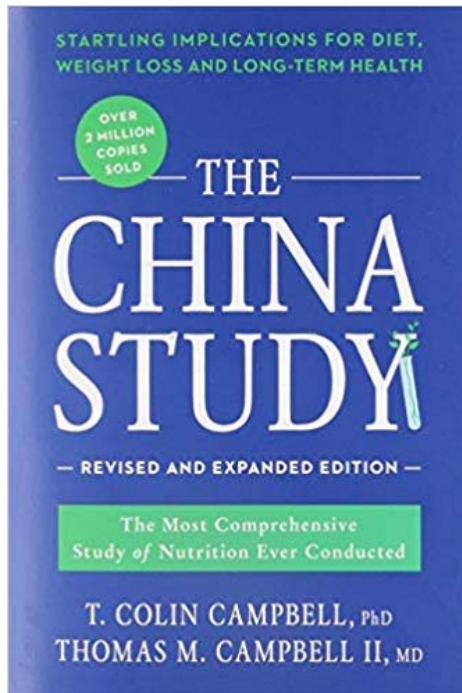


SUPPORTING YOUR PATIENTS'
TRANSITION TO PLANT-BASED EATING



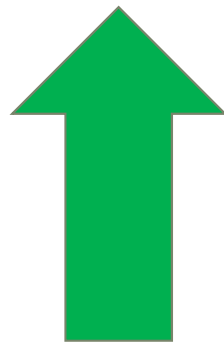
Plant-Based Eating 101

Plant-Based Popularity

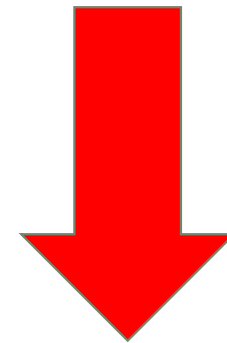




Plant-Based Eating

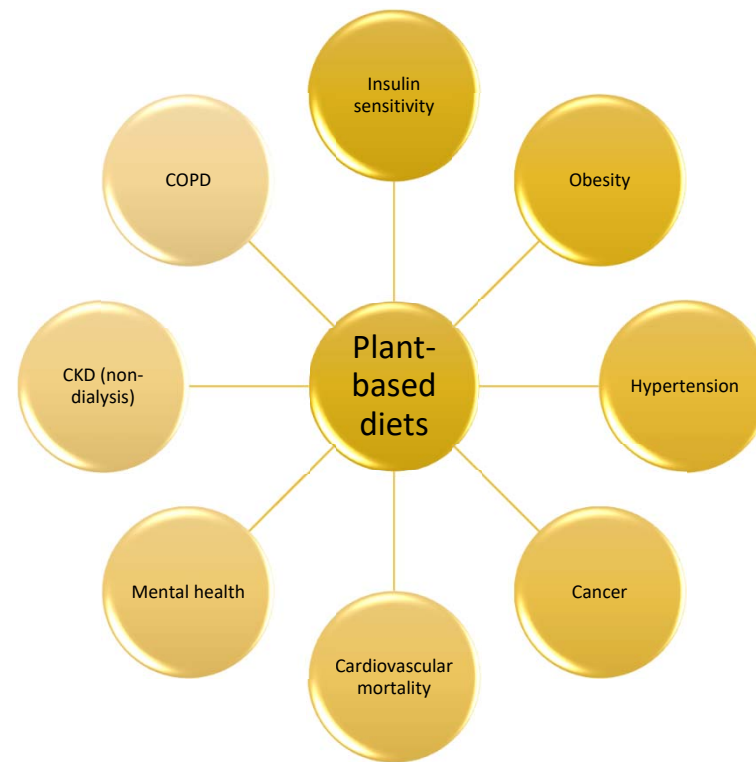


- Whole grains
- Vegetables
- Fruit
- Plant-based protein
- Plant-based fats



- Red meat
- Processed Sugar
- Dairy
- Refined grains
- Animal fats

Plant-based diets in current literature





Special Considerations in ESRD

Protein

Potassium

Phosphorus

Protein/Energy Wasting

- Defined as "a form of chronic disease-related malnutrition that is contributed to, and complicated by, exposure to chronic inflammatory, hypermetabolic, and/or hypercatabolic conditions."

Energy: 30-35
kcal/kg ABW

Protein:

1.2 g/kg ABW (HD)

1.3 g/kg ABW (PD
& HHD)

- 8-10 ounces protein per day
- 50% High Biological Value

Protein/Energy Requirements

Animal Protein vs. Plant Protein

Animal Protein

- 2-7x protein per calorie
- 2-3x protein per serving

Plant Protein

- Fiber

Appetite & Intake

Limit or Avoid These Foods

Dairy Products
Milk
Yogurt
Cheese
Ice Cream

Legumes
Dried Beans
(Pinto, Kidney, Lima, Navy, Soy, Lentils)
Dried Peas
(Black-eyed, Split Peas)

Grains and Cereals
Bran Cereal & Muffins
Granola
Grape-nuts®
Whole Wheat Cereal or Crackers
Pretzel with Oatmeal, Dark Rye, or Whole Wheat
Pancakes Waffles
Corn Tortillas

Beverages
Cola
Cherry Cola
Chocolate Drinks
Beer
Coffee Drinks with Milk

Vegetables (comparared to other vegetables)
Corn
Green Peas
Snow Peas
Mushrooms

Other
Sardines
Organ Meats
Liver Avocado
Nuts & Seeds
Peanut Butter
Dried Fruits
Chocolate

Meats
Deli Meats
Ham Bologna
Roast Beef
Turkey Chicken

Cured Meats
Salami Pastrami
Sausage Hot Dogs

Canned Meats
Spam® Treat®
Vienna Sausage
Potted Meat
Tuna Salmon

Seasonings
Salt
Soy Sauce
Accent
Teriyaki Sauce
BBQ Sauce
Gatesap

Vegetables
Canned with Sodium
Sauerkraut
Vegetable Juice Cocktail
Tomato Juice

Other
Processed Cheese
Bouillon Broth
Salad Dressings
Pickles Olives
Instant and Canned Soups
Frozen Dinners

Fast Foods
and many restaurant foods

Grains
Pancakes
Waffles
Ready-to-eat Cereals
Commercial Rice & Pasta Mixes
Salted Pretzels
Salted Crackers
Salted Chips

Fruits
Apricots
Banana
Cantaloupe
Dates
Dried Figs
Guava
Honeydew & Most Melons
Grapefruit
Japanese Persimmon
Kiwi Mango
Nectarine
Orange Papaya
Fresh Pear
Prunes Tangelo
Most Dried Fruit
Avocado

Vegetables
Fresh Bamboo Shoots
Beet Greens
Chard
Chinese Cabbage (cooked)
Potatoes (baked, hash browns, chips, etc. unless soaked in water, or blanched)
Cooked Spinach
Sweet Potato
Winter Squash
Tomato Paste
Tomato Sauce
Tomato Juice
All Vegetable Juices

Other
Nuts & Seeds
Salt Substitute
Dried Beans & Peas
Chocolate

High Phosphorus PO₄
High Sodium Na⁺
High Potassium K⁺
Caution!

Discuss these foods with your dietitian before eating. Potassium, Phosphorus, and Sodium MUST be limited in your daily diet to keep your heart and bones healthy.

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High Phosphorus Foods

DAIRY PRODUCTS

Milk
Cheese
Ice Cream
Pudding
Cream Soup
Yogurt
Milkshake

Asparagus
Peas
Mushrooms
Corn
Dried Beans & Peas
Raisins & Other Dried Fruit
Chocolate & Caramel

Bran Muffins
Bran Cereals
Pancakes & Waffles
Whole Wheat & Corn Bread
Biscuits
Pizza

Sardines
Nuts
Peanut Butter
Cocoa
Beer
Colas

<http://www.CulinaryKidneyCooks.com>

Protein Content and Potential Renal Acid Load

Taken from St Jules DE, et al. "Managing protein-energy wasting in hemodialysis patients: A comparison of animal- and plant-based protein foods." Seminars in Dialysis 2019 32:41-46

TABLE 1 Protein content and potential renal acid load of animal- and plant-based protein foods

Food	USDA Code	Protein (g)		PRAL (mEq) 3-oz
		3-oz	100-kcal	
Meat		23.4	13.3	12.3
Ground beef, 80% lean	23576	21.5	10.0	10.7
Chicken, mixed ^a	05041/05045	24.8	15.6	13.3
Ground pork, 84% lean	10975	22.7	9.2	11.2
Turkey, mixed ^a	05220/05188	24.6	18.3	14.0
Finfish		19.3	19.9	9.5
Salmon	15086	22.5	16.9	11.9
Tuna, canned light	15121	16.5	22.6	8.6
Tilapia	15262	22.2	20.4	9.6
Cod	15016	19.4	21.8	8.4
Catfish	15233	15.7	17.6	9.0
Shellfish		19.7	22.2	8.4
Shrimp	15271	20.4	24.3	11.2
Crab	15226	19.0	20.2	5.6
Eggs	01129	18.9	8.1	13.5
Nuts		7.3	2.8	1.6
Peanuts	16390	10.4	4.2	2.8
Almonds	12063	8.9	3.5	0.8
Pecans	12143	4.0	1.3	0.9
Walnuts	12157	6.0	2.2	2.0
Seeds		7.6	3.6	-3.1
Sesame seeds	12024	7.2	3.0	-0.1
Pumpkin seeds	12163	7.9	4.2	-6.1
Legumes		12.8	7.4	1.5
Pinto beans	16043	11.6	6.3	-1.5
Navy beans	16038	11.2	5.9	-1.5
Chickpeas	16057	10.9	5.4	3.2
Lentils	16070	13.4	7.8	3.2
Tofu, firm	16126	17.1	11.6	4.2

PRAL: potential renal acid load.

Animal Protein vs. Plant Protein

Animal Protein

- 2-7x protein per calorie
- 2-3x protein per serving
- 8-14mEq hydrogen ions

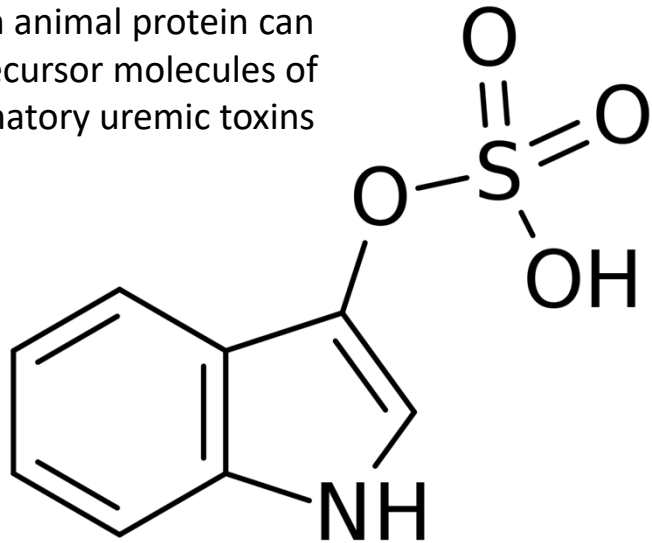
Plant Protein

- Fiber
- -3 to 2 mEq hydrogen ions

Uremic Toxins

Indoxyl Sulfate

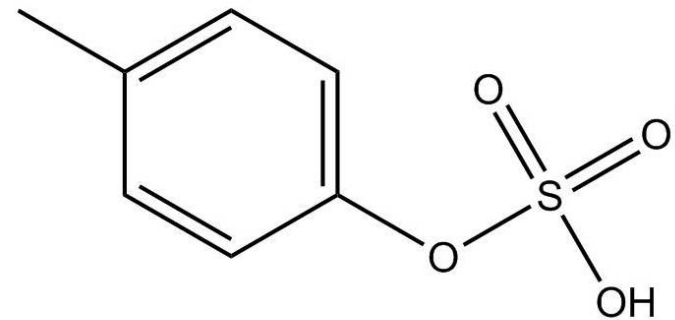
Diets high in animal protein can increase precursor molecules of pro-inflammatory uremic toxins



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Precursor AA: Tryptophan

P-Cresyl Sulfate



Precursor AAs: Tyrosine and Phenylalanine

Microbiome



Diets low in fruits, vegetables, and yogurt have lower prevalence of fiber and probiotics present in the gut, which can lead to gut dysbiosis



Restoration of gut symbiosis via increased fruit, vegetable, yogurt, and/or probiotic intake may reduce inflammation and improve clinical outcomes in CKD patients

Animal Protein vs. Plant Protein

Animal Protein

- 2-7x protein per calorie
- 2-3x protein per serving
- 8-14mEq hydrogen ions
- GDUT's

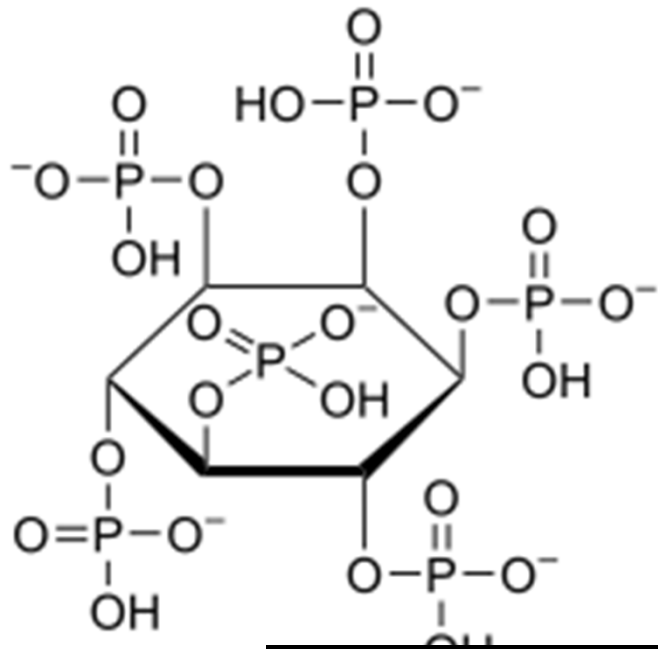
Plant Protein

- Fiber
- -3 to 2 mEq hydrogen ions
- Fewer GDUT's



Plant-based Protein Supplements

- Plant-based protein supplements can take many forms
 - Pea protein
 - Brown rice protein
 - Sunflower seed protein
 - Soy protein
 - Pumpkin seed protein
- Check micronutrient levels



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Bone & Mineral Outcomes

- Phosphorus from plant foods
 - Stored in plants as phytate, also referred to as InsP6
 - Predominantly present in unprocessed foods
 - Plant-based dietary phosphate is less well-absorbed
 - <40% for plants, vs 40-60% for animal foods

Vascular Calcification

- Directly contributes to morbidity and mortality in the CKD population
 - Calcifications of the arterial wall
 - Calciphylaxis
 - Formed by hydroxyapatite
- InSP6 inhibits crystallization and has a higher potency than traditional pharmacological treatments for vascular calcification



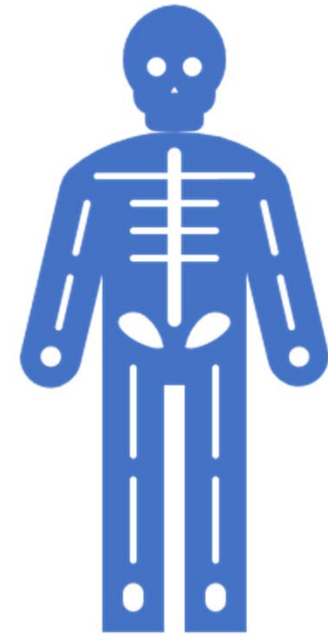
Vascular Calcification

- Animals studies by Grases et al produced the following results:
 - Rats fed a diet high in InsP6 had calcium levels 40% lower than those on diets without InsP6
 - Two groups of rats were induced to have hypertension and hypercalcemia
 - The group on a diet devoid of InsP6 developed calcifications in renal papillae, renal interstitium, renal tubules, and renal vessels
 - The group that received InsP6 injections did not develop calcification.
 - Intravenous administration of InsP6 reduced calcifications by 60% in the aorta and 68% in myocardial tissue of male Sprague-Dawley rats. A control group treated by cinacalcet saw a reduction of vascular calcification of 24%.



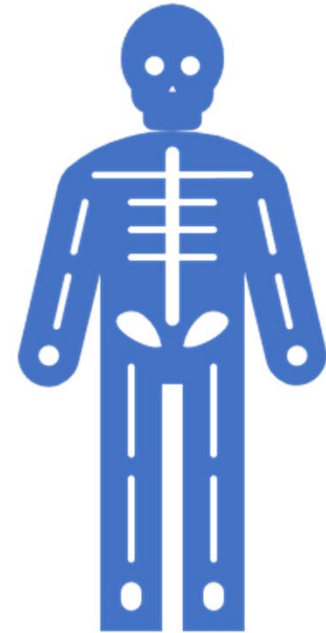
Vascular Calcification

- Prospective cross-sectional study by Sanchis et al looked at single lateral abdominal plaque in patients with CKD stage 2-3. Dietary survey completed to assess InsP6 intake and urine measured for InsP6 metabolites.
- Patients without calcifications had a significantly higher intake of InsP6 and greater elimination of InsP6 in urine
- Lentil consumption was higher among patients with less calcifications



Vascular Calcification

- Indoxyl sulfate (IS) is directly related to aortic calcification, vascular stiffness, and adverse cardiovascular events.¹⁸
- Higher serum indoxyl sulfate concentrations are associated with increased overall and cardiovascular mortality.¹⁸
- Key drivers:
 - IS induces oxidative stress
 - IS impairs the ability of endothelial cells to heal



Phosphate
reduction can
increase
malnutrition

Restriction of dietary phosphorus may have unintended consequence of restricting protein sources.

Survival 27% higher in patients with >1000mg phosphorus rx, and 29% higher in patients with no phosphate restriction.

Potassium

Not all sources are created
equally





Supporting Patients from Knowledge to Action

Barriers



Western culture places a high value on animal intake



Culture of dairy in the Dairyland



Attachment to meat



Lack of knowledge about plant-based diets



Food insecurity



Family support



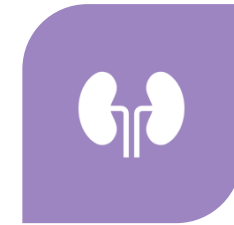
GAUGE MOTIVATION AND
INTEREST IN ADOPTING A PLANT-
BASED DIET



IDENTIFY & ENGAGE
SUPPORTIVE FAMILY MEMBERS



IS PHOSPHORUS BINDER
PRESCRIPTION ADEQUATE TO
COVER ACTUAL PHOSPHORUS
INTAKE?



IS A POTASSIUM BINDER
APPROPRIATE TO ADD?

Evaluate



Learn

Give plant-based cooking a try

Educate

- Include those family, friends, and caregivers who help patients make dietary choices in our nutrition education sessions



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Tips for Serving Sizes

Thrive On



3-5 oz



1 cup



Palm of hand
(3-5 oz or 1/2 cup protein)



Fist
(1 cup breads & grains)

VEGGIES



4 oz

BREADS & GRAINS

Educate

Use educational materials that emphasize home cooking, dietary variety, and portion sizes.



Cupped hand
(1/2 cup fruits & veggies)



Glass size
(4 oz fluids)



Educate

Teach patients how to take binders correctly, and how to adjust the number of binders per meal to account for the phosphorus content/meal

Educate

- How to evaluate different sources of dietary phosphate
- How choose foods with a lower phosphate to protein ratio

INGREDIENTS: WATER, SUGAR, CORN SYRUP, MILK PROTEIN CONCENTRATE, VEGETABLE OIL (CANOLA, HIGH OLEIC SUNFLOWER, CORN), COCOA PROCESSED WITH ALKALI, SOY PROTEIN ISOLATE, AND LESS THAN 0.5% OF POTASSIUM CITRATE, MAGNESIUM PHOSPHATE, POTASSIUM CHLORIDE, CELLULOSE GEL AND GUM, SALT, CALCIUM PHOSPHATE, CALCIUM CARBONATE, SODIUM ASCORBATE, SOY LECITHIN, CHOLINE BITARTRATE, ALPHA TOCOPHERYL ACETATE, ASCORBIC ACID, CARRAGEENAN, FERRIC PYROPHOSPHATE, NATURAL AND ARTIFICIAL FLAVOR, ZINC SULFATE, VITAMIN A PALMITATE, NIACINAMIDE, VITAMIN D₃, CALCIUM PANTOTHENATE, MANGANESE SULFATE, COPPER SULFATE, PYRIDOXINE HYDROCHLORIDE, THIAMINE HYDROCHLORIDE, BETA CAROTENE, RIBOFLAVIN, CHROMIUM CHLORIDE, FOLIC ACID, BIOTIN, POTASSIUM IODIDE, VITAMIN K₁, SODIUM SELENITE, SODIUM MOLYBDATE, VITAMIN B₁₂

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Educate

Teach patients how to cook

- Techniques to reduce potassium content
- How to handle unfamiliar foods
- How to season vegetables
- Plant-based recipes



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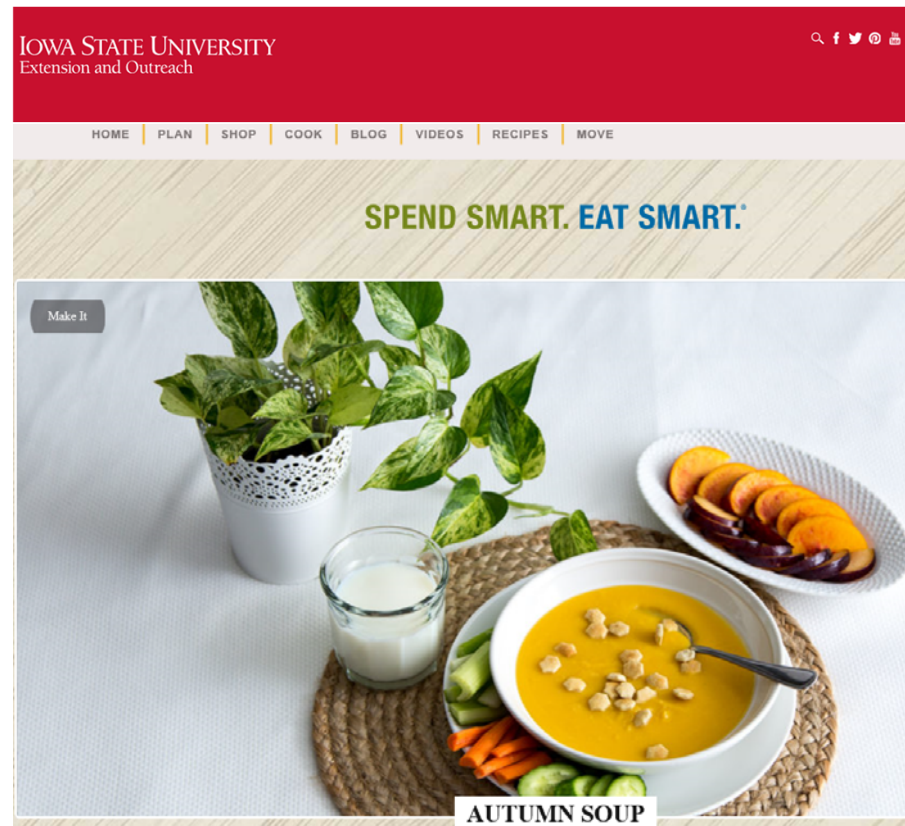
Educate

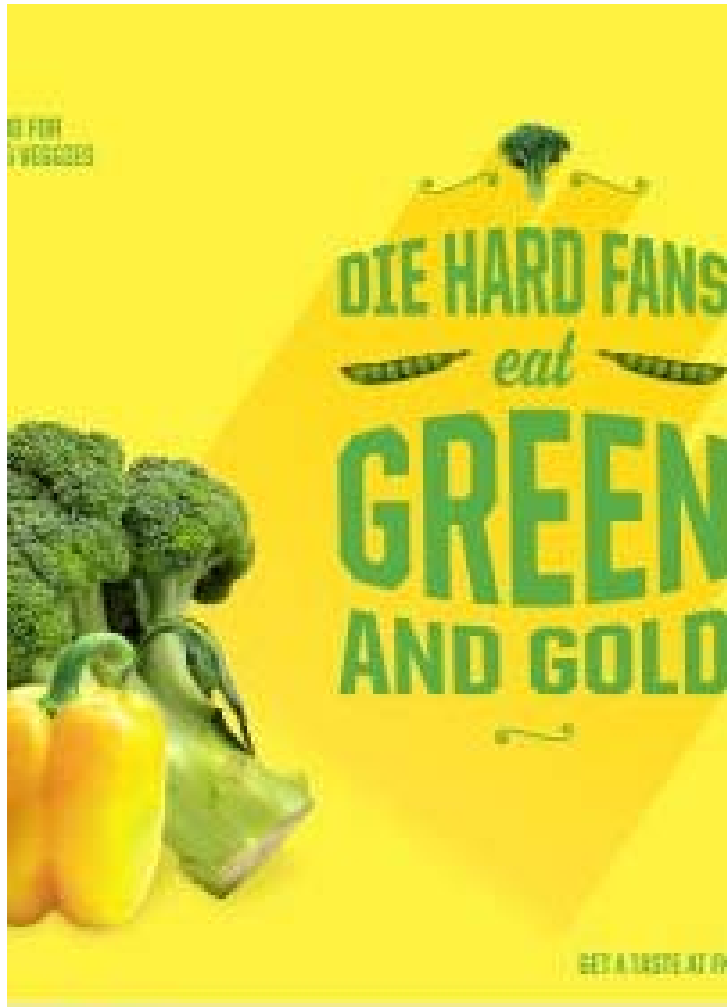
- How to properly select and store plant-based foods
- How to stock a plant-based pantry
- How to prevent food waste



Use Community Resources

- University of Wisconsin FoodWise
- Iowa State University Extension and Outreach Spend Smart. Eat Smart





healthTINE This material was funded by USDA's Supplemental Nutrition Assistance Program - SNAP. University of Wisconsin-Extension is an equal-opportunity provider.



UW Extension

healthTINE

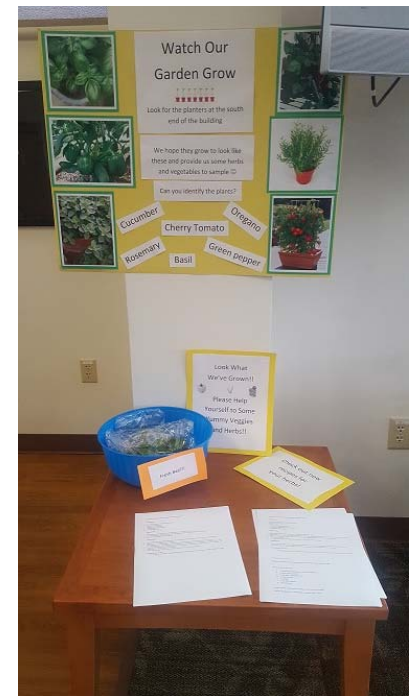
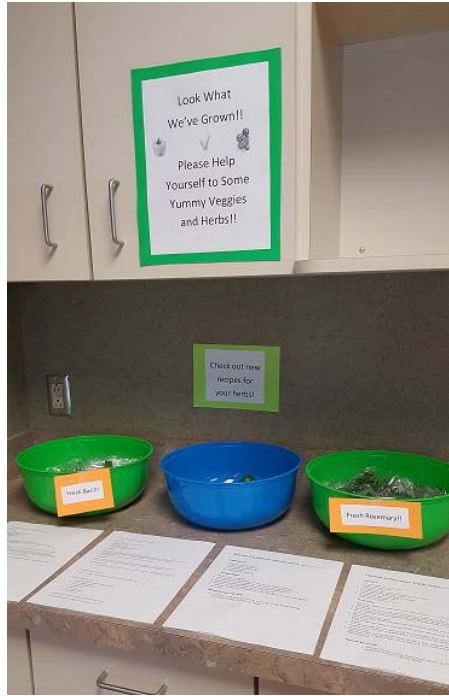
This material was funded by USDA's Supplemental Nutrition Assistance Program - SNAP.

Market Fruits & Veggies

Connect Patients and Resources

- Wisconsin Seniors Farmers Market Program
- Did you know most local farmers markets have vendors that accept EBT?





Innovate

Photos courtesy of Jill Hoyt, RDN



yammer



Collaborate



Liberalizing dietary options may help promote adequate protein/calorie intake for dialysis patients



Plant-based phosphorus and potassium may impact hyperkalemia and hyperphosphatemia differently than animal-based or inorganic forms of phosphorus and potassium



Plant foods may have beneficial effects on vascular calcification, the gut microbiome, and GI symptoms in dialysis patients



Culture change required to move away from a meat-based, plant-restricted diet model to one that considers individual patient needs and interests



Education, advocacy, and innovation among renal nutrition practitioners are essential to help patients increase proportion of plant foods in the diet

Summary

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Questions?