

# Whole-Food Low-Protein Plant-Based Nutrition to Prevent or Slow Progression of Chronic Kidney Disease



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## Intended Audience: Chronic Kidney Disease Stages 1-5 Nondialysis

**W**HOLE-FOOD, LOW-PROTEIN, PLANT-BASED diets can be both nutritionally adequate and provide benefit to treat patients with chronic kidney disease (CKD) who desire to delay or avoid dialysis and maintain wellness. While the precise amount of protein should be determined with a registered dietitian, low protein is typically defined as 0.6–0.75 g per kilogram of body weight or 0.3 g per kilogram of body weight with supplementation. Several explanations exist to describe the benefit of this approach. Furthermore, patients will likely adhere to this eating pattern if they have clear goals and beliefs that the prescribed diet may help them with their health.

## Whole-Food Plant-Based Diets are Naturally Low in Absorbable Protein

Contrary to higher protein intake, low-protein diets, particularly plant protein, decrease intraglomerular pressure thus lowering proteinuria. Reduction in uremic, nitrogenous waste that causes poor appetite and increased workload on the kidneys denotes an additional benefit of protein restriction.<sup>1,2</sup> Before the widespread accessibility of dialysis in developed nations, low-protein diets served as the treatment of choice.<sup>3</sup> While conflicting opinions now exist on this therapy because of the Modification of Diet in Renal Disease (MDRD) trial, numerous trials succeeding MDRD as well as meta-analyses of the MDRD trial confirm the beneficial effect of lowering dietary protein to treat CKD.<sup>4</sup>

## Plants are High in Antioxidants and Phytochemicals Which Lower Inflammation

Common in patients with CKD, chronic, low-grade inflammation plays a role in CKD progression as well as a decline in overall health.<sup>5</sup> Fruits, vegetables, and legumes contain high levels of antioxidants and phytochemicals that mediate this inflammatory state.<sup>6</sup> Animal protein, especially when processed or exposed to high-temperature cooking, is subject to oxidation thereby generating reactive oxygen species, and chemical toxins; both of which contribute to inflammation.<sup>7</sup>

## Phosphorus Absorption From Plants is Less

Bone mineral metabolism derangements increase as kidney disease progresses leading to poor bone health and increased cardiovascular disease (CVD) risk. One may not observe elevated phosphorus levels before dialysis, although some do. However, fibroblast growth factor (FGF-23), a phosphaturic hormone, will likely increase. Phosphorus in plants is stored in the form of phytate. Humans do not express the enzyme phytase necessary to break down and absorb this form. Thus, less than 50% of the phosphorus from plants will be absorbed, improving levels in patients with CKD. In turn, FGF-23 levels are also lower when the percentage of protein from plants is higher in the diet. While FGF-23 increases urinary excretions of phosphorus to maintain normal levels, as FGF elevates, so does arterial stiffness, endothelial dysfunction, left ventricular mass, and progression of CKD.<sup>8–10</sup>

## Plant-Based Diets are Innately Alkaline

Acidosis in patients with CKD has been linked to low albumin levels, muscle wasting, bone derangements, and progression of disease.<sup>11</sup> Sulfate-containing amino acids, abundant in animal protein, contribute to the patient's acid load. By contrast, plant-based proteins, more alkaline, are associated with higher serum bicarbonate levels in patients with CKD.<sup>10</sup>

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Financial Disclosures: None.

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1051-2276/20\$36.00

<https://doi.org/10.1053/j.jrn.2020.05.005>

## Plant-Based Diets Provide Additional Benefits for Comorbidities Associated with CKD

Evidence supports prevention, treatment, and reversal of the major comorbidities associated with CKD; diabetes, hypertension, and CVD.

Whole plant food intake to prevent and treat diabetes has been shown in numerous meta-analysis and observational studies.<sup>12,13</sup> Diets rich in meat have been shown to increase intracellular lipid storage which leads to insulin resistance.<sup>14</sup> Thus, other meta-analysis revealed associations with diabetes and intake of red and processed meat. This was after adjustments were made for saturated fat, total fat intake, and BMI.<sup>13</sup>

A meta-analysis of seven controlled trials and 32 observational studies revealed that plant-based diets are associated with lower blood pressure when compared with omnivorous diets.<sup>15</sup>

Review of the Nurses' Health Study showed lower CVD mortality with the inclusion of more vegetable protein as opposed to animal protein which had an increase in CVD mortality.<sup>16</sup> In addition, Dean Ornish's famous Lifestyle Heart Trial revealed that 82% of patients following his plant-based program not only halted atherosclerosis but actually regressed the disease.<sup>17</sup> In addition to traditional CVD risk factors, patients with CKD have bone mineral derangements leading to poor CVD outcomes. Trimethylamine N-oxide, produced by the gut microbiota, denotes a newer factor in not only the development of CVD in patients with CKD but also a kidney toxin. Interestingly, those who consume a plant-based diet possess a gut microbiota that will not convert animal-based foods to trimethylamine N-oxide.<sup>18</sup>

### Will Patients Eat a Whole-Food Low-Protein Plant-Based Diet?

Adherence and acceptability of plant-based diets has been shown in numerous studies, across many years, among varied patient populations.<sup>19-21</sup> However, when patients and practitioners align in shared decision-making toward a common goal, adherence and success is more likely. Consistent follow-up also increases the likelihood of success.<sup>22</sup> For the efforts of this discussion, slowing the path or avoiding dialysis and maintaining wellness characterizes the goal of the CKD stages 1-5 population. Plant-based diets low in protein provide a clear conduit to achieve this end as evidenced by numerous studies.

### Conclusion

Whole-food, low-protein, plant-based diets provide a healthy option for patients with damaged kidneys. Not only does this approach provide hope for patients wishing to delay or avoid dialysis, but also it aids with comorbid conditions that contribute to decline in overall health.

The attached handout on whole-food, low-protein, plant-based diets can be used with your patients with CKD 1-5 not yet on dialysis.

### Acknowledgments

None.

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# Eat a Whole-Food, Low-Protein, Plant-Based Diet to Protect Kidney Function

## How to Eat

### Why Plant-Based?

- ◆ Naturally Lower in Protein Compared to Animal Protein
  - High Protein Intake Speeds the Progression of Kidney Decline.
- ◆ Less Kidney Strain
  - Plant Proteins Create Fewer Toxins for the Kidneys to Remove Which Allows Them to Rest.
- ◆ Improved Proteinuria
  - Replacing Animal Protein with Plant Protein Reduces Protein in the Urine, Particularly in Diabetics.
- ◆ Decreased Inflammation
  - Fruits and Vegetables Contain High Levels of Antioxidants and Phytochemicals Which Lowers Inflammatory Markers.
- ◆ Less Absorbable Phosphorus
  - Plant proteins have less absorbable phosphorus compared to animal proteins.
- ◆ Additional Benefits
  - Plant-Based Diets Have Been Shown to Prevent, Treat, and Reverse Diabetes, Cardiovascular Disease and Hypertension; All of Which are Common Among Patients with Chronic Kidney Disease (CKD).

### Food to Avoid

- ◆ Animal Protein- Anything that Moves, Has a Mother, or Has a Face:



- ◆ Heavily Processed Foods:
  - Highly-Processed Snack Foods (Ex: Chips, Cakes, Cookies)
  - "Vegan" Meats
  - Over-Processed Grains (Ex: Crackers, Pastries, White Bread)
  - Sugar-Sweetened Beverages

### Food to Include

#### It Depends on Your Level of Kidney Function

- ◆ Patients with CKD Stages 1 - 3
  - Simply Adopting a Whole-Food, Plant-Based Diet will Lower Absorbable Protein to an Acceptable Level.
  - If Your Potassium Level is Normal; You Do Not Have a Potassium Restriction. Continue to Work with Your Doctor and Dietitian to Monitor this Level.

## Eat a Whole-Food, Low-Protein, Plant-Based Diet to Protect Kidney Function

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### FOOD CHOICE EXAMPLES

#### CKD STAGES 1 – 3 (ABUNDANT)

- ◆ **FRUIT:** Strawberries, Blueberries, Blackberries, Raspberries, Cranberries, Oranges, Grapefruit, Lemons, Limes, Kiwi, Bananas, Cantaloupe, Melons, Mango, Papaya, Apples, Grapes, Cherries, Plums, Pineapple, Pears, and Peaches
- ◆ **VEGETABLES :** Spinach, Broccoli, Cabbage, Lettuce, Asparagus, Brussel Sprouts, Green Beans, Green Peas, Kale, Cabbage, Mustard Greens, Turnip Greens, Cucumber, Leeks, Celery, Carrots, Squash, Carrots, Cauliflower, Corn, Eggplant, Pumpkin, Peppers, Mushrooms, Potatoes, Yams, Beans, Peas, Lentils, Onions, Peppers, and Radishes
- ◆ **WHOLE GRAINS:** Oatmeal, Quinoa, Brown Rice, Couscous, Bread, Pasta
- ◆ **NUTS & SEEDS:** Almonds, Pistachios, Sunflower Seeds, Walnuts, Pecans, Chia Seeds, Flax Seeds, Brazil Nuts
- ◆ **Patients with CKD Stages 4 to Dialysis**
  - ◇ Ask Your Physician if Any of Your Medications Elevate or Lower Potassium.
  - ◇ Partner with Your Dietitian to Lower Your Protein Intake Further.
  - ◇ Increase Healthy Fats to Maintain Calories on a Low-Protein Diet.
  - ◇ Ask About Supplementing Diet with Ketoanalogues.

### Supplementation

- ◆ Work with your dietitian on possible supplementation with:
  - ◇ Vitamin D
  - ◇ Omega 3
  - ◇ Vitamin B12
  - ◇ Probiotic

### FOOD CHOICE EXAMPLES

#### CKD STAGES 4 & ABOVE

- ◆ **LOW-POTASSIUM FRUIT:** Strawberries, Blueberries, Blackberries, Raspberries, Cranberries, Cherries, Pineapple, Pears, Peaches, and Watermelon
- ◆ **LOW-POTASSIUM VEGETABLES:** Broccoli, Cabbage, Lettuce, Asparagus, Green Beans, Green Peas, Mustard Greens, Turnip Greens, Cucumber, Leeks, Celery, Carrots, Cauliflower, Corn, Eggplant, Onions, Peppers, and Radishes
- ◆ **WHOLE GRAINS:** Oatmeal, Quinoa, Brown Rice, Couscous, Bread, Pasta