



## Vegetarian Nutrition

a dietetic practice group of the  
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### RD Resources for Professionals:

# Vegetarian Diets in Chronic Kidney Disease

**People with chronic kidney disease (CKD) require varying degrees of nutrition intervention based on numerous factors, including stage of kidney disease and treatment modality.**

Additionally, there is a wide diversity among vegetarians regarding what foods are acceptable. Diets should be planned according to individual needs and preferences.

## Dietary Goals

Dietary goals for people with CKD include the following<sup>1</sup>:

- to slow the rate of progression of kidney failure
- to maintain good nutritional status
- to minimize uremic toxicity and the metabolic disorders of kidney failure
- to decrease proteinuria
- to decrease the risk of secondary complications associated with kidney disease such as heart disease, bone disease and altered blood pressure control

## Stages of Kidney Disease

Chronic kidney disease is classified according to the level of kidney function, based on the glomerular filtration rate (GFR), widely accepted as the best overall measure of kidney function in health and disease<sup>2</sup>. Nutrition needs vary depending on the stage of kidney function and other co-morbid conditions, such as hypertension, diabetes and cardiovascular disease.

## Quantity and Quality of Protein

High protein intakes have long been known to have potential adverse effects in those with pre-existing kidney disease. The relatively lower protein intake typical of vegetarians may help reduce the risk of progression of kidney disease without compromising nutritional status. Emerging epidemiological evidence indicates that higher protein intake (> 20% versus 10% of total daily calories) is associated with loss of kidney function in women with mild kidney insufficiency and with the development of microalbuminuria in people with diabetes and hypertension<sup>3</sup>. Based on two meta-analyses, low protein diets reduced risks related to loss of kidney function, based on GFR and/or increased albuminuria, with greater benefits seen in those with diabetes<sup>4-5</sup>. In people with type 1 diabetes and CKD stage 2, even a modest limitation of dietary protein intake to 0.9 g/kg/day provided benefits beyond established medical therapies<sup>3</sup>. In the DASH and DASH-Sodium diets, a higher protein intake (1.4 g/kg/day) is recommended. However, sources of protein in the DASH diets emphasize vegetables, low-fat or nonfat dairy products, whole grains, nuts, legumes, fish and poultry. Data suggest that nonmeat protein may have a beneficial effect on blood pressure<sup>6</sup>. Plant sources of protein have been shown to decrease proteinuria, reduce glomerular filtration rate and renal blood flow, and result in milder renal tissue damage when compared to animal proteins. Several small studies in diabetes and CKD indicate that vegetable or soy protein sources also may be kidney sparing compared to red-meat sources, and in the Nurses Health Study, the risk of losing kidney function in women with mild kidney insufficiency was related primarily to animal meat intake. Higher dairy or vegetable protein intake did not increase this risk<sup>3,7</sup>.

## Chronic Kidney Disease: A Clinical Action Plan<sup>2</sup>

| Stage | GFR (ml/min) | Description  | Diet Needs  |
|-------|--------------|--|---|
| 1     | 90           | Kidney damage, protein in the urine, normal filtration                       | DASH*-Sodium diet (and treatment of any co-morbid conditions; CVD risk reduction) |
| 2     | 60-89        | Kidney damage with a mild decrease in filtration kidney                      | DASH*-Sodium diet (and treatment of any co-morbid conditions; CVD risk reduction) |
| 3     | 30-59        | Moderate decrease in filtration; evaluate and treat complications            | Low Sodium, low phosphorus and low protein  |
| 4     | 15-29        | Severe decline in filtration; begin preparing for kidney replacement therapy | Low sodium, low phosphorus, low protein and low potassium                         |
| 5     | < 15         | Kidney failure and dialysis or transplant will be needed soon.               | Low sodium low phosphorus, low potassium, high protein, fluid restriction         |

Adapted from: National Kidney Foundation: K/DOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification. Am J Kidney Dis 2002; 39(suppl 1):S1-S266. \* DASH = Dietary Approaches to Stop Hypertension diet

Therefore, a DASH-type diet that emphasizes sources of protein other than red meat may be a reasonable alternative to a lower protein intake in people with hypertension and CKD stages 1 to 2. A modified version of the DASH diet is recommended for people with diabetes and in CKD stages 3 and 4<sup>8</sup>. Reductions in albuminuria and stabilization of kidney function have been reported with dietary protein intakes at the RDA level of 0.8 g/kg body weight/day or ~10% of daily caloric intake<sup>3</sup>. Regardless of the level of protein intake, 50% to 75% of the protein should be of high biological value, derived predominantly from dairy, soy, and vegetable-based proteins. By CKD stage 5 on renal replacement therapies, higher protein intakes of 1.2 to 1.5 g/kg/day are recommended<sup>1</sup>.

### Quantity and Quality of Carbohydrates and Fat

When dietary protein intake is limited, increases in carbohydrates and fats will be required to meet caloric needs, and the qualitative aspects of these macronutrients should be considered. Dietary guidelines recommend that carbohydrates come primarily from whole grains, fruits, vegetables, and nonfat or low-fat dairy products<sup>9</sup>. Dietary fiber is encouraged and may produce metabolic benefits on glycemia and lipids. Available evidence suggests that increased intake of omega-3 and monounsaturated fatty acids may have potentially favorable effects on progression of CKD<sup>3,10</sup>. Cardiovascular disease is the leading cause of death among people with kidney disease, regardless of treatment modality<sup>10</sup>. Vegetarians typically have lower blood cholesterol levels and lower rates of hypertension<sup>9</sup>. Consumption of soy products provides a modest reduction in **LDL-cholesterol and triglycerides<sup>11</sup>**.

### Phosphorus, Potassium, and Sodium

Phosphorus binders will be needed by CKD stages 3 to 5 if emphasis on whole grains and dairy products is maintained. Dietary phosphorus should be restricted to 1.0 g/day and potassium to 2.4 g/day. Dietary sodium is restricted to 2.3 g/day, consistent with the DASH diet. The sodium content of some processed vegetarian foods can be quite high<sup>1,12</sup>.

Minimizing the metabolic disorders of kidney failure can be a challenge since, other than egg whites, animal flesh proteins offer the lowest quantity of phosphorus relative to the quantity and quality of protein. About 50 to 70% of phosphorus is absorbed from a typical mixed diet. In general, phosphorus bioavailability is greater in animal products (>70%) than from plant-based foods (50%). Much of the phosphorus in grains and legumes can be in the form of phytic acid (inositol phosphate), which reduces the absorption of phosphorus to approximately 50%<sup>12</sup>. The widespread use of phosphorus-containing additives in many processed foods creates additional challenges.

Fruits, vegetables, dairy and legumes may need to be limited in people who must restrict their intake of potassium. With careful planning these foods can be worked into a vegetarian diet, however, amounts will need to be modified and **potassium levels monitored carefully<sup>1</sup>**.

## Vitamins D and B12, Calcium, Iron and Zinc

Even in the general chronic kidney disease population, these nutrients are all supplemented to some degree depending on the metabolic status of the patient. All vegans must regularly consume reliable sources of vitamin B12, such as fortified foods (nutritional yeast, ready-to-eat cereals, meat analogs, and soymilk). If these foods are not eaten regularly (2-3 servings per day) a daily vitamin B12 supplement of 5 to 10 µg or a weekly B12 supplement of 2,000 µg may be used<sup>9</sup>. Serum levels of vitamin D, calcium, iron, and zinc should be evaluated before supplements are prescribed<sup>1</sup>.

## Resources

1. Renal Dietitians Dietetic Practice Group/National Kidney Foundation Council on Renal Nutrition. *National Renal Diet: Professional Guide, 2nd ed.* 2002, The American Dietetic Association; Chicago, IL.
2. National Kidney Foundation: K/DOQI Clinical Practice Guidelines for Chronic Kidney Disease: Evaluation, Classification, and Stratification. *Am J Kidney Dis* 2002; 39(suppl 1):S1-S266.
3. National Kidney Foundation: K/DOQI Clinical Practice Guidelines and Clinical Practice Recommendations for Diabetes and Chronic Kidney Disease. *Am J Kidney Dis* 2007; 49 (suppl 2):S1-S179.
4. Kasiske BL, et al. A meta-analysis of the effects of dietary protein restriction on the rate of decline in renal function. *Am J Kidney Dis* 1998; 31:954-961.
5. Pedrini MT, et al. The effect of dietary protein restriction on the progression of diabetic and nondiabetic renal diseases: A meta-analysis. *Ann Intern Med* 1996; 124:627-632.
6. Sacks FM, et al. Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group. *N Engl J Med* 2001; 344:3-10.
7. Knight EL, et al. The impact of protein intake on renal function decline in women with normal renal function or mild renal insufficiency. *Ann Intern Med* 2003; 138:460-467.
8. National Kidney Foundation: K/DOQI Clinical Practice Guidelines on Hypertension and Antihypertensive Agents in Chronic Kidney Disease. *Am J Kidney Dis* 2004; 43(suppl 1):S1-S290.
9. Position of the American Dietetic Association: Vegetarian diets. *J Am Diet Assoc* 2003; 103:748-765.
10. National Kidney Foundation: K/DOQI Clinical Practice Guidelines for Management of Dyslipidemias in Patients with Kidney Disease. *Am J Kidney Dis* 2003; 41(suppl 3):S1-S91.
11. AHRQ Evidence Reports and Summaries: #126 Effects of Soy on Health Outcomes. AHRQ Publication No. 05-E024-2. August 2005.
12. Pagenkemper J. Planning a vegetarian renal diet. *J Renal Nutr* 1995;5:234-38.

## Minimizing Uremic Toxicity

The last goal of diet therapy in kidney failure may be more difficult to manage on a vegetarian diet. Essential amino acid needs can be provided by both vegetable and animal protein sources. However, with the exception of soy, vegetable proteins will contribute a greater amount of nonessential amino acids when compared to animal proteins. The metabolic outcome is an increased amount of urea generated. When a mixture of plant protein foods is consumed, some complementation of amino acids will occur to decrease the urea load. However, minimizing uremic toxicity symptoms in vegetarians may be more difficult to achieve in a patient approaching end-stage renal disease. Vegetarian patients undergoing dialytic treatments should achieve sufficient urea reduction, assuming an adequate dialysis prescription is being delivered<sup>12</sup>.

## Summary Points

- Substitution of vegetable protein for animal protein may protect against the development of proteinuria in patients with diabetes.
- High protein intake, from either animal or vegetable sources, likely accelerates CKD.
- Vegetable protein diets can meet protein requirements and provide adequate nutrition in people with CKD.
- Meal plans need to be individualized to include vegetarian eating preferences as much as is possible within the constraints of the diet for kidney disease.
- Increased phosphate binders may be needed at meals and snacks for CKD stages 3-5.
- The dialysis prescription should be adjusted as needed for adequate urea clearances and possible lower potassium dialysates.