

Is There Room for More Than White Rice in the Renal Diet? A New Look at Ancient Grains

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CONSUMPTION OF ANCIENT grains for better health has been getting much attention in media headlines over the past few years. When our patients ask us if they can include grains in their diet what should our answer be as renal dietitians? This article weighs in on ancient grains by looking at their nutrient content and potential health benefits.

It is well known in the renal nutrition field that white rice and refined grain products are encouraged for our patients as they are low in potassium and phosphorous. However, with new food trends and research emerging, we need to reevaluate the role of ancient grains and the renal diet. Ancient grains have been around for years, yet many of these whole grains make up only a small percentage of grain consumption in Westernized civilizations. The most commonly consumed grains in the United States over the past few decades include wheat, oats, rice, maize, and rye, with wheat making up 66%–75% of the total.¹ Over the past few years' ancient grains such as quinoa, teff, farro, freekah, and spelt, to name a few, are making a comeback on grocery store shelves. You can now find ancient grains alongside rice on grocery store shelves, and many restaurants are using ancient grains in dishes that are commonly served with rice. According to NPD's Supply Track, a company that tracks over 700,000 commercial and noncommercial foodservice operators, case shipments of ancient grains to foodservice outlets increased by double digits in 2017.² Ancient grains are gaining popularity because of their rich nutrient profiles. Whole grains are rich sources of fiber, vitamins, and minerals and are naturally low in sodium, with most containing less than 10 mg per ½ cup serving. They provide a great source of iron, zinc, magnesium, and vitamin E and also supply a variety of phytochemicals such as phenolics, carotenoids, lignans, beta-glucan, and inulin.³

Food manufacturers are also taking part in the increasing market for whole grains. Top selling food companies are now marketing products featuring whole grains such as quinoa, farro, and amaranth. This is great news for consumers who would like to have more whole grain options on grocery store shelves. It is important to note that education should be provided to renal disease patients on nutrition label reading as many of these products can contain more ingredients than just the grain itself. Prepackaged and preseasoned whole grain mixes can be very high in sodium and contain phosphorous additives and other potassium-rich ingredients such as potato starch and potassium-rich vegetables. It is important to instruct patients on how to identify high-sodium foods, phosphorous additives, and commonly used high-potassium ingredients on food packages.

What constitutes a whole grain? A whole grain has 3 main parts, the outer layer called the bran, a middle layer called the endosperm, and a smaller inner layer called the germ. The bran contains most of the grains phytonutrients and fiber content. The endosperm is the largest part of the kernel and contains starchy carbohydrates, protein, and a small amount of vitamins and minerals. The germ or the plants embryo is where most of the vitamins, and minerals, protein and fat are stored. It has only been for the past 100 years that Americans have been consuming refined grains; plants that have had their bran and germ removed. Whole grains on the other hand have been around for much longer, dating back more than 10,000 years ago.¹ The definition for whole grains is defined by the American Association of Cereal Chemists and the FDA as "Cereal grains that consist of the intact, ground, cracked or flaked caryopsis, whose principal anatomical components—the starchy endosperm, germ, and bran—are present in the same relative proportions as they exist in the intact caryopsis".⁴ Therefore, a whole grain must contain 100% of the bran, endosperm, and germ present in the initial grain kernel. With this definition, the grain can be ground and/or separated from its initial state with processing before being incorporated into food products or made into flour. For a listing of the nutrient content of different grain flours refer to Table 1.

Whole grains are recommended for an overall healthy diet and have been shown to be beneficial in disease prevention for diabetes, cancer, hypertension, and heart

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Table 1. Grain Flours Listed in the Order of Lowest to Highest Potassium Content

Grain Flour Serving Size 1 Cup Flour	Calories (Kcal)	Protein (g)	Carbohydrates (g)	Fiber (g)	Potassium (mg)	Phosphorous (mg)	Sodium (mg)	Iron (mg)	Magnesium (mg)	Zinc (mg)	Vitamin E (alpha-tocopherol) (mg)
Wheat flour, white, all purpose, enriched	455	13	95	3.4	134	135	2	5.8	28	0.9	0.1
Millet flour	455	13	89	4.2	267	339	5	4.7	142	3.1	0.1
Rye flour, medium	356	11.1	77	12	381	230	2	2.6	64	2.2	1.5
Oat flour, partially debranned	420	15	68	6.8	386	470	20	4.2	150	3.3	0.7
Whole grain sorghum flour	434	10	93	8	392	336	4	3.8	149	2	0.6
Wheat flour, whole grain	408	16	86	12.8	436	428	2	4.3	164	3.1	0.9
Barley flour	511	16	110	14.9	457	438	6	4	142	3	0.8
Buckwheat flour whole-groat	402	15	88	12	692	404	13	4.9	301	3.7	0.4

<https://ndb.nal.usda.gov>.²¹

health.⁵⁻⁸ Whole grains have also been found to offer a hypocholesterolemic effect by helping to lower LDL cholesterol levels, especially oats and barley, which is due to their viscous fiber content and β -glucans.^{9,10} The 2015–2020 USDA Dietary Guidelines for Americans recommend consuming 6 servings of grains per day with at least half coming from whole grains.¹¹ However, refined grains are often advised over whole grains for kidney disease patients because of having lower levels of potassium and phosphorous. Since most of the nutrients present in the grain are located in the germ, refined grains contain less potassium and phosphorous than the initial intact whole grain; in addition, B vitamins, iron, zinc, fiber, and phytochemicals are lost as well.

Although whole grains may contain more potassium and phosphorous than refined grains, should this be a reason to eliminate whole grains from the renal diet? It has been shown that phosphorous naturally present in plant-based foods is not well absorbed. Decreased absorption results as humans lack the enzyme that is needed to break down phytates that are present in plant-based foods.^{12,13} It is estimated that only 30%–50% of inorganic phosphorous present in plant sources is absorbed.^{14,15} What about potassium? There is currently a lack of evidence-based studies showing that dietary potassium intake is associated with increased serum potassium levels and if following a low-potassium diet even helps to prevent hyperkalemia.^{16,17} It is known that hyperkalemia increases the risk of mortality in hemodialysis patients,¹⁷ but more studies are needed to determine dietary potassium's role in serum potassium levels and mortality risk.

Another benefit with whole grains is that they are high in fiber and can help to increase fecal bulk and prevent constipation. Stool output has a big effect on potassium removal from the body, and this physiological mechanism

of potassium removal has been shown to be heightened in renal disease patients. A study by Hayes et al.¹⁸ showed that potassium excretion in stool was 3 times higher in hemodialysis patients compared with controls, reaching up to 3,000 mg/day being excreted in stool. Studies have also shown that constipation occurs at a higher rate in hemodialysis patients and may be due to restrictions in fruits, vegetables, whole grains, and fluids.¹⁹ In a cohort study by Sumida et al, which looked at 3,504,732 United States veterans with an eGFR \geq 60 mL/min per 1.73 m², it was found that constipation was associated with higher incidence rates of CKD and ESRD and faster eGFR decline.²⁰ Although there are no studies examining constipation and serum potassium levels with whole-grain intake, inclusion of whole grains in the renal diet may be beneficial in helping to prevent constipation and encourage potassium removal from the body.

Foods containing more than 200 mg of potassium per serving may be considered high-potassium foods and are often restricted or limited in the renal diet. According to nutrient analysis of whole grains showcased in Table 2, there are many whole grains where a ½ cup serving size is well below this amount. Educating patients on whole grains that are lower in potassium and focusing on proper portion sizes to avoid excessive intake can be an ideal goal for renal disease patients.

To answer the question if ancient grains can be a part of the renal diet, I would say yes. They offer a good source of micronutrients, phytochemicals, and fiber. Whole grains are also a naturally low-sodium food, and many contain less than 200 mg of potassium per serving. With proper nutrition counseling on recommended portion sizes and how to read nutrition labels to identify sodium content and phosphorous additives, ancient grains can be a great addition to the renal diet.

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