

Hidden Phosphorus: Where Do We Go From Here?

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BETWEEN APRIL AND OCTOBER 2005, the *Journal of Renal Nutrition* published a series of articles focusing on hidden dietary phosphorus.¹⁻³ Since then, health care professionals have become more aware of the problems patients and professionals face in limiting dietary phosphorus. Also, during this time, more information regarding the effect of dietary phosphorus on the general population has been uncovered. This final article of the hidden phosphorus series will review where we have been, what has been discovered since the first publication of this series, and where we are heading in the struggle for dietary phosphorus control.

The idea for this series began in 2003 with the publication of "Hidden Sources of Phosphorus in the Typical American Diet: Does It Matter in Nephrology?" by Drs. Jaime Uribarri and Mona Calvo.⁴ This article introduced the nephrology community to the increased use of phosphate additives by American manufacturers and how this practice impacted the population with chronic kidney disease (CKD).

Although new to the nephrology community, the impact of phosphate additives on the general public's bone health was well known to Dr. Calvo. Her studies have shown that in the general public, an alteration in the dietary calcium phosphorus ratio may have detrimental effects on bone health.

In her first study, Dr. Calvo studied eight men and eight women. For the first week, participants ate a diet balanced in calcium and phosphorus. In

the following week, the diet, which was created using common grocery store items, was altered to provide four times more phosphorus than calcium. Results showed an increase in serum parathyroid hormone, serum phosphorus, plasma 1, 25 dihydroxyvitamin D, and urinary hydroxyproline.⁵

In her follow-up study, Dr. Calvo expanded the study size to 15 women who ate a balanced diet for 28 days. Participants then switched to a study diet consisting of 1700 mg phosphorus and 400 mg calcium for 28 days. Again, both the control and test diets were created using common grocery store items. Results from this longer study showed a significant increase in serum parathyroid levels.⁶

Dr. Calvo emphasizes that the test diet is not an uncommon phosphorus load in the American diet, especially among young adults. As Americans switch from meals made from "scratch" to more convenience products, the amount of phosphorus in the diet continues to increase (M. Calvo, PhD, oral communication, August 1, 2006). In addition, many Americans have increased their consumption of beverages containing phosphate additives. Such beverages now include sodas, flavored water, fortified waters and juices, and sports drinks. It is easy to see how a typical American can consume more than the Dietary Reference intake of 1000 mg of phosphorus per day.

The impact of phosphate additives on the population with renal disease is immense. Foods containing additives now stretch into all segments of the food pyramid. In addition to the beverages listed above, examples include enhanced meat products, cereal and snack bars, flavored waters, and frozen meals. These are inexpensive products that our low-income patients with CKD are using to meet their dietary needs. Many within

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The Kidney-Friendly Shelf

Did you know that **20 million** Americans have kidney disease?¹ That is more than double the number who are diagnosed with coronary heart disease,² and even more than the 17 million³ people with diabetes.

For the millions who have lost half of their kidney function, significant dietary restriction is the most important intervention in slowing the progression of their disease and continuing their quality of life. In fact, for your customers with kidney impairment, attention to diet is so vital that the government has mandated that each and every end-stage renal disease patient have his or her own dietitian.

The smart response from your store is the "**Kidney-Friendly Shelf**," a specialty location that answers the needs of your community while allowing your store to "*catch the wave*" for condition-specific nutrition. As with diabetes, heart disease, and gluten-free condition specific areas, the "**Kidney-Friendly Shelf**" assembles in one convenient and welcoming location your most enjoyable and satisfying foods that are "Excellent for Kidney Health!"

Customer Benefits:

- The "**Kidney-Friendly Shelf**" establishes instantly an easy way to locate and identify kidney-friendly foods among the thousands of food products currently offered in your store.
- The "**Kidney-Friendly Shelf**" provides an introduction to new foods such as DairyDelicious® very low phosphorus, low salt cheddar cheese sauce designed for both the widespread population with chronic kidney disease and those with high blood pressure and heart disease. Too, DairyDelicious low phosphorus milk stands out among the aseptic milks and milk alternatives because of its specific health benefit.

Retailer Benefits:

- The "**Kidney-Friendly Shelf**" promotes sales by providing your customers with clear-cut and healthful choices in one location.
- The "**Kidney-Friendly Shelf**" makes easy use of your existing inventory to showcase products from multiple categories that are especially good for kidney health such as cereals, snacks, pastas, and sodas. Please see Table 1 for examples of more than 80 shelf-stable products and brands.

Figure 1. Kidney-Friendly Shelf.

our patient population shop at megastores and discount grocery stores. Unfortunately, these stores are the largest purveyor of phosphate-enhanced foods. Expecting our population to change their shopping habits when they already

face multiple financial challenges is not practical. As such, the health care practitioner is left with limited options for phosphate control.

In most cases, phosphate binder therapy is adjusted to address the additional dietary phos-

- The "**Kidney-Friendly Shelf**" does not require the small-quantity purchase of both refrigerated- and shelf-stable products designed for specific medical conditions such as gluten intolerance.
- The "**Kidney-Friendly Shelf**" provides a positive outreach to your many customers with kidney disease, and creates excellent local and regional public relations.
- Most important, for retail venues with a pharmacy, the "**Kidney-Friendly Shelf**" will provide easy one-stop shopping for kidney patients who refill an average of 7–10 medications each month. The "**Kidney-Friendly Shelf**" will consequently generate a significant increase in pharmacy revenues by both attracting new customers and retaining existing ones.

As noted above, attached is a listing of food products and staples in most every shelf stable category that may be added to the "**Kidney-Friendly Shelf**." The list is by no means exhaustive, and, of course, products should be adjusted to regional tastes.

The "**Kidney-Friendly Shelf**" would be a great benefit to me, my family, and many others customers in the community. I encourage you to devote a convenient and welcoming section in your store to meeting our needs.

Sincerely,

- (1) National Kidney Foundation, 2005
- (2) National Heart, Lung and Blood Institute, 2004
- (3) "Diabetes Care," 2004

Figure 1. Kidney-Friendly Shelf (continued).

phorus load. However, this practice has its limitations. The National Kidney Foundation's Kidney Disease Outcomes Initiatives Guidelines for Bone Metabolism and Disease suggest to limit the use of calcium-based binders to minimize calcium load. There are also concerns about vascular calcification.⁷ Sevelamer hydrochloride increases the dietary acid load, which can contribute to metabolic acidosis,⁸ and lanthanum carbonate use is limited to 3 g per day.⁹ Phosphate binder therapies are often combined to maximize phosphate absorption. Unfortunately, this only adds to the financial burden of the patients, because they now must pay for more than one prescription to achieve phosphorus control.

Looking beyond the population with Stage 5 CKD to the larger arena of kidney disease, more emphasis is being given to mineral management in CKD Stages 3 and 4. More than 8 million Americans have lost one half of their kidney function and have glomerular filtration rates less than 60 mL/min.¹⁰ Alterations in mineral metabolism, vitamin D activation, and serum parathyroid levels in these earlier stages of CKD have been shown to contribute to renal osteodystrophy and may contribute to cardiovascular disease. Phosphorus diet restrictions are recommended in CKD Stages 3 and 4 when serum phosphorus levels are greater than 4.6 mg/dL or when serum parathyroid levels are above the recommended

Table 1. Shelf-Stable Products to Be Considered for the Kidney-Friendly Shelf. Some Products Should Be Used in Moderation Depending on Individual Needs

CATEGORY	PRODUCT	BRAND EXAMPLE
Vegetables and Side Dishes	Low Sodium Canned Vegetables: Green Beans, Wax Beans, Peas, Carrots, Corn, Asparagus, Beets	Several Manufacturers
	Rice, White	Several Manufacturers
	Apple Sauce	Mott's®
Milk and Cheese	Milk (low phosphorus, low potassium)	DairyDelicious®
	Cheddar Cheese Sauce (very low phosphorus, low sodium)	DairyDelicious® DiaryDelicious®
Cereals	Corn Flakes	Kellogg's Corn Flakes®
	Crisped Rice	Rice Krispies®
	Puffed Rice	Quaker®
	Grits	Several Manufacturers
	Rice Cereal–Hot	Cream of Rice®
	Wheat Cereal–Hot	Cream of Wheat®
Cookies	Shortbread	Lorna Doone®
	Sugar Cookies	Several Manufacturers
	Vanilla Wafers	Several Manufacturers
	Ginger Snaps	Several Manufacturers
Cakes	Angel Food, Pound, and Lemon Cake	Duncan Hines® Cake Mix
	Apple, Cherry, and Blueberry Pie	Several Manufacturers
	Doughnuts, Plain	Several Manufacturers
	Marshmallows	Several Manufacturers
Snacks	Unsalted Popcorn, Pretzels, Rice Cakes	Several Manufacturers
	Unsalted Crackers and Melba Toast	Several Manufacturers
	Fruit Cocktail	Several Manufacturers
	No Sugar-Added Fruit, Can or Jar	Several Manufacturers
	Sugar Free Chewing Gum	Several Manufacturers
Beverages	Coffee, Decafinated Coffee	All Manufacturers
	Regular and Diet Lemon-Lime Soda	All Manufacturers
	Regular and Diet Ginger Ale	All Manufacturers
	Regular and Diet Root Beer	A&W®
	Orange, Grape and Cherry Drink	Kool-Aid®
	Apple, Cranberry, and Grape Juice	Several Manufacturers
Bread	Sandwich Rolls	Arnold® Select
	Low Sodium Flour Tortillas	Several Manufacturers
	Bagels (plain, cinnamon, sesame, onion, egg)	Several Manufacturers
	Hamburger Buns	Several Manufacturers
	Bread Sticks, Plain	Progresso®
Pasta	Macaroni	All Manufacturers
	Spaghetti	All Manufacturers
	Spirals (Fusilli) and Shells	All Manufacturers
	COMING SOON: Deluxe Macaroni and Cheese Dinner (very low phosphorus, low sodium)	DairyDelicious
Seasonings, Spices, and Spreads	Sweeteners	Splenda®, Sweet-n-Low®, Aspartame
	Salt Replacers	Mrs. Dash®
	Pepper, Onion, and Garlic Powder	All Manufacturers
	Cilantro, Oregano, Dill, Basil, Sage, Paprika, Cinnamon, Nutmeg, Parsley, Rosemary, Curry	All Manufacturers
	Mayonnaise and Spreads	Several Manufacturers
	Yellow Mustard, Organic Mustard	French's®, Annie's Naturals®
	Low Sodium Salad Dressings	Several Manufacturers
	Low Sodium Bread Crumbs	Several Manufacturers
	Hot Sauce	Frank's®
	Lemon Juice	Several Manufacturers
Oil and Vinager	Vegetable Oil	Several Manufacturers
	Olive Oil	Several Manufacturers
	Corn Oil	Several Manufacturers
	White Vinager	Several Manufacturers
	Balsamic Vinager	Several Manufacturers
Puddings, Toppings, and Syrups	Whipped Topping Mix–Dry	Dream Whip®
	Sugar Free Gelatin	Jell-O®
	Light Chocolate Syrup	Hershey®
	Vanilla, Orange, and Almond Extract	Several Manufacturers

levels for CKD Stages 3 and 4.⁷ Unfortunately, this segment of our population faces the greatest challenges. Many are not diagnosed until later in the disease, preventing them from receiving appropriate medical intervention. For those who are diagnosed early in their disease process, access to renal dietitians is limited by the lack of insurance coverage for ongoing, long-term dietary education and support.

In 2006, an effort to bring back the phosphorus content to the nutrition label was launched jointly by the National Kidney Foundation Council on Renal Nutrition and the American Dietetic Association Renal Practice Group.¹¹ The effort faced many formidable challenges, including how the phosphorus content would be deciphered. Organic phosphate, which is found naturally in foods, is only 40% to 60% absorbed because it is bound to protein or other molecules such as phytate, whereas inorganic phosphate, such as phosphate additives, is 90% to 100% absorbed.⁴ Asking food manufacturers to perform multiple analyses or to disclose ingredient amounts, which in some cases is proprietary information, was too big of a challenge at the time the petition was submitted to the Food and Drug Administration. As a result, the project has been tabled until solutions to this and other challenges can be found.

Still undeterred, efforts to bring “kidney-friendly” foods to the market are under way. Spearheaded by Dr. William Pordy, founder of the Delicious Milk Company, Inc., and supported by Drs. Calvo and Uribarri and other nephrologists, there is now a pioneering effort to encourage manufacturers to make more kidney-friendly food products lower in phosphorus, sodium, potassium, and calcium, and to induce the retailer to create a “Kidney-Friendly Shelf.” “This is a win-win arrangement. Our patients and all of the folks with CKD 3 and 4 win by having one convenient and welcoming location to find foods that are designed for them alongside existing products from the store that are good for kidney health, and the grocer wins by keeping current customers, earning new ones, and delivering products that address the current issues of condition specific nutrition,” says Dr. Pordy (W. Pordy, MD, FACP, oral communication, April 4, 2007). Dr. Joseph Vassalotti, Medical Director for the National Kidney Foundation concurs,

“Kidney healthy foods would be an attractive way to avoid the challenge that food labels designed for the general population pose for CKD patients” (J. Vassalotti, MD, FASN, written communication, November 26, 2006).

As the food industry is driven by consumer demand, information regarding the need and desire for kidney-friendly foods must get to industry leaders. Food retailers who have a high demand for these products will demand more kidney-friendly foods from the manufacturer. Retailer information regarding the “Kidney-Friendly Shelf” and a list of kidney-friendly foods to be included on this shelf have been included in this article as a tool for health care professionals and patients with CKD (Figure 1 and Table 1).

Health care professionals need to continue educating other health care providers and patients on hidden dietary sources of phosphorus. Educational materials listing hidden phosphorus products can be displayed in waiting rooms. Low literacy posters showing pictures of new high-phosphorus foods can be used to reach those who cannot read nutrition ingredient labels. “Safe” food lists and pictures offer useful alternatives and encourage a variety of food choices.

Obtaining serum phosphorus control has been a long and ongoing battle. It is my hope that this four-part series has been beneficial in our challenges and has offered practical solutions to bring a long and meaningful quality of life to the patients and community we serve.

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