# Cutting phosphate in diet reduces deaths, heart problems related to kidney disease

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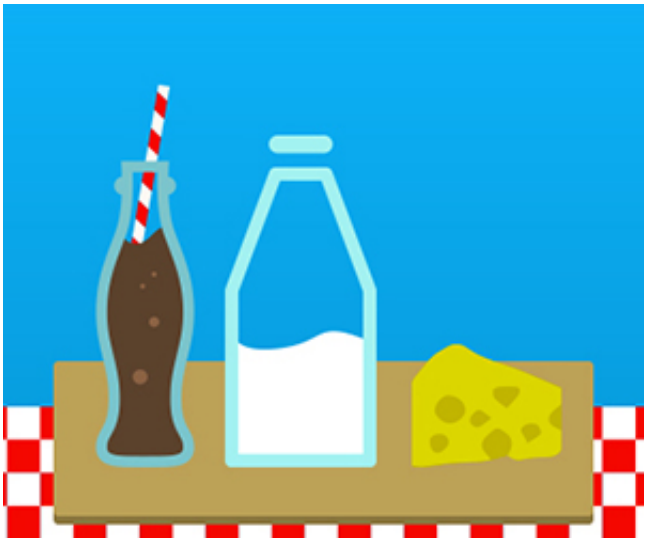

Severely cutting dietary phosphate early in the course of chronic kidney disease can prevent related heart and vascular problems, a new study in rats indicates. Phosphate, an essential mineral, is found in colas, milk, cheese and other dairy products, beans and high-protein foods, and often is added as a preservative in processed foods.

(Medical Xpress)—Millions of Americans suffer from chronic kidney disease, a condition that rarely causes symptoms until its later stages. But long before kidneys fail and dialysis becomes a way of life, the body experiences collateral damage.

This is especially problematic in the heart and blood vessels, which

become hardened and calcified as the kidneys begin to falter. In fact, patients with chronic kidney disease are far more likely to die of heart disease than kidney failure.

But new research in rats with chronic kidney disease shows that severely restricting phosphate in the diet reduces deaths and reverses vascular calcification and kidney damage. If the findings are confirmed in people, strictly limiting dietary phosphate early in the course of progressive kidney disease may help patients live longer, healthier lives with fewer heart and vascular problems.

The research, at Washington University School of Medicine in St. Louis, is available online in Kidney International, the journal of the International Society of Nephrology.

"It appears that early, strict control of phosphate is crucial," said senior author Eduardo Slatopolsky, MD, the Joseph Friedman Professor of Renal Diseases in Medicine. "Waiting until a person is on dialysis to get phosphate under control is too late."

Phosphate is an essential mineral that keeps bones and teeth healthy. It is found in various forms in many foods that Americans consume, including colas, milk, cheese and other dairy products, and beans and other high-protein foods. Phosphate frequently is added as a preservative in processed foods.

While healthy kidneys easily filter waste products such as phosphate from the blood, they are less able to do so as kidney function declines. Over time, a buildup of phosphate in the blood contributes to an accumulation of calcium in the heart and blood vessels.

Calcium deposits are an early sign of coronary artery disease. They contribute to the formation of plaques in blood vessels that eventually

can block blood flow to the heart, leading to heart attacks. The deposits also stiffen blood vessels, increasing blood pressure. This can cause cardiomyopathy, which develops when the main pumping chamber of the heart becomes enlarged and can't effectively pump blood to the body.

"A buildup of calcium in blood vessels is a huge concern," Slatopolsky said. "That we were able to reverse blood vessel calcification by severely restricting phosphate is impressive and may have important implications for the treatment of chronic kidney disease."

As kidney disease worsens, patients are advised to follow a strict diet to limit the buildup of toxic waste products in the blood. But it is not until the kidneys fail and patients are on dialysis that blood levels of phosphorus, potassium and other waste products are monitored closely.

As part of the study, co-authors Jane Finch and Cindy Ritter, both staff scientists in the Renal Division, fed a high-phosphate diet to normal, healthy rats and to rats with uremia, a complication of chronic kidney disease that occurs when the body's waste products accumulate in the blood. Three months later, the researchers found that blood levels of phosphate in the animals, as well as deposits of calcium in blood vessels and in the heart, were much higher in rats with uremia than in the healthy rats.

The rats with uremia then were divided into three groups. For another three months, one group was fed a high-phosphate diet; the second was fed a high-phosphate diet and also received a phosphate binder, a medication given to dialysis patients to help remove phosphate from the blood; and the third group was fed a low-phosphate diet.

The researchers found that rats eating a high-phosphate diet had the highest blood levels of phosphate and the highest death rate, at just over

70 percent. Rats that received the phosphate binder had a 38 percent mortality rate, and rats on the low-phosphate diet had a mortality rate of only 6 percent.

"The decrease in mortality rates was dramatic," Slatopolsky said. "We don't know the mechanism, but it's possible that bone cells called osteoclasts or immune cells called macrophages break down the plaques and reabsorb the calcium."

The researchers also found that markers of heart disease onset and declining kidney function were reduced substantially in the rats on the low-phosphate diet. Importantly, kidney function in these rats improved over the course of the study, unlike that in rats on the high-phosphate diet.

In patients with end-stage kidney disease, the left ventricle of the heart often is enlarged, an indicator that the heart's ability to pump blood to the body is declining. The researchers saw similar signs of heart problems in rats on the high-phosphate diet, but in the animals fed a low-phosphate diet, the left ventricles appeared healthy in size and shape.

"More studies are needed," Slatopolsky said. "But it may be that patients with chronic kidney disease are not the only ones who may benefit from restricting phosphate in their diets. It's possible that people at high risk of kidney failure, including those with uncontrolled diabetes or high blood pressure, may be able to delay the onset of kidney problems by limiting phosphate. That's an intriguing possibility that's worth evaluating."

**More information:** Finch JL, Lee DH, Liapis H, Ritter C, Zhang S, Suarez E, Ferder L and Slatopolsy E. "Phosphate restriction significantly reduces mortality in uremic rats with established vascular calcification." *Kidney International.* Oct. 9, 2013.