

## Diet and Kidney Diseases

### High Dietary Phosphate Boosts Blood Pressure in Healthy People

High dietary phosphate levels are known to be harmful for patients with advanced kidney disease. Now an abstract presented at ASN Kidney Week 2017 suggests that high phosphate diets also may have detrimental effects on the cardiovascular health of healthy people.

In patients with advanced kidney disease there is evidence that a high-phosphate diet is associated with worse cardiovascular disease, said Kevin J. Martin, MD, a professor of internal medicine and director of the division of nephrology at St. Louis University, who was not involved in the study. In fact, patients are often urged to limit phosphorous in their diets, a tricky task given that food makers are not required to list this popular preservative on labeling, Martin explained. Phosphorous binding agents are also sometimes used, but he noted more evidence from clinical trials is needed to determine their effects (Cannata-Andía JB and Martin KJ. *Nephrol Dial Transplant* 2016; 31:541–7).

Epidemiological studies have also found higher dietary phosphate intake and blood phosphate concentration are linked to worse cardiovascular outcomes, noted one of the abstract's authors, Reto Krapf, MD, of the University of Basel in Switzerland. This is particularly concerning because phosphate levels appear to be increasing in Western diets.

To determine if increased dietary phosphate might have cardio-toxic effects, Krapf and his colleagues conducted a prospective study in which 20 healthy young people with normal kidney function were randomly assigned to a high- or low-phosphate diet for 11 weeks. At 6 weeks, both groups received a 600,000 U dose of vitamin D3.

Patients on the high-phosphate diet experienced increased systolic (plus 4.1) and diastolic blood pressure (plus 3.2) compared with baseline and with the low-phosphate group. The average heart rate in this group also increased by 4 beats per minute. Plasma renin/aldosterone concentrations and 24-hour urinary excretion rates of sodium, aldosterone, and free cortisol were comparable between the two groups. The vitamin D dose had no effect on blood pressure or pulse rate in the high-phosphate group, but it increased phosphate levels in the low-phosphate diet group.

At follow-up visits 2 months after the diet ended, the elevated blood pressures and pulse rate in the high-phosphate group returned to normal.

“By identifying the phenomenon of dietary phosphate-induced hypertension and acceleration of mean heart rate, we provide at least one important mechanism that explains the increased cardiovascular morbidity and

mortality associated with increased phosphate intake,” Krapf said. “Our study also identifies increased sympathetic activity as the most likely cause of phosphate-induced hypertension.”

Martin said the study was well done and extends the evidence regarding the vascular toxicity of high-phosphate diets into an otherwise healthy population.

“Just a high-phosphate diet is enough to raise blood pressure; that was kind of interesting,” Martin said. He suggested it might help organizations like the National Kidney Foundation convince the US Food and Drug Administration to require phosphate labeling.

Krapf suggested that limiting phosphate in the diet might be a good step to protect kidney health.

“Hypertension is a very important cause of kidney disease and high phosphate intake or experimentally administered high phosphate loading has been shown to cause kidney disease and progressive renal failure,” he said. “Thus, limiting phosphate intake in humans—both with normal and decreased renal function—may protect the kidneys both directly [by decreasing phosphate load] and indirectly [by decreasing blood pressure].” ●

“Effect of Dietary Phosphate Intake on Blood Pressure in Healthy Humans” (Abstract SA-OR027)

### Lower Acid Diet May Boost Exercise Capacity, Especially in Elderly

By Bridget M. Kuehn

Eating a lower acid diet—typically lots of fruits and vegetables—may help boost exercise capacity, particularly for older patients, according to an abstract presented at Kidney Week.

Acid-producing diets, such as those rich in animal proteins, can exacerbate chronic kidney disease—so nephrologists often prescribe a low acid diet or bicarbonate supplements to balance a patient's acid load. High acid diets may also have ill effects on otherwise healthy individuals, particularly those who are experiencing age-related renal decline.

Now, Enni-Maria Hietavala, MS, a PhD student in the laboratory of Antti Mero at the University of Jyväskylä in Finland, shows that eating a low acid diet boosts exercise capacity. In the study, 88 healthy volunteers (22 adolescents, 33 young adults, and 33 elderly individuals) were assigned to eat a high acid or a low acid diet for 7 days and then switch to the other diet. At the end of each week, the participants were monitored as they performed a strenuous cycling test and provided blood samples.

The study found that base levels in the body declined for all participants during the high acid diet. Base levels were lower in both young and elderly women who performed suboptimally on the cycling test after eating the

high acid diet. In young women, the maximum exercise workload was 19% shorter and the maximum cardiorespiratory capacity was lower after eating the high acid diet compared with the low acid diet.

Previously, Hietavala, MS, and her colleagues published a study showing that older people are more sensitive to the ill effects of a high acid diet on their exercise capacity (Hietavala Em, et al. *European Journal of Clinical Nutrition* 2015; 69:399–404).

“When you are young your kidneys work well and you have a large base buffer capacity,” explained her co-author Lynda Frassetto, MD, an emeritus professor of nephrology at the University of California-San Francisco. But as people age they become less able to compensate. The current findings, if validated, suggest that eating a low acid diet should help individuals maintain muscle and bone mass via exercise, while promoting better kidney function, Frassetto said.

Bess Dawson Hughes, MD, a professor of medicine and director of the Bone Metabolism Laboratory at Tufts University in Boston, said the study will likely trigger additional research to find out if the benefits of a low acid diet on exercise capacity are sustained over time.

Although it is too soon to make clinical recommen-

dations based on the results, they may have important implications for older adults.

“This diet modification is particularly important in elders whose exercise capacity is low,” Dawson-Hughes explained. “It may enable people to have better functional capacity to live independently.”

Bicarbonate supplements have been shown to help boost exercise capacity in elite athletes in some studies (Burke LM. *Nestle Nutr Inst Workshop Ser* 2013; 75:15–26), and Dawson-Hughes and her colleagues have also found improved muscle power in older women given bicarbonate supplements over 3 months (Dawson-Hughes B, et al. *Osteoporosis Int* 2010; 21:1171–1179). The low acid diet used by Hietavala was high in fruits and vegetables. This suggests that following current dietary recommendations for fruits and vegetables may be enough to help.

“If we were to do what is recommended by the dietary guidelines, we wouldn't have these [high] acid loads,” Dawson-Hughes said. “It's another piece of evidence that we need those fruits and vegetables.” ●

“Low Dietary Acid Intake May Help the Kidneys Improve Exercise Capacity” (Oral Abstract 068)



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