

Is phosphate the next sodium?

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Is phosphate the next sodium—a once seemingly benign food additive now linked to heart disease and death? It's nearly as ubiquitous as sodium in processed foods but so under the radar, it's not even listed on food labels.

Phosphate's low profile may soon change. A new Northwestern Medicine research center, funded by the American Heart Association (AHA), will investigate potential [heart](#) damage caused by excess dietary [phosphate](#), particularly in African Americans, who have disparately high rates of [cardiovascular disease](#) and may consume diets high in processed foods.

The goals are to find new ways to prevent and treat [heart failure](#) and build evidence for regulating phosphate in the food supply to try to improve public health.

"Poor people and minorities are more likely to eat greater amounts of processed foods because those items are cheaper and more readily available, especially in neighborhoods where there is not a supermarket and limited availability of healthier fresh foods," said lead investigator Dr. Myles Wolf. "We think reducing dietary phosphate consumption in low-income and African American populations may reduce their higher risks of heart disease and, thereby, minimize one of the most glaring health disparities in the U.S."

In the future, phosphate content may need to be listed on food labels, Wolf said.

Wolf is the Margaret Gray Morton Professor of Medicine and the director of the Center for Translational Metabolism and Health at Northwestern University Feinberg School of Medicine. He also is a physician at Northwestern Memorial Hospital.

The Northwestern center will conduct three research projects to investigate phosphate-related damage on a public health, clinical science and molecular level. With a nearly \$4 million grant, the center is one of four new AHA-funded centers on disparities in [heart disease](#) and stroke.

The studies will build on Northwestern research already linking a high-phosphate diet to an increase of a hormone, FGF23, that strongly predicts risk of heart failure and death. And that link, scientists believe, may explain the higher incidence of heart failure in poor people and minorities, who eat more of the phosphate-laden processed foods, thereby raising their levels of the hormone.

Nearly half of all African-American men and women have some form of cardiovascular disease, according to the AHA.

Food additives are the most absorbable source of phosphate in the human diet. They are commonly found in processed meats, packaged goods, fast food and processed beverages such as certain sodas, lemonades, bottled teas and other soft drinks. The food industry adds phosphate to processed foods to improve taste and appearance and extend shelf life.

"Any food item that's wrapped in plastic has a good chance of having phosphate added to it," Wolf said.

A healthy adult diet likely requires only 800 to 1,200 milligrams per day of phosphate, but a similar diet that substitutes processed foods for their fresh equivalents can contain closer to 2,000 milligrams of daily phosphate, according to research by Wolf's team.

In an earlier study, Wolf and colleagues showed blacks and lower income individuals had higher phosphate and FGF23 levels in their blood than whites and people with higher incomes.

"Now we are trying to connect all the dots at a [public health](#) level," Wolf said.

How high dietary phosphate may injure the heart

When people consume large amounts of phosphate, their bones make more FGF23, which helps the body excrete the excess phosphate. If elevated FGF23 persists because of a diet high in [processed foods](#), the hormone may cause thickening and stiffening of the walls of the heart's main pumping chamber, a condition called left [ventricular hypertrophy](#). As a result, the heart muscle is less effective at filling with blood to

pump throughout the body, eventually leading to heart failure.

If people have kidney disease, which itself increases FGF23 levels, eating a high phosphate diet further ramps up production of the hormone and places extra stress on the heart.

Since African Americans have a genetic predisposition to a much higher risk of kidney disease, a high phosphate diet might place them at even greater risk of FGF23-related heart damage than Caucasians and contribute to well-known disparities in heart failure.

The studies the new Northwestern AHA center on health disparities will conduct are:

1) Population science: Center investigators will examine how access to healthy food, socioeconomic status and race affect FGF23 levels and the trajectory of those levels over 10 years. Mercedes Carnethon, associate professor of preventive medicine at Feinberg, who heads this arm of the study, also will investigate how those hormone levels predict change in cardiac structure and function related to left ventricular hypertrophy. She will use data from the CARDIA (Coronary Artery Risk in Young Adults) study, for which Northwestern is one of the four main national field sites.

2) Basic science: Center investigators will study the molecular mechanisms of how FGF23 causes left ventricular hypertrophy. "We will also investigate pharmacological and dietary approaches to prevent cardiac injury induced by high levels of FGF23 in pre-clinical animal models," said Wolf, who leads this study.

3) Clinical science: Center investigators will modify the high-phosphate diets of individuals in low-income neighborhoods, so the participants will eat fresh versions of the same food items rather than the processed

alternatives. Scientists will then determine if the lower phosphate diets reduce the participants' FGF23 levels and improve measures of their cardiovascular health. This study will be conducted at the University of Alabama at Birmingham and led by Orlando Gutierrez, associate professor of medicine.

Provided by Northwestern University

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