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BYPRODUCT OF INTESTINAL BACTERIA MAY JEOPARDIZE HEART HEALTH IN PATIENTS WITH KIDNEY DISEASE

Levels that accumulate due to poor urinary clearance may cause atherosclerosis and heart disease

Highlights

- Blood levels of TMAO, a byproduct generated from intestinal bacterial as they metabolize dietary nutrients, progressively increase with advancing severity of kidney disease.
- TMAO levels are dramatically reduced when kidney function is restored following kidney transplantation.
- High TMAO levels are linked with an increased risk of atherosclerosis and premature death in patients with chronic kidney disease.

An estimated 26 million people in the United States have chronic kidney disease, and heart disease is the leading cause of death in these patients.

Washington, DC (July 30, 2015) — In patients with chronic kidney disease (CKD), atherosclerosis is exceedingly common and contributes to the development of heart disease, which is the leading cause of death in this group. New research suggests that an organic byproduct generated by intestinal bacteria may be responsible for the formation of cholesterol plaques in the arteries of individuals with decreased kidney function. The findings, which appear in an upcoming issue of the *Journal of the American Society of Nephrology (JASN)*, suggest that targeting this byproduct may be a novel strategy for safeguarding the heart health of patients with CKD.

Trimethylamine-N-oxide (TMAO) is generated by certain intestinal bacteria as they metabolize dietary nutrients called choline and L-carnitine. Research has shown that giving TMAO to rodents promotes atherosclerosis and that humans with higher concentrations of TMAO in the bloodstream are at increased risk of developing heart disease. Because TMAO is cleared from the bloodstream almost exclusively by urinary excretion, the kidneys likely play an important role in maintaining low blood levels of the compound.

In a study of 104 patients with CKD, Jason Stubbs, MD, Alan Yu, MB, BChir (The Kidney Institute at the University of Kansas Medical Center), and their colleagues found that blood levels of TMAO increased as kidney function declined. In a subset of 6 patients who underwent kidney transplantation, the procedure led to a significant drop in TMAO levels. Furthermore, in a separate group of 220 CKD patients, high levels of TMAO in the bloodstream were linked with an increased risk of atherosclerosis and death over a 4-year period.

“Based on evidence that TMAO production is dependent on the metabolism of specific dietary constituents by intestinal bacteria, therapies targeting the generation of TMAO precursors by intestinal bacteria may represent a novel strategy for reducing cardiovascular disease and mortality in patients with CKD,” said Dr. Stubbs.

In an accompanying editorial, W.H. Wilson Tang, MD (Cleveland Clinic) noted that dietary sources of TMAO generation, such as some species of deep-sea fish, eggs, and meat, should be reviewed and possibly reduced in the diets of patients with CKD. He also stressed that there is considerable excitement over the prospects of modulating intestinal microbiota as a therapeutic strategy in CKD. “There is much to learn in this complex relationship between ourselves and the microbes living within,” he wrote.

Study co-authors include John House, MS, A. Jacob Ocque, MS, Shiqin Zhang, PhD, Cassandra Johnson, Cassandra Kimber, MD, Kyle Schmidt, Aditi Gupta, MD, James Wetmore, MD, Thomas Nolin, PharmD, PhD, and John Spertus, MD, MPH.

Disclosures: The authors reported no financial disclosures.

The article, entitled “Serum Trimethylamine-N-oxide is Elevated in CKD and Correlates with Coronary Atherosclerosis Burden,” will appear online at <http://jasn.asnjournals.org/> on July 30, 2015.

The editorial, entitled “Trimethylamine N-Oxide as a Novel Therapeutic Target in CKD,” will appear online at <http://jasn.asnjournals.org/> on ####day, #####, 2015, doi XXX.

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