

Lack of diversity of microorganisms in the gut or elevated gut metabolites implicated in heart failure severity

June 20 2022



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Some people who experience heart failure have less biodiversity in their gut or have elevated gut metabolites, both of which are associated with more hospital visits and greater risk of death, according to a systematic review of research findings led by Georgetown University School of Nursing & Health Study researchers and colleagues.

The [gut microbiome](#) is a delicately balanced ecosystem comprised primarily of [bacteria](#) as well as viruses, fungi and protozoa. The microbiome can affect cardiovascular disease, which is a leading cause of death in the United States; heart failure, affecting over six million Americans annually, is often the end stage of progressive cardiovascular disease.

For their overview, the investigators looked at seven years of genetic, pharmacologic and other types of research findings from around the world to generate a wide perspective on how the microbiome can influence heart failure. The investigators zeroed in on one harmful metabolite, trimethylamine-N-oxide (TMAO), that can be produced by churning gut microbiota when full-fat dairy products, egg yolks and red meat are consumed.

The analysis appeared June 20, 2022, in *Heart Failure Reviews*.

"To diagnose and manage heart failure we rely on certain findings and test results, but we do not know how poor heart function influences the activities of the gut, including the absorption of food and medications," says Kelley Anderson, Ph.D., FNP, CHFNP, associate professor of

nursing at Georgetown and corresponding author of the study. "There is now an appreciation of a back-and-forth relationship between the heart and elements in the gut, as clearly the heart and vascular system do not work in isolation—the health of one system can directly influence the other, but clear connections are still being worked out scientifically."

The investigators parsed 511 research articles published between 2014 and 2021 that connected the microbiome with heart failure and winnowed their focus to the 30 most relevant articles. In recent years, more advanced technology, particularly tools that can closely examine the biological roles of DNA and RNA in the body, provided more detailed insights into the gut/heart relationship and those studies were of particular interest.

The researchers could not pinpoint the effects of diet on the interplay between the microbiome and the cardiovascular system due to a lack of strong data from the studies they reviewed. The investigators noted that nutrition is an important component of overall cardiovascular health, so having the opportunity to explore the impact of diet in relation to the microbiome is a promising area for future research efforts.

In terms of possible interventions to mitigate negative impacts of the microbiome on [heart disease](#), Anderson noted that there are ongoing studies evaluating the use of antibiotics, prebiotics and probiotics, all of which can impact the microbiome, as well as intestinal binders that glom on to and help shuttle harmful elements out of the gut.

"We are currently developing a forward-looking study to evaluate the microbiome in patients with heart failure. We are particularly interested in the symptomatic experience of patients with end-stage heart failure as well as disease-related weight loss and wasting during this stage of [cardiovascular disease](#)," says Anderson.

More information: The Heart and Gut Relationship: A Systematic Review of the Evaluation of the Microbiome and Trimethylamine-N-Oxide (TMAO) in Heart Failure, *Heart Failure Reviews* (2022). [DOI: 10.1007/s10741-022-10254-6](https://doi.org/10.1007/s10741-022-10254-6)

Provided by Georgetown University Medical Center

Citation: Lack of diversity of microorganisms in the gut or elevated gut metabolites implicated in heart failure severity (2022, June 20) retrieved 3 January 2023 from <https://medicalxpress.com/news/2022-06-lack-diversity-microorganisms-gut-elevated.html>

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