Lipid biomarkers key to cardiac repair differences in blacks and whites after heart attack

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Ganesh Halade, PhD, of the University of South Florida Morsani College of Medicine, was the study's lead author. Credit: University of South Florida

Black men and women have higher incidences than whites of developing advanced heart failure following a heart attack. Despite racial disparities in heart attacks (a leading contributor to heart failure), and rehospitalizations and deaths caused by heart disease, the underlying physiology accounting for worse cardiovascular outcomes among blacks is poorly understood.

A new study published May 4 in *ESC Heart Failure* profiles bioactive lipids in blood samples from hospitalized black and white patients soon after a severe heart attack. The preliminary research was conducted by a team at the University of South Florida Health (USF Health) Morsani College of Medicine and the University of Alabama at Birmingham. The researchers wanted to delineate potential differences in the immune-responsive processes needed to safely clear (resolve) acute inflammation after heart attack-induced tissue injury, with the aim of finding more individualized therapies for heart failure.

"Metabolic and leukocyte-responsive signaling control the acute inflammation needed for timely cardiac repair after a heart attack. But inflammation that is not cleared and remains long-term plays a key role in the pathology leading to heart failure," said lead author Ganesh Halade, Ph.D., associate professor of cardiovascular sciences at the Morsani College of Medicine and a member of the USF Health Heart Institute.

"Understanding race and sex-based differences in inflammation and its resolution will help us develop more personalized diagnoses and treatments to delay or prevent heart failure."

A mouse model study published by Dr. Halade earlier this month discovered that heart repair occurs faster in female mice than males after a heart attack, which improves survival and delays cardiac failure.

In this human study, the researchers collected blood plasma from 53 patients, grouped by race and sex, within 24 to 48 hours after a heart attack. Baseline acute injury caused by the heart attack was similar in all the patients, and so were their ages and body mass indexes. No significant sex-or race-specific differences were detected in total cholesterol, HDL, LDL or triglyceride levels—all indicators (biomarkers) currently used by clinicians to help predict risk and manage cardiovascular disease. Measures of various subtypes of leukocytes (cells that regulate immune fitness) were similar across all patients.

Looking for distinct bioactive lipid "signatures," or inflammatory biomarkers, that might predict poorer cardiovascular outcomes after heart attack, the researchers measured three major polyunsaturated fatty acids: arachidonic acid (AA), docosahexaenoic acid (DHA), and eicosapentaenoic acid (EPA).

These omega fatty acids circulate in blood and depend upon what people eat. Also analyzed were dozens of specific proresolving mediator (SPM) indicators and a few other signaling molecules that form when these fatty acids metabolize in response to immune activation.

Overall, black patients showed higher concentrations of the three activated fatty acids after a heart attack than white patients, the researchers found. The comparative analyses of SPMs showed that resolvin E1, a potent proresolving mediator of inflammation derived from the fatty acid EPA, was significantly lower in black men and women than in whites. An earlier major clinical trial linked EPA with reduced ischemic events such as heart attack and stroke in patients with high risk for, or existing, cardiac disease, and another showed that high levels of EPA significantly decreased the risk of heart failure.

The researchers conclude that bioactive lipids are key for diagnosis and treatment of cardiac repair after heart attack to delay heart failure.

Randomized controlled clinical trials will be needed to definitively determine whether distinct SPM signatures can be used to predict, diagnose, treat or prevent heart failure following a heart attack, Dr. Halade said. "If we can stratify risk among larger patient groups to determine who is deficient in SPMs critical for cardiac repair, we may be able to restore those targeted SPMs to improve outcomes."

More information: Ganesh V. Halade et al, Race?based and sex?based differences in bioactive lipid mediators after myocardial infarction, *ESC Heart Failure* (2020). DOI: 10.1002/ehf2.12730

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