PLASMA CERAMIDES
A NOVEL BIOMARKER OF UNSTABLE ATHEROSCLEROTIC CARDIOVASCULAR DISEASE
WHAT ARE CERAMIDES?
Ceramides are complex lipids that play a central role in cell membrane integrity, cellular stress response, inflammatory signaling, and apoptosis. Synthesis of ceramides from saturated fats and sphingosine occurs in all tissues. Ceramides accumulate in tissues not suited for lipid storage during conditions of metabolic dysfunction and dyslipidemia. Three specific ceramides have been identified as highly linked to cardiovascular disease: Cer(16:0), Cer(18:0), Cer(24:1).

PLASMA CERAMIDES AND RISK OF CARDIOVASCULAR EVENTS
Plasma ceramides are elevated in patients with coronary artery disease (CAD), insulin resistance, and type 2 diabetes mellitus. Elevations of plasma ceramides are significantly higher among patients with acute coronary syndromes and unstable angina compared to stable CAD. Plasma ceramides are predictors of adverse cardiovascular events resulting from unstable atherosclerotic plaque. Risk conferred by ceramides is independent of traditional biomarkers including age, sex, smoking status, and history of CAD.

ELEVATED PLASMA CERAMIDE CONCENTRATIONS ARE A RISK FACTOR FOR:
- Myocardial infarction.
- Emergency coronary revascularizations (PCI and CABG).
- Acute coronary syndrome hospitalizations.
- Cardiovascular mortality.
- Cerebrovascular accidents (stroke).

WHY ORDER PLASMA CERAMIDES OVER OTHER BIOMARKER TESTS THAT PREDICT RISK?
- Plasma ceramides predict adverse cardiovascular events.
  - Within 1 year among patients with established coronary artery disease.4
  - Within 3 to 5 years for patients with suspected CAD and/or chronic heart failure.4–6
- Risk conferred by plasma ceramides is independent of LDL cholesterol, HDL cholesterol, C-reactive protein, LDL particles, HDL particles, and Lp-PLA2 (concentration and activity).
- Plasma ceramides are a modifiable risk marker.6,7
  - Standard statin therapies (simvastatin and rosuvastatin) significantly reduce plasma ceramides within 5 weeks.
  - Plasma ceramides are significantly lower among patients with reduced PCSK9 activity.

WHICH TEST SHOULD I ORDER?
- Plasma Ceramides
  (Mayo ID: CERAM)

WHEN SHOULD I ORDER?
Ordering this test is helpful for establishing an individual’s risk or determining whether a residual risk remains. Specific ordering scenarios include:
- Patients with established coronary artery disease.
- Patients with history of or clinical suspicion for acute coronary syndrome or a myocardial infarction.
- Patients with intermediate or undetermined atherosclerotic cardiovascular risk, as 19.4% cardiovascular events occur in the absence of traditional risk factors.8
RESEARCH IN SUPPORT OF CERAMIDES TESTING

A NESTED CASE CONTROL FROM THE COROGENE STUDY

- The Corogene study is a prospective cohort study consisting of patients assigned to coronary angiogram. Cases (n=80) included stable patients with CAD, who had experienced CV death within an average follow-up of 2.5 years.
- Controls (n=80) were selected from patients who survived the follow-up period and were matched for age, sex, smoking, type 2 diabetes and statin use at study entry.
- Cer(16:0), Cer(18:0), and Cer(24:1) were highly predictive of CV death.

SPECIAL PROGRAM AT UNIVERSITY MEDICINE - ACUTE CORONARY SYNDROMES (SPUM-ACS) AND BERGEN CORONARY ANGIOGRAPHY COHORT (BECAC) STUDIES

- SPUM-ACS: 51 CV deaths recorded during one-year follow-up among 1,637 ACS patients enrolled at four Swiss university hospitals.
- BECAC: 81 CV deaths during a median follow-up of 4.6 years among 1,580 adults referred to elective coronary angiography.
- A significant increase in actual events is observed when patients are stratified according to the Ceramide Risk Score.

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<th>BECAC (5-YEAR RISK)</th>
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<td><strong>SCORE</strong></td>
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<td><strong>SCORE</strong></td>
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TAP INTO THE EXPERTISE OF MAYO CLINIC

The Cardiovascular Laboratory Medicine Group within Mayo Clinic works to accommodate the growing demand for development, validation, and use of analytes to predict risk for both primary and secondary prevention.

Focused on acute-care cardiology, risk stratification, and genomics, the group integrates laboratory cardiology with its colleagues in cardiology, pediatric cardiology, genetics, cardio-thoracic and vascular surgery—as well as cerebrovascular specialists in neurology.

REFERENCES

FOR MORE INFORMATION ABOUT CARDIOVASCULAR TESTING, VISIT
MayoMedicalLaboratories.com/ceramides

mayomedicallaboratories.com news.mayomedicallaboratories.com /mayocliniclabs @mayocliniclabs

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