BOSTON HEART DIAGNOSTICS
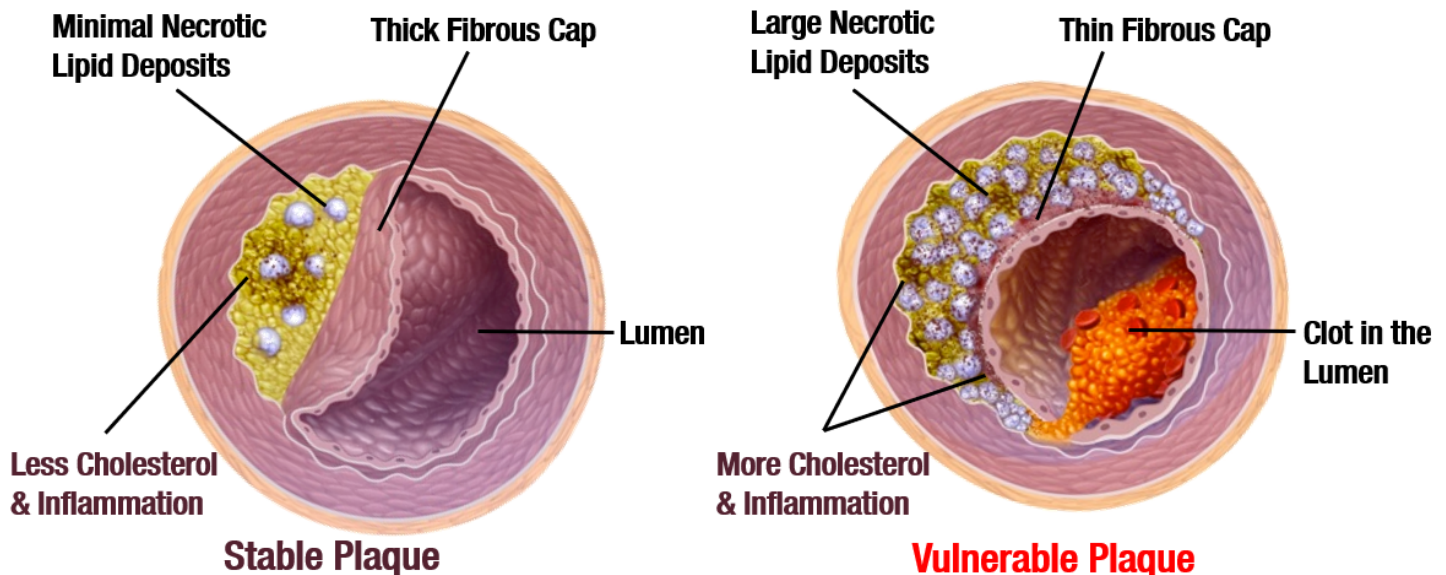# INFLAMMATION AND OXIDATION TESTING
Cardiovascular disease is an inflammatory disease

Inflammation and oxidation markers can be early indicators of a patient's cardiovascular disease (CVD) risk. Elevated values can indicate the presence of unstable plaque, and/or accelerated atherosclerosis in artery walls. These are associated with preventable adverse outcomes such as sudden cardiac death, myocardial infarction, and stroke.[1-12] Studies indicate greater risk with multiple elevated inflammatory markers.[4-7]

For 57% of patients, sudden death is the first sign of heart disease[9]

UNDERSTANDING INFLAMMATION AND VULNERABLE PLAQUE

Inflammation often reflects suboptimally treated cardiovascular risk factors that promote plaque formation in the artery wall. Some clinicians think of this as "arteries on fire". To reduce inflammation and oxidation, address the underlying causes including those illustrated below.

Stable Plaque

Minimal Necrotic Lipid Deposits — Thick Fibrous Cap — Lumen — Less Cholesterol & Inflammation

Vulnerable Plaque

Large Necrotic Lipid Deposits — Thin Fibrous Cap — Clot in the Lumen — More Cholesterol & Inflammation

Stable Plaque
- **Optimal Lipoproteins:** LDL-C <70 mg/dL, sdLDL-C <25 mg/L, HDL-C >50 mg/dL, and Lp(a) <30 mg/dL
- **Optimal Inflammation, Clotting & Oxidation markers:** hs-CRP <1.0 mg/L and IL-6 <2.5 pg/mL, fibrinogen <370 mg/dL, and ox-PL-apoB <5.0 nmol/L
- **Optimal Plaque Markers:** LpPLA2 <180 nmol/min/mL and MPO <370 pmol/L

Vulnerable Plaque
- **Abnormal Lipoproteins:** LDL-C >130 mg/dL, sdLDL-C >50 mg/L, HDL-C <40 mg/dL, and Lp(a) >50 mg/dL
- **Elevated Inflammation, Clotting & Oxidation markers:** hs-CRP >3.0 mg/L and IL-6 >5.0 pg/mL, fibrinogen >470 mg/dL, and ox-PL-apoB >7.5 nmol/L
- **Elevated Plaque Markers:** LpPLA2 >225 nmol/min/mL and MPO >470 pmol/L

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ABOUT INFLAMMATION AND OXIDATION TESTS

Boston Heart offers the tests listed below.

hs-CRP (high-sensitivity C-reactive protein): A protein produced in response to inflammation and excessive deposits of cholesterol and fat in the liver and other tissues. High levels can predict cardiovascular events. hs-CRP is useful in determining how well a patient is responding to lifestyle change and statin treatment.[11]

LpPLA$_2$ (lipoprotein-associated phospholipase A$_2$): An enzyme made by white blood cells in response to plaque in the artery walls. LpPLA$_2$ levels reflect the overall atherosclerotic burden and risk of CVD events.[7,8]

MPO (myeloperoxidase): An enzyme made by white blood cells in response to inflammation. In patients with established CVD, elevated levels can indicate unstable plaque and a high risk of having a near-term cardiac event (within 1 to 6 months).[2-6]

Fibrinogen: A protein that is important for blood clotting. High levels are associated with an increased risk of cardiovascular disease.[12]

IL-6 (interleukin-6): A cytokine produced by macrophages in response to specific proteins which serve as detection molecules of the innate immune system. Studies show that IL-6 levels are significantly increased with an excess of cholesterol-laden macrophages in the arterial walls.[13-15]

OxPL-apoB (oxidized phospholipids): Lipids found on all apoB-containing lipoproteins, including LDL, VLDL, and especially on Lp(a). [16,17] Oxidized phospholipids are highly pro-inflammatory and contribute to many diseases of aging. Levels can be used to reclassify patients into higher or lower risk categories allowing better personalized care.[16,17]

TMAO (trimethylamine N-oxide): A gut microbial metabolite that reflects the relationship between dietary patterns, intestinal bacteria, and health. Chronic consumption of red meat, egg yolks, and dairy increases TMAO levels which are associated with increased mortality.[18]

34% of strokes occur in people under the age 65[10]

ORDERING INFORMATION

Test Name	Test Code
hs-CRP	601
LpPLA$_2$	602
MPO	604
Fibrinogen	701
IL-6	1191
OxPL-apoB	635
TMAO	630

SPECIMEN REQUIREMENTS

hs-CRP, LpPLA$_2$, IL-6, OxPL-apoB, or TMAO: 1.0 mL serum collected in serum separator tube (SST/tiger top)

MPO or Fibrinogen: 1.0 mL plasma collected in an EDTA plasma separator tube (pearl top)

Shipping:
Refer to the standard packaging instructions on the Boston Heart Instructions for Specimen Preparation and Handling sheet.

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