Berkeley HeartLab’s cardiovascular risk markers for personalized disease management

Elevated:
LDL IIIa+b, LDL IVb, Apo B, Lp(a), Homocysteine, Fibrinogen, hs-CRP, Lp-PLA₂, Triglycerides, or Insulin

Low:
HDL-C, HDL2b, or Vitamin D, 25-hydroxy

For Physicians
## Disorders Determine Treatment

<table>
<thead>
<tr>
<th>Disorder</th>
<th>Relative Risk</th>
<th>Treatment</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevated LDL Cholesterol</td>
<td>2-3 X</td>
<td>Resin, Statin, Niacin, Fibrates, Inhibitor of Cholesterol Absorption, Diet and Exercise</td>
<td>LDL &lt; 100 mg/dL</td>
</tr>
<tr>
<td>Elevated Apo B</td>
<td></td>
<td></td>
<td>Apo B &lt; 60 mg/dL</td>
</tr>
<tr>
<td>Elevated Small Dense LDL</td>
<td>3 X</td>
<td>Niacin, Fibrates, Statins (minor effect), Diet and Exercise</td>
<td>LDL III a+b ≤ 15%</td>
</tr>
<tr>
<td>Low HDL2b</td>
<td>2-3 X</td>
<td>Niacin, Diet and Exercise</td>
<td>HDL2b &gt; 20% male</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HDL2b &gt; 30% female (premenopausal goal)</td>
</tr>
<tr>
<td>Elevated Lp(a)</td>
<td>3-5 X</td>
<td>Niacin, Fenofibrate (limited effect)</td>
<td>&lt; 30 mg/dL or decrease of 50%</td>
</tr>
<tr>
<td>Elevated Triglycerides</td>
<td>2-3 X</td>
<td>Niacin, Fibrates, Fish Oil, Statins (modest effect), Diet and Exercise</td>
<td>TG &lt; 150 mg/dL</td>
</tr>
</tbody>
</table>

*Determine underlying cause of elevated homocysteine, insulin, hs-CRP, and/or fibrinogen and treat accordingly*

### Berkeley HeartLab Proprietary Lipoprotein Subclass Determination

Berkeley HeartLab’s proprietary methodology for advanced lipid subclass analysis provides valuable insight into cardiovascular disease management. Our LDL-S₃GGE⁺ gels and HDL-S₁₀GGE⁺ gels utilize segmented gradient gel separation technology, a high resolution approach that distinguishes more lipid subclasses. This resolving power allows healthcare providers more insight with which to characterize cardiovascular risk, differentiate treatment needs, and monitor response to therapy.

### Apo E Population Distribution and Dietary Modification

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Apo E2</th>
<th>Apo E3</th>
<th>Apo E4</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Population</td>
<td>2/2</td>
<td>2/3</td>
<td>3/3</td>
</tr>
<tr>
<td></td>
<td>1%</td>
<td>10%</td>
<td>62%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate (35%) fat diet if elevated TG</td>
</tr>
</tbody>
</table>
The traditional way of assessing heart disease with blood tests is with a lipid panel that includes measuring HDL ("good") and LDL ("bad") cholesterol. Unfortunately, this approach has failed to identify a large percentage of people who are at risk for heart attacks. Nearly half of all heart attack patients were considered by their doctors to have no prior elevated risk for heart disease. Our advanced cardiovascular tests help provide a more accurate and individualized picture of your risk by looking more closely at the risk associated with your HDL and LDL levels, as well as looking at other risk markers that affect your overall heart health.

Berkeley HeartLab Advanced Cardiovascular Tests

Heart disease is complex. Numerous factors can contribute to your heart health picture. Luckily, looking more closely at risk markers in your blood can reveal elevated risk or even flag existing heart disease, helping your doctor determine the therapy you need to achieve better heart health.

**LDL IIIa+b, LDL IVb - Small LDL Particles**

- The small LDL particles, LDL IIIa+b and LDL IVb, can cause plaque build-up to progress much faster because they enter the artery wall more easily than larger LDL particles
- Having too many small LDL particles is a powerful risk factor for a heart attack
- Certain medications, proper nutrition, and regular exercise can help your body produce fewer small LDL particles

**HDL2b - Large HDL Particle**

- The larger HDL2b particles help clean the arteries by picking up cholesterol
- Low levels of HDL2b can increase your risk for heart disease
- Certain medications, weight loss with exercise, and stopping tobacco use are some ways to improve HDL2b levels
Insulin - Hormone

- Insulin is released from the pancreas to regulate blood sugar (glucose) levels
- Constant high levels are linked to an increased risk for heart disease, diabetes, and other health conditions
- High insulin levels can be improved with proper nutrition, exercise, stress management, or certain medications

NT-proBNP - Stress on the Heart

- NT-proBNP is a hormone released from heart muscle cells in response to ongoing stress or strain on the heart
- A high level of NT-proBNP is a warning signal that your heart is being overworked
- The early identification of high levels may help your physician decide on a treatment plan to lower the risk of a heart disease event

Vitamin D - Hormone

- Low Vitamin D levels are linked to an increased risk of heart disease, stroke, diabetes, hypertension, and heart failure
- Vitamin D levels may be low for many reasons, such as insufficient sun exposure, eating diets poor in Vitamin D, and obesity
- If levels are low, your physician may recommend Vitamin D supplements
ApoB – LDL Particle Number

- ApoB is a direct measurement of the number of lipoprotein particles, including LDL ("bad cholesterol"), IDL, and VLDL
- A high apoB number indicates increased risk for heart disease
- Certain medications, improved eating habits, increased physical activity, and loss of body fat are some ways to improve apoB

Lp(a) Extended Range

- High levels of Lp(a) are associated with increased risk of cardiovascular disease and stroke
- Lp(a) is inherited. Diet and exercise have limited to no effect on lowering Lp(a), however certain medications can lower levels

Homocysteine

- High levels of homocysteine can cause injury to blood vessel walls, increasing your risk for heart disease and stroke
- Nutrition, such as increasing intake of folate-rich foods, plays an important role in reducing levels of homocysteine
**Lp-PLA₂ – Inflammation in the Artery**

- High levels of Lp-PLA₂ can predict risk of a heart attack or stroke
- When both Lp-PLA₂ levels and systolic blood pressure are high, stroke risk increases significantly
- Certain medications can reduce levels of Lp-PLA₂

**CRP (hs) – Inflammation in the Body**

- High levels of C-Reactive Protein (CRP) indicate inflammation due to infection or tissue injury
- If both CRP and Lp-PLA₂ levels are high, your risk for a heart attack or stroke increases significantly
- Certain medications and food may have anti-inflammatory benefits

**Fibrinogen – Inflammation Marker & Clotting Factor**

- Fibrinogen is a part of the blood’s clotting process and can be elevated due to inflammation
- Continual high levels are linked to an increased risk for heart disease
- Fibrinogen levels can be lowered by stopping tobacco use and losing excessive body fat
Berkeley HeartLab Genetic Tests

Every individual is unique. The genes that you were born with may impact your heart health. Our genetic tests can help your doctor assess your risk for heart disease, as well as how your body will respond to certain heart medications.

**KIF6 Genotype Test**

- The KIF6 Genotype Test can give insight into your heart disease risk as well as your response to the statin medications atorvastatin (Lipitor®) and pravastatin (Pravachol®)
- People who are KIF6 carriers may have a higher risk of heart disease events (such as a heart attack)\(^a\)
- However, for people who are KIF6 carriers, the statin medications atorvastatin (Lipitor) or pravastatin (Pravachol) may help reduce this risk\(^b\)

---

**SLCO1B1 Genotype Test**

- The SLCO1B1 Genotype Test can give insight into your risk of myopathy (muscle weakness, cramps, stiffness, inflammation, spasms, or paralysis) while taking certain statins\(^c\)
- People who are SLCO1B1 carriers may have a higher risk of myopathy while taking certain statins
**CYP2C19 Genotype Test**

- The *CYP2C19* Genotype Test can give insight into how your body processes the medication clopidogrel (Plavix®)\(^d\).
- For people who are Poor or Intermediate Metabolizers, Plavix may be less effective at preventing blood clots\(^e\).
- For people who are Ultra-Rapid Metabolizers, Plavix may be overly effective, which may increase the risk of a bleeding problem\(^e\).

**LPA-Aspirin Genotype Test**

- The *LPA-Aspirin* Genotype Test can give insight into your risk for heart disease as well as your response to aspirin.
- People who are *LPA-Aspirin* carriers may have a higher risk of heart disease events (such as a heart attack)\(^f\).
- However, for people who are *LPA-Aspirin* carriers, low-dose aspirin may help reduce this risk\(^e\).

**4q25-AF Risk Genotype Test**

- The 4q25-AF Risk Genotype Test can give insight into your risk for atrial fibrillation (irregular heart beat) and risk for stroke caused by atrial fibrillation.
- People who are 4q25-AF Risk carriers may have a higher risk for atrial fibrillation (AF) and stroke caused by AF\(^h\).

**LPA-Intron 25 Genotype Test**

- The *LPA-Intron 25* Genotype Test can give insight into your risk for heart disease.
- People who are *LPA-Intron 25* carriers may have a higher risk of heart disease\(^l\).
9p21-MI Risk Genotype

- The 9p21-MI Risk Genotype Test can give insight into your risk for certain types of heart disease
- People who are 9p21-MI Risk carriers may have a higher risk of a heart attack (myocardial infarction [MI]) before the age of 60 years in women and 50 years in men, abdominal aortic aneurysm (AAA), or blocked coronary arteries or a heart attack at any age.

ApoE Genotype

- The ApoE Genotype Test can give insight into your heart disease risk as well as your response to different amounts of dietary fats
- There are 6 ApoE genotypes: 2/2, 2/3, 3/3, 2/4, 3/4, and 4/4
- People who have the 3/4 or 4/4 genotype may have a higher risk of heart disease.