

Patient	Name:		Provider:		Accession No:	
	DOB:	Gender: F	Account No:		Requisition No:	
	Patient ID:	Fasting: Yes			Report Date & Time:	
	ACC/AHA Risk Score:	BMI:			Received Date & Time:	
	Patient Info:				Collection Date & Time:	

LipoMap Test by NMR¹

Our 600 MHz nuclear magnetic resonance (NMR) analysis using Bruker software allows us to accurately assess 35 standard and advanced serum lipid, lipoprotein, and apolipoprotein parameters as previously described (Jimenez B et al. Anal Chem. 2018; 90:11962-11971). For atherogenic very low density lipoprotein (VLDL), intermediate density lipoprotein (IDL), and low density lipoprotein (LDL) parameters, high values (red) are >75th percentile, borderline values (yellow) are in the 50-75th range, and normal values (green) are <50th percentile range of our population. High values are associated with increased cardiovascular disease (CVD) risk. For protective HDL parameters, values in red are <25th percentile, borderline values are in the 25-50th percentile range, and normal values are >50th percentile range of our population. For HDL parameters decreased values are associated with increased CVD risk. NMR values correlate very highly with values obtained by chemical methods.

Test Name	Optimal	Borderline	Increased Risk	Interpretation	Footnotes	Previous Results
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Lipid, Lipoprotein and Apolipoprotein Tests

Total Cholesterol	157			Total Cholesterol is OPTIMAL . This is a measure of cholesterol in all serum lipoproteins. High values are associated with an increased risk of CVD if LDL-C is also high.		
	<200	200-240	>240 mg/dL			
Direct LDL-C	83			LDL-C is OPTIMAL . LDL is a small atherogenic lipoprotein that is generally the major cholesterol carrying lipoprotein in serum. High values are associated with an increased risk of CVD.		
	<100	100-160	>160 mg/dL			
HDL-C			40	HDL-C is INCREASED RISK . This measures cholesterol in all HDL particles. HDL allows reverse cholesterol transport to remove cholesterol from the body. HDL is associated with protection and low levels are associated with an increased risk of CVD.		
		>60	50-60	<50 mg/dL		
Non-HDL-C	117			Non-HDL-C is OPTIMAL . This is a measure of cholesterol in all non-HDL particles. High values are associated with an increased risk of CVD.		
	<130	130-190	>190 mg/dL			
Triglycerides	144			Triglycerides are OPTIMAL . Triglycerides are comprised of three fatty acids attached to a glycerol backbone. High values may be associated with an increased risk of CVD and/or pancreatitis.		
	<150	150-200	>200 mg/dL			
sdLDL-C		35		sdLDL-C is BORDERLINE . Small dense LDL is the most atherogenic LDL particle. High values are associated with an increased risk of CVD.		
		<20	20-40	>40 mg/dL		
%sdLDL-C			42	%sdLDL-C is INCREASED RISK . %sdLDL-C is the percentage of LDL-C that is sdLDL-C. High values are associated with an increased risk of CVD. It is most important to optimize sdLDL-C.		
		<20	20-30	>30 %		
IDL-C			17.5	IDL-C is INCREASED RISK . IDL is an intermediate sized lipoprotein. High values are associated with an increased risk of CVD.		
		<7.0	7.0-12.0	>12.0 mg/dL		
VLDL-C		30.8		VLDL-C is BORDERLINE . VLDL is the major triglyceride-carrying lipoprotein in the fasting state and is the largest particle in fasting serum. High values may be associated with an increased risk of CVD and/or pancreatitis.		
		<30.0	30.0-40.0	>40.0 mg/dL		
ApoA-I			125.9	ApoA-I is INCREASED RISK . ApoA-I is the major protein of HDL. Low levels are associated with an increased risk of CVD.		
		>180.0	140.0-180.0	<140.0 mg/dL		
ApoA-II			29.6	ApoA-II is INCREASED RISK . ApoA-II is another important protein in HDL. Low levels are associated with an increased risk of CVD.		
		>35.0	32.0-35.0	<32.0 mg/dL		
ApoB		95		ApoB is BORDERLINE . ApoB is the major protein in all atherogenic VLDL, IDL, and LDL lipoproteins. High levels are associated with an increased risk of CVD and is a better measure of CVD risk than LDL-C.		
		<80	80-120	>120 mg/dL		

Notes

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LipoMap Test by NMR¹ Continued

Test Name	Optimal	Borderline	Increased Risk	Interpretation	Footnotes	Previous Results
Lipid Ratios						
TC/HDL-C	3.92			TC/HDL-C is OPTIMAL . This ratio has been shown to be an excellent marker of CVD risk. High levels are associated with an increased risk of CVD. This ratio is more predictive of CVD risk than either parameter alone.		
	<4.00	4.00-6.00	>6.00			
ApoB/ApoA-I		0.75		ApoB/ApoA-I is BORDERLINE . This ratio has been shown to be an excellent marker of CVD risk. High levels are associated with an increased risk of CVD.		
	<0.60	0.60-0.90	>0.90			

Atherogenic Lipoprotein Particles

Test Name	Optimal	Borderline	Increased Risk	Interpretation	Footnotes	Previous Results
Total ApoB-P		1728		Total ApoB-P is BORDERLINE . This value indicates the particle number of all apoB-containing lipoproteins including VLDL, IDL, and LDL. High levels are associated with an increased risk of CVD.		
	<1400	1400-2000	>2000 nmol/L			
LDL-P		1264		LDL-P is BORDERLINE . This value indicates the levels of all LDL particles. LDL is generally the major cholesterol carrying lipoprotein and is a small atherogenic lipoprotein particle. High values have been associated with an increased risk of CVD.		
	<1200	1200-1800	>1800 nmol/L			
IDL-P			138	IDL-P is INCREASED RISK . This value indicates the IDL particle number. IDL is an intermediate sized lipoprotein particle. High values have been associated with an increased risk of CVD.		
	<70	70-100	>100 nmol/L			
VLDL-P			275	VLDL-P is INCREASED RISK . This indicates the VLDL particle number. VLDL is the major triglyceride-carrying lipoprotein in the fasting state. High values may be associated with an increased risk of CVD, insulin resistance, diabetes and/or pancreatitis.		
	<120	120-180	>180 nmol/L			

LDL Particles

Test Name	Optimal	Borderline	Increased Risk	% of Total LDL	LDL Particles	Interpretation	Footnotes	Previous Results
LDL1-P	<90			7%		LDL1-P is OPTIMAL , LDL2-P is OPTIMAL , LDL3-P is OPTIMAL , LDL4-P is OPTIMAL , LDL5-P is INCREASED RISK , and LDL6-P is INCREASED RISK . LDL particles range in size from very small to very large with LDL1 being the largest. Smaller particles are more atherogenic and larger particles are less atherogenic. LDL6 is the smallest and densest LDL particle and is the most atherogenic. Cholesterol lowering medications like statins lower the concentration of all LDL particles. Lifestyle changes like weight loss, healthy diet and exercise improve the size distribution of LDL particles resulting in a more favorable LDL particle profile.		
	<140	140-190	>190 nmol/L					
LDL2-P	68			5%				
	<150	150-200	>200 nmol/L					
LDL3-P	92			7%				
	<190	190-260	>260 nmol/L					
LDL4-P	181			13%				
	<230	230-330	>330 nmol/L					
LDL5-P			447	33%				
	<290	290-400	>400 nmol/L					
LDL6-P			494	36%				
	<300	300-450	>450 nmol/L					

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LipoMap Test by NMR¹ Continued

Test Name	Optimal	Borderline	Increased Risk	Interpretation	Footnotes	Previous Results
ApoB-100 and TG in Atherogenic Particles						
LDL-apoB		70		LDL-apoB is BORDERLINE. This value is the amount of apoB contained in all LDL particles. High values are associated with an increased risk of CVD.		
	<70	70-100	>100 mg/dL			
IDL-apoB			7.6	IDL-apoB is INCREASED RISK. This value is the amount of apoB contained in all IDL particles. High values may be associated with an increased risk of CVD.		
	<4.0	4.0-6.0	>6.0 mg/dL			
VLDL-apoB			15.1	VLDL-apoB is INCREASED RISK. This value is the amount of apoB contained in all VLDL particles. High values may be associated with an increased risk of CVD and/or pancreatitis.		
	<6.0	6.0-10.0	>10.0 mg/dL			
LDL-TG			30	LDL-TG is INCREASED RISK. This value is the amount of triglyceride carried in all LDL particles. High values are associated with an increased risk of CVD.		
	<24	24-28	>28 mg/dL			
IDL-TG		9.5		IDL-TG is BORDERLINE. This value is the amount of triglyceride carried in all IDL particles. High values may be associated with an increased risk of CVD.		
	<6.0	6.0-10.0	>10.0 mg/dL			
VLDL-TG			114	VLDL-TG is INCREASED RISK. This value is the amount of triglyceride carried in all VLDL particles. High values may be associated with an increased risk of CVD and/or pancreatitis.		
	<60	60-90	>90 mg/dL			
Test Name	Optimal	Borderline	Increased Risk	Interpretation	Footnotes	Previous Results

HDL Particles

HDL-P			28.4	HDL Particle Level (HDL-P) is INCREASED RISK. This value indicates the number of HDL particles. HDL particles protect against CVD. Low values of HDL-P are associated with an increased risk of CVD.		
	>43	36.0-43.0	<36 µmol/L			
Test Name	Optimal	Borderline	Increased Risk	Interpretation	Footnotes	Previous Results

Lipoprotein Cholesterol Esterification

LDL-FC/LDL-C	0.37			LDL-FC/LDL-C is OPTIMAL. LDL-FC/LDL-C is the ratio of free cholesterol to esterified cholesterol (cholesterol with a fatty acid attached) within LDL. A high ratio indicates markedly decreased LDL cholesterol esterification as seen in patients with liver disease or certain genetic HDL deficiency disorders.		
	<0.50		≥0.50			
HDL-FC/HDL-C	0.33			HDL-FC/HDL-C is OPTIMAL. HDL-FC/HDL-C is the ratio of free cholesterol to esterified cholesterol (cholesterol with a fatty acid attached) within HDL. A high ratio indicates markedly decreased HDL cholesterol esterification as seen in patients with liver disease or certain genetic HDL deficiency disorders.		
	<0.50		≥0.50			

LipoMap Interpretation and Considerations

Interpretation: Some of the LDL-related parameters are in the increased risk category. Favorable lifestyle habits are always important for optimizing this. LDL-lowering medications such as statins, ezetimibe, and PCSK9 inhibitors are important when lifestyle measures do not bring LDL-C levels to goal. This is especially important in patients with established CVD.

The VLDL-P level is increased risk. Lower levels are associated with less insulin resistance. Healthy lifestyle habits are the best way to optimize these levels. This includes avoiding excess alcohol.

Some of the HDL-related parameters are increased risk. Healthy lifestyle habits are the best way to optimize this. They include a healthy eating pattern (low in refined sugar/starch, and animal fat from meat/dairy), exercise, reducing excess body fat, and not smoking.

Prior to the use of lipid lowering agents for lipoprotein abnormalities, it is important to identify and treat secondary causes including obesity, diabetes, hypothyroidism, liver disease, and kidney disease if possible, and/or the use of oral estrogens, testosterone, or steroids, and to emphasize lifestyle modification. Our Lifestyle Program using dietary modification and exercise can help patients optimize their lipoprotein profiles. For high risk patients and those with established CVD, it is very important to optimize LDL particle number, LDL-C, sdLDL-C, and LDL6-P, which may require medications including statins, ezetimibe, and if necessary proprotein convertase subtilisin kexin 9 (PCSK9) inhibitors.

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Notes

Footnotes

The intended use of this report is to provide an aid in the physician's treatment decisions. This report is intended for a physician or other qualified health care provider. Please consult with your physician regarding any questions.

¹This test was developed and its performance characteristics determined by Boston Heart Diagnostics. It has not been cleared or approved by the U.S. Food and Drug Administration (FDA). The FDA has determined that such clearance is not necessary. This test is used for clinical purposes. It should not be regarded as investigational or for research. Methods: HDL Map: Gel electrophoresis; Cholesterol Balance and Fatty Acid Balance: GC/MS; MPO: Immunoturbidometric; CoQ10: UPLC/UV; Adiponectin: Latex turbidimetric immunoassay; OxPL-apoB and Aldosterone: Chemiluminescent immunoassay; LDL-P, HDL-P and LipoMap: NMR; TMAO: LC/MS/MS; Dried Blood Spot Testing.

²A fasting glucose level of >125 mg/dL indicates the presence of diabetes mellitus, and a fasting glucose level of <70 mg/dL indicates hypoglycemia.

³A test result in the low range is normal in a non-diabetic, but low if a patient has diabetes (consistent with diabetes).

⁴Genetic analysis is performed by real time Polymerase Chain Reaction (PCR) using TaqMan® probes. Amplified gene nucleotide sites: APOE - Apolipoprotein E, T471C rs429358, C609T rs7412; F5 - Coagulation Factor V, G1746A rs6025; F2 - Coagulation Factor 2, G20210A rs1799963; CYP2C19 (Clopidogrel response) -Cytochrome P450 2C19, G681A rs4244275, G636A rs4986893, C-806T rs12248560; SLC01B1 (Statin Myopathy) - Solute Carrier Organic Anion Transporter Family, Member 1B1, T625C rs4149056. MTHFR – Methylenetetrahydrofolate reductase, C677T rs1801133, A1298C rs1801131. Limitations: Other rare mutations not detected by these assays may be present in some individuals. Recommendation: Genetic counseling with discussion of testing for other family members is recommended.

* Tests performed with alternative methodologies are not displayed for comparative purposes.

▲ = Critical Value, ▲ = Alert Value, TNP = Test Not Performed, PEND = Test Result Pending, GSP = Glycated Serum Protein, ADA = American Diabetes Association

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