bostonheart diagnostics®

FINAL REPORT

Patient
Name:
DOB: Gender: M
Patient ID: Fasting:
ACC/AHA Risk Score: BMI:
Patient Info:

Provider
Provider:
Account No:

Specimen
Accession No:
Requisition No:
Report Date & Time:
Received Date & Time:
Collection Date & Time:

Lipids and Apolipoproteins

Test Name	Optimal	Borderline	Increased Risk	Footnotes	Previous Results
Total Cholesterol		224			
	<200	200-240	>240 mg/dL		
Direct LDL-C		153			
	<100	100-160	>160 mg/dL		
HDL-C		44			
	>50	40-50	<40 mg/dL		
Triglycerides		153		10	
	<150	150-200	>200 mg/dL		
Non-HDL-C		180			
	<130	130-190	>190 mg/dL		
ApoB			138		
	<80	80-120	>120 mg/dL		
sdLDL-C			55		
	<25	25-49	>49 mg/dL		
VLDL-C	27				
	<30	30-40	>40 mg/dL		
Lp(a)	27				
	<30	30-50	>50 mg/dL		
ApoA-I		138.3			
	>160	120-160	<120 mg/dL		

Lipid Ratios

TC/HDL-C		5.1			
	<4	4-6	>6		
VLDL-C/TG	0.18				
	<0.2	0.2-0.3	>0.3		
ApoB/ApoA-I			1.00		
	<0.6	0.6-0.9	>0.9		
HDL-C/TG		0.29			
	>0.5	0.25-0.5	<0.25		

Boston Heart HDL Map® Test[1,6]

Test Name	Optimal	Borderline	Increased Risk	HDL Particles	Footnotes	Previous Results
α-1			22.8			
	>35	25-35	<25 mg/dL			
α-2		53.8				
	>55	45-55	<45 mg/dL			
α-3			25.3			
	<20	20-25	>25 mg/dL			
α-4		20.0				
	<20	20-25	>25 mg/dL			
preβ–1	13.9					
	<20	20-25	>25 mg/dL			

Interpretation: This HDL map is **ABNORMAL**. Alpha-1 levels are low, a pattern associated with abnormal HDL metabolism and an increased CVD risk.

Consideration: Non-selective beta blockers, anabolic steroids, progesterone, and secondary causes of dyslipidemia such as thyroid, kidney or liver disorders may lower alpha-1. Optimize LDL-C, Triglycerides, sdLDL, ApoB, HOMA-IR, Omega-3 Index, reduce refined carbohydrates, increase physical activity; avoid excess body fat and smoking to increase alpha-1.

Boston Heart Cholesterol Balance® Test[1]

	Normalized Value	Absolute Value	Footnotes
Normalized Value (µmol x 100/mmol of Total Cholesterol)			
Absolute Value (mg/L)			
Production Markers: BORDERLINE			
Lathosterol (85 – 125)	125	2.8	
Desmosterol (65 – 75)	58	1.3	
Absorption Markers: HIGH			
Beta-sitosterol (115 – 155)	162	3.9	
Campesterol (170 – 230)	52	1.2	
Cholesterol Balance Score (Production/Absorption)	1.0		
Over Absorber (0.2 – 0.5 – 1.1) Over Producer			

Interpretation: Increased amounts of Lathosterol and Beta-sitosterol may indicate an increased cellular production and intestinal absorption of cholesterol. Desmosterol accounts for a minor portion (20%) of overall cholesterol production.

Consideration: Consider lifestyle modification, statin and ezetimibe therapy.

Notes

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Test Name	Optimal	Borderline	Increased Risk	Footnotes	Previous Results
Inflammation and Oxidation Tests					
hs-CRP		2.9			
	<1.0	1.0-3.0	>3.0 mg/L		
$LpPLA_2$ Activity	172				
	<180	180-224	≥225 nmol/min/mL		
OxPL-apoB	1.1				
	<2.0	2.0-3.0	>3.0 nmol/L		
Metabolic Tests					
HbA1c	5.5				
	<5.7	5.7-6.4	>6.4 %		
Glucose[2]	93			10	
	70-99	100-125	<70 or >125 mg/dL		
Insulin[3]			23	10,11	
	<10	10-15	>15 µU/mL		
Glycated Protein	139				
	<200	200-250	>250 µmol/L		
Adiponectin[1]			4.3		
	>10	7-10	<7 µg/mL		
HOMA-IR			5.3	12	
	<2	2-3	>3		
HOMA-S			18.9	10	
	>50.0	33.3-50.0	<33.3		
HOMA-B			276	10	
			%		

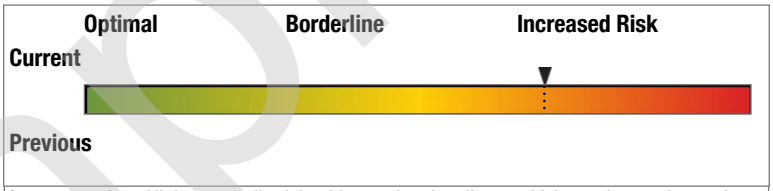
Interpretation: BORDERLINE hs-CRP may indicate inflammation and may be associated with increased CVD risk.

Consideration: Consider evaluating potential contributing CVD risk factors. Identify and treat underlying causes such as atherogenic lipoproteins and metabolic markers. If indicated, control blood pressure, encourage smoking cessation and weight reduction.

Interpretation:
LOW Adiponectin levels indicate high risk of developing insulin resistance and diabetes.
Based on the HbA1c value, the estimated Average Glucose (eAG) is 111 mg/dL which includes the non-fasting state.

Consideration: Consider encouraging dietary modification supported by education. If indicated encourage weight reduction, smoking cessation, increased activity and control blood pressure.

Boston Heart Beta Cell Function and Risk Index



Interpretation: High metabolic risk with very low insulin sensitivity and very elevated beta cell activity. Beta cell risk is in the 69th percentile. Fasting status not provided. Patient assumed to be fasting for at least 8 hours; not fasting can interfere with the accuracy of the Beta Cell Index.

Consideration: Consider weight loss and/or exercise to increase insulin sensitivity. For elevated beta cell activity (HOMA-B), consider limting refined carbohydrates such as sugars and starches to reduce insulin demand.

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Patient		Provider		Specimen	
Name:		Provider:		Accession No:	
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Boston Heart Fatty Acid Balance™ Test[1]

Test Name	Optimal	Borderline	Increased Risk	Interpretation	Footnotes	Previous Results
Saturated Fatty Acid Index		**30.1**		Saturated FA Index is BORDERLINE. Higher levels of plasma saturated fatty acids are associated with an increased risk of CVD. Consider restricting dietary intake of saturated fat by choosing poultry without skin, fish, low fat dairy products, and lean cuts of meat, and replacing butter with plant based oils. Consider reducing endogenous (internal) production of saturated fat by losing weight if appropriate, limiting added sugars, refined starches, and alcohol.	12	
	<30.0	**30.0-33.0**	>33.0 %			
Trans Fatty Acid Index	**0.39**			Trans FA Index is OPTIMAL.	12	
	<0.50	0.50-0.70	>0.70 %			
Unsaturated/Saturated Ratio	**2.27**			Unsaturated/Saturated Ratio is OPTIMAL.	12	
	>2.25	2.00–2.25	<2.00			
Omega-3 Fatty Acid Index			**1.14**	Omega-3 FA Index is LOW. A low Omega-3 FA index is associated with an increased risk for CVD. Eicosapentaenoic Acid (EPA) level is LOW. Increased EPA levels have been associated with lower risk of heart disease. Docosahexaenoic Acid (DHA) level is LOW. Increased DHA levels have been associated with a lower risk of CVD. Consider recommending consumption of at least 2-3 meals of oily fish such as salmon, sardines, herring, tuna, and mackerel weekly or a fish oil or EPA supplement.	12	
	>4.50	2.50-4.50	**<2.50 %**			
EPA			**<15.6**		12	
	>50.0	20.0-50.0	**<20.0 µg/mL**			
DHA			**30.5**		12	
	>100.0	60.0-100.0	**<60.0 µg/mL**			
ALA		**25.1**		Alpha Linolenic Acid (ALA) level is BORDERLINE. Higher levels of ALA have been associated with a lower risk of CVD. Consider recommending increasing intake of walnuts, chia seeds, ground flaxseeds, or flaxseed oil.	12	
	>30.0	**14.0–30.0**	<14.0 µg/mL			
EPA/AA Ratio			**0.05**	EPA/AA Ratio is LOW. Some authorities indicate that an EPA/AA ratio of >0.75 is optimal, usually only achieved with supplementation.	12	
	>0.17	0.07-0.17	**<0.07**			
AA/EPA Ratio			**19.20**	AA/EPA Ratio is HIGH. Some authorities indicate that an AA/EPA ratio of <1.33 is optimal, usually only achieved with supplementation.	12	
	<5.88	5.88-14.29	**>14.29**			
	Low	Mid	High			
Monounsaturated Fatty Acid Index			**24.1**	Values are reported according to the lowest, middle and highest thirds of our reference population. Dietary monounsaturated fats from plant sources reduce heart disease risk; however, blood levels of monounsaturated fats do not necessarily correlate closely with dietary intake. More data are needed on the complex effects of omega-6 fatty acids on cardiovascular risk.	12	
	<20.0	20.0-23.0	>23.0 %			
Omega-6 Fatty Acid Index			**43.2**		12	
	<39.0	39.0-43.0	>43.0 %			
Linoleic Acid (LA)			**1321.6**		12	
	<930.0	930.0-1150.0	>1150.0 µg/mL			
Arachidonic Acid (AA)	**212.2**				12	
	<250.0	250.0-320.0	>320.0 µg/mL			
Omega-3/Omega-6 Ratio	**0.04**				12	
	<0.07	0.07-0.10	>0.10			

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Patient ID: Gender: M

Provider
Provider:
Account No:

Specimen
Accession No:
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Chemistry Tests

Test Name	Low	Normal	High	Footnotes	Previous Results
BUN		11.8			
	<3.0	3.0-25.0	>25.0 mg/dL		
Creatinine		0.90			
	<0.67	0.67-1.17	>1.17 mg/dL		
Sodium		138			
	<135	135-146	>146 mmol/L		
Potassium		4.6			
	<3.5	3.5-5.3	>5.3 mmol/L		
Chloride		104			
	<98	98-110	>110 mmol/L		
CO_2		23			
	<20	20-31	>31 mmol/L		
Anion Gap		11			
	<3	3-16	>16 mmol/L		
Total Protein		7.1			
	<6.3	6.3-7.7	>7.7 g/dL		
Albumin		4.6			
	<3.5	3.5-5.2	>5.2 g/dL		
Calcium		9.9			
	<8.6	8.6-10.4	>10.4 mg/dL		
Total Bilirubin		0.5			
		0.0–1.2	>1.2 mg/dL		

Test Name	Optimal	Borderline	Increased Risk	Footnotes	Previous Results
Uric Acid	6.0				
	<7.0	7.0-10.0	>10.0 mg/dL		
Glucose[2]	93			10	
	70-99	100-125	<70 or >125 mg/dL		
AST		68			
	<40	40-120	>120 U/L		
ALT		89			
	<40	40-120	>120 U/L		
Alkaline Phosphatase	82				
	<130	130-200	>200 U/L		

Other Kidney Tests

Test Name	Optimal	Borderline	Increased Risk	Footnotes	Previous Results
BUN/Creatinine	13.1				
	<=23		>23		
eGFR	100				
	>60	30-60	<30 mL/min/1.73 m²		

Other Tests

Test Name	Low	Mid	High	Footnotes	Previous Results
Vitamin D, 25-OH		43		9	
	<30	30-100	>100 ng/mL		

Test Name	Optimal	Borderline	Increased Risk	Footnotes	Previous Results
Homocysteine	9.1				
	<10	10-14	>14 µmol/L		

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Name:		Provider:		Accession No:	
Patient ID:	Gender: M	Account No:		Report Date & Time:	

Lipids and Apolipoproteins

Test Name	01.21.2025 (Most Recent)
Total Cholesterol	224
Direct LDL-C	153
HDL-C	44
Triglycerides	153
Non-HDL-C	180
ApoB	138
sdLDL-C	55
VLDL-C	27
Lp(a)	27
ApoA-I	138.3

Lipid Ratios

Test Name	01.21.2025 (Most Recent)
TC/HDL-C	5.1
VLDL-C/TG	0.18
ApoB/ApoA-I	1.00
HDL-C/TG	0.29

Boston Heart HDL Map® Test[1,6]

Test Name	01.21.2025 (Most Recent)
α-1	22.8
α-2	53.8
α-3	25.3
α-4	20.0
preβ–1	13.9

Boston Heart Cholesterol Balance® Test[1]

Test Name	01.21.2025 (Most Recent)
Lathosterol	125
Desmosterol	58
Beta-sitosterol	162
Campesterol	52

Inflammation and Oxidation Tests

Test Name	01.21.2025 (Most Recent)
hs-CRP	2.9
$LpPLA_2$ Activity	172
OxPL-apoB	1.1

Metabolic Tests

Test Name	01.21.2025 (Most Recent)
HbA1c	5.5
Glucose[2]	93
Insulin[3]	23
Glycated Protein	139
Adiponectin[1]	4.3
HOMA-IR	5.3
HOMA-S	18.9
HOMA-B	276

Boston Heart Fatty Acid Balance™ Test[1]

Test Name	01.21.2025 (Most Recent)
Saturated Fatty Acid Index	30.1
Trans Fatty Acid Index	0.39
Unsaturated/Saturated Ratio	2.27
Omega-3 Fatty Acid Index	1.14
EPA	<15.6
DHA	30.5
ALA	25.1
EPA/AA Ratio	0.05
AA/EPA Ratio	19.20
Monounsaturated Fatty Acid Index	24.1
Omega-6 Fatty Acid Index	43.2
Linoleic Acid (LA)	1321.6
Arachidonic Acid (AA)	212.2
Omega-3/Omega-6 Ratio	0.04

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Patient		Provider		Specimen	
Name:		Provider:		Accession No:	
Patient ID:	Gender: M	Account No:		Report Date & Time:	

Test Name	01.21.2025 (Most Recent)
Chemistry Tests	
BUN	11.8
Creatinine	0.90
Sodium	138
Potassium	4.6
Chloride	104
CO_2	23
Anion Gap	11
Total Protein	7.1
Albumin	4.6
Calcium	9.9
Total Bilirubin	0.5
Uric Acid	6.0
Glucose[2]	93
AST	68
ALT	89
Alkaline Phosphatase	82
Other Kidney Tests	
BUN/Creatinine	13.1
eGFR	100
Other Tests	
Vitamin D, 25-OH	43
Homocysteine	9.1

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FINAL REPORT

Patient		Provider		Specimen	
Name:		Provider:		Accession No:	
Patient ID:	Gender: M	Account No:		Report Date & Time:	

Treatment Consideration Summary

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.

	Lifestyle and Dietary Modification	Statins	Ezetimibe	Fibrates	Omega-3 Fatty Acids	Soluble Fiber Supplements	Bile Acid Sequestrants
Lipids							
LDL-C	•	•	•	•		•	•
HDL-C	•	•		•	•		•
Triglycerides	•	•		•	•	•	
Non-HDL-C	•	•	•	•	•		•
ApoB	•	•	•	•			•
sdLDL-C	•	•	•	•	•	•	
ApoA-I	•	•					
HDL Map Test							
Alpha-1	•	•					
Cholesterol Balance Test							
Production Markers	•	•					
Absorption Markers	•		•			•	
Inflammation Tests							
hs-CRP	•	•			•		
Metabolic Tests							
HOMA-IR	•						
Adiponectin	•			•	•		
Insulin	•						
Fatty Acid Balance Test							
Omega-3 FA Index	•				•		
EPA	•				•		
DHA	•				•		

Lifestyle and Dietary Modification

Therapeutic lifestyle change is the cornerstone for reducing risk for Cardiovascular Disease (CVD) and diabetes.

The following recommendations are based on the American Heart Association's dietary and lifestyle guidelines. Consume a dietary pattern that achieves ≤6% of calories from saturated fat and emphasizes intake of vegetables, fruits and whole grains; includes low-fat dairy products, poultry, fatty fish, legumes, non-tropical vegetable oils and nuts; and limits intake of refined grains, sweets, sugar-sweetened beverages and red meats. Eliminate foods high in trans fat.

If indicated: control blood pressure, **reduce weight**, engage in smoking cessation and **be physically active** — work up to getting at least 30 minutes of a moderate intensity physical activity, at least 5 days per week.

- To increase alpha-1 levels it is important to reduce weight, reduce refined carbohydrate intake, eliminate trans fats and increase physical activity.
- Elevated production markers indicate an increased cellular production of cholesterol which may be associated with obesity and metabolic syndrome. Therapeutic lifestyle changes focus on LDL-C reduction through weight loss and decreased intake of animal fat, refined carbohydrates, sweets and sugar-sweetened beverages.
- Increased amounts of sterol absorption markers indicate increased intestinal absorption of cholesterol. Decreasing dietary cholesterol as found in eggs, dairy products and meats and consuming more soluble fiber may reduce LDL-C. Sources of soluble fiber include pectin in apples and pears, psyllium, legumes and oats.
- To increase ApoA-1, HDL-C and to decrease ApoB, non-HDL-C, LDL-C levels it is important to reduce saturated fat intake, refined carbohydrates, sugars and eliminate trans fats.
- To lower small dense LDL-C and triglycerides reduce intake of simple carbohydrates and alcohol and if indicated reduce weight and increase physical activity. An elevation in small dense LDL-C is often associated with metabolic syndrome. Triglycerides are utilized for fat storage or for energy. Elevated levels may increase CVD risk by altering lipoprotein metabolism by increasing the formation of small dense LDL particles and lowering levels of large HDL particles.
- To optimize insulin, HOMA-IR, adiponectin and reduce risk of diabetes and CVD it is important to reduce weight and simple carbohydrate intake.
- To improve Fatty Acid Balance results refer to the dietary changes provided in the Fatty Acid Balance interpretation section of this report.
- Consider visiting mybostonheart.com to create a Personalized Nutrition and Life Plan to help you achieve your lifestyle and dietary modification goals.

Patient		Provider		Specimen	
Name:		Provider:		Accession No:	
Patient ID:	Gender: M	Account No:		Report Date & Time:	

Report Interpretation (continued)

Statins

According to studies, statins have been shown to reduce cholesterol production, increase LDL clearance and lower the risk of CVD and its progression. Statins can lower CoQ10 levels.

Statins:
- may raise alpha-1 by 10-25%. Statins promote the production of HDL into large particles, such as alpha-1 and alpha-2. Alpha-1 HDL is a large protective form of HDL.
- may be effective in reducing cholesterol production and LDL cholesterol levels but also may increase absorption of cholesterol.
- may raise HDL-C by 5-10%; may lower LDL-C by 30-60%; may lower non-HDL cholesterol; may decrease triglycerides by 10-50%. Triglycerides are utilized for fat storage or for energy. Elevated levels increase CVD risk and alter lipoprotein metabolism by increasing the formation of small dense LDL particles and lowering levels of large HDL particles.
- may raise ApoA-1; may lower ApoB; ApoA-1 is the primary protein on each HDL particle. ApoB is the primary protein on non-HDL lipoproteins and is a direct measure of the number of atherogenic lipoproteins.
- may lower small dense LDL significantly especially in patients with elevated triglycerides. According to studies, small dense LDL is believed to be more atherogenic than larger, more buoyant LDL particles.
- lowering CRP with statin therapy has been shown to lower CVD events. Elevated CRP may indicate inflammation and CVD risk.

Ezetimibe (Cholesterol Absorption Inhibitor)

Ezetimibe blocks the intestinal absorption of both biliary and dietary cholesterol, but may also promote a compensatory increase in cholesterol production. Combination therapy with statins may improve clinical outcomes.

Ezetimibe:
- is effective in lowering over absorption of cholesterol in the intestinal wall.
- may lower non-HDL cholesterol; may reduce LDL-C up to 20%.
- may lower ApoB up to 15%; modestly lowers small dense LDL especially in patients with elevated triglycerides.

Fibrates

For patients unable to tolerate statins consider fibrate therapy. Fibrates have been shown to slightly lower alpha-1 levels.

Fibrates:
- may lower triglycerides 23-54%; may modestly lower LDL-C by 20-31%; provide a modest increase in HDL-C by 5-15%; may lower non-HDL cholesterol.
- may lower ApoB; may modestly reduce small dense LDL.
- have been shown to increase adiponectin gene expression and circulating adiponectin concentrations.

Omega-3 Fatty Acids

Studies have shown that Omega-3 Fatty Acids are essential to heart health. Their benefits may include improved cholesterol balance, improved immune system function, reduced inflammation and reduced rates of heart disease.

Omega-3 Fatty Acids:
- may modestly increase HDL-C; may modestly decrease non-HDL-C; reduce plasma triglycerides by about 25-50% resulting primarily from the decline in hepatic very low density lipoprotein (VLDL- TG) production and secondarily from the increase in VLDL clearance.
- may lower small dense LDL-C.
- may increase adiponectin up to 15% in combination with other lipid lowering therapies.

To improve Fatty Acid Balance results focus on the dietary changes provided in the Fatty Acid Balance interpretation section of this report. Consuming 1-2 grams of concentrated fish oil daily or 1800 mg of EPA per day has been shown to decrease heart disease morbidity and mortality.

Soluble Fiber Supplements

Soluble fiber works by decreasing cholesterol absorption in the gut by increasing LDL receptor expression in the liver. Consider a soluble fiber supplement such as guar gum, psyllium, pectin and glucomannan.

- Increased amounts of sterol absorption markers indicate an increase in intestinal absorption of cholesterol.

Bile Acid Sequestrants

Bile Acid Sequestrants (BAS), according to studies, bind bile acids in the intestine, causing more liver cholesterol to be converted to bile acids and decreasing availability of cholesterol to build bile acids. This process upregulates LDL receptors and increases LDL clearance.

Bile Acid Sequestrants:
- may lower ApoB up to 12%; may increase HDL 3-5%; may lower LDL-C up to 20%; may lower non-HDL cholesterol.

Notes

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Patient ID:	Gender: M	Account No:		Report Date & Time:	

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.

[1]This 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; Aldosterone: Chemiluminescent immunoassay; LDL-P, HDL-P, LipoMap and Serum MetaboMap: NMR; TMAO: LC/MS/MS; Dried Blood Spot Testing.

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

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

[4]Genetic 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; SLCO1B1 (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.

[6]Test performed at 200 Crossing Boulevard, Framingham, MA 01702. CLIA#: 22D2100622. NYSDOH: 9021.

[9]Biotin concentrations of up to 600 ng/mL in patient serum have been shown to have no impact on assay results.

[10]Fasting status not provided. Patient assumed to be fasting for at least 8 hours; not fasting adversely affects results.

[11]High doses of biotin (>5mg/day) may interfere with assay results. Patient assumed to be refraining from biotin supplementation for at least 3 days prior to blood draw.

[12]Reference ranges provided are valid for fasting specimens only. Clinical judgement is required for interpretation of results on non- fasting specimens.

* 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