bostonheart diagnostics®

FINAL REPORT

Patient

Provider
Provider: TONY BOGGESS DO
1310 S Main St
Ann Arbor, MI 48104

Account No: 7724

Specimen
Accession No: B4070470
Requisition No:
Report Date & Time: 10.02.2017 9:33 AM
Received Date & Time: 09.28.2017 4:19 PM
Collection Date & Time: 09.27.2017 08:30 AM

Test Name	Optimal	Borderline	High Risk	Notes	Previous Results
Lipid Tests					
Total Cholesterol		**200**			
	<200	**200-240**	>240 mg/dL		
Direct LDL-C		**127**			
	<100	**100-160**	>160 mg/dL		
HDL-C		**56**			
	>60	**50-60**	<50 mg/dL		
Triglycerides	**96**				
	<150	150-200	>200 mg/dL		
Non-HDL-C		**144**			
	<130	**130-190**	>190 mg/dL		
sdLDL-C[1]		**23**			
	<20	**20-40**	>40 mg/dL		
%sdLDL-C	**18**				
	<20	20-30	>30 %		
VLDL-C	**17**				
	<30	30-40	>40 mg/dL		
Lp(a)	**<15**				
	<30	30-50	>50 mg/dL		
Lipid Ratios					
TC/HDL-C	**3.6**				
	<4	4-6	>6		
VLDL-C/TG	**0.18**				
	<0.2	0.2-0.3	>0.3		
HDL-C/TG	**0.58**				
	>0.5	0.25-0.5	<0.25		
Inflammation Tests					
hs-CRP		**2.3**			
	<1.0	**1.0-3.0**	>3.0 mg/L		
LpPLA$_2$ Activity	**124**				
	<180	180-224	≥225 nmol/min/mL		
MPO[1]	**263**				
	<450	450-650	>650 pmol/L		

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.

Boston Heart Cholesterol Balance® Test[1]

Normalized Value (µmol x 100/mmol of Total Cholesterol)
Absolute Value (mg/L)

	Normalized Value	Absolute Value	Notes
Production Markers: HIGH			
Lathosterol (90 – 160)	**205**	**4.1**	
Desmosterol (70 – 90)	**65**	**1.3**	
Absorption Markers: LOW			
Beta-sitosterol (100 – 180)	**89**	**1.9**	
Campesterol (150 – 260)	**96**	**2.0**	

Cholesterol Balance Score (Production/Absorption) **1.9**

Over Absorber (0.2 – 0.5 – 1.1) Over Producer

Interpretation: Elevated levels of Lathosterol may indicate an increased cellular production of cholesterol. Desmosterol accounts for a minor portion (20%) of overall cholesterol production.

Consideration: Consider lifestyle modification and statin therapy.

Notes
Specimen: Acceptable

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Metabolic Tests

Test Name	Optimal	Borderline	High Risk	Notes	Previous Results
HbA1c		**5.7**			
	<5.7	**5.7-6.4**	>6.4 %		
HOMA-IR		**2.5**			
	<2	**2-3**	>3		
Glucose[2]		**101**			
	70-99	**100-125**	<70 or >125 mg/dL		
GSP	**197**				
	<200	200-250	>250 µmol/L		
Adiponectin[1]	**>25.0**				
	>13	9-13	<9 µg/mL		

Test Name	Low	Optimal	High	Notes	Previous Results
Insulin[3]		**10**			
	<5	**5-15**	>15 µU/mL		

Interpretation: BORDERLINE glucose and HbA1c indicates prediabetes as established by the ADA. Prediabetes is a major risk factor for metabolic syndrome and has been associated with increased risk of developing diabetes, hyperlipidemia, hypertension and CVD.

Consideration: Consider encouraging dietary modification supported by education and consider glucose lowering and/or insulin sensitizing medications. If indicated encourage weight reduction, smoking cessation, increased activity and control blood pressure.

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Boston Heart Fatty Acid Balance™ Test[1]

Test Name	Optimal	Borderline	High	Interpretation	Notes	Previous Results
Saturated Fatty Acid Index	**29.5**			Saturated FA Index is OPTIMAL.		
	<30.0	30.0-33.0	>33.0 %			
Trans Fatty Acid Index		**0.51**		Trans FA Index is BORDERLINE. Higher levels of plasma trans fatty acids are associated with an increased risk of CVD. Consider restricting dietary intake of fried foods, foods containing partially hydrogenated fats, shortening, or stick margarine, and replacing with plant based oils.		
	<0.50	**0.50–0.80**	>0.80 %			
	Optimal	Borderline	Low			
Monounsaturated Fatty Acid Index		**20.5**		Monounsaturated FA Index is BORDERLINE. Higher plasma levels of MUFA have been associated with a lower risk of CVD. Consider increasing intake of almonds, avocado or plant based oils (including olive).		
	>22.0	**19.0–22.0**	<19.0 %			
Unsaturated/Saturated Ratio Index	**2.33**			Unsaturated/Saturated Ratio Index is OPTIMAL.		
	>2.25	2.00–2.25	<2.00			
Omega-3 Fatty Acid Index	**6.73**			Omega-3 FA Index is OPTIMAL. Eicosapentaenoic Acid (EPA) level is OPTIMAL. Docosahexaenoic Acid (DHA) level is OPTIMAL. Maintain current level of dietary and/or supplemental intake of Omega-3 fatty acids.		
	>4.50	2.00–4.50	<2.00 %			
EPA	**89.3**					
	>50.0	15.6-50.0	<15.6 µg/mL			
DHA	**132.6**					
	>100.0	45.0–100.0	<45.0 µg/mL			
ALA		**15.9**		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, and canola or flaxseed oil.		
	>30.0	**14.0–30.0**	<14.0 µg/mL			
	Low	Mid	High			
Omega-6 Fatty Acid Index		**41.5**		Values are reported according to the lowest, middle and highest thirds of our reference population. Some authorities have recommended a goal below the 10th percentile for the Omega-6/Omega-3 Ratio Index (a value of 9.0) and the AA/EPA Ratio Index (a value of 5.0).		
	<41.0	41.0–46.0	>46.0 %			
Linoleic Acid (LA)			**1044.8**			
	<825.0	825.0–1040.0	>1040.0 µg/mL			
Arachidonic Acid (AA)		**282.1**				
	<220.0	220.0–290.0	>290.0 µg/mL			
AA/EPA Ratio Index	**3.2**					
	<13.0	13.0–25.0	>25.0			
Omega-6/Omega-3 Ratio Index	**5.75**					
	<15.0	15.0–24.0	>24.0			

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Chemistry Tests

Test Name	Low	Normal	High	Notes	Previous Results
BUN		19.5			
	<3.0	3.0-25.0	>25.0 mg/dL		
Creatinine		0.78			
	<0.51	0.51-0.95	>.95 mg/dL		
Sodium		138			
	<135	135-146	>146 mmol/L		
Potassium		4.5			
	<3.5	3.5-5.3	>5.3 mmol/L		
Chloride		100			
	<98	98-110	>110 mmol/L		
CO_2		24			
	<20	20-31	>31 mmol/L		
Anion Gap		14			
	<3	3-16	>16 mmol/L		
Total Protein	6.4				
	<6.6	6.6-8.7	>8.7 g/dL		
Albumin		4.3			
	<3.5	3.5-5.2	>5.2 g/dL		
Calcium		10.2			
	<8.6	8.6-10.4	>10.4 mg/dL		
Uric Acid		6.4			
	<6	6-10	>10 mg/dL		
Total Bilirubin		0.6			
		0.0–1.2	>1.2 mg/dL		
Direct Bilirubin		0.1			
		0.0-0.3	>0.3 mg/dL		

Test Name	Optimal	Borderline	High Risk	Notes	Previous Results
Glucose[2]		101			
	70-99	100-125	<70 or >125 mg/dL		
AST	19				
	<40	40-120	>120 U/L		
ALT	19				
	<40	40-120	>120 U/L		
Alkaline Phosphatase	118				
	<130	130-200	>200 U/L		

Other Kidney Tests

Test Name	Low	Normal	High	Notes	Previous Results
Magnesium		2.2			
	<1.6	1.6-2.6	>2.6 mg/dL		
Phosphorus		3.4			
	<2.5	2.5-4.5	>4.5 mg/dL		

Test Name	Optimal	Borderline	High	Notes	Previous Results
BUN/Creatinine			25.0		
	<=23		>23		
eGFR / Non-African American	78				
	>60	30-60	<30 mL/min/1.73 m²		
eGFR / African American	90				
	>60	30-60	<30 mL/min/1.73 m²		

Iron Tests

Test Name	Low	Normal	High	Notes	Previous Results
Iron		79			
	<37	37-145	>145 µg/dL		
UIBC		262			
	<112	112-347	>347 µg/dL		
TIBC		341			
	<250	250-370	>370 µg/dL		
Ferritin		36			
	<15	15-150	>150 ng/mL		

Test Name	Low	Mid	High	Notes	Previous Results

Other Tests

Test Name	Low	Normal	High	Notes	Previous Results
B12			>2000		
	300-450	451-946	<300 or >946 pg/mL		
Vitamin D, 25-OH		43			
	<30	30-100	>100 ng/mL		

Test Name	Optimal	Borderline	High	Notes	Previous Results
Folate	>20.0				
	>14.0	10.0-14.0	<10.0 ng/mL		
CoQ10[1]	3.43			6	
	>1.40	0.70-1.40	<0.70 mg/L		
Homocysteine	9.9				
	<10	10-14	>14 µmol/L		

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Thyroid Tests

Test Name	Low	Optimal	High	Notes	Previous Results
TSH		2.72			
	<0.27	0.27-4.2	>4.2 µIU/mL		
Total T4		6.9			
	<4.5	4.5-11.7	>11.7 ug/dL		
Free T4		1.18			
	<0.93	0.93-1.70	>1.70 ng/dL		
Total T3		1.1			
	<0.8	0.8-2.0	>2.0 ng/mL		
Free T3		3.2			
	<2.0	2.0-4.4	>4.4 pg/mL		
TPO		10			
		<40	≥40 IU/mL		

Female Hormone Tests

Test Name	Test Results	Range	Notes	Previous Results
Estradiol	<25.0	See below		
Progesterone	0.46	See below		
LH	34.5	See below		
FSH	46.6	See below		
SHBG	59.7	17.3-125.0 nmol/L		

Female Hormone Reference Ranges by Phase

	Follicular	Ovulation	Luteal	Postmenopausal
Estradiol	12.4-233.0	41.0-398.0	22.3-341.0	<=138.0 pg/mL
Progesterone	0.06-0.89	0.12-12.0	1.83-23.9	<0.05-0.13 ng/mL
LH	2.4-12.6	14.0-95.6	1.0-11.4	7.7-58.5 mIU/mL
FSH	3.5-12.5	4.7-21.5	1.7-7.7	25.8-134.8 mIU/mL

Test Name	Test Results	Range	Notes	Previous Results
Total Testosterone	8.7	2.9-40.8 ng/dL		
Free Testosterone	1.1	1.0-8.5 pg/mL		
DHEA-S	34.4	9.40-246.0 µg/dL		

Test Name	Low	Optimal	High	Notes	Previous Results
Parathyroid Hormone		64			
	<15	15-65	>65 pg/mL		

Test Name	Test Results	Range	Notes	Previous Results
Cortisol	16	See below		

Cortisol Reference Ranges by Collection Time

	Low	Optimal	High
Cortisol (7-10AM)	<6	6-19	>19 µg/dL
Cortisol (4-8PM)	<2	2-12	>12 µg/dL

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Complete Blood Count (CBC)

Test Name	Low	Normal	High	Notes	Previous Results
WBC		4.37			
	<3.50	3.50-10.50	>10.50 x10E3/µL		
RBC			5.21		
	<3.80	3.80-5.10	>5.10 x10E6/µL		
Hemoglobin		14.9			
	<11.7	11.7-15.5	>15.5 g/dL		
Hematocrit		44.1			
	<35.0	35.0-45.0	>45.0 %		

Test Name	Low	Normal	High	Notes	Previous Results
MCV		84.6			
	<80.0	80.0-100.0	>100.0 fL		
MCH		28.6			
	<27.0	27.0-33.0	>33.0 pg		
MCHC		33.8			
	<32.0	32.0-36.0	>36.0 g/dL		
RDW		13.7			
	<11.0	11.0-15.0	>15.0 %		
Platelet		259			
	<150	150-450	>450 x10E3/µL		
MPV		10.6			
	<7.5	7.5-12.5	>12.5 fL		

White Blood Cell Differential

	Value			Absolute Value			
Test Name	Test Results	Notes	Previous Results	Test Results	Range	Notes	Previous Results
Neutrophils	37.8%			1.65	1.50-7.80 x10E3/µL		
Lymphocytes	38.7%			1.69	0.85-3.90 x10E3/µL		
Monocytes	14.4%			0.63	0.20-0.95 x10E3/µL		
Eosinophils	5.5%			0.24	0.00-0.50 x10E3/µL		
Basophils	1.8%			0.08	0.00-0.20 x10E3/µL		
Immature Granulocytes	1.8%			0.08	0.00-0.10 x10E3/µL		

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Test Name	10.02.2017 (Current)
Lipid Tests	
Total Cholesterol	200
Direct LDL-C	127
HDL-C	56
Triglycerides	96
Non-HDL-C	144
sdLDL-C[1]	23
%sdLDL-C	18
VLDL-C	17
Lp(a)	<15
Lipid Ratios	
TC/HDL-C	3.6
VLDL-C/TG	0.18
HDL-C/TG	0.58
Boston Heart Cholesterol Balance® Test[1]	
Lathosterol	205
Desmosterol	65
Beta-sitosterol	89
Campesterol	96
Inflammation Tests	
hs-CRP	2.3
$LpPLA_2$ Activity	124
MPO[1]	263
Metabolic Tests	
HbA1c	5.7
HOMA-IR	2.5
Glucose[2]	101
GSP	197
Adiponectin[1]	>25.0
Insulin[3]	10

Test Name	10.02.2017 (Current)
Boston Heart Fatty Acid Balance™ Test[1]	
Saturated Fatty Acid Index	29.5
Trans Fatty Acid Index	0.51
Monounsaturated Fatty Acid Index	20.5
Unsaturated/Saturated Ratio Index	2.33
Omega-3 Fatty Acid Index	6.73
EPA	89.3
DHA	132.6
ALA	15.9
Omega-6 Fatty Acid Index	41.5
Linoleic Acid (LA)	1044.8
Arachidonic Acid (AA)	282.1
AA/EPA Ratio Index	3.2
Omega-6/Omega-3 Ratio Index	5.75
Chemistry Tests	
BUN	19.5
Creatinine	0.78
Sodium	138
Potassium	4.5
Chloride	100
CO_2	24
Anion Gap	14
Total Protein	6.4
Albumin	4.3
Calcium	10.2
Uric Acid	6.4
Total Bilirubin	0.6
Direct Bilirubin	0.1
Glucose[2]	101
AST	19
ALT	19
Alkaline Phosphatase	118

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Other Kidney Tests

Test Name	10.02.2017 (Current)
Magnesium	2.2
Phosphorus	3.4
BUN/Creatinine	25.0
eGFR / Non-African American	78
eGFR / African American	90

Iron Tests

Test Name	10.02.2017 (Current)
Iron	79
UIBC	262
TIBC	341
Ferritin	36

Thyroid Tests

Test Name	10.02.2017 (Current)
TSH	2.72
Total T4	6.9
Free T4	1.18
Total T3	1.1
Free T3	3.2
TPO	10

Other Tests

Test Name	10.02.2017 (Current)
B12	>2000
Folate	>20.0
Vitamin D, 25-OH	43
Homocysteine	9.9
CoQ10[1]	3.43

Female Hormone Tests

Test Name	10.02.2017 (Current)
Estradiol	<25.0
Progesterone	0.46
LH	34.5
FSH	46.6
SHBG	59.7
Total Testosterone	8.7
Free Testosterone	1.1
DHEA-S	34.4
Parathyroid Hormone	64
Cortisol	16

Complete Blood Count (CBC)

Test Name	10.02.2017 (Current)
WBC	4.37
RBC	5.21
Hemoglobin	14.9
Hematocrit	44.1
MCV	84.6
MCH	28.6
MCHC	33.8
RDW	13.7
Platelet	259
MPV	10.6

White Blood Cell Differential

Test Name	10.02.2017 (Current)
Neutrophils	37.8
Lymphocytes	38.7
Monocytes	14.4
Eosinophils	5.5
Basophils	1.8
Immature Granulocytes	1.8

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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	Niacin	Fibrates	Glucose Lowering and/or Insulin Sensitizing Medications	Omega-3 Fatty Acids	Soluble Fiber Supplements	Bile Acid Sequestrants
Lipids								
LDL-C	•	•	•	•			•	•
HDL-C	•	•	•	•		•		•
Non-HDL-C	•	•	•	•		•		•
sdLDL-C	•	•	•	•		•	•	
Cholesterol Balance Test								
Production Markers	•	•						
Inflammation Tests								
hs-CRP	•	•	•			•		
Metabolic Tests								
HbA1c	•				•			•
HOMA-IR	•				•			
Glucose	•				•		•	•
Other Tests								
Uric Acid	•							

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.

• 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.
• To increase HDL-C and to decrease 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 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.
• To optimize glucose, HbA1c, HOMA-IR, and reduce risk of diabetes and CVD it is important to reduce weight and simple carbohydrate intake.
• Uric acid is the end product of purine metabolism and is commonly associated with metabolic syndrome. Stay well hydrated and consider reducing high fructose corn syrup, alcohol and purines in the diet.

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 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 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.

Niacin

Consensus guidelines recommend monitoring glycemic control after initiating niacin (nicotinic acid) treatment or increasing its dosage.

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Report Interpretation (continued)

Niacin (continued)

Niacin:
- may increase HDL-C 14-26%. Niacin is the most effective pharmacological agent for increasing HDL-C. Niacin may decrease LDL-C 5-17%; may lower non-HDL cholesterol.
- may reduce the level of small dense LDL-C.
- may decrease CRP by 15-24% in patients with stable coronary artery disease and metabolic syndrome.

Fibrates

For patients unable to tolerate statins consider fibrate therapy.

Fibrates:
- may modestly lower LDL-C by 20-31%; provide a modest increase in HDL-C by 5-15%; may lower non-HDL cholesterol.
- may modestly reduce small dense LDL.

Glucose Lowering and/or Insulin Sensitizing Medications

Insulin sensitizers increase glucose uptake in muscle cells and adipocytes. Glucose stabilizing medications help to lower blood sugar.

- Glucose lowering and insulin sensitizing medications may lower HOMA-IR.
- Homeostasis Model Assessment of Insulin Resistance (HOMA-IR) is the standard measure of insulin resistance based on both fasting insulin and glucose levels.

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.
- may lower small dense LDL-C.
- Omega-3 fatty acids may lower CRP.

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.

- Soluble fiber may lower blood glucose.

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 increase HDL 3-5%; may lower LDL-C up to 20%; may lower non-HDL cholesterol.
- may modestly decrease blood glucose; may decrease HbA1c up to 0.5%.

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.

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; sdLDL-C: Enzymatic colorimetric; Adiponectin: Latex turbidimetric immunoassay.

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.

6 Test performed at 175 Crossing Boulevard, Framingham, MA 01702. CLIA#: 22D1083041. NYSDOH: 8729.

* 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