Dr. Eric Choi | ChiroPlus Wellness Care

Functional Health Report

Practitioner Copy

Susan Unhealthy

Lab Test on Sep 25, 2015
Conventional US Units

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Health Improvement Plan

The Health Improvement Plan takes all the information on this report and creates unique customized recommendations to help bring the systems of your body back into balance. This plan focuses on the top areas of need as presented in this report.

Adrenal Stress

The results of this blood test indicate a tendency towards adrenal stress and adrenal hyperfunction and a need for adrenal gland support. The following provides personalized nutritional support for stress tolerance:

Rationale:
Sodium ↑, Potassium ↓, Sodium/Potassium Ratio ↑, BUN ↑, Chloride ↑

Product Name
Adrenotone

Dosage and Directions
Take 3 capsules daily, one capsule three times per day with meals.

Details
Adrenotone™ is a combination of standardized herbs and nutrients which are known for rejuvenating the adrenals. This product is designed to promote healthy cortisol levels, hypothalamic and pituitary function (HPTA axis), and catecholamine production (dopamine, norepinephrine, and epinephrine).* Adrenotone™ does not contain glandulars.

* These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure or prevent any disease.

Metabolic Syndrome

The results of this blood test indicate a tendency towards metabolic syndrome and a need for blood sugar support. The following provide personalized nutritional support for blood sugar regulation*:

Rationale:
Glucose ↑, Triglycerides ↑, Hemoglobin A1C ↑, Insulin - Fasting ↑, Cholesterol - Total ↑, LDL Cholesterol ↑, HDL Cholesterol ↓, DHEA-S, Female ↓

Product Name
GlucoSupreme™ Herbal

Dosage and Directions
Take 4 capsules daily, 2 capsules twice a day with meals.

Details
GlucoSupreme™ Herbal is ideal for supporting healthy insulin and glucose levels. This unique, synergistic formula combines standardized herbs and other botanicals that are shown to support healthy blood sugar through various mechanisms, including cinnamon, corosolic acid from banaba, isoflavones from kudzu, and ginsenosides from ginseng. It also contains Salacia, an ayurvedic herb that supports proper leptin and insulin signaling.

Product Name
Metabolic Synergy™

Dosage and Directions
Take 6 capsules per day, 2 with each meal.

Details
Metabolic Synergy™ helps maintain healthy glucose and insulin levels, while supporting the conversion of carbohydrates to be used for energy by providing nutrients for the TCA cycle. The magnesium, chromium, zinc, manganese, and vanadium are true chelates from Albion, the leader in the manufacture of mineral chelates with superior absorption. It also includes our proprietary NatureFolate™ blend of active-isomer naturally occurring folates.

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Hyperlipidemia

The results of this blood test indicate a tendency towards hyperlipidemia, which has been shown to increase the risk of developing atherosclerotic coronary artery disease. There is a need for cardiovascular support, especially support to help lower excessive blood fats. The following provide personalized nutritional support for helping to lower excessive blood fats*:

Rationale:
Cholesterol - Total ↑, Triglycerides ↑, LDL Cholesterol ↑, Cholesterol/HDL Ratio ↑, HDL Cholesterol ↓

Product Name
Foresterol™

Dosage and Directions
Take 3 tablets per day, 1 with each meal.

Details
Foresterol™ contains Reducol™, a phytosterol mixture from the non-GMO tall oil of the coniferous pine tree. Reducol™ has such significant LDL cholesterol-lowering properties that the FDA allows cholesterol-lowering claims for the plant sterols it contains.* Foresterol™ mainly consists of four major phytosterols: beta-sitosterol, campesterol (in the free sterol form, not as sterol esters), campestanol, and sitostanol.

Product Name
Lipotrienols RYR™

Dosage and Directions
Take 2 capsules per day in the evening with food, or as directed by your health care practitioner. For best results, do not take within six hours of taking a vitamin E supplement containing d-alpha tocopherol.

Details
Lipotrienols RYR™ is a powerful combination of natural substances designed to provide nutritional support for cardiac and vascular health. This formula includes high delta-fraction tocotrienols, organic red yeast rice extract (Monascus purpurea), and lycopene with added lecithin for bioavailability.*

WARNING: Do not use if you are pregnant, may become pregnant, or are breast feeding, as using this product may cause birth defects.

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Increased Cardiovascular Disease Risk

The results of this blood test indicate a higher than optimal risk of this patient developing cardiovascular disease and shows a need for cardiovascular support. The following provide key nutrients to improve cardiovascular health and lower the risk of developing cardiovascular disease.*

Rationale:
Glucose ↑, Cholesterol - Total ↑, Triglycerides ↑, LDL Cholesterol ↑, HDL Cholesterol ↓, Hs CRP, Female ↑, Homocysteine ↑, Hemoglobin A1C ↑, Insulin - Fasting ↑, Vitamin D (25-OH) ↓

Product Name
CoQnol™ 100mg

Dosage and Directions
Take 1 softgel per day with a meal.

Details
CoQnol™ is a non-GMO form of ubiquinol, which is the reduced, antioxidant form of CoQ10. Both ubiquinone and ubiquinol are critical to the cellular ATP (energy) production cycle. Without the presence of both ubiquinone and ubiquinol within the body's cells, cellular energy cannot be generated or sustained. The ability to convert ubiquinone to ubiquinol may diminish with age and with increased oxidative stress in certain individuals.

Product Name
Homocysteine Supreme™

Dosage and Directions
Take 2 capsules per day with meals.

Details
Homocysteine Supreme™ contains synergistic nutrients, including our proprietary NatureFolate™ blend of active isomer naturally-occurring folates, known to facilitate the efficient metabolism of homocysteine. Homocysteine Supreme™ maintains a healthy homocysteine pathway, allowing for the normal production of its necessary and important end products. These include the sulfur-containing amino acids taurine and cysteine, and the neurotransmitters norepinephrine and dopamine.* An optimally functioning homocysteine pathway provides methyl and sulfur groups for biochemical reactions such as detoxification, healthy immune function, ideal joint and cartilage structure, and brain and cardiovascular health.

Product Name
HTN Complex™

Dosage and Directions
Take 4 capsules daily, 2 capsules twice per day.

Details
HTN Complex™ is a formula created to help maintain normal blood pressure levels. This formula contains nutrients that address these various mechanisms to promote healthy blood pressure. Hawthorne Extract (Crataegus oxyacantha) and Pomegranate (Punica granatum) are important ingredients included for their antioxidant activity, cardioprotective properties and promotion of normal vascular tone.

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Product Name
Niacin CRT™ 500mg

Dosage and Directions
Take 1 tablet per day with a meal.

Details
Niacin CRT™ is a unique wax-matrix tablet, which utilizes the latest Controlled Release Technology (CRT) technology. This technology delivers niacin in a continuous, controlled rate over a 6-8 hour period, throughout the tablet's transit time in the bowel. Flushing sometimes happens with time-release niacin, as there can be fairly large surges of niacin released intermittently. However, flushing is less likely with controlled release niacin. This product is available in 500 mg and 750 mg tablets, with this new higher dosage of 750 mg being more convenient for those with a greater need for lipid management.

FemaleTestosterone Deficiency

The results of this blood test indicate a trend towards testosterone deficiency and a need for testosterone metabolism support. The following provides personalized nutritional support for testosterone regulation.

Rationale:
Testosterone, Free Female ↓, Testosterone, Total Female ↓

Product Name
LibidoStim-F™

Dosage and Directions
Take two capsules per day

Details
LibidoStim-F™ is a blend of nutraceutical and herbal ingredients for supporting healthy female sexual desire and pleasure. The combination of ingredients in LibidoStim-F™ promotes healthy metabolism of testosterone and estrogen, and normal blood flow and adrenal function.*

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Hypothyroidism

The results of this blood test indicate a tendency towards hypothyroidism and a need for thyroid gland support. If you haven't done so already, you may want to consider running a thyroid antibody panel to rule out autoimmune thyroiditis.The following provide personalized support for the thyroid glands*:

Rationale:
TSH ↑, Total T4 ↓, Total T3 ↓, T3 Uptake ↓, Cholesterol - Total ↑, Triglycerides ↑, Free T3 ↓, Free Thyroxine Index (T7) ↓, Thyroid Peroxidase (TPO) Abs LABCORP ↑, Thyroglobulin Abs LABCORP ↑

Product Name
Iodine Synergy™

Dosage and Directions
Take 1 capsule per day.

Details
Iodine Synergy™ contains potassium iodide for supporting normal thyroid function, including balanced production of thyroid hormones and the health of breast and prostate tissue. Potassium iodide is a weak salt and easily splits apart in the gut, leaving free iodide ions to join together forming I2 Iodine. The selenium in this product works synergistically with iodine to support the normal conversion of T4 into T3, and supplies antioxidant protection to the thyroid gland.

Product Name
Thyroid Synergy™

Dosage and Directions
Take 2 capsules per day with meals.

Details
Thyroid Synergy™ was designed to be a top-quality, all-in-one formula for the nutritional support of thyroid function. The non-stimulating adaptogenic botanical American ginseng (Panax quinquifolius) helps maintain healthy cortisol, blood glucose and insulin levels, along with a balanced conversion of peripheral thyroid hormone. Essential vitamins, minerals, and other nutrients work synergistically to provide a premium thyroid product in just two capsules a day.

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Thyroid Conversion Issues

The results of this blood test indicate a tendency towards a type of hypothyroidism connected to a difficulty converting thyroxine (T4) into triiodothyronine (T3). With this condition there is a need for thyroid gland support.The following provide personalized support for the thyroid glands*:

Rationale:
Total T3 ↓, Free T3 ↓

Product Name
Thyroid Synergy™

Dosage and Directions
Take 2 capsules per day with meals.

This product has already been recommended earlier in this report. Please do not increase the dosage because the product has been listed more than once.

Details
Thyroid Synergy™ was designed to be a top-quality, all-in-one formula for the nutritional support of thyroid function. The non-stimulating adaptogenic botanical American ginseng (Panax quinquifolius) helps maintain healthy cortisol, blood glucose and insulin levels, along with a balanced conversion of peripheral thyroid hormone. Essential vitamins, minerals, and other nutrients work synergistically to provide a premium thyroid product in just two capsules a day.

Female Hormonal Support

The results of this blood test indicate a need for female hormonal support. The following provide personalized female hormone support. Please note that these products may be more suited for either pre-menopausal or peri-menopausal/menopausal support.*

Rationale:
DHEA-S, Female ↓, Testosterone, Total Female ↓, Testosterone, Free Female ↓, Progesterone, Female ↓

Product Name
FemGuard+Balance™

Dosage and Directions
Take 4 capsules per day.

Details
FemGuard+Balance™ supports classic herbal hormonal balancing in the form of vitex, polygonum and black cohosh, along with DIM and chrysin for protection and support of beneficial estrogen aromatase activity. Calcium-D-glucarate promotes the proper elimination of excess estrogens. Rosemary, resveratrol, grape seed extract, and EGCg from green tea are included for maximum antioxidant protection. Vitamins B6, B12, and folates (NatureFolate™ blend) promote proper cell differentiation.* Magnesium and calcium are also included to help support bone and hormone health.

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This Health Improvement Plan has been prepared for your patient based upon current algorithms. Additional personalized recommendations for nutritional support may be applicable based on this laboratory evaluation, your patient's history and your clinical practice experience.

Suggested Individual Nutrient Recommendations

Your Health Improvement Plan takes all the information on this report and creates unique customized recommendations to help bring the systems of your body back into balance. This plan focuses on the top areas of need as presented in this report.

Vitamin B12/Folate Need

The results of this blood test indicate that this patient's vitamin B12/folate levels might be lower than optimal and shows a need for vitamin B12/folate supplementation. The following provide a good source of vitamin B12/folate to bring levels back into the optimal range.*

Rationale:
MCV ↑, Homocysteine ↑, RDW ↑, Folate ↓

Product Name
Ultra B12-Folate

Dosage and Directions
Take 1 to 3 capsules per day with meals.

Details
Ultra B12-Folate is a unique formula that combines vitamin B12 (cobalamin) with our proprietary NatureFolate™ blend of active isomer naturally-occurring folates. These two vitamins work synergistically, improving methylation and helping to promote balanced concentrations of homocysteine.* While many manufacturers offer them separately, this formula offers the convenience of getting both B vitamins in one capsule. The premium B12 in this product comes from equal amounts of adenosylcobalamin and methylcobalamin.

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Vitamin D Need

The results of this blood test indicate that this patient's vitamin D levels might be lower than optimal and shows a need for vitamin D supplementation. The following provide a good source of vitamin D to bring levels back into the optimal range.*

Rationale:
Vitamin D (25-OH) ↓

Product Name
Vitamin D Supreme

Dosage and Directions
Take 1 capsule per day with a meal.

Details
Vitamin D Supreme provides a clinically useful dose of vitamin D3 and vitamin K in both the K1 and MK-7 form of K2. This formula contains higher therapeutic doses than Vitamin D Synergy for situations where more aggressive repletion is required. Vitamins D and K are essential for optimal bone and arterial health and for maintaining the immune system in proper balance. The amount of vitamin D and K in this formula may be beneficial for those who do not get adequate sun exposure and/or dietary sources of these vitamins. Vitamins D & K work as a team. Thus, increasing doses of vitamin D will increase the need for vitamin K.

Selenium Need

The results of this blood test indicate that this patient's selenium levels might be lower than optimal and shows a need for selenium supplementation. The following provide a good source of selenium to bring levels back into the optimal range.*

Rationale:
Total T3 ↓, Free T3 ↓, T3 Uptake ↓

Product Name
DFH Complete Multi™

Dosage and Directions
Take 6 capsules per day, 2 with each meal.

Details
DFH Complete Multi™ is a full-spectrum multivitamin with Albion chelated minerals for maximum absorption and bioavailability. This powerhouse multivitamin supplies supportive nutrients not normally found in regular multis, such as alpha lipoic acid, TMG, fruit bioflavanoids, choline, and inositol. This formula also contains high gamma tocopherol vitamin E, high levels of all the B vitamins, including our proprietary NatureFolate™ blend of active isomer naturally-occurring folates, and natural mixed carotenoids.

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Electrolyte Need

The results of this blood test indicate that this patient's electrolytes might be lower than optimal and shows a need for electrolyte/mineral supplementation. The following provide a good source of electrolytes to bring levels back into the optimal range.*

Rationale:
Potassium ↓, Phosphorus ↓

Product Name
Complete Mineral Complex

Dosage and Directions
Take 3 capsules per day.

Details
Complete Mineral Complex is ideal for use when mineral replenishment is desired. This product is iron-free and utilizes the finest chelated minerals from Albion Advanced Nutrition for optimal absorption.

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This Health Improvement Plan has been prepared for your patient based upon current algorithms. Additional personalized recommendations for nutritional support may be applicable based on this laboratory evaluation, your patient's history and your clinical practice experience.

Product Summary Report

The Product Summary Report takes all the information on this report and provides a summary of the nutritional supplements recommended to help bring the systems of the body back into balance. This plan focuses on the top areas of need as presented in this report.

Protocols	Primary Product		Dosage	✔
Adrenal Stress	Adrenotone		Take 3 capsules daily, one capsule three times per day with meals.	☐
Metabolic Syndrome	GlucoSupreme™ Herbal		Take 4 capsules daily, 2 capsules twice a day with meals.	☐
Hyperlipidemia	Foresterol™		Take 3 tablets per day, 1 with each meal.	☐
Increased Cardiovascular Disease Risk	CoQnol™ 100mg		Take 1 softgel per day with a meal.	☐
FemaleTestosterone Deficiency	LibidoStim-F™		Take two capsules per day	☐
Hypothyroidism	Iodine Synergy™		Take 1 capsule per day.	☐
Thyroid Conversion Issues	Thyroid Synergy™		Take 2 capsules per day with meals.	☐
Female Hormonal Support	FemGuard+Balance™		Take 4 capsules per day.	☐
Vitamin B12/Folate Need	Ultra B12-Folate		Take 1 to 3 capsules per day with meals.	☐
Vitamin D Need	Vitamin D Supreme		Take 1 capsule per day with a meal.	☐
Selenium Need	DFH Complete Multi™		Take 6 capsules per day, 2 with each meal.	☐
Electrolyte Need	Complete Mineral Complex		Take 3 capsules per day.	☐

Other Potential Product Recommendations

Protocols	Primary Product		Dosage	✔
Metabolic Syndrome	Metabolic Synergy™		Take 6 capsules per day, 2 with each meal.	☐

Protocols	Primary Product		Dosage	✔
Hyperlipidemia	Lipotrienols RYR™		Take 2 capsules per day in the evening with food, or as directed by your health care practitioner. For best results, do not take within six hours of taking a vitamin E supplement containing d-alpha tocopherol.	☐
Increased Cardiovascular Disease Risk	Homocysteine Supreme™		Take 2 capsules per day with meals.	☐
	HTN Complex™		Take 4 capsules daily, 2 capsules twice per day.	☐
	Niacin CRT™ 500mg		Take 1 tablet per day with a meal.	☐
Hypothyroidism	Thyroid Synergy™		Take 2 capsules per day with meals. This product has already been recommended earlier in this report. Please do not increase the dosage because the product has been listed more than once.	☐

This Product Summary Report has been prepared for your patient based upon current algorithms. Additional personalized recommendations for nutritional support may be applicable based on this laboratory evaluation, your patient's history and your clinical practice experience.

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Blood Test Results Report

The Blood Test Results Report lists the results of the patient's Chemistry Screen and CBC and shows you whether or not an individual biomarker is outside of the optimal range and/or outside of the clinical lab range. The biomarkers appear in the order in which they appear on the lab test form.

Above Optimal Range ↑ 13 Current 0 Previous	**Above Standard Range** ↑↑ 13 Current 0 Previous	**Alarm High** ⚠ 5 Current 0 Previous
Below Optimal Range ↓ 17 Current 0 Previous	**Below Standard Range** ↓↓ 4 Current 0 Previous	**Alarm Low** ⚠ 1 Current 0 Previous

Biomarker	Current Sep 25 2015	Optimal Range	Standard Range	Units
Glucose	105.00 ↑↑	75.00 - 86.00	65.00 - 99.00	mg/dL
Hemoglobin A1C	6.80 ↑↑	4.50 - 5.50	0.00 - 5.70	%
Insulin - Fasting	5.20 ↑	0.00 - 5.00	2.00 - 19.00	µIU/ml
C-Peptide	1.50	1.10 - 1.60	0.80 - 3.10	ng/ml
BUN	18.00 ↑	10.00 - 16.00	7.00 - 25.00	mg/dL
Creatinine	0.98	0.80 - 1.10	0.40 - 1.50	mg/dL
BUN/Creatinine Ratio	18.36 ↑	10.00 - 16.00	6.00 - 22.00	Ratio
eGFR Non-Afr. American	84.00 ↓↓	90.00 - 200.00	90.00 - 200.00	mL/min/1.73m2
Sodium	144.00 ↑	135.00 - 142.00	135.00 - 146.00	mEq/L
Potassium	3.20 ↓↓	4.00 - 4.50	3.50 - 5.30	mEq/L
Sodium/Potassium Ratio	45.00 ⚠	30.00 - 35.00	30.00 - 35.00	ratio
Chloride	107.00 ↑	100.00 - 106.00	98.00 - 110.00	mEq/L
CO2	20.00 ↓	25.00 - 30.00	19.00 - 30.00	mEq/L
Anion gap	20.20 ↑↑	7.00 - 12.00	6.00 - 16.00	mEq/L
Uric Acid, female	4.20	3.00 - 5.50	2.50 - 7.00	mg/dL
Protein, total	6.80 ↓	6.90 - 7.40	6.10 - 8.10	g/dL
Albumin	4.40	4.00 - 5.00	3.60 - 5.10	g/dL
Globulin, total	2.30 ↓	2.40 - 2.80	1.90 - 3.70	g/dL
Albumin/Globulin Ratio	1.91	1.40 - 2.10	1.00 - 2.50	ratio
Calcium	9.70	9.20 - 10.00	8.60 - 10.40	mg/dL
Calcium/Albumin Ratio	2.20	0.00 - 2.60	0.00 - 2.60	ratio
Phosphorus	2.80 ↓	3.00 - 4.00	2.50 - 4.50	mg/dL
Calcium/Phosphorous Ratio	3.46 ↑↑	2.30 - 2.70	2.30 - 2.70	ratio
Magnesium	2.40	2.20 - 2.50	1.50 - 2.50	mg/dl
Alk Phos	67.00 ↓	70.00 - 100.00	35.00 - 115.00	IU/L
AST (SGOT)	15.00	10.00 - 26.00	10.00 - 35.00	IU/L
ALT (SGPT)	42.00 ↑↑	10.00 - 26.00	6.00 - 29.00	IU/L
LDH	168.00	140.00 - 200.00	120.00 - 250.00	IU/L
Bilirubin - Total	1.20 ↑	0.10 - 0.90	0.20 - 1.20	mg/dL

GGT	18.00	10.00 - 30.00	3.00 - 70.00	IU/L
Iron - Serum	80.00 ↓	85.00 - 130.00	40.00 - 160.00	µg/dL
Ferritin	135.00 ↑	30.00 - 70.00	10.00 - 232.00	ng/mL
TIBC	375.00 ↑	250.00 - 350.00	250.00 - 425.00	µg/dL
% Transferrin saturation	23.00	20.00 - 35.00	15.00 - 50.00	%
Cholesterol - Total	227.00 ↑↑	160.00 - 180.00	125.00 - 200.00	mg/dL
Triglycerides	154.00 ↑↑	70.00 - 80.00	0.00 - 150.00	mg/dL
LDL Cholesterol	131.00 ↑↑	0.00 - 120.00	0.00 - 130.00	mg/dL
HDL Cholesterol	39.00 ↓↓	55.00 - 70.00	46.00 - 100.00	mg/dL
VLDL Cholesterol	8.00	0.00 - 10.00	0.00 - 29.00	mg/dl
Cholesterol/HDL Ratio	5.82 ⚠	0.00 - 4.00	0.00 - 5.00	Ratio
Triglyceride/HDL Ratio	3.94 ⚠	0.00 - 2.00	0.00 - 2.00	ratio
TSH	3.32 ↑	1.30 - 2.00	0.40 - 4.50	µU/mL
Free T3	2.74 ↓	3.00 - 3.50	2.30 - 4.20	pg/ml
Total T3	89.00 ↓	90.00 - 168.00	76.00 - 181.00	ng/dL
Free T4	1.30	1.00 - 1.50	0.80 - 1.80	ng/dL
Total T4	5.30 ↓	6.00 - 11.90	4.50 - 12.00	µg/dL
T3 Uptake	24.00 ↓	27.00 - 37.00	22.00 - 35.00	%
Free Thyroxine Index (T7)	1.60 ↓	1.70 - 4.60	1.40 - 3.80	Index
Thyroid Peroxidase (TPO) Abs LABCORP	85.00 ↑↑	0.00 - 34.00	0.00 - 34.00	IU/ml
Thyroglobulin Abs LABCORP	1.80 ⚠	0.00 - 0.90	0.00 - 0.90	IU/ml
Hs CRP, Female	3.82 ↑↑	0.00 - 1.50	0.00 - 2.90	mg/L
Homocysteine	24.00 ⚠	0.00 - 7.20	0.00 - 10.30	µmol/L
Vitamin D (25-OH)	19.80 ⚠	50.00 - 90.00	30.00 - 100.00	ng/ml
Vitamin B12	822.00	400.00 - 1100.00	200.00 - 1100.00	pg/ml
Folate	8.00 ↓	15.00 - 25.00	5.50 - 10.00	ng/ml
DHEA-S, Female	194.00 ↓	275.00 - 400.00	35.00 - 325.00	µg/dl
Testosterone, Free Female	0.70 ↓	1.00 - 2.20	0.20 - 5.00	pg/ml
Testosterone, Total Female	32.00 ↓	35.00 - 45.00	2.00 - 45.00	ng/dl
Sex Hormone Binding Globulin, female	45.00	25.00 - 122.00	17.00 - 124.00	nmol/L
Estradiol, Female	362.00	352.00 - 450.00	19.00 - 357.00	pg/ml
Progesterone, Female	12.40 ↓	18.00 - 27.00	2.60 - 27.00	ng/ml
Total WBCs	5.80	5.50 - 7.50	3.80 - 10.80	k/cumm
RBC, Female	4.42	3.90 - 4.50	3.80 - 5.10	m/cumm
Hemoglobin, Female	14.20	13.50 - 14.50	11.70 - 15.50	g/dl
Hematocrit, Female	46.20 ↑↑	37.00 - 44.00	35.00 - 45.00	%
MCV	97.00 ↑	82.00 - 89.90	80.00 - 100.00	fL
MCH	31.30	28.00 - 31.90	27.00 - 33.00	pg
MCHC	33.20	32.00 - 35.00	32.00 - 36.00	g/dL
Platelets	252.00	155.00 - 385.00	140.00 - 400.00	k/cumm
RDW	14.70 ↑	11.70 - 13.00	11.00 - 15.00	%
Neutrophils	67.00 ↑	40.00 - 60.00	40.00 - 74.00	%
Lymphocytes	22.00 ↓	24.00 - 44.00	14.00 - 46.00	%
Monocytes	7.00	0.00 - 7.00	4.00 - 13.00	%

Eosinophils	4.00 ↑↑	0.00 - 3.00	0.00 - 3.00	%
Basophils	0.00	0.00 - 1.00	0.00 - 1.00	%
Cortisol - AM	3.00 ↓↓	4.00 - 22.00	4.00 - 22.00	µg/dL
Cortisol - PM	4.00	3.00 - 17.00	3.00 - 17.00	µg/dL
Leptin, Female	25.60 ↑↑	4.70 - 23.70	4.70 - 23.70	ng/ml
Gastrin	92.00 ↑	45.00 - 90.00	0.00 - 100.00	pg/ml

% Deviation from Optimal Report

This report shows the biomarkers on the blood test that are farthest from optimal expressed as a %. The biomarkers that appear closest to the top and the bottom are those biomarkers that are farthest from optimal and should be carefully reviewed.

Biomarker	% from Median	Lab Result	Low	High	Optimal Reference Ranges Low High
Triglycerides	790	**154.00**	70.00	80.00	
Cholesterol - Total	285	**227.00**	160.00	180.00	
Homocysteine	283	**24.00**	0.00	7.20	
Sodium/Potassium Ratio	250	**45.00**	30.00	35.00	
Calcium/Phosphorous Ratio	240	**3.46**	2.30	2.70	
TSH	239	**3.32**	1.30	2.00	
Glucose	223	**105.00**	75.00	86.00	
Anion gap	214	**20.20**	7.00	12.00	
Ferritin	212	**135.00**	30.00	70.00	
Hs CRP, Female	205	**3.82**	0.00	1.50	
Thyroid Peroxidase (TPO) Abs LABCORP	200	**85.00**	0.00	34.00	
RDW	181	**14.70**	11.70	13.00	
Hemoglobin A1C	180	**6.80**	4.50	5.50	
ALT (SGPT)	150	**42.00**	10.00	26.00	
Thyroglobulin Abs LABCORP	150	**1.80**	0.00	0.90	
Triglyceride/HDL Ratio	147	**3.94**	0.00	2.00	
MCV	140	**97.00**	82.00	89.90	
Cholesterol/HDL Ratio	96	**5.82**	0.00	4.00	
BUN/Creatinine Ratio	89	**18.36**	10.00	16.00	
Bilirubin - Total	88	**1.20**	0.10	0.90	
Neutrophils	85	**67.00**	40.00	60.00	
Eosinophils	83	**4.00**	0.00	3.00	
BUN	83	**18.00**	10.00	16.00	
Hematocrit, Female	81	**46.20**	37.00	44.00	
Sodium	79	**144.00**	135.00	142.00	
TIBC	75	**375.00**	250.00	350.00	
Chloride	67	**107.00**	100.00	106.00	
Leptin, Female	60	**25.60**	4.70	23.70	
LDL Cholesterol	59	**131.00**	0.00	120.00	
Gastrin	54	**92.00**	45.00	90.00	
Insulin - Fasting	54	**5.20**	0.00	5.00	
Monocytes	50	**7.00**	0.00	7.00	
RBC, Female	37	**4.42**	3.90	4.50	
MCH	35	**31.30**	28.00	31.90	
Calcium/Albumin Ratio	35	**2.20**	0.00	2.60	

C-Peptide	30	**1.50**	1.10	1.60	
VLDL Cholesterol	30	**8.00**	0.00	10.00	
Albumin/Globulin Ratio	23	**1.91**	1.40	2.10	
Hemoglobin, Female	20	**14.20**	13.50	14.50	
Magnesium	17	**2.40**	2.20	2.50	
Calcium	12	**9.70**	9.20	10.00	
Vitamin B12	10	**822.00**	400.00	1100.00	
Creatinine	10	**0.98**	0.80	1.10	
Free T4	10	**1.30**	1.00	1.50	
Uric Acid, female	-2	**4.20**	3.00	5.50	
LDH	-3	**168.00**	140.00	200.00	
Platelets	-8	**252.00**	155.00	385.00	
MCHC	-10	**33.20**	32.00	35.00	
Albumin	-10	**4.40**	4.00	5.00	
GGT	-10	**18.00**	10.00	30.00	
AST (SGOT)	-19	**15.00**	10.00	26.00	
Sex Hormone Binding Globulin, female	-29	**45.00**	25.00	122.00	
% Transferrin saturation	-30	**23.00**	20.00	35.00	
Total WBCs	-35	**5.80**	5.50	7.50	
Estradiol, Female	-40	**362.00**	352.00	450.00	
Cortisol - PM	-43	**4.00**	3.00	17.00	
Basophils	-50	**0.00**	0.00	1.00	
Total T3	-51	**89.00**	90.00	168.00	
Free Thyroxine Index (T7)	-53	**1.60**	1.70	4.60	
eGFR Non-Afr. American	-55	**84.00**	90.00	200.00	
Cortisol - AM	-56	**3.00**	4.00	22.00	
Lymphocytes	-60	**22.00**	24.00	44.00	
Alk Phos	-60	**67.00**	70.00	100.00	
Iron - Serum	-61	**80.00**	85.00	130.00	
Total T4	-62	**5.30**	6.00	11.90	
Phosphorus	-70	**2.80**	3.00	4.00	
Protein, total	-70	**6.80**	6.90	7.40	
Globulin, total	-75	**2.30**	2.40	2.80	
Testosterone, Free Female	-75	**0.70**	1.00	2.20	
Testosterone, Total Female	-80	**32.00**	35.00	45.00	
T3 Uptake	-80	**24.00**	27.00	37.00	
Free T3	-102	**2.74**	3.00	3.50	
Progesterone, Female	-112	**12.40**	18.00	27.00	
DHEA-S, Female	-115	**194.00**	275.00	400.00	
Folate	-120	**8.00**	15.00	25.00	
Vitamin D (25-OH)	-126	**19.80**	50.00	90.00	
CO2	-150	**20.00**	25.00	30.00	
HDL Cholesterol	-157	**39.00**	55.00	70.00	
Potassium	-210	**3.20**	4.00	4.50	

Out of Optimal Range Report

The following results show all of the biomarkers that are out of the optimal reference range. The biomarkers that appear closest to the top of each section are those biomarkers that are farthest from optimal and should be carefully reviewed.

Above Optimal Range ↑
31 Total

Below Optimal Range ↓
22 Total

Above Optimal

Triglycerides ↑ 154.00 mg/dL (+ 790 %)

Serum triglycerides are composed of fatty acid molecules that enter the blood stream either from the liver or from the diet. Levels will be elevated in metabolic syndrome, fatty liver, in patients with an increased risk of cardiovascular disease, hypothyroidism and adrenal dysfunction

Cholesterol - Total ↑ 227.00 mg/dL (+ 285 %)

Cholesterol is a steroid found in every cell of the body and in the plasma. It is an essential component in the structure of the cell membrane where it controls membrane fluidity. It provides the structural backbone for every steroid hormone in the body, which includes adrenal and sex hormones and vitamin D. The myelin sheaths of nerve fibers are derived from cholesterol and the bile salts that emulsify fats are composed of cholesterol. Cholesterol is made in the body by the liver and other organs, and from dietary sources. The liver, the intestines, and the skin produce between 60-80% of the body's cholesterol. The remainder comes from the diet. An increased cholesterol is just one of many independent risk factors for cardiovascular disease. It is also associated with metabolic syndrome, hypothyroidism, biliary stasis, and fatty liver.

Homocysteine ↑ 24.00 µmol/L (+ 283 %)

Homocysteine is a molecule formed from the incomplete metabolism of the amino acid methionine. Deficiencies in Vitamins B6, B12 and folate cause methionine to be converted into homocysteine. Homocysteine increases the risk of cardiovascular disease by causing damage to the endothelial lining of the arteries, especially in the heart. Increased levels of homocysteine are associated with an increased risk of cardiovascular disease and stroke, as well as cancer, depression and inflammatory bowel disease.

Sodium/Potassium Ratio ↑ 45.00 ratio (+ 250 %)

The sodium:potassium ratio is determined from the serum sodium and serum potassium levels. Both of these elements are under the influence of the adrenal glands. An increased sodium:potassium ratio is associated with acute stress.

Calcium/Phosphorous Ratio ↑ 3.46 ratio (+ 240 %)

The calcium:phosphorous ratio is determined from the serum calcium and serum phosphorous levels. This ratio is maintained by the parathyroid glands and is also affected by various foods. A high ratio is often caused by high serum calcium and low serum phosphorous, so investigating the reasons for this is important. A diet high in refined carbohydrates can decrease serum phosphorous thus increasing the calcium:phosphorous ratio.

TSH ↑ 3.32 µU/mL (+ 239 %)

TSH or thyroid stimulating hormone is a hormone produced by the anterior pituitary to control the thyroid gland's production of T4, to store T4 and to release it into the blood stream. TSH synthesis and secretion is regulated by the release of TRH (Thyroid Releasing Hormone) from the hypothalamus. TSH levels describes the body's desire for more thyroid hormone (T4 or T3), which is done in relation to the body's need for energy. A high TSH is the body's way of saying "we need more thyroid hormone". Optimal TSH levels, in a normally functioning pituitary, can tell us that the amount of T4 in the blood match the body's current need and/or ability to utilize the energy necessary for optimal cell function. When the pituitary is not functioning in an optimal manner, the TSH test can be quite misleading.

Glucose ↑ 105.00 mg/dL (+ 223 %)

Blood glucose levels are regulated by a number of important hormones including insulin and glucagon. Glucose is also directly formed in the body from carbohydrate digestion and from the conversion in the liver of other sugars, such as fructose, into glucose. Increased blood glucose is associated with type 1 & 2 diabetes, metabolic syndrome and insulin resistance.

Anion gap ↑ 20.20 mEq/L (+ 214 %)

The anion gap is the measurement of the difference between the sum of the sodium and potassium levels and the sum of the serum CO2/bicarbonate and chloride levels.

Ferritin ↑ 135.00 ng/mL (+ 212 %)

Ferritin is the main storage form of iron in the body. Increased levels are associated with iron overload, an increasing risk of cardiovascular disease, inflammation and oxidative stress.

Hs CRP, Female ↑ 3.82 mg/L (+ 205 %)

High Sensitivity C-Reactive Protein (Hs-CRP) is a blood marker that can help indicate the level of chronic inflammation in the body. Increased levels are associated with in increased risk of inflammation, cardiovascular disease, stroke, and diabetes.

Thyroid Peroxidase (TPO) Abs LABCORP ↑ 85.00 IU/ml (+ 200 %)

Thyroid peroxidase (TPO) is an enzyme inside the cells of the thyroid that attaches iodine molecules to a tyrosine molecule to form the thyroid hormone Thyroxine or T4. The Thyroid Peroxidase (TPO) antibody test measures the level of antibodies in the blood that are attacking the TPO enzyme inside the thyroid cells. Elevated levels of Thyroid Peroxidase (TPO) Antibodies are found in Autoimmune Thyroiditis, such as Hashimotos Thyroiditis.

RDW ↑ 14.70 % (+ 181 %)

The Red Cell Distribution Width (RDW) is essentially an indication of the degree of abnormal variation in size of red blood cells (called anisocytosis). Although the RDW will increase with vitamin BI2 deficiency, folic acid, and iron anemia, it is increased most frequently with vitamin B12 deficiency anemia.

Hemoglobin A1C ↑ 6.80 % (+ 180 %)

The Hemoglobin A1C test measure the amount of glucose that combines with hemoglobin to form glycohemoglobin during the normal lifespan of a red blood cell, which is about 120 days. The amount of glycohemoglobin formed is in direct proportion to the amount of glucose present in the blood stream during the 120-day red blood cell lifespan. In the presence of high blood glucose levels (hyperglycemia) the amount of hemoglobin that is glycosylated to form glycohemoglobin increases and the hemoglobin A1C level will be high. Hemoglobin A1C is used primarily to monitor long-term blood glucose control and to help determine therapeutic options for treatment and management. Studies have shown that the closer to normal the hemoglobin A1C levels are kept, the less likely those patients are to develop the long-term complications of diabetes.

ALT (SGPT) ↑ 42.00 IU/L (+ 150 %)

SGPT/ALT is an enzyme present in high concentrations in the liver and to lesser extent skeletal muscle, the heart, and kidney. SGPT/ALT will be liberated into the bloodstream following cell damage or destruction. Any condition or situation that causes damage to the hepatocytes will cause a leakage of SGPT/ALT in to the bloodstream. These would be exposure to chemicals, viruses (viral hepatitis, mononucleosis, cytomegalovirus, Epstein Barr, etc.), alcoholic hepatitis. The most common non-infectious cause of an increased ALT is a condition called steatosis (fatty liver).

Thyroglobulin Abs LABCORP ↑ 1.80 IU/ml (+ 150 %)

Thyroglobulin is a protein produced by the follicular cells of the thyroid gland to produce Thyroxine (T4) and Triiodothyronine (T3). Thyroglobulin Antibodies are immune cells that attack the thyroglobulin in the thyroid. Elevated Thyroglobulin antibodies are found in patients with Hashimoto's thyroditis and Grave's disease.

Triglyceride/HDL Ratio ↑ 3.94 ratio (+ 147 %)

The Triglyceride:HDL ratio is determined from serum trigleceride and HDL levels. Increased ratios are associated with an increased risk of developing insulin resistance and Type II Diabetes.

MCV ↑ 97.00 fL (+ 140 %)

The MCV is a measurement of the volume in cubic microns of an average single red blood cell. MCV indicates whether the red blood cell size appears normal (normocytic), small (microcytic), or large (macrocytic). An increase or decrease in MCV can help determine the type of anemia present. An increased MCV is associated with B12, folate, or vitamin C deficiency.

Cholesterol/HDL Ratio ↑ 5.82 Ratio (+ 96 %)

The ratio of total cholesterol to HDL is a far better predictor of cardiovascular disease than cholesterol by itself. A lower ratio is ideal because you want to lower cholesterol (but not too low) and raise HDL. A level below 3.0 would be ideal. Every increase of 1.0, i.e. 3.0 to 4.0 increases the risk of heart attack by 60%.

BUN/Creatinine Ratio ↑ 18.36 Ratio (+ 89 %)

The BUN/Creatinine is a ratio between the BUN and Creatinine levels. An increased level is associated with renal dysfunction.

Bilirubin - Total ↑ 1.20 mg/dL (+ 88 %)

The total bilirubin is composed of two forms of bilirubin: Indirect or unconjugated bilirubin, which circulates in the blood on its way to the liver and direct or conjugated bilirubin, which is the form of bilirubin made water soluble before it is excreted in the bile. An increase in total bilirubin is associated with a dysfunction or blockage in the liver, gallbladder, or biliary tree, oxidative stress or red blood cell hemolysis.

Neutrophils ↑ 67.00 % (+ 85 %)

Neutrophils are the white blood cells used by the body to combat bacterial infections. They are the most numerous and important white cell in the body's reaction to inflammation. Levels will be increased in bacterial infections.

Eosinophils ↑ 4.00 % (+ 83 %)

Eosinophils are a type of White Blood Cell, which are often increased in patients that are suffering from intestinal parasites or food or environmental sensitivities/allergies.

BUN ↑ 18.00 mg/dL (+ 83 %)

BUN or Blood Urea Nitrogen reflects the ratio between the production and clearance of urea in the body. Urea is formed almost entirely by the liver from both protein metabolism and protein digestion. The amount of urea excreted as BUN varies with the amount of dietary protein intake. Increased BUN may be due to an increased production of urea by the liver or decreased excretion by the kidney. BUN is a test used predominantly to measure kidney function, where it will be increased. An increased BUN is also associated with dehydration and hypochlorhydria.

Hematocrit, Female ↑ 46.20 % (+ 81 %)

The hematocrit (HCT) measures the percentage of the volume of red blood cells in a known volume of centrifuged blood. It is an integral part of the Complete Blood Count (CBC) or Hemotology panel. Elevated levels of hematocrit are associated with dehydration. An increased hematocrit is also associated with but by no means diagnostic of asthma or emphysema. Due to the lack of optimum oxygenation of the blood, the body will increase the red blood cell count to increase the number of cells that can be oxygenated. The hematocrit will go up accordingly.

Sodium ↑ 144.00 mEq/L (+ 79 %)

Sodium is an important blood electrolyte and functions to maintain osmotic pressure, acid-base balance, aids in nerve impulse transmission, as well as renal, cardiac and adrenal functions. Increased sodium is most often due dehydration (sweating, diarrhea, vomiting, polyuria, etc.) or adrenal stress.

TIBC ↑ 375.00 µg/dL (+ 75 %)

Total Iron Binding Capacity is an approximate estimation of the serum transferrin level. Transferrin is the protein that carries the majority of the iron in the blood. Elevated levels of TIBC are associated with iron deficiency anemia.

Chloride ↑ 107.00 mEq/L (+ 67 %)

Chloride plays an important role in human physiology. The amount of serum chloride is carefully regulated by the kidneys. Chloride is involved in regulating acid-base balane in the body. Increased levels are associated with metabolic acidosis and adrenal stress.

Leptin, Female ↑ 25.60 ng/ml (+ 60 %)

Leptin is a homrone produced by adipose (fat) tissue. Ongoing research indictaes that leptin plays a role in many physiological processes in the body including immunity, bone formation, blood cell formation and blood sugar regulation. Increasing leptin levels are associated with increasing body fat levels.

LDL Cholesterol ↑ 131.00 mg/dL (+ 59 %)

LDL functions to transport cholesterol and other fatty acids from the liver to the peripheral tissues for uptake and metabolism by the cells. It is known as “bad cholesterol” because it is thought that this process of bringing cholesterol from the liver to the peripheral tissue increases the risk for atherosclerosis. An increased LDL cholesterol is just one of many independent risk factors for cardiovascular disease. It is also associated with metabolic syndrome, oxidative stress and fatty liver.

Gastrin ↑ 92.00 pg/ml (+ 54 %)

Insulin - Fasting ↑ 5.20 µIU/ml (+ 54 %)

insulin is the hormone released in response to rising blood glucose levels and decreases blood glucose by transporting glucose into the cells. Often people lose their ability to utilize insulin to effectively drive blood glucose into energy-producing cells. This is commonly known as “insulin resistance” and is associated with increasing levels of insulin in the blood. Excess insulin is associated with greater risks of heart attack, stroke, metabolic syndrome and diabetes.

Below Optimal

Potassium ↓ 3.20 mEq/L (- 210 %)

Potassium is one of the main electrolytes in the body. Due to the critical functions of potassium for human metabolism and physiology it is essential for the body to maintain optimum serum levels even though a small concentration is found outside of the cell. Potassium levels should always be viewed in relation to the other electrolytes. Potassium concentration is greatly influenced by adrenal hormones. Decreased levels are associated with adrenal stress and may also be elevated with high blood pressure.

HDL Cholesterol ↓ 39.00 mg/dL (- 157 %)

HDL functions to transport cholesterol from the peripheral tissues and vessel walls to the liver for processing and metabolism into bile salts. It is known as “good cholesterol” because it is thought that this process of bringing cholesterol from the peripheral tissue to the liver is protective against atherosclerosis. Decreased HDL is considered atherogenic (tending towards the formation of fatty plaques in the artery).

CO2 ↓ 20.00 mEq/L (- 150 %)

Carbon Dioxide is a measure of bicarbonate in the blood. CO_2, as bicarbonate, is available for acid-base balancing. Bicarbonate neutralizes metabolic acids in the body. Decreased levels are associated with metabolic acidosis.

Vitamin D (25-OH) ↓ 19.80 ng/ml (- 126 %)

This vitamin D test measures for levels of 25-OH vitamin D and is a very good way to assess vitamin D status. Decreased vitamin D levels are a sign of Vitamin D deficiency.

Folate ↓ 8.00 ng/ml (- 120 %)

Folate functions as a coenzyme in the process of methylation. Along with vitamin B12, folate is essential for DNA synthesis. Low folate intake can result in folate deficienc, which can impair methylation, DNA synthesis and red blood cell production.

DHEA-S, Female ↓ 194.00 µg/dl (- 115 %)

DHEA is produced primarily from the adrenals and is the most abundant circulating steroid in the human body and influences more than 150 known anabolic (repair) functions throughout the body and brain. It is the precursor for the sex hormones: testosterone, progesterone and estrogen. Decreased levels are associated with many common age-related conditions, including diseases of the nervous, cardiovascular, and immune systems such as metabolic syndrome, coronary artery disease, osteoporosis, mood disorders and sexual dysfunction. Ideally DHEA levels should be maintained at the level of a healthy 30-year-old in order to maximize the anti-aging effects.

Progesterone, Female ↓ 12.40 ng/ml (- 112 %)

Progesterone is a steroid hormone mainly formed in the cells of the corpus luteum and during pregnancy in the placenta. Progesterone levels are used in fertility diagnosis for the detection of ovulation and assessment of the luteal phase of menstruation.

Free T3 ↓ 2.74 pg/ml (- 102 %)

T-3 is the most active thyroid hormone and is primarily produced from the conversion of thyroxine (T-4) in the peripheral tissue. Free T3 is the unbound form of T3 measured in the blood. Free T3 represents approximately 8 – 10% of circulating T3 in the blood. Free T-3 levels may be decreased with hypothyroidism and is associated with selenium deficiency.

T3 Uptake ↓ 24.00 % (- 80 %)

The T-3 uptake test has nothing to do with actual T-3 levels, as the name might suggest. Decreased levels are associated with hypothyroidism and deficiencies of iodine and selenium.

Testosterone, Total Female ↓ 32.00 ng/dl (- 80 %)

The total testosterone test measures both the testosterone that is bound to serum proteins and the unbound form (free testosterone). In women, low total testosterone levels have been linked to an increased risk for the following: osteoporosis, decreased lean body mass and decreased libido.

Testosterone, Free Female ↓ 0.70 pg/ml (- 75 %)

The free testosterone test measures the testosterone that is unbound to serum proteins such as Sex Hormone Binding Globulin. In women, low free testosterone levels have been linked to an increased risk for the following: osteoporosis, decreased lean body mass and decreased libido.

Globulin, total ↓ 2.30 g/dL (- 75 %)

Globulins constitute the body's antibody system and the Total globulin is a measurement of all the individual globulin fractions in the blood. Decreased levels are associated with inflammation in the digestive system and immune insufficiency.

Phosphorus ↓ 2.80 mg/dL (- 70 %)

Phosphorous levels, like calcium, are regulated by parathyroid hormone (PTH). Phosphate levels are closely tied with calcium, but they are not as strictly controlled as calcium. Plasma levels may be decreased after a high carbohydrate meal or in people with a diet high in refined carbohydrates. Serum phosphorous is a general marker for digestion. Decreased phosphorous levels are associated with hypochlorhydria.

Protein, total ↓ 6.80 g/dL (- 70 %)

Total serum protein is composed of albumin and total globulin. Conditions that affect albumin and total globulin readings will impact the total protein value. A decreased total protein can be an indication of malnutrition, digestive dysfunction due to HCl need, or liver dysfunction. Malnutrition leads to a decreased total protein level in the serum primarily from lack of available essential amino acids.

Total T4 ↓ 5.30 µg/dL (- 62 %)

T-4 is the major hormone secreted by the thyroid gland. T-4 production and secretion from the thyroid gland is stimulated by the pituitary hormone TSH. Total T4 reflects the total amount of T4 present in the blood i.e. amount bound to thyroid binding globulin and free levels. Decreased total T-4 levels are associated with Hypothyroidism and/or a selenium deficiency.

Iron - Serum ↓ 80.00 µg/dL (- 61 %)

Serum iron reflects iron that is bound to serum proteins such as transferrin. Serum iron levels will begin to fall somewhere between the depletion of the iron stores and the development of anemia. Decreased iron levels are associated with iron deficiency anemia, hypochlorhydria and internal bleeding. The degree of iron deficiency is best appreciated with ferritin, TIBC and % transferrin saturation levels.

Alk Phos ↓ 67.00 IU/L (- 60 %)

Alkaline phosphatase (ALP) is a group of isoenzymes that originate in the bone, liver, intestines, skin, and placenta. It has a maximal activity at a pH of 9.0-10.0, hence the term alkaline phosphatase. Decreased levels of ALP have been associated with zinc deficiency.

Lymphocytes ↓ 22.00 % (- 60 %)

Lymphocytes are a type of white blood cell. Decreased levels are often seen in a chronic viral infection when the body can use up a large number of lymphocytes and oxidative stress.

Cortisol - AM ↓ 3.00 µg/dL (- 56 %)

The serum cortisol test is used to identify dysfunction in the adrenal gland. Decreased levels are associated with adrenal insufficiency or an underproduction of cortisol (eg, Addison disease).

eGFR Non-Afr. American ↓ 84.00 mL/min/1.73m2 (- 55 %)

The eGFR is a calculated estimate of the kidney's Glomerular Filtration Rate. It uses 4 variables: age, race, creatinine levels and gender to estimate kidney function. Levels below 60 are an indication of a loss of kidney function and may require a visit to a renal specialist for further evaluation.

Free Thyroxine Index (T7) ↓ 1.60 Index (- 53 %)

The Free Thyroxine Index is a calculated measurement used to determine how much active thyroid hormone (thyroxine/Free T4) is available. Decreased levels are associated with hypothyroidism.

Total T3 ↓ 89.00 ng/dL (- 51 %)

T-3 is the most active thyroid hormone and is primarily produced from the conversion of thyroxine (T-4) in the peripheral tissue. T-3 is 4 -5 times more metabolically active than T-4. Total T3 reflects the total amount of T3 present in the blood i.e. amount bound to protein and free levels. Decreased total T-3 are associated with Hypothyroidism and/or a selenium deficiency.

Functional Index Report

The indices shown below represent an analysis of this blood test. These results have been converted into your patient's individual Functional Index Report based on our latest research. This report gives you an indication of the level of dysfunction that exists in the various physiological systems in the body. Please use this report in conjunction with the " Practitioner's Only Clinical Dysfunctions Report" to identify which dysfunctions and conditions are causing changes in the Functional Index and to put together a unique treatment plan designed to bring their body back into a state of functional health, wellness and energy.

Score Guide: **90% - 100%** - Dysfunction Highly Likely, **70% - 90%** - Dysfunction Likely, **50% - 70%** - Dysfunction Possible, **< 50%** - Dysfunction Less Likely.

Functional Index	0% — 100%
Lipid Panel Index	100%
Acid-Base Index	100%
Electrolyte Index	100%
Blood Sugar Index	100%
Adrenal Function Index	100%
Thyroid Function Index	100%
Sex Hormone Index - Female	100%
Cardiovascular Risk Index	93%
GI Function Index	86%
Inflammation Index	73%
Bone Health Index	69%
Gallbladder Function Index	67%
Liver Function Index	65%
Immune Function Index	63%
Allergy Index	60%
Oxidative Stress Index	43%
Kidney Function Index	42%
Red Blood Cell Index	36%
Heavy Metal Index	31%
Toxicity Index	17%

Lipid Panel Index

A high Lipid Panel Index indicates that there is a strong clinical indication of hyperlipidemia, which has been shown to indicate a potential risk of developing atherosclerotic coronary artery disease. Although hyperlipidemia is a cause, it's important to look at many other risks for this disease including smoking, blood sugar dysregulation, hypertension, elevated homocysteine and other diet and lifestyle considerations. Based on this blood test, your patient's Lipid Panel is:

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Cholesterol - Total ↑, Triglycerides ↑, LDL Cholesterol ↑, Cholesterol/HDL Ratio ↑, HDL Cholesterol ↓

Biomarkers Considered:
Cholesterol - Total, Triglycerides, LDL Cholesterol, Cholesterol/HDL Ratio, HDL Cholesterol

Acid-Base Index

A high Acid-Base Index indicates a functional imbalance in the body's pH system. Consider metabolic acidosis or metabolic alkalosis as a cause for this imbalance. Based on this blood test, your patient's Acid-Base Index is:

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Anion gap ↑, Potassium ↓, Chloride ↑, CO2 ↓

Biomarkers Considered:
Anion gap, Potassium, Chloride, CO2, Calcium

Electrolyte Index

A high Electrolyte Index indicates that there's a degree of dysfunction in the body's electrolytes: potassium, sodium, chloride, potassium and magnesium. View the Nutrient Index report to identify which electrolytes might be deficient. Based on this blood test, your patient's Electrolyte Index is:

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Potassium ↓, Phosphorus ↓

Biomarkers Considered:
Sodium, Potassium, Chloride, Calcium, Phosphorus, Magnesium

Blood Sugar Index

A high Blood Sugar Index indicates that there is dysfunction in this patient's blood sugar regulation. Blood sugar dysregulation is affected by genetics, diet, lifestyle, nutrition and environment. Some factors to consider include hypoglycemia, metabolic syndrome, insulin resistance, hyperinsulinemia, and type 2 Diabetes. Based on this blood test, your patient's Blood Sugar Index is:

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Glucose ↑, Hemoglobin A1C ↑, Insulin - Fasting ↑, Cholesterol - Total ↑, Triglycerides ↑, LDL Cholesterol ↑, HDL Cholesterol ↓, DHEA-S, Female ↓

Biomarkers Considered:
Glucose, LDH, Hemoglobin A1C, Insulin - Fasting, Cholesterol - Total, Triglycerides, LDL Cholesterol, HDL Cholesterol, DHEA-S, Female

Adrenal Function Index

A high Adrenal Function Index indicates that that there is dysfunction within your patient's adrenal system and further assessment is needed to find out what the dysfunction is. Consider factors that contribute to adrenal hyperactivity, stress, or adrenal insufficiency. Based on this blood test, your patient's Adrenal Function Index is:

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Sodium ↑, Potassium ↓, Sodium/Potassium Ratio ↑, BUN ↑, Chloride ↑, Cholesterol - Total ↑, Triglycerides ↑, DHEA-S, Female ↓, Cortisol - AM ↓

Biomarkers Considered:
Sodium, Potassium, Sodium/Potassium Ratio, Glucose, BUN, Chloride, CO2, Cholesterol - Total, Triglycerides, DHEA-S, Female, Cortisol - AM, Cortisol - PM

Thyroid Function Index

A high Thyroid Index indicates that there is dysfunction in your patient's thyroid and there is a need for further assessment and treatment. There is a strong likelihood that there's significant distress in the systems that help regulate the thyroid gland in the body. This may be caused by increased levels of stress, adrenal insufficiency, iodine and/or selenium deficiency, liver dysfunction, kidney insufficiency, a low calorie diet etc. Consider that the dysfunction might be a hyperactive thyroid (hyperthyroid) or a hypothyroid situation: primary hypothyroidism (a dysfunction in the thyroid itself), secondary hypothyroidism (dysfunction in the anterior pituitary), or low T3 syndrome (T4 under conversion). Based on this blood test, your patient's Thyroid Function Index is:

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
TSH ↑, Total T4 ↓, Total T3 ↓, Free T3 ↓, T3 Uptake ↓, Free Thyroxine Index (T7) ↓

Biomarkers Considered:
TSH, Total T4, Free T4, Total T3, Free T3, T3 Uptake, Free Thyroxine Index (T7)

Patient Result Not Available - Consider Running In Future Tests:
Reverse T3

Sex Hormone Index - Female

The Female Sex Hormone Index indicates an increasing level of sex hormone deficiencies in your patient. Review the individual levels of hormones to identify which hormones are causing the high index: testosterone, DHEA and estradiol. Based on this blood test, your patient's Female Sex Hormone Index is:

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
DHEA-S, Female ↓, Testosterone, Total Female ↓, Testosterone, Free Female ↓, Progesterone, Female ↓

Biomarkers Considered:
DHEA-S, Female, Estradiol, Female, Testosterone, Total Female, Testosterone, Free Female, Progesterone, Female

Cardiovascular Risk Index

The Cardiovascular Risk Index is based on the measurement of 15 elements in a blood test that indicate an increase risk of this patient developing cardiovascular disease (heart attack, coronary artery disease and stroke). A high Cardiovascular Risk Index indicates that your patient may have an increased risk of cardiovascular disease, atherosclerosis, endothelial dysfunction, and inflammation. Based on this blood test, your patient's Cardiovascular Risk Index is:

[93%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Glucose ↑, Cholesterol - Total ↑, Triglycerides ↑, LDL Cholesterol ↑, HDL Cholesterol ↓, Hs CRP, Female ↑, Homocysteine ↑, Hemoglobin A1C ↑, Insulin - Fasting ↑, Vitamin D (25-OH) ↓

Biomarkers Considered:
Glucose, AST (SGOT), LDH, Cholesterol - Total, Triglycerides, LDL Cholesterol, HDL Cholesterol, Ferritin, Hs CRP, Female, Homocysteine, Hemoglobin A1C, Testosterone, Free Female, Insulin - Fasting, Vitamin D (25-OH)

Patient Result Not Available - Consider Running In Future Tests:
Fibrinogen

GI Function Index

A high reading in the GI Function Index indicates that there is dysfunction within your patient's GI system and further assessment is needed to pinpoint exactly what that dysfunction is. Some of the factors to consider include hypochlorhydria, gastric inflammation, Helicobacter pylori, pancreatic insufficiency, dysbiosis and intestinal hyperpermeability. Based on this blood test, your patient's Functional GI Index is:

[86%] - Dysfunction Likely. Improvement required.

Rationale:
BUN ↑, Protein, total ↓, Globulin, total ↓, Phosphorus ↓, Alk Phos ↓, MCV ↑, Eosinophils ↑, Iron - Serum ↓, Anion gap ↑

Biomarkers Considered:
BUN, Protein, total, Globulin, total, Albumin, Phosphorus, Alk Phos, MCV, Eosinophils, Basophils, Iron - Serum, Creatinine, Chloride, Anion gap, Uric Acid, female, Calcium, GGT, Total WBCs, Hemoglobin, Female

Inflammation Index

A high Inflammation Index reflects the degree of inflammation that your patient may be dealing with. A number of elements in the blood increase in the presence of dysfunctions and diseases associated with inflammation: cardiovascular disease, diabetes, hypertension, autoimmune diseases, and fibromyalgia to name a few. Based on this blood test, your patient's Inflammation Index is:

[73%] - Dysfunction Likely. Improvement required.

Rationale:
Hs CRP, Female ↑, Homocysteine ↑, Sodium/Potassium Ratio ↑, Globulin, total ↓, RDW ↑, Vitamin D (25-OH) ↓

Biomarkers Considered:
Hs CRP, Female, Homocysteine, Uric Acid, female, LDH, Sodium/Potassium Ratio, Globulin, total, Cholesterol - Total, Triglycerides, HDL Cholesterol, Iron - Serum, Ferritin, Platelets, Lymphocytes, Basophils, Alk Phos, RDW, Vitamin D (25-OH)

Patient Result Not Available - Consider Running In Future Tests:
Fibrinogen, ESR, Female, Creatine Kinase, C-Reactive Protein

Bone Health Index

A high reading in the Bone Health Index indicates that there is trend towards dysfunction in this patient's bone health. Some of the factors to consider include elevated bone resorption, low bone mineral density, increased bone activity, poor vitamin D status, osteoporosis, osteopenia, or a decrease in osteoblastic activity. Based on this blood test, your patient's Bone Health Index is:

[69%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
CO2 ↓, DHEA-S, Female ↓, Glucose ↑, Hs CRP, Female ↑, Phosphorus ↓, Potassium ↓, Progesterone, Female ↓, Sodium ↑, Vitamin D (25-OH) ↓

Biomarkers Considered:
Alk Phos, BUN, Calcium, CO2, DHEA-S, Female, Glucose, Hs CRP, Female, Phosphorus, Potassium, Progesterone, Female, Protein, total, Sodium, Vitamin D (25-OH)

Gallbladder Function Index

A high Gallbladder Function Index indicates that that there is dysfunction within your patient's hepato-biliary system and further assessment is needed to find out what the dysfunction is. Some factors to consider include problems in the liver that compromises the production of bile (biliary insufficiency), the progressive thickening of the bile itself within the gallbladder (biliary stasis) or biliary obstruction that causes cholestasis, a condition of impaired bile flow. Biliary obstruction can occur in the liver but more often occurs outside the liver where it is most often due to a common calculi and usually occurs on a spectrum of mild to severe. Biliary obstruction usually has a genesis in biliary stasis. Based on this blood test, your patient's Gallbladder Function Index is:

[67%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
Cholesterol - Total ↑, ALT (SGPT) ↑, Bilirubin - Total ↑

Biomarkers Considered:
GGT, Alk Phos, Cholesterol - Total, ALT (SGPT), LDH, Bilirubin - Total, Triglycerides

Patient Result Not Available - Consider Running In Future Tests:
Bilirubin - Direct

Liver Function Index

A high Liver Function Index may indicate the need for further assessment of liver function. Factors affecting liver function include steatosis (the accumulation of fat within the liver), Hepatitis (inflammation of the hepatic cells from infections, toxins, etc.) liver cell damage from cirrhosis, infection, alcohol, chemical damage and hepatic necrosis or a decrease in either phase 1 or phase 2 liver detoxification pathways. Based on this blood test, your patient's Liver Function Index is:

[65%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
ALT (SGPT) ↑, Bilirubin - Total ↑, Cholesterol - Total ↑, Ferritin ↑, Protein, total ↓, RDW ↑, MCV ↑

Biomarkers Considered:
ALT (SGPT), BUN, Albumin, Globulin, total, Albumin/Globulin Ratio, Alk Phos, AST (SGOT), LDH, Bilirubin - Total, Cholesterol - Total, Triglycerides, Iron - Serum, Ferritin, GGT, Protein, total, RDW, MCV

Patient Result Not Available - Consider Running In Future Tests:
Bilirubin - Direct

Immune Function Index

A high reading in the Immune Function Index indicates that there is dysfunction within your patient's immune system and further assessment is needed to pinpoint exactly what that dysfunction is. Some of the factors to consider include immune insufficiency, bacterial or viral infections or GI dysfunction associated with immune function: abnormal mucosal barrier function, secretory IgA dysfunction or dysbiosis. Based on this blood test, your patient's Immune Function Index is:

[63%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
Globulin, total ↓, Neutrophils ↑, Lymphocytes ↓, Alk Phos ↓, Iron - Serum ↓

Biomarkers Considered:
Total WBCs, Globulin, total, Neutrophils, Lymphocytes, Monocytes, Albumin, Alk Phos, Iron - Serum, Ferritin

Allergy Index

The Allergy Index reflects the degree of food or environmental sensitivities/allergies your patient may be dealing with. A number of elements on a blood test may increase in association with food allergies and/or sensitivities. A high Allergy Index may indicate the need for further assessment or evaluation through allergy elimination/challenge, more sophisticated allergy testing and/or GI function assessment. Based on this blood test, your patient's Allergy Index is:

[60%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
Eosinophils ↑

Biomarkers Considered:
Eosinophils, Basophils

Nutrient Index Report

The indices shown below represent an analysis of your patient's blood test results. These results have been converted into their individual Nutrient Assessment Report based on our latest research. This report gives you an indication of their general nutritional status. Nutritional status is influenced by actual dietary intake, digestion, absorption, assimilation and cellular uptake of the nutrients themselves. You can use this information, along with information about individual nutrient deficiencies, to put together a unique treatment plan designed to bring their body back into a state of functional health, wellness and energy.

Score Guide: **90% - 100%** - Nutrient Status is Poor, **75% - 90%** - Nutrient Status is Low, **50% - 75%** - Moderate Nutrient Status, **< 50%** - Optimum Nutrient Status

Nutrient Index	0% 100%
Carbohydrate Index	100%
Vitamin Index	100%
Mineral Index	71%
Hydration Index	60%
Protein Index	39%
Fat Index	12%

Carbohydrate Index

The Carbohydrate Index gives us an assessment of your patient's dietary intake of carbohydrates, especially refined carbohydrates and sugars. A diet high in refined carbohydrates and sugars will deplete phosphorus stores and other important co-factors for carbohydrate metabolism. It may also increase serum glucose and serum triglyceride levels. Follow up a high Carbohydrate Index with a thorough assessment of blood sugar regulation and also an investigation into this patient's dietary consumption of sugars and refined carbohydrates. Based on this blood test, your patient's Carbohydrate Index is:

[100%] - Nutrient Status is Poor. Much improvement required.

Rationale:
Glucose ↑, Phosphorus ↓, Cholesterol - Total ↑, Triglycerides ↑, LDL Cholesterol ↑, HDL Cholesterol ↓

Biomarkers Considered:
Glucose, Phosphorus, LDH, Cholesterol - Total, Triglycerides, LDL Cholesterol, HDL Cholesterol, Total WBCs

Vitamin Index

The Vitamin Index gives us a general indication of the balance of certain vitamins in the body based on the results of this blood test. A high Vitamin Index indicates a level of deficiency or need in one or more of the vitamins reflected in this index, which includes vitamin B12, vitamin B6, folate, thiamin, vitamin D and vitamin C. Factors to consider are the amount in the diet, the ability to digest and breakdown individual vitamins from the food or supplements consumed, and the ability of those vitamins to be absorbed, transported and ultimately taken up into the cells themselves. Please use the information at the bottom of this report to identify which vitamin or vitamins may be in need. Based on this blood test, your patient's Vitamin Index is:

[100%] - Nutrient Status is Poor. Much improvement required.

Rationale:

Anion gap ↑, Homocysteine ↑, Vitamin D (25-OH) ↓, MCV ↑

Biomarkers Considered:
Anion gap, Albumin, AST (SGOT), ALT (SGPT), GGT, Homocysteine, Vitamin D (25-OH), MCV

Mineral Index

The Mineral Index gives us a general indication of the balance of certain minerals in the body based on the results of this blood test. A high Mineral Index indicates a level of deficiency or need in one or more of the minerals reflected in this index, which includes calcium, zinc, copper, potassium, molybdenum, selenium, magnesium, iodine and iron. Factors to consider include the amount in the diet, the ability to digest and breakdown individual minerals from food or supplements consumed, the ability of those minerals to be absorbed, transported and ultimately taken up by the cells themselves. In the case of certain minerals, such as iron and potassium, you must also consider the possibility of a mineral deficiency due to increased excretion or loss, such as increased bleeding causing an iron deficiency. Please use the information at the bottom of this report to identify which mineral or minerals may be deficient. Based on this blood test, your patient's Mineral Index is:

[71%] - Moderate Nutrient Status. There may be improvement needed in certain areas.

Rationale:
Potassium ↓, Phosphorus ↓, Alk Phos ↓, Iron - Serum ↓, TIBC ↑, Total T3 ↓, Free T3 ↓

Biomarkers Considered:
Potassium, Uric Acid, female, Calcium, Phosphorus, Alk Phos, GGT, Iron - Serum, Ferritin, TIBC, % Transferrin saturation, Total T3, Free T3, MCV, Magnesium

Hydration Index

The Hydration index gives us a good indication of how well hydrated your patient was at the time their blood was drawn. Dehydration is a very common problem and often shows up on a standard blood chemistry and CBC test. Insufficient water intake and/or excessive use of diuretics such as over the counter and prescription drugs, botanical medicines, caffeine etc. are the most common cause of dehydration and may be a cause of an increased Hydration Index. An increased albumin is a sign of dehydration along with increased and BUN, Sodium, Potassium, RBC count, Hemoglobin and Hematocrit. Based on this blood test, your patient's Hydration Index is:

[60%] - Moderate Nutrient Status. There may be improvement needed in certain areas.

Rationale:
BUN ↑, Sodium ↑, Hematocrit, Female ↑

Biomarkers Considered:
Albumin, BUN, Sodium, Potassium, Protein, total, RBC, Female, Hemoglobin, Female, Hematocrit, Female

Individual Nutrient Deficiencies

The values below represent the degree of deficiency for individual nutrients based on your patient's blood results. The status of an individual nutrient is based on a number of factors such as actual dietary intake, digestion, absorption, assimilation and cellular uptake of the nutrients themselves. All of these factors must be taken into consideration before determining whether or not your patient/client actually needs an individual nutrient. Use the information in this section to put together an individualized treatment plan to bring your patient back into a state of optimal nutritional function.

Score Guide: **90% - 100%** - Deficiency Highly Likely, **70% - 90%** - Deficiency Likely, **50% - 70%** - Deficiency Possible, **< 50%** - Deficiency Less Likely.

Nutrient Deficiencies	0% 100%
Vitamin D Need	100%
Selenium Need	100%
Vitamin B12/Folate Need	95%
DHEA Need	80%
Thiamine Need	80%
Zinc Need	70%
Iodine Need	55%
Calcium Need	43%
Magnesium Need	25%
Iron Deficiency	24%
Vitamin C Need	11%
Vitamin B6 Need	10%
Molybdenum Need	0%
Glutathione Need	0%

Vitamin D Need

The results of this blood test indicate that this patient's Vitamin D levels might be lower than optimal.

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Vitamin D (25-OH) ↓

Biomarkers Considered:
Vitamin D (25-OH)

Selenium Need

Consider selenium deficiency if the **total T-3** is reduced, the **free T-3** is reduced or **T-3 uptake** is reduced along with a normal **TSH** and T-4 level. Inactive T-4 is converted into T-3, the active thyroid hormone, by cleaving an iodine molecule from its structure. Selenium plays an active role in this cleaving process.

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Total T3 ↓, Free T3 ↓, T3 Uptake ↓

Biomarkers Considered:
Total T3, Free T3, T3 Uptake

Vitamin B12/Folate Need

Consider a Vitamin B12 and folate need if the MCV is increased along with an increased MCH. If there is also an

increased RDW, MCHC, and LDH (especially the LDH-1 isoenzyme fraction), and a decreased uric acid level the probability of vitamin B-12 or folic acid anemia is very high. Serum Vitamin B12 and serum folate may also decreased.

[95%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
MCV ↑, Homocysteine ↑, RDW ↑, Folate ↓

Biomarkers Considered:
MCV, LDH, Homocysteine, Uric Acid, female, Albumin, Total WBCs, RBC, Female, Hemoglobin, Female, Hematocrit, Female, MCH, MCHC, RDW, Neutrophils, Folate, Vitamin B12

DHEA Need

The results of this blood test indicate that this patient's DHEA levels might be lower than optimal.

[80%] - Dysfunction Likely. Improvement required.

Rationale:
DHEA-S, Female ↓

Biomarkers Considered:
DHEA-S, Female

Thiamine Need

Consider Thiamine deficiency with an **increased anion gap** along with a **decreased CO_2**. **Hemoglobin** and **hematocrit** levels may be normal or decreased. Due to thiamine's role in glycolysis, **LDH** levels may be decreased and **glucose** levels may be normal to increased.

[80%] - Dysfunction Likely. Improvement required.

Rationale:
Anion gap ↑, CO2 ↓, Glucose ↑

Biomarkers Considered:
Anion gap, CO2, Glucose, LDH, Hemoglobin, Female, Hematocrit, Female

Zinc Need

Consider a zinc need if the **Alk phos** levels are decreased.

[70%] - Dysfunction Likely. Improvement required.

Rationale:
Alk Phos ↓

Biomarkers Considered:
Alk Phos

Iodine Need

Consider an iodine deficiency if the **total T4** is decreased along with a decreased **free T4**. The **total T3** is often increased and there's a normal or mildly elevated **TSH**.

[55%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
Total T4 ↓, T3 Uptake ↓, TSH ↑

Biomarkers Considered:
Total T4, Free T4, Total T3, Free T3, T3 Uptake, TSH

Clinical Dysfunctions Report

Advanced Practitioner Only Report

The Clinical Dysfunctions Report shows a list of likely Health Concerns and Nutrient Deficiencies that your patient may be suffering from based on an analysis of their Chemistry Screen and CBC results. Health Concerns that are most likely are listed at the top of the report and the least likely at the bottom.

Score Guide: **90% - 100%** - Dysfunction Highly Likely, **70% - 90%** - Dysfunction Likely, **50% - 70%** - Dysfunction Possible, **< 50%** - Dysfunction Less Likely.

Health Concerns	0% 100%
Hypothyroidism - Primary	100%
Adrenal Stress	100%
Insulin Resistance	100%
Hypothyroidism - T4 under conversion	100%
Metabolic Syndrome	100%
Testosterone Deficiency	100%
Dysglycemia	100%
Metabolic Acidosis	88%
Hypochlorhydria	79%
Endothelial Dysfunction	73%
Fatty Liver/Steatosis	71%
Gastric Inflammation	69%
Hypothyroidism - Secondary	69%
Liver Dysfunction	65%
Biliary Insufficiency/Stasis	64%
Intestinal Parasites	60%
Bacterial Infection	55%
Gout	50%
Fatty Liver - Early Stage	45%
Immune Insufficiency	44%
Renal Insufficiency	42%
Biliary Obstruction	36%
Anemia	36%
Adrenal Insufficiency	35%
Metabolic Alkalosis	35%
Muscle Atrophy/Breakdown	33%
Iron Overload	29%
Liver Cell Damage	29%
Liver Cirrhosis	8%
Hypoglycemia	0%
Hyperthyroidism	0%

Health Concerns	0%	100%
Viral Infection	0%	
Pancreatic Insufficiency	0%	
Renal Disease	0%	
Intestinal Hyperpermeability	0%	

Hypothyroidism - Primary

In primary hypothyroidism the problem is located in the thyroid gland itself, which fails to produce thyroid hormone. Consider primary hypothyroidism with an increased **TSH**, a decreased **Total T4**, a decreased **Total T3**, a decreased **Free T4**, a decreased **Free T3** and a decreased **T3-uptake**. Additional elements that may be out of range with primary hypothyroidism include an increased **total cholesterol** and **triglyceride** level. Primary hypothyroidism is often preceded by autoimmune thyroid disease. If you have a patient with suspected thyroid disease you should screen for thyroid antibodies.

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
TSH ↑, Total T4 ↓, Total T3 ↓, T3 Uptake ↓, Cholesterol - Total ↑, Triglycerides ↑, Free T3 ↓, Free Thyroxine Index (T7) ↓, Thyroid Peroxidase (TPO) Abs LABCORP ↑, Thyroglobulin Abs LABCORP ↑

Biomarkers Considered:
TSH, Total T4, Total T3, T3 Uptake, Cholesterol - Total, Triglycerides, Free T4, Free T3, Free Thyroxine Index (T7), Thyroid Peroxidase (TPO) Abs LABCORP, Thyroglobulin Abs LABCORP

Patient Result Not Available - Consider Running In Future Tests:
Thyroid Peroxidase (TPO) Abs, Thyroglobulin Abs

Adrenal Stress

Adrenal stress can cause an increase in the secretions of both the glucocorticoid and mineralcorticoid hormones. An increase in aldosterone, the major mineralcorticoid, from adrenal stress will have an impact on potassium and sodium metabolism causing an increase in serum sodium and a decrease in serum potassium. Consider Adrenal Stress with an **increased serum sodium** along with a **decreased serum potassium**. Additional elements that may be out of range with adrenal stress include an **increased chloride**, an **increased BUN,** an **increased CO2** and a **decreased serum triglyceride and total cholesterol.** Urinary chloride will be decreased. Adrenal stress can be confirmed with salivary cortisol/DHEA studies.

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Sodium ↑, Potassium ↓, Sodium/Potassium Ratio ↑, BUN ↑, Chloride ↑

Biomarkers Considered:
Sodium, Potassium, Sodium/Potassium Ratio, BUN, Chloride, CO2, Cholesterol - Total, Triglycerides, Cortisol - AM, Cortisol - PM

Insulin Resistance

Insulin resistance is the condition in which people lose sensitivity to the hormone insulin. As the cells become resistant to insulin, levels of insulin and blood glucose will rise. Consider insulin resistance with an increased **fasting insulin** and an increased **fasting blood glucose**, an increased **Hemoglobin A1C**, an increased **triglyceride** and an increased **Triglyceride/HDL ratio.** You may also see an increased **total cholesterol**, an increased **C-Peptide**, a decreased **HDL** and a decreased **phosphorous**.

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Glucose ↑, Phosphorus ↓, Cholesterol - Total ↑, Triglycerides ↑, HDL Cholesterol ↓, Insulin - Fasting ↑, Triglyceride/HDL Ratio ↑

Biomarkers Considered:
Glucose, Phosphorus, Cholesterol - Total, Triglycerides, HDL Cholesterol, Insulin - Fasting, Triglyceride/HDL Ratio, C-Peptide

Hypothyroidism - T4 under conversion

T4 under conversion or low T3 syndrome is a form of hypothyroidism that clearly demonstrates the problem of using TSH alone as a marker for Hypothyroidism. Consider T4 under conversion or low T3 syndrome when you have a **normal TSH** along with a **decreased Total T3**, a **decreased Free T3**, a **normal Total T4**, a **normal Free T4** and an **increased reverse T3**. These patients will be suffering from all the classic signs and symptoms of low thyroid.

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Total T3 ↓, Free T3 ↓

Biomarkers Considered:
Total T3, Free T3

Patient Result Not Available - Consider Running In Future Tests:
Reverse T3

Metabolic Syndrome

Consider metabolic syndrome with an increased **triglyceride**, an increased **total cholesterol**, an increased **LDL** cholesterol, a decreased **HDL**, an increased fasting **blood glucose** and an increased **hemoglobin A1C**. Additional elements that may be out of range with metabolic syndrome include an increased fasting **insulin**, an increased **uric acid** and decreased **DHEA**.

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Glucose ↑, Triglycerides ↑, Hemoglobin A1C ↑, Insulin - Fasting ↑, Cholesterol - Total ↑, LDL Cholesterol ↑, HDL Cholesterol ↓, DHEA-S, Female ↓

Biomarkers Considered:
Glucose, Triglycerides, Hemoglobin A1C, Insulin - Fasting, Uric Acid, female, Cholesterol - Total, LDL Cholesterol, HDL Cholesterol, DHEA-S, Female

Testosterone Deficiency

Consider a functional testosterone deficiency with a decreased **total testosterone** and a decreased **free testosterone**.

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Testosterone, Free Female ↓, Testosterone, Total Female ↓

Biomarkers Considered:
Testosterone, Free Female, Testosterone, Total Female

Dysglycemia

Dysglycemia is an imbalance in the ability of the body to regulate blood glucose levels causing unhealthy blood glucose levels that can lead to Diabetes, Metabolic Syndrome, Obesity, Insulin Resistance and Hyperinsulinemia. Consider dysglycemia with an **elevated blood glucose level** and an **elevated hemoglobin A1C level**.

[100%] - Dysfunction Highly Likely. Much improvement required.

Rationale:
Glucose ↑, Hemoglobin A1C ↑

Biomarkers Considered:
Glucose, Hemoglobin A1C

Metabolic Acidosis

Consider metabolic acidosis if the **anion gap** is increased along with an increased **potassium**, a decreased **CO_2** and an increased **chloride**.

[88%] - Dysfunction Likely. Improvement required.

Rationale:
Anion gap ↑, Chloride ↑, CO2 ↓

Biomarkers Considered:
Anion gap, Potassium, Chloride, CO2

Hypochlorhydria

Consider hypochlorhydria with an increased total **globulin** level and a normal or decreased **total protein** and/or **albumin**, an increased **BUN**, a decreased serum **phosphorous**. Other values that may be reflective of a developing or chronic hypochlorhydria include an increased **MCV** and **MCH**, a decreased **calcium** and **iron**, a decreased **chloride**, an increased **anion gap** and a decreased **alkaline phosphatase**.

[79%] - Dysfunction Likely. Improvement required.

Rationale:
BUN ↑, Protein, total ↓, Phosphorus ↓, Alk Phos ↓, MCV ↑, Iron - Serum ↓, Anion gap ↑

Biomarkers Considered:
BUN, Protein, total, Globulin, total, Albumin, Phosphorus, Alk Phos, MCV, Iron - Serum, Anion gap, Calcium, MCH, Gastrin

Endothelial Dysfunction

Consider endothelial dysfunction with an increased **homocysteine**, an increased **blood glucose**, an increased **fibrinogen**, an increased **HS-CRP**, a decreased **free serum testosterone**, and an increased **iron**. Some of the other causes of endothelial dysfunction include smoking, hypertension, nutrient deficiencies, a standard Western diet, and a lack of exercise.

[73%] - Dysfunction Likely. Improvement required.

Rationale:
Hs CRP, Female ↑, Homocysteine ↑, Glucose ↑

Biomarkers Considered:
Hs CRP, Female, Homocysteine, Glucose, Iron - Serum

Patient Result Not Available - Consider Running In Future Tests:
Fibrinogen

Fatty Liver/Steatosis

Steatosis or fatty liver is caused by the accumulation of fat in the functional units of the liver. Non Alcoholic Steatotic Hepatitis is one of the most common causes of elevated liver enzymes. Fatty liver will cause extensive liver cell damage, so early detection is essential. Consider steatosis/fatty liver if the **SGPT/ALT** is increased above the **SGOT/AST** and **GGTP** levels, which may be elevated. Advanced steatosis will cause the **SGPT/ALT** to be elevated as much as 4 times the upper limit of normal. Consider it more likely if the **LDH** and **alkaline phosphatase** levels are also increased.

[71%] - Dysfunction Likely. Improvement required.

Rationale:
ALT (SGPT) ↑, Ferritin ↑

Biomarkers Considered:
ALT (SGPT), Alk Phos, AST (SGOT), GGT, LDH, Ferritin

Gastric Inflammation

Gastric inflammation or gastritis is often secondary to hypochlorhydria where the pattern is similar but the total globulin level may be decreased unless inflammation is severe, which may lead to an increased **globulin** level due to the increased production of inflammatory immunoglobulins. Consider gastric inflammation or gastritis with a decreased **total globulin**, a decreased serum **protein**, a decreased **phosphorous**, a decreased **hemoglobin** and an increased **BUN**. Additional elements that may be out of range with gastric inflammation include an increased **basophil** count, an increased **ESR**, a decreased **albumin** and a decreased **creatinine**.

[69%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
Globulin, total ↓, Protein, total ↓, BUN ↑, Phosphorus ↓, Gastrin ↑

Biomarkers Considered:
Globulin, total, Protein, total, Hemoglobin, Female, BUN, Creatinine, Albumin, Phosphorus, Basophils, Gastrin

Patient Result Not Available - Consider Running In Future Tests:
ESR, Female

Hypothyroidism - Secondary

Thyroid hypofunction is often secondary to an anterior pituitary hypofunction (Secondary Hypothyroidism). Suspect anterior pituitary dysfunction if the subjective indications of thyroid hypofunction are present and the following pattern is seen: A decreased **TSH**, a decreased or normal **Total T4**, a decreased or normal **Free T4** and a decreased or normal **Free T3**. The likelihood increases if serum **triglycerides** are elevated and **total cholesterol** is increased. Additional elements that may be out of range with secondary hypothyrodism include an increased **BUN** above the "normal" range and an increased **calcium**. Anterior pituitary hypofunction is a common problem and one that is frequently mistaken for thyroid hypofunction (the subjective indications are usually identical and the patient's axillary temperature will frequently be below normal).

[69%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
Cholesterol - Total ↑, Triglycerides ↑, Total T4 ↓, Free T3 ↓, Free Thyroxine Index (T7) ↓

Biomarkers Considered:
TSH, BUN, Calcium, Cholesterol - Total, Triglycerides, Total T4, Free T4, Free T3, Free Thyroxine Index (T7)

Liver Dysfunction

[65%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
ALT (SGPT) ↑, Ferritin ↑, Bilirubin - Total ↑, Cholesterol - Total ↑, Protein, total ↓, RDW ↑, MCV ↑

Biomarkers Considered:
ALT (SGPT), Ferritin, Alk Phos, AST (SGOT), GGT, Bilirubin - Total, Cholesterol - Total, LDH, Albumin, Globulin, total, BUN, Triglycerides, Albumin/Globulin Ratio, Protein, total, Iron - Serum, RDW, MCV

Patient Result Not Available - Consider Running In Future Tests:
Bilirubin - Direct

Biliary Insufficiency/Stasis

Biliary stasis or insufficiency can often be caused by a mild obstruction in the extra-hepatic biliary duct. **GGTP** levels will frequently be increased above optimal but not necessarily. **Bilirubin** levels (total and/or direct) will also be elevated along with **alkaline phosphatase, LDH**, **triglycerides** and **total cholesterol**. **SGPT/ALT** may be normal or increased. Many cases of biliary stasis will show normal lab values. In these situations suspect biliary stasis or insufficiency if there are strong subjective indicators. If the score for Biliary Insufficiency/Stasis is elevated consider further testing or treat accordingly.

[64%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
Cholesterol - Total ↑, ALT (SGPT) ↑, Bilirubin - Total ↑

Biomarkers Considered:
GGT, Cholesterol - Total, Alk Phos, ALT (SGPT), LDH, Bilirubin - Total, Triglycerides

Patient Result Not Available - Consider Running In Future Tests:
Bilirubin - Direct

Intestinal Parasites

Consider intestinal parasites with increased **eosinophils**, increased **basophils**, and increased **monocytes**. Intestinal parasites are **probable** and should be ruled out. Additional elements that may be out of range with intestinal parasites include a decreased **hemoglobin**, a decreased **hematocrit** and a decreased **serum iron**. It is important to do further studies if you suspect intestinal parasites, i.e. a stool analysis with ova and parasite, especially if the subjective indicators are present.

[60%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
Eosinophils ↑

Biomarkers Considered:
Eosinophils, Basophils, Iron - Serum, Hemoglobin, Female, Hematocrit, Female, Monocytes

Bacterial Infection

Consider a bacterial infection if theres an **increased total WBC count** along with an **increased Neutrophil count**, a **normal or decreased Lymphocyte count**. **Increased Monocytes** indicate the recovery period of the infection. Additional elements that may be out of range with a bacterial infection include an **increased bands** and an **increased serum iron**. Expect to see increased Band cells in the acute phase as the body is pumping out immature neutrophils to cope with the infection.

[55%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
Neutrophils ↑, Lymphocytes ↓

Biomarkers Considered:
Neutrophils, Total WBCs, Monocytes, Iron - Serum, Lymphocytes

Gout

Gout is a condition in which uric acid crystals precipitate in the tissue, especially the big toe (tophi). Consider gout if there is an increased **uric acid**. The likelihood increases if there is also a decreased **phosphorous**, an increased **total cholesterol**, an increased **BUN** and a normal or increased **creatinine**.

[50%] - Dysfunction Possible. There may be improvement needed in certain areas.

Rationale:
BUN ↑, Phosphorus ↓, Cholesterol - Total ↑

Biomarkers Considered:
Uric Acid, female, BUN, Creatinine, Phosphorus, Cholesterol - Total

Blood Test History Report

The Blood Test History Report lists the results of your patient's Chemistry Screen and CBC tests side by side with the latest test listed on the left hand side. This report allows you to compare results over time and see where improvement has been made and allows you to track progress.

Biomarker		Latest Test Result Sep 25 2015
Glucose		105.00 ↑↑
Hemoglobin A1C		6.80 ↑↑
Insulin - Fasting		5.20 ↑
Fructosamine		
C-Peptide		1.50
BUN		18.00 ↑
Creatinine		0.98
eGFR Non-Afr. American		84.00 ↓↓
eGFR African American		
BUN/Creatinine Ratio		18.36 ↑
Sodium		144.00 ↑
Potassium		3.20 ↓↓
Sodium/Potassium Ratio		45.00 ⚠
Chloride		107.00 ↑
CO2		20.00 ↓
Anion gap		20.20 ↑↑
Uric Acid, female		4.20
Protein, total		6.80 ↓
Albumin		4.40

Biomarker		Latest Test Result Sep 25 2015
Globulin, total		2.30 ↓
Albumin/Globulin Ratio		1.91
Calcium		9.70
Calcium/Albumin Ratio		2.20
Phosphorus		2.80 ↓
Calcium/Phosphorous Ratio		3.46 ↑↑
Magnesium		2.40
Alk Phos		67.00 ↓
LDH		168.00
AST (SGOT)		15.00
ALT (SGPT)		42.00 ↑↑
GGT		18.00
Bilirubin - Total		1.20 ↑
Bilirubin - Direct		
Bilirubin - Indirect		
Iron - Serum		80.00 ↓
Ferritin		135.00 ↑
TIBC		375.00 ↑
% Transferrin saturation		23.00
Cholesterol - Total		227.00 ↑↑
Triglycerides		154.00 ↑↑
LDL Cholesterol		131.00 ↑↑

Biomarker		Latest Test Result Sep 25 2015
HDL Cholesterol		39.00 ↓↓
VLDL Cholesterol		8.00
Cholesterol/HDL Ratio		5.82 ⚠
Triglyceride/HDL Ratio		3.94 ⚠
Leptin, Female		25.60 ↑↑
TSH		3.32 ↑
Total T4		5.30 ↓
Total T3		89.00 ↓
Free T4		1.30
Free T3		2.74 ↓
T3 Uptake		24.00 ↓
Free Thyroxine Index (T7)		1.60 ↓
Thyroid Peroxidase (TPO) Abs		
Thyroid Peroxidase (TPO) Abs LABCORP		85.00 ↑↑
Thyroglobulin Abs LABCORP		1.80 ⚠
Thyroglobulin Abs		
Reverse T3		
Hs CRP, Female		3.82 ↑↑
C-Reactive Protein		
ESR, Female		
Homocysteine		24.00 ⚠
Fibrinogen		

Biomarker		Latest Test Result Sep 25 2015
Creatine Kinase		
Vitamin D (25-OH)		19.80 ❗
Vitamin B12		822.00
Folate		8.00 ↓
DHEA-S, Female		194.00 ↓
Testosterone, Free Female		0.70 ↓
Testosterone, Total Female		32.00 ↓
Sex Hormone Binding Globulin, female		45.00
Estradiol, Female		362.00
Progesterone, Female		12.40 ↓
Collagen Cross-Linked NTx		
Creatinine Clearance		
Cortisol - AM		3.00 ↓↓
Cortisol - PM		4.00
Gastrin		92.00 ↑
Total WBCs		5.80
RBC, Female		4.42
Reticulocyte count		
Hemoglobin, Female		14.20
Hematocrit, Female		46.20 ↑↑
MCV		97.00 ↑
MCH		31.30

Biomarker		Latest Test Result Sep 25 2015
MCHC		33.20
Platelets		252.00
RDW		14.70 ↑
Neutrophils		67.00 ↑
Bands		
Lymphocytes		22.00 ↓
Monocytes		7.00
Eosinophils		4.00 ↑↑
Basophils		0.00

Recommended Further Testing

Advanced Practitioner Only Report

Based on the results of the analysis of this blood test, the following areas may require further investigation. The suggestions for further testing are merely examples and do not attempt to provide you with an exhaustive list of further evaluation methods.

Primary Hypothyroidism

The results of this blood test indicate that this patient might be at an increased risk of Primary Hypothyroidism, which may be causing the elements listed below to be outside the optimal range. If you haven't done so already, you may want to consider running additional thyroid tests such as a Thyroid Antibody Panel to rule out possible Hashimoto's Thyroiditis. The Thyroid Antibodies to consider running are: Thyroid Peroxidase Antibodies (TPO Ab) and Thyroglobulin Antibodies (TGH Ab).

Rationale:
TSH ↑, Total T4 ↓, Total T3 ↓, T3 Uptake ↓, Cholesterol - Total ↑, Triglycerides ↑, Free T3 ↓, Free Thyroxine Index (T7) ↓, Thyroid Peroxidase (TPO) Abs LABCORP ↑, Thyroglobulin Abs LABCORP ↑

Adrenal Dysfunction

The results of this blood test indicate that this patient may dealing with an adrenal imbalance because a number of the elements below are out of the optimal range. A blood test can tell us about trends towards adrenal stress or adrenal insufficiency but you may want to do an Adrenal Salivary test to give you more information on the type and severity of the adrenal issue.

Rationale:
Sodium ↑, Potassium ↓, Sodium/Potassium Ratio ↑, BUN ↑, Chloride ↑, Cholesterol - Total ↑, Triglycerides ↑, DHEA-S, Female ↓, Cortisol - AM ↓

Additional Lipid Testing

The results of this blood test indicate that this patient may dealing with hyperlipidemia, which may be causing the elements listed below to be outside the optimal range. If you haven't done so already, you may want to consider running additional lipid tests such as a VAP test to get more information on the nature of the hyperlipidemia and it's associated cardiovascular disease risk. The VAP Test is an expanded lipid panel that directly measures LDL, HDL, VLDL, Total cholesterol and triglyceride levels.The test also measures the following: The LDL particle density (clusters of small, dense LDL greatly increase the risk of cardiovascular disease). It also measure all the important lipoprotein subclasses: HDL2 (the most protective form of HDL), HDL3 (not as protective as HDL2), Intermediate Density Lipoproteins IDLs (these are often elevated in people with a family history of diabetes) and Very Low Density Lipoproteins (VLDL1, VLDL2, VLDL3). Knowing the different fractions of VLDL is important because high levels of VLDL3 put your patients at a greater risk of cardiovascular disease. Finally the test measures Lipoprotein (a) (Lp(a)), high levels of which are a very strong risk factor for heart attacks and strokes.

Rationale:
Cholesterol - Total ↑, Triglycerides ↑, LDL Cholesterol ↑, Cholesterol/HDL Ratio ↑, HDL Cholesterol ↓

Female Hormone Dysfunction

The results of this blood test indicate that this patient may dealing with an imbalance in female hormone regulation because a number of the elements below are out of the optimal range. We cannot tell from a blood test what kind of condition this patient is dealing with because the tests are not specific for a particular time in the menstrual cycle and we have no way of determining whether or not this patient is pre-menopausal, peri-menopausal or menopausal. A blood test can tell us about trends towards female hormone dysfunction but you may want to consider doing one of the Female Hormone Salivary panels to get more information on the type and severity of the issue.

Rationale:
DHEA-S, Female ↓, Testosterone, Total Female ↓, Testosterone, Free Female ↓, Progesterone, Female ↓

Zinc Deficiency

The results of this blood test indicate that this patient may dealing with a zinc deficiency because the alk phos level is decreased. We cannot tell categorically that your patient has a zinc deficiency because there are no tests specifically testing for zinc levels on a common Chemistry Screen. The likelihood of zinc deficiency increases with the presence of clinical signs of zinc deficiency: white spots on nails, reduced sense of smell or taste, cuts that are slow to heal, acne, increased susceptibility to colds, infections, and flu, and for our male patients prostatic hypertrophy. If you suspect zinc deficiency, you may want to follow up with an in-office Zinc Taste Test or check White Blood cell or Red Blood cell zinc levels, which may be decreased.

Rationale:
Alk Phos ↓

What to Look For When Values Are Out of Range Report

Advanced Practitioner Only Report

This report shows what you need to look for when the blood tests results are out of the optimal reference range. The report lists all the biomarkers that are above or below the optimal reference range and lists all the possible associated health concerns with a short description.

Glucose ↑ (105.00 mg/dL)

Insulin resistance (Early stage) and glucose intolerance

Research has shown that individuals progress through several stages of insulin resistance and glucose intolerance before becoming a classic type II diabetic. The stages include: Normal glucose tolerance hypoglycemia (often due to hyperinsulinemia) insulin insensitivity/resistance eventually overt type II diabetes. An increased fasting blood glucose level is a sign that this individual is possibly in an insulin resistant phase, also known as a pre-diabetic state.

Early stage of Hyperglycemia/Diabetes

If serum glucose (> 86 mg/dL or 4.77 mmol/L) and Hemoglobin A1C (> 5.5% or 0.055) are both elevated, diabetes is probable. Serum triglycerides are often higher than the total cholesterol level in patients with diabetes. Urinary glucose may be increased, HDL levels decreased (< 55 or < 1.42 mmol/L), BUN (> 16 or 5.71 mmol/L) and creatinine (>1.1 or >97.2 mmol/dL) frequently increased with the renal damage associated with diabetes. Follow-up with appropriate testing to confirm the diagnosis, e.g. oral Glucose Insulin Tolerance Testing (GITT).

Metabolic Syndrome / insulin resistance

Metabolic Syndrome or hyperinsulinemia is a cluster of related symptoms: Increased triglycerides (>80 or >0.90 mmol/L), increased total cholesterol (>180 or 4.66 mmol/L), decreased HDL cholesterol (< 55 or < 1.42 mmol/L), obesity, increased blood insulin levels (>5 or 35.88), increased glucose (> 86 mg/dL or 4.77 mmol/L) and increased blood pressure. The hallmark of this syndrome is the insulin resistance that leads to high glucose levels and an imbalance in blood fats. The overall effect is an increased risk for cardiovascular disease and diabetes.

Thiamine (Vitamin B1) need

An increased glucose (> 86 mg/dL or 4.77 mmol/L) is associated with a thiamine need. Thiamine transports glucose across the blood brain barrier and is an essential component in the enzymatic conversion of pyruvate into acetyl CoA that allows pyruvate to enter the Kreb's cycle. If glucose is increased (> 86 mg/dL or 4.77 mmol/L) and the hemoglobin A1C is normal, thiamine need is possible. If CO_2 is decreased (<25) and the anion gap is increased (>12) along with moderately high serum glucose (>86 or 4.77 mmol/L), thiamine need is probable. Due to thiamine's role in glycolysis, LDH levels may be decreased (<140).

Anterior Pituitary resistance to cortisol

During the decompensated/maladapted phase of the chronic stress response, the hypothalamus and pituitary become less and less sensitive to cortisol, causing increased cortisol resistance. The net result is an increase in cortisol levels in the body because the negative feedback loop that shuts cortisol production down is not activated. Increased levels of circulating cortisol will cause increased blood glucose levels through increased gluconeogenesis. Excess cortisol will also reduce the utilization and uptake of glucose by the cell.

Acute stress

Increasing levels of stress cause the body to move into the chronic stress response. This is marked by an increased Cortisol to DHEA ratio, which causes an increase in gluconeogenic activity and a concomitant rise in blood glucose levels. Excess cortisol will also reduce the utilization and uptake of glucose by the cell.

Fatty liver (early development) and Liver congestion

High blood glucose (>86 or 4.77 mmol/L) levels have been associated with increased levels of blood fats, e.g. high total cholesterol (>180 or 4.66 mmol/L), LDL (>100 or 2.59 mmol/L) and triglycerides (>80 or >0.90 mmol/L), low HDL (< 55 or < 1.42 mmol/L). In individuals with liver congestion, this may lead to the deposition of fat in the liver and the development of fatty liver.

Hemoglobin A1C ↑ (6.80 %)

Diabetes mellitus

This test is a measurement of long-term blood glucose control and management. Values will be increased in patients with poorly controlled diabetes. It is important to remember that a patient who has recently made the changes to control their short-term blood glucose levels may still show elevated levels of glycosylated hemoglobin.

Insulin resistance (early stage) and glucose intolerance

An increased hemoglobin A1C above the optimal range (>5.5% or >0.055) is a sign that this individual is not controlling their long term glucose levels very well. They are possibly in the insulin resistant phase, also known as a pre-diabetic state. Research has shown that individuals progress through several stages of insulin resistance and glucose intolerance before becoming a classic type II diabetic. The stages include: Normal glucose tolerance hypoglycemia (often due to hyperinsulinemia) insulin insensitivity/resistance eventually overt type II diabetes.

Insulin - Fasting ↑ (5.20 µIU/ml)

Elevated fasting insulin levels are associated with greater risks of heart attack, stroke, metabolic syndrome and diabetes.

Insulin resistance (Early stage) and glucose intolerance

Research has shown that individuals progress through several stages of insulin resistance and glucose intolerance before becoming a classic type II diabetic. The stages include: Normal glucose tolerance hypoglycemia (often due to hyperinsulinemia) insulin insensitivity/resistance eventually overt type II diabetes. An increased fasting blood glucose level is a sign that this individual is possibly in an insulin resistant phase, also known as a pre-diabetic state.

Early stage of Hyperglycemia/Diabetes

If fasting insulin is elevated along with an elevated serum glucose (> 86 mg/dL or 4.77 mmol/L) and Hemoglobin A1C (> 5.5% or 0.055) diabetes is probable. Serum triglycerides are often higher than the total cholesterol level in patients with diabetes. Urinary glucose may be increased, HDL levels decreased (< 55 or < 1.42 mmol/L), BUN (> 16 or 5.71 mmol/L) and creatinine (>1.1 or >97.2 mmol/dL) frequently increased with the renal damage associated with diabetes. Follow-up with appropriate testing to confirm the diagnosis, e.g. oral Glucose Insulin Tolerance Testing (GITT).

Metabolic Syndrome / insulin resistance

Metabolic Syndrome or hyperinsulinemia is a cluster of related symptoms: Increased triglycerides (>80 or >0.90 mmol/L), increased total cholesterol (>180 or 4.66 mmol/L), decreased HDL cholesterol (< 55 or < 1.42 mmol/L), obesity, increased blood insulin levels (>5 or 35.88), increased glucose (> 86 mg/dL or 4.77 mmol/L) and increased blood pressure. Fasting insulin may also be elevated. The hallmark of this syndrome is the insulin resistance that leads to high glucose levels, high insulin levels and an imbalance in blood fats. The overall effect is an increased risk for cardiovascular disease and diabetes.

Insulinoma (pancreatic islet tumor)

A pancreatic islet tumor can cause levels of insulin to rise high. If you see hyperinsulinemia with hypoglycemia (blood glucose levels lower than 30 mg/dL or lower than 1.66 mmol/L) then refer patient to an endocrinologist for further investigation.

BUN ↑ (18.00 mg/dL)

Renal disease

Consider impaired renal function due to a potential renal disease with an increased BUN (>25 or 8.93 mmol/L), serum creatinine (>1.4 or >123.8 mmol/dL), a BUN/Creatinine ratio between 10-20, a urine specific gravity between 1.010 - 1.016, an increased uric acid (>5.9 or > 351 mmol/dL), an increased serum phosphorous (>4.0 or 1.29 mmol/L), an LDH >200), and an SGOT/AST (>30). Suspected renal disease should be referred to a qualified practitioner if present. However, an elevated BUN found in isolation of the pattern below is more indicative of renal insufficiency or other causes.

Renal insufficiency

An increased BUN level (>16 or 5.71 mmol/L) can be a sign of renal insufficiency, an often over-looked condition. Suspect renal insufficiency if there is an increased BUN level (>16 or 5.71 mmol/L) with a normal or increased serum Creatinine (>1.1 or 97.2mmol/dL), a normal to increased Uric Acid (>5.9 or > 351 mmol/dL), and an increased serum phosphorous (>4.0 or 1.29 mmol/L). LDH and SGOT/AST will usually be normal.

Dehydration

If BUN is increased suspect dehydration. S**uspect a short-term (acute) dehydration** if there is an increased HGB (>14.5 or 145 in women or 15 or 150 in men) and/or HCT (>44 or 0.44 in women and >48 or 0.48 in men) along with an increased RBC count (>4.5 in women and >4.9 in men). A relative increase in Sodium (>142) and Potassium (>4.5) can be noted as well. **Suspect a long-term (chronic) dehydration** if any of the above findings are accompanied by an increased Albumin (>5.0 or 50 g/L), increased BUN (>16 or 5.71 mmol/L) and/or serum Protein (>7.4 or 74 g/L).

Hypochlorhydria

An increased BUN level is associated with hypochlorhydria, a decreased production of hydrochloric acid in the stomach. Hypochlorhydria is possible with an increased globulin level (>2.8 or 28 g/L) and a normal or decreased Total Protein/Albumin. Hypochlorhydria is probable if globulin levels are increased (>2.8 or 28 g/L) along with an increased BUN (>16 or 5.71 mmol/L), a decreased or normal Total Protein/Albumin and/or decreased serum Phosphorous (<3.0 or 0.97 mmol/L). Other values that may be reflective of a developing or chronic hypochlorhydria include increased or decreased gastrin (<50 or >100), an increased MCV (>90) and MCH (>31.9), a decreased or normal calcium (<9.2 or 2.30 mmol/L) and iron (<85 or 15.22 mmol/dL), a decreased chloride (<100), an increased anion gap (>12) and a decreased alkaline phosphatase (<70).

Diet- excessive protein intake or catabolism

Since the BUN level is dependent on dietary protein, an increased dietary protein or an increased catabolism of protein will lead to an increased BUN level (>16 or 5.71 mmol/L).

Adrenal stress

BUN levels will be increased in states of protein catabolism, which is increased in adrenal hyperfunction. Excess cortisol levels will cause mobilization and an increased level of amino acids in the blood and liver by promoting protein catabolism. This will increase the levels of BUN (>16 or 5.71 mmol/L).

Dysbiosis

An increased BUN level (>16 or 5.71 mmol/L) in the absence of other causes may be due to dysbiosis.

Edema

An increased BUN (>16 or 5.71 mmol/L) is associated with edema. Edema is rarely primary and is most often secondary to other metabolic disturbances, e.g. renal dysfunction, food/environmental sensitivities, cardiac muscle stress, or endocrine dysfunction. Investigate with appropriate testing (i.e. cardiac, hormone, and allergy testing). Serum sodium levels may also be decreased (<135).

Anterior pituitary dysfunction

An increased BUN above 25 or 8.93 mmol/L should be viewed as a sign of renal dysfunction. In cases of renal dysfunction the serum creatinine will most likely be elevated. If the serum creatinine is not above 1.1 and the BUN is elevated above 25 or 8.93 mmol/L consider that the problem may be due to an anterior pituitary dysfunction and not renal dysfunction.

BUN/Creatinine Ratio ↑ (18.36 Ratio)

Renal disease

Consider impaired renal function due to a potential renal disease with an increased BUN (>25 or 8.93 mmol/L), serum creatinine (>1.4 or >123.8 mmol/dL), BUN/Creatinine ratio (between 10-20), Urine specific gravity (1.010 - 1.016), Uric acid (>5.9 or > 351 mmol/dL), serum phosphorous (>4.0 or 1.29 mmol/L) LDH (>200), and SGOT/AST (>30). Suspected renal disease should be referred to a qualified practitioner if present. However, an elevated BUN found in isolation of the pattern below is more indicative of renal insufficiency or other causes.

eGFR Non-Afr. American ↓ (84.00 mL/min/1.73m2)

Levels of eGFR below 60 are an indication of a loss of kidney function and may require a visit to a renal specialist for further evaluation.

Levels below 15 indicate that a treatment for kidney failure, such as dialysis or transplant will be needed.

Sodium ↑ (144.00 mEq/L)

Adrenal Stress

Adrenal stress causes an increase in the secretions of both the glucocorticoid and mineralcorticoid hormones. An increase in aldosterone, the major mineralcorticoid, from adrenal stress will have an impact on sodium regulation. Increased aldosterone levels will cause an increase in sodium resorption from the kidney, which will cause an increase in serum sodium. If the sodium levels are increased (>142) along with a decreased potassium (<4.0), adrenal stress is **possible**. The sodium:potassium ratio will also be increased. Other values that may be out of balance include increased chloride (>106), increased aldosterone and cortisol levels. If the cortisol level is significantly elevated, rule out adrenal adenoma. Urinary chloride will be decreased. Adrenal stresscan be confirmed with salivary cortisol studies.

Dehydration

If sodium is increased suspect dehydration. Dehydration is a very common problem and should be factored into your blood chemistry and CBC analysis. Suspect a short-term (acute) dehydration if there is an increased HGB (>14.5 or 145 in women or 15 or 150 in men) and/or HCT (>44 or 0.44 in women and >48 or 0.48 in men) along with an increased RBC count (>4.5 in women and >4.9 in men). A relative increase in Sodium (>142) and Potassium (>4.5) can be noted as well. Suspect a long-term (chronic) dehydration if any of the above findings are accompanied by an increased Albumin (>5.0 or 50 g/L), increased BUN (>16 or 5.71 mmol/L) and/or serum Protein (>7.4 or 74 g/L).

Potassium ↓ (3.20 mEq/L)

Adrenal Stress

Adrenal stress causes an increase in the secretions of both the glucocorticoid and mineralcorticoid hormones. An increase in aldosterone, the major mineralcorticoid, from adrenal hyperfunction has an impact on potassium metabolism. Increased aldosterone levels will cause an increase in the amount of renal potassium excretion, which will cause a decrease in serum potassium. If the potassium levels are decreased (<4.0) along with a normal or increased sodium (>142), and/or chloride (>106), adrenal stress is **possible**. The sodium:potassium ratio will also be increased. Other values that may be out of balance include increased aldosterone and cortisol levels. If the cortisol level is significantly elevated, rule out adrenal adenoma. Urinary chloride will be decreased. Adrenal stress can be confirmed with salivary cortisol studies.

Drug Diuretics

Many of the diuretic drugs are potassium sparing. Even so, serum potassium can be decreased with the use of these drugs. In these cases the BUN (>16 or 5.71 mmol/L) and creatinine (>1.1 or 97.2mmol/dL) will frequently be increased, indicating renal insufficiency, and sodium will be decreased. On the other hand, it is important to not presume that a patient needs potassium because they are on a drug diuretic. Prolonged diuretic use may also deplete thiamine.

Benign Essential Hypertension

Benign Essential Hypertension is common with decreased potassium, even when cortisol, renin and other indicators may be normal. Generally, increased potassium suggests a congestive heart problem, and decreased potassium suggests a fatigued heart muscle. HTN has many potential causes and should be investigated with other methodologies beyond blood chemistries.

Sodium/Potassium Ratio ↑ (45.00 ratio)

Acute Stress

An elevated sodium:potassium ratio is an indication of acute stress. Acute stress causes an increase in adrenal activity and an increase in aldosterone output. Aldosterone causes sodium to be retained in the body and an increase in serum sodium. This also causes the potassium to be excreted thus lowering the serum potassium levels. The net effect is an increased sodium:potassium ratio.

An inflammation indicator

An elevated sodium:potassium ratio is an indication of a higher aldosterone output. Aldosterone is often considered a pro-inflammatory hormone and cortisol is an anti-inflammatory hormone so an increase in aldosterone, as seen in a high sodium:potassium ratio is seen as an inflammatory indicator associated with inflammation and pain.

Chloride ↑ (107.00 mEq/L)

Metabolic Acidosis

Increased chloride levels are associated with metabolic acidosis. Consider metabolic acidosis if the CO_2 is decreased (<25), along with an increased chloride (>106) and/or an increased anion gap (>12).

Adrenal stress

Increased chloride levels are associated with adrenal hyperfunction. Consider adrenal stress if the chloride levels (>106) are increased along with increased sodium (>142) and decreased potassium (<4.0).

CO2 ↓ (20.00 mEq/L)

Metabolic Acidosis

Serum CO_2, or bicarbonate will be decreased (<25), in metabolic acidosis. Consider metabolic acidosis if the CO_2 is decreased (<25), along with an increased chloride (>106) and/or an increased anion gap (>12).

Respiratory alkalosis

The CO_2 levels (<25) are often decreased in respiratory alkalosis, which is due to conditions that cause excess loss of CO_2 from the lungs. The classic presentation of this phenomenon is hyperventilation syndrome caused by hysteria, anxiety, stress, etc. Other causes include low blood pressure, shock, direct stimulation of the respiratory centers by drugs or trauma, and high altitude. Bicarbonate is lost due to the formation of CO_2 in the lungs.

Anion gap ↑ (20.20 mEq/L)

Thiamine (vitamin B1) need

An increased anion gap (>12) is associated with thiamine deficiency. If the anion gap is increased (>12) along with a decreased CO_2 (<25), thiamine deficiency is possible. Hemoglobin and hematocrit levels may be normal or decreased (<37 or 0.37 in women and 40 or 0.4 in men). Due to thiamine's role in glycolysis, LDH levels may be decreased and glucose levels may be normal to increased (> 86 mg/dL or 4.77 mmol/L).

Metabolic Acidosis

Consider metabolic acidosis if the anion gap is increased (>12) along with a decreased CO_2 (<25) and an increased chloride (>106).

Protein, total ↓ (6.80 g/dL)

Hypochlorhydria

A decreased or normal total protein level is often associated with a decreased production of hydrochloric acid in the stomach (Hypochlorhydria). Hypochlorhydria is **possible** with an increased globulin level (>2.8 or 28 g/L) and a normal or decreased total protein (6.9 or 69 g/L) and/or albumin (< 4.0 or 40 g/L). Hypochlorhydria is **probable** if globulin levels are increased (>2.8 or 28 g/L) along with an increased BUN (>16 or 5.71 mmol/L), a decreased or normal total protein (6.9 or 69 g/L) and/or albumin (<4.0 or 40 g/L), and/or decreased serum phosphorous (<3.0 or <0.97 mmol/L). Other values that may be reflective of a developing or chronic hypochlorhydria include increased or decreased gastrin (<50 or >100), an increased MCV (>90) and MCH (>31.9), a decreased or normal calcium (<9.2 or 2.30 mmol/L) and a decreased iron (<85 or 15.22 mmol/dL), a decreased CO_2 (<25), an increased anion gap (>12) and a decreased alkaline phosphatase (<70)

Digestive dysfunction/ inflammation

Suspect primary digestive inflammation or inflammation secondary to HCL insufficiency with a low total protein (6.9 or 69 g/L). This pattern will be similar to that of Hypochlorhydria but the globulin may be decreased (< 2.4 or 24 g/L) unless inflammation is severe.Decreased total globulin (<2.4 or 24 g/L), decreased serum phosphorous (<3.0 or 0.97 mmol/L) , increased BUN (>16 or 5.71 mmol/L) , basophils (>1) and ESR.

Liver dysfunction

Dysfunction in the liver will have a great impact on protein production and synthesis, which will affect total serum protein levels. Therefore, a decreased total serum protein level (<6.9 or 69 g/L) may be indicative of a liver dysfunction. Functionally oriented liver problems, such as detoxification issues, liver congestion, and conjugation problems are extremely common and should be evaluated based upon early prognostic indicators. The liver should always be viewed in the context of the hepato-biliary tree. Some of the key clinical indicators include:

Diet- Low Protein/ Protein Deficiency/ Malnutrition/ Amino Acid Need

Protein digestion is dependent on an optimal pH in the stomach. A decreased total protein (<6.9 or 69 g/L) can be an indicator for digestive dysfunction, which will greatly compromise protein digestion and absorption. Protein malnutrition is due primarily to the lack of available essential amino acids from the diet.

Globulin, total ↓ (2.30 g/dL)

Digestive Inflammation/Gastritis

Suspect primary digestive inflammation or inflammation secondary to HCL insufficiency. The pattern will be similar to that of hypochlorhydria but the globulin may be decreased (< 2.4 or 24 g/L) unless inflammation is severe. Many patients with the subjective and laboratory indications of HCI need experience an aggravation of their symptoms when taking HCL supplementation. Patients with this type of reaction probably have gastric inflammation due to a long-term HCL need. If inflammation is suspected or present, support the digestive terrain to heal the inflammation appropriately for 3 to 4 weeks prior to initiating HCl therapy. Acute digestive inflammation may lead to an increased

globulin level (>2.8 or 28 g/L) due to the increased production of inflammatory immunoglobulins. Chronic digestive inflammation due to colitis, enteritis, Crohn's etc., will compromise protein breakdown and absorption, leading to a widespread protein deficiency in the body and a decreased level of the inflammatory immunoglobulins, hence the decreased total globulin level (<2.4 or 24 g/L). Decreased total globulin (<2.4 or 24 g/L), decreased serum phosphorous (<3.0 or <0.97 mmol/L), increased BUN (>16 or 5.71 mmol/L), basophils (> 1) and ESR.

Immune insufficiency

A decreased total globulin (< 2.0 or 20 g/L) suggests immune insufficiency. Suspect an increased use of globulin by the liver, spleen, thymus, kidneys, or heart. Apart from known kidney or heart dysfunction, rule out a chronic immune disruptor (virus, xenobiotics, toxicity etc.) and consider a serum protein electrophoresis test (look for a decreased gamma fraction) in the investigation of immune insufficiency.

Phosphorus ↓ (2.80 mg/dL)

Parathyroid Hyperfunction

Parathyroid hyperfunction will cause an increase in PTH levels, which can lead to a decreased serum phosphorous. If the serum phosphorous is decreased (<3.0 or <0.97 mmol/L) and the calcium is significantly increased (>10.5 or 2.63 mmol/L) parathyroid hyperfunction is **possible**. Alkaline phosphatase levels may also be increased (>100), along with a normal or decreased serum or RBC magnesium. Follow up with a serum parathyroid hormone test. If parathyroid hormone levels are also increased presume clinical hyperparathyroidism exists.
Hyperparathyroidism may be due to space-occupying lesions on one or more of the glands. Surgical removal may be necessary to determine if there is a neoplasm. A patient with increased serum calcium and an increased PTH should be checked by an endocrinologist, as hyperparathyroidism is a serious condition.

Hypochlorhydria

A decreased serum phosphorous is associated with a decreased production of hydrochloric acid in the stomach (hypochlorhydria). Hypochlorhydria is **possible** with a decreased serum phosphorous (<3.0 or <0.97 mmol/L) and an increased or decreased globulin level (< 2.4 / 24 g/L or >2.8 / 28 g/L) and a normal or decreased total protein (<6.9 or 69 g/L). If the BUN is also increased (>16 or 5.71 mmol/L), hypochlorhydria is highly **probable**.
Other values that may be reflective of a developing or chronic hypochlorhydria include increased or decreased gastrin (<50 or >100), an increased MCV (>90) and MCH (>31.9), a decreased or normal calcium (<9.2 or 2.30 mmol/L) and iron (< 85 or 15.22 mmol/dL), a decreased chloride (<100), an increased anion gap (>12) and a decreased alkaline phosphatase (<70).

Hyperinsulinism

Phosphate crosses the cell membrane with glucose. Hyperinsulinism, therefore, will cause an increased uptake of glucose by the cells and will also increase phosphorous uptake, possibly contributing to a decreased serum phosphorous level (<3.0 or 0.97 mmol/L).

Diet- high in refined carbohydrates

Phosphate crosses the cell membrane with glucose. Plasma levels may be decreased (<3.0 or 0.97 mmol/L) after a meal high in refined carbohydrates. A diet high in refined carbohydrates and sugars will deplete phosphorous stores and other important co-factors for carbohydrate metabolism.

Calcium/Phosphorous Ratio ↑ (3.46 ratio)

A high calcium/phosphorous ratio favors deposition of calcium into the soft tissue. This deposition will decrease the availability of ionized calcium and reduce the serum calcium reading.

Indicative of Excess Calcium and Decreased Phosphorous

An increased calcium:phosphorous ratio above 2.7 indicates that there is either excess serum calcium or decreased serum phosphorous, or both. Therefore, we need to look at the clinical implications of elevated calcium and decreased phosphorous.

Parathyroid Hyperfunction

Parathyroid hyperfunction will cause an increase in PTH levels, which can lead to significantly increased serum calcium above the normal reference range. If the serum calcium is significantly increased above the ***normal*** reference range (>10.6 or 2.65 mmol/L) with a decreased phosphorous (<3.0 or <0.97 mmol/L) parathyroid hyperfunction is **possible**. Alkaline phosphatase levels may also be increased (>100), along with a normal or decreased serum or RBC magnesium. Follow-up with a serum parathyroid hormone test. If parathyroid hormone levels are also increased, presume clinical hyperparathyroidism exists.

Thyroid dysfunction (primary or secondary)

Serum calcium may be increased in either primary thyroid hypofunction or secondary thyroid hypofunction due to anterior pituitary hypofunction. With primary hypothyroidism the calcium levels may be increased (>10.0 or 2.5 mmol/L) along with an increased TSH (>2.0). With secondary thyroid hypofunction due to anterior pituitary hypofunction, the calcium levels may be increased (>10.0 or 2.5 mmol/L) along with a decreased TSH (<1.3).

Tissue/Cell Damage

Increased serum levels of calcium (>10.0 or 2.5 mmol/L) is associated with tissue or cell damage due to a disruption in the cellular memberane. Calcium is a vital component of the interstitial matrix where it facilitates cell to cell adhesion and communication. Calcium will be released into the serum if this matrix is disrupted. Space-occupying lesions should be considered and ruled out with appropriate examination and testing.

Hyperinsulinism

Phosphate crosses the cell membrane with glucose. Hyperinsulinism, therefore, will cause an increased uptake of glucose by the cells and will also increase phosphorous uptake, possibly contributing to a decreased serum phosphorous level (<3.0 or 0.97 mmol/L).

Diet- high in refined carbohydrates

Phosphate crosses the cell membrane with glucose. Plasma levels may be decreased after a meal high in refined carbohydrates. A diet high in refined carbohydrates and sugars will deplete phosphorous stores and other important co-factors for carbohydrate metabolism.

Alk Phos ↓ (67.00 IU/L)

Zinc deficiency

Alkaline phosphatase is a zinc dependent enzyme. Decreased levels (<70) have been associated with zinc deficiency

along with decreased WBC or RBC zinc levels and a low normal or decreased total WBC. Follow up an increased alkaline phosphatase with a zinc taste test.

ALT (SGPT) ↑ (42.00 IU/L)

Dysfunction located inside the liver

If the SGPT/ALT is increased above the levels of the SGOT/AST and GGTP consider that the problem or area of involvement is **possibly** inside the liver.

Fatty liver (steatosis)

If the SGPT/ALT is increased (>30) above the SGOT/AST and GGTP levels (>30), liver dysfunction due to fatty liver is probable. Consider it more likely if the LDH (>200) and ALP levels (>100) are also increased. In advanced steatosis the SGPT/ALT levels can be elevated 4 times the upper limit of normal (<140), accompanied with an elevation in SGOT/AST. SGPT/ALT is usually greater then the SGPT/AST level.

Liver dysfunction

An increased SGPT/ALT (>30) is associated with liver dysfunction. Dysfunction in the liver may cause an increase in SGPT/ALT from hepatocytes.

Biliary tract obstruction

Suspect biliary tract obstruction when the SGPT/ALT is elevated (>30) with increased GGTP (>30), total bilirubin (>1.2 or >20.5 mmol/dL), alkaline phosphatase (>100) and/or LDH (>200)

Liver infection

When the SGPT/ALT is elevated above the normal reference range (>40) or higher consider that there may be a liver infection. Hepatitis, CMV, EBV, Infectious mononucleosis, etc. should be ruled out when the SGPT/ALT is greatly elevated.

Excessive muscle breakdown or turnover

SGPT/ALT may be elevated when there is excessive muscle breakdown. Conditions such as weight-training and muscular injury can cause elevated levels of SGPT/ALT to appear in the bloodstream.

Cirrhosis of the liver

An increase SGPT/ALT is associated with liver cirrhosis. Suspect liver cirrhosis if SGPT/ALT (>45) is increased along with an increased SGOT/AST (>40) and GGTP (>70), with a decreased serum albumin (<4.0 or 40g/L), increased serum ALP (>200), increased serum bilirubin (>1.2 or >20.5 mmol/dL), decreased cholesterol (<160 or 4.14 mmol/L), increased globulin (>2.8 or 28 g/L), increased LDH (>200)

Liver cell damage

Liver damage due to active cellular destruction (i.e. chronic/acute hepatitis, active cirrhosis, infectious mononucleosis, hepatic necrosis, alcoholic hepatitis) will usually result in significantly elevated SGPT/ALT values (30-50 times higher than normal)

Bilirubin - Total ↑ (1.20 mg/dL)

Gallbladder Dysfunction: insufficiency or stasis

Consider gallbladder dysfunction due to either biliary stasis or biliary insufficiency when total bilirubin levels are elevated (>1.2 or >20.5 mmol/dL) along with an increased alkaline phosphatase (>100). GGTP, SGOT/AST, and SGPT/ALT may be normal or increased (>30). Cholesterol levels may be also increased (>180 or 4.65 mmol/L) but in many cases of gallbladder dysfunction the cholesterol is decreased (<160 or 4 mmol/L). Many cases of biliary stasis will show normal lab values. In these situations suspect biliary stasis or insufficiency if there are strong subjective indicators.

Oxidative stress

Oxidative stress can cause an increased destruction in red blood cells, which will cause an increased level of the total bilirubin (>1.2 or >20.5 mmol/dL) and an increased level of the indirect bilirubin (>1.0 or 17.1 mmol/dL).

Thymus dysfunction

Consider an abnormality in the thymus with an elevated bilirubin (>1.2 or >20.5 mmol/dL) and an increased HGB (>14.5 or 145 g/L in women or 15 or 150 g/L in men) , HCT (>44 or 0.44 in women and >48 or 0.48 in men), and RBCs (>4.5 in women and >4.9 in men) .

Biliary tract obstruction/biliary caculi

Bile tract obstruction/biliary calculi should be ruled out when the total bilirubin is increased (>1.2 or 20.5 mmol/dL) along with an increase in both the direct (>0.2 or 3.4 mmol/dL) and indirect bilirubin (>1.0 or 17.1 mmol/dL). You will likely see an increased GGTP (>30), a normal to increased SGPT/ALT (>30), an elevated alkaline phosphatase (>100), and/or LDH (>200).

Liver dysfunction

An increased total bilirubin (>1.2 or 20.5 mmol/dL) is associated with liver dysfunction. Dysfunction in the liver may also cause an increase in albumin (>4.0 or 40g/L) and an increase of SGPT/ALT (>30) from hepatocytes.

RBC hemolysis

Increased hemolysis of red blood cells will lead to an increased formation of indirect or unconjugated bilirubin (>1.0 or 17.1 mmol/dL). The level of total bilirubin will rise (>1.2 or 20.5 mmol/dL) when the level of indirect or unconjugated bilirubin exceeds the liver's ability to clear it from the blood. The direct or conjugated fraction remains normal or slightly elevated.

Gilbert's syndrome

Gilbert's syndrome is a genetic defect in the ability to clear unconjugated or indirect bilirubin due to a decreased function in one of the phase II liver detoxification pathway enzymes. Males are affected more than females. Clinically, the disorder has elevated total bilirubin levels with 90% or more of the total bilirubin coming from indirect/unconjugated bilirubin. GGTP, SGOT/AST, and SGPT/ALT show no signs of abnormality. Diagnosis is difficult. Follow the patient for 12-18 months. Persistently elevated total and unconjugated bilirubin level in the absence of other abnormal liver function tests is diagnostic for Gilbert's syndrome.

Iron - Serum ↓ (80.00 µg/dL)

Anemia- iron deficiency

This is the most prevalent anemia worldwide. The major causes are: Dietary inadequacies, Malabsorption, Increased iron loss, Increased iron requirements e.g. pregnancy. If there is a decreased serum iron (< 85 or 15.22 mmol/dL) with a decreased MCH (<28), MCV (<82), and MCHC (<32), ferritin (<33 in men and 10 in women), % transferrin saturation and/or HGB (<13.5 or 135 g/L in women and <14 or 140 in men) and/or HCT (<37 or 0.37 in women and 40 or 0.4 in men), and increased RDW (>13), then iron deficiency anemia is **probable**. If TIBC is increased (>350 or 62.7 mmol/dL), internal/microscopic bleeding is **possible**, and should be ruled out with reticulocyte count, urinalysis, and/or stool analysis. If serum phosphorous is decreased (<3.0 or <0.97 mmol/L) and serum globulin is increased (>2.8 or 28 g/L) or decreased (<2.4 or 24 g/L), iron anemia may be **secondary to hypochlorhydria**.

Hypochlorhydria

A low serum iron level is often associated with hypochlorhydria. Adequate levels of stomach acid are necessary for iron absorption. Hypochlorhydria is **possible** with a low serum iron (< 85 or 15.22 mmol/dL) and an increased (> 2.8 or 28 g/L) or decreased (<2.4 or 24 g/L) total globulin. Hypochlorhydria is **probable** if the BUN is also increased (>16 or 5.71 mmol/L) and/or serum phosphorous is decreased (<3.0 or <0.97 mmol/L).

Internal bleeding and internal microscopic bleeding

A decreased total serum iron (< 85 or 15.22 mmol/dL) may be due to internal bleeding. TIBC (>350 or 62.7 mmol/dL), transferrin, and reticulocyte count (>1) will be elevated. HGB (<13.5 or 135 g/L in women and <14 or 140 in men) and HCT (<37 or 0.37 in women and 40 or 0.4 in men) may be decreased or normal depending on the severity of the bleeding. Internal microscopic bleeding may present with a decreased TIBC (<250 or 44.8 mmol/dL) and an elevated reticulocyte count. If this pattern is present, internal bleeding **must** be ruled out with reticulocyte count, urinalysis, and/or stool analysis. **Refer to a doctor qualified to diagnose and treat internal bleeding.**

Ferritin ↑ (135.00 ng/mL)

Hemochromatosis/ hemosiderosis/iron overload

Hemochromatosis is a disease produced by an excess absorption of iron, which leads to deposition of excess iron in the tissues, especially the liver. Laboratory changes include an increased serum iron (>130 or 23.27 mmol/dL), a decreased TIBC (<250 or 44.8 mmol/dL), an increased % transferrin saturation (usually > 60%), and **an increased ferritin level** (>200 ng/ml **and often >1000)**. SGOT/AST may be elevated (>40).

Excess consumption of iron

Excess consumption of iron can come from a number of different sources: Elevated levels of iron in the drinking water, Iron cookware, especially when used to cook acidic foods e.g. tomatoes, Consumption of iron containing supplements. All of the above are often the reason for an increased serum iron (>130 or 23.27 mmol/dL) and an increased ferritin (> 200 ng/ml)

Cardiovascular Risk

Low ferritin is the best measure of iron deficiency but most people do not know that elevated ferritin is an important maker of cardiovascular health. High levels are found in inflammation, ischemic heart disease, iron overload (hemosiderosis), and hemochromatosis, the genetic disease that causes iron to be deposited into the tissue. When the

transferrin saturation rate, transferrin iron binding capacity, and serum iron are all normal, then a high serum ferritin indicates inflammation, not hemochromatosis.

Inflammation/ liver dysfunction/ oxidative stress

Serum ferritin is one of a group of proteins that can become increased in response to inflammation, infection, or trauma. Elevations can last for weeks. An elevated ferritin (>200) along with normal serum iron is suggestive of inflammation, liver dysfunction, or oxidative stress.

TIBC↑ (375.00 µg/dL)

Anemia- iron deficiency

If the total iron binding capacity is increased (>350 or 62.7 mmol/dL) along with a decreased total iron (< 85 or 15.22 mmol/dL), MCV (<82), MCH (<28), Serum ferritin (< 30), % transferrin saturation, and/or HGB (<13.5 or 135 g/L in women and <14 or 140 in men) and/or HCT (<37 or 0.37 in women and 40 or 0.4 in men) , iron anemia is **probable**.

Internal bleeding

With a high (>350 or 62.7 mmol/dL) TIBC there is always the possibility of microscopic bleeding, which should be ruled out with reticulocyte count, urinalysis, and/or stool analysis.

Cholesterol - Total↑ (227.00 mg/dL)

Increased cardiovascular disease risk

Increased cholesterol levels are associated with an increased risk of developing cardiovascular disease, atherosclerosis, coronary artery disease and stroke. Although this may be true, it is important to look at many of the other risks for this disease before jumping to conclusion that elevated cholesterol levels are the culprit. Other risks for atherosclerosis, cardiovascular disease and stroke include: smoking, elevated homocysteine levels, elevated fasting glucose, elevated fasting insulin, elevated Hs-CRP, elevated fibrinogen, B6, B12 and folate deficiency, ingestion of chlorine, blood sugar dysregulation, and hypertension. Consider an increased risk of cardiovascular disease with an increased triglyceride level (>80 or 0.90 mmol/L) in relation to an increased total cholesterol (>180 or 4.66 mmol/L) with an increased uric acid level (>5.9 or > 351 mmol/dL), a decreased HDL (< 45 or < 1.16 mmol/L) and an increased LDL (>100 or 2.59 mmol/L). Platelet levels may also be increased (>385). Homocysteine levels are frequently increased > 7.2, Hs-CRP are frequently >0.55 in men and >1.5 in women, and fibrinogen levels are frequently increased above 300.

Primary hypothyroidism

Primary hypothyroidism is **possible** if the total cholesterol is increased (>180 or 4.66 mmol/L) along with an increased triglyceride (>80 or >0.90 mmol/L) and TSH (>2.0).

Adrenal insufficiency

Consider adrenal insufficiency if the total cholesterol is elevated (>180 or 4.66 mmol/L) with an increased triglyceride level (>80 or >0.90 mmol/L) and a decreased serum potassium (<4.0). Confirm with salivary adrenal studies or other functional adrenal tests.

Secondary Hypothyroidism (Anterior pituitary dysfunction)

Increased cholesterol levels are associated with thyroid hypofunction that is secondary to an anterior pituitary dysfunction. If cholesterol levels are increased (>180 or 4.66 mmol/L) with a decreased TSH (<1.3), and an elevated serum triglyceride (>80 or >0.90 mmol/L), then consider that anterior pituitary hypofunction is **probable**.

Gallbladder dysfunction - Biliary stasis

Thickened bile is the hallmark of biliary stasis. It may occur if the total cholesterol is increased (>180 or 4.66 mmol/L). GGTP levels will frequently be increased (>30) but not necessarily. Bilirubin levels may also be elevated (>1.2 or 20.5 mmol/dL). There may also be an increased alkaline phosphatase (>100) and SGOT/AST and SGPT/ALT may be normal or increased (>30). However, many cases of biliary stasis will show normal lab values.

Metabolic Syndrome

If triglycerides are increased above the total cholesterol level with increased LDL cholesterol (>100 or 2.59 mmol/L), a decreased HDL (< 55 or < 1.42 mmol/L), an increased fasting blood glucose (> 86 mg/dL or 4.77 mmol/L) and an increased fasting insulin (>5), then metabolic syndrome and hyperinsulinemia is **probable**.

Fatty liver (early development) and Liver congestion

If total cholesterol (>180 or 4.66 mmol/L), LDL (>100 or 2.59 mmol/L) and triglyceride levels (>80 or >0.90 mmol/L) are increased, and HDL levels are decreased (< 55 or < 1.42 mmol/L), then fatty liver is **possible**. Liver congestion, due to the early development of fatty liver, should be considered if total cholesterol is above 180 or 4.66 mmol/L, triglycerides are increased (>80 or >0.90 mmol/L), and the SGPT/ALT is below 10.

Early stage of insulin resistance

Elevated cholesterol and other lipids often accompany the elevated glucose levels that are seen in insulin resistance.

Poor metabolism and utilization of fats

This is often the case in patients that are eating an optimal diet and have elevated cholesterol and triglyceride levels.

Early stage Diabetes

Elevated blood lipids are seen in patients with diabetes. The triglycerides are often higher than the total cholesterol level. Lipid metabolism problems are a hallmark of the early stages of diabetes.

Triglycerides ↑ (154.00 mg/dL)

Metabolic Syndrome /hyperinsulinemia/early stage diabetes

If triglycerides are increased above the total cholesterol level with increased LDL cholesterol (>100 or 2.59 mmol/L), a decreased HDL (< 55 or < 1.42 mmol/L), and increased fasting blood glucose (> 86 mg/dL or 4.77 mmol/L), then metabolic syndrome and hyperinsulinemia is probable. Metabolic Syndrome can lead to adrenal dysregulation, so adrenal hyperfunctioning should be ruled out. Elevated triglycerides are seen in patients with diabetes. The triglycerides are often higher than the total cholesterol level. Lipid metabolism problems are a hallmark of the early stages of diabetes.

Fatty liver and Liver congestion

Increased triglycerides are associated with liver congestion and the early development of fatty liver (steatosis). If total cholesterol (>180 or 4.66 mmol/L), LDL (>100 or 2.59 mmol/L) and triglyceride levels (>80 or >0.90 mmol/L) are increased, and HDL levels are decreased (< 55 or < 1.42 mmol/L), then the early development of fatty liver is possible. Liver congestion, due to the fatty liver, should be considered if total cholesterol is above 180, triglycerides are increased (>80 or >0.90 mmol/L), and the SGPT/ALT is below 10.

Early stage of insulin resistance

Elevated triglycerides often accompany the elevated glucose levels that are seen in hyperinsulinism and insulin resistance.

Increased risk of cardiovascular disease, stroke and atherosclerosis

An increased triglyceride level is associated with the development of atherosclerosis and an increase in cardiovascular risk and stroke. Atherosclerosis is probable with an increased triglyceride level (>80 or 0.90 mmol/L) in relation to total cholesterol (>180 or 4.66 mmol/L) with an increased uric acid level (>5.9 or > 351 mmol/dL), a decreased HDL (< 45 or < 1.16 mmol/L) and an increased LDL (>100 or 2.59 mmol/L). Platelet levels may also be increased (>385). Homocysteine levels are frequently increased > 7.2 with atherosclerosis. Hs-CRP are frequently >0.55 in men and >1.5 in women, and fibrinogen levels are frequently increased above 300. Diabetes and thyroid hypofunction should also be considered with this pattern.

Poor metabolism and utilization of fats

This is often the case in patients that are eating an optimal diet and have elevated triglyceride and cholesterol levels.

Hypothyroidism

Primary hypothyroidism is possible if the triglycerides and cholesterol levels are increased along with an increased TSH >2.0. Consider Secondary Hypothyroidism if the TSH is decreased (<1.3).

Hyperlipoproteinemia

Lipoprotein disorders usually present with elevated total cholesterol and triglyceride levels. There are 6 distinctive sub-types of these disorders, which are mostly genetic in nature. The lipid electrophoresis is one of the bests methods for determining the various metabolic problems associated with hyperlipoproteinemia.

Alcoholism

Alcohol is extremely calorie dense. Regular alcohol consumption and alcoholism can lead to significantly elevated levels of triglycerides in the blood. This is often accompanied by a greatly increased GGTP.

LDL Cholesterol ↑ (131.00 mg/dL)

Metabolic Syndrome /hyperinsulinemia

If LDL levels are increased (>100 or 2.59 mmol/L), triglycerides are increased (> 80 or 0.90 mmol/L) with decreased HDL cholesterol (< 55 or < 1.42 mmol/L), and increased fasting blood glucose (> 86 mg/dL or 4.77 mmol/L), then

metabolic syndrome and hyperinsulinemia is **probable**. Metabolic Syndrome can lead to adrenal dysregulation, so adrenal hyperfunctioning should be ruled out.

Increased risk of atherosclerosis, cardiovascular risk and stroke

An increased LDL level is associated with the development of atherosclerosis and an increased risk for cardiovascular disease and stroke. If there is an increased triglyceride level (>80 or 0.90 mmol/L) in relation to total cholesterol (>180 or 4.66 mmol/L) with an increased uric acid level (>5.9 or > 351 mmol/dL), a decreased HDL (< 45 or < 1.16 mmol/L) and an increased LDL (>100 or 2.59 mmol/L), atherosclerosis is **probable**. Platelet levels may also be increased (>385). Homocysteine levels are frequently increased > 7.2 with atherosclerosis. Hs-CRP are frequently >0.55 in men and >1.5 in women, and fibrinogen levels are frequently increased above 300. Diabetes and thyroid hypofunction should also be considered with this pattern.

Hyperlipidemia

Increased LDL cholesterol and total cholesterol levels are associated with hyperlipidemia, which has been shown to indicate a potential risk of developing atherosclerotic coronary artery disease. If LDL is increased (>100 or 2.59 mmol/L) with an increased total cholesterol (>180 or 4.66 mmol/L) and an increased LDL/HDL ratio and an increased level of triglycerides (>80 or >0.90 mmol/L) with HDL less than 25% of the total cholesterol, hyperlipidemia is **probable.**

Oxidative stress

Increased LDL levels are associated with increasing free radical activity and oxidative stress. The peroxidation of LDL may promote the accumulation of cholesterol in the macrophages and smooth muscle cells, which can lead to atherosclerotic plaque formation.

Fatty liver (early development) and Liver congestion

If LDL levels are increased, along with increased triglyceride and total cholesterol levels, and HDL levels are decreased, the early development of fatty liver is **possible**. Liver congestion, due to the fatty liver, should be considered if total cholesterol is above 180 or 4.99 mmol/L, triglycerides are increased (>80 or >0.90 mmol/L), and the SGPT/ALT is below 10.

Diet- high in refined carbohydrates

The Standard American Diet (SAD), which is very high in refined carbohydrates, can contribute to increased LDL.

HDL Cholesterol ↓ (39.00 mg/dL)

Hyperlipidemia and atherosclerosis

If HDL is less than 25% of the total cholesterol, then there is a strong clinical indication that hyperlipidemia is present. If the serum triglycerides (>80 or >0.90 mmol/L) and LDL (>100 or 2.59 mmol/L) are also increased, hyperlipidemia is likely present and atherosclerosis should be ruled-out.

Diets high in refined carbohydrates

The Standard American Diet (SAD), which is very high in refined carbohydrates, can contribute to decreased HDL levels (< 55 or < 1.42 mmol/L)

Metabolic Syndrome /hyperinsulinemia

If HDL levels are decreased (< 55 or < 1.42 mmol/L), triglycerides are increased above the total cholesterol level with increased LDL cholesterol (>100 or 2.59 mmol/L) and increased fasting blood glucose (> 86 mg/dL or 4.77 mmol/L), then metabolic syndrome and hyperinsulinemia are **probable**. Metabolic Syndrome can lead to adrenal dysregulation, so adrenal hyperfunctioning should be ruled out.

Oxidative stress

Unoxidized cholesterol, including HDL cholesterol, acts as an antioxidant and a free radical scavenger in the body, so decreased levels put the body at risk for developing oxidative stress, especially lipid peroxidation, and increases the chance of free radical induced diseases.

Heavy metal/Chemical overload

Patients with historically low HDL and total cholesterol levels may be more prone to heavy metal and chemical toxins due to poor cell membrane integrity. This is irrespective of level of exposure, but related more to susceptibility of the individual patient. This may also leave patients at an increased risk for developing neoplasm.

Fatty liver (early development) and Liver congestion

If HDL levels are decreased (< 55 or < 1.42 mmol/L), and LDL (>100 or 2.59 mmol/L), triglyceride (>80 or >0.90 mmol/L) and total cholesterol levels (>180 or 4.66 mmol/L) are increased, then the early development of fatty liver is **possible**. Liver congestion, due to the fatty liver, should be considered if total cholesterol is above 220 or 5.69 mmol/L, triglycerides are increased (>80 or >0.90 mmol/L), and the SGPT/ALT is below 10. Fatty liver is caused by obesity, excessive alcohol consumption, prescription drugs (e.g. steroids), iron overload, solvent exposure, and rapid weight loss. Fatty changes to the liver tissue can impair the liver's detoxification ability. The degree of fatty liver changes is directly related to the amount of obesity. Fatty liver and liver congestion increases the risk of insulin resistance, hypertension, Metabolic Syndrome, and type II diabetes mellitus.

Hyperthyroidism

The increased metabolic activity found in hyperthyroidism can lead to decreased HDL levels. The body preferentially uses fatty acids, which are transported via lipoproteins, for energy in this heightened metabolic state.

Lack of exercise/ sedentary lifestyle

A sedentary lifestyle has been shown to decrease HDL levels. Increasing cardiovascular and resistance exercise is a very good way to elevate HDL levels.

Cholesterol/HDL Ratio ↑ (5.82 Ratio)

A high cholesterol/HDL ratio is associated with an increased risk of cardiovascular disease.

Triglyceride/HDL Ratio ↑ (3.94 ratio)

Increased Risk of Insulin Resistance and Type II Diabetes

An increased Triglyceride:HDL ratio is significantly associated with an increased risk for developing insulin resistance and Type II Diabetes.

TSH ↑ (3.32 µU/mL)

Primary hypothyroidism

In primary hypothyroidism the problem is located in the thyroid gland itself, which fails to produce thyroid hormone. Primary hypothyroidism is often preceded by autoimmune thyroid disease. If you have a patient with suspected thyroid disease you should screen for thyroid antibodies. Primary hypothyroidism will present with TSH levels increased above 2.0 and you may see a normal or decreased total T4 level (<6.0 mcg/dL or 77 nmol/L) and/or T-3 (<90 ng/dl or 1.4nmol/L), free T4 (<1.0 ng/dl or 12.9 pmol/L), free T3 <3.0 ng/dl or 300 pg/dl), increased cholesterol (>180 or 4.66 mmol/L) and triglyceride level (>80 or 0.9 mmol/L)

Free T3 ↓ (2.74 pg/ml)

Primary hypothyroidism

With a decreased total T-3 level (<90 or 2.6 nmol/L) and/or decreased free T3 (<3.0 or <4.61 pmol/L) there is an increased association with clinical primary hypothyroidism. Some reports suggest that occasionally persons have mildly hypothyroid T-4 levels but enough T-3 secretion by the thyroid to maintain a clinically functional thyroid state.

T4 Conversion Hypothyroidism – Low T3 Syndrome

Low T3 syndrome is similar to a condition called Euthyroid sick syndrome, which is a condition of normal thyroid gland activity with a reduced peripheral 5'-deiodination conversion of T4 into T3 due to liver or renal dysfunction or disease. However, Low T3 syndrome is due to many of the conditions that affect the peripheral conversion of T4 into T3 with a rise in reverse T3 levels (stress, malnutrition, low calorie diets, lack of exercise etc.). In both cases there will be an increase in rT3. Consider this condition with Normal TSH, Low total T3 (<90 or <1.39 nmol/L), Low free T3 (<3.0 or <4.61 pmol/L), Normal total T4, Normal free T4, Increased reverse T3 (>26.7 ng/dl). With Low T3 Syndrome we don't see any liver or kidney dysfunction.

Secondary Hypothyroidism (Anterior Pituitary Hypofunction)

Thyroid hypofunction is often secondary to an anterior pituitary hypofunction (Secondary Hypothyroidism). Suspect anterior pituitary dysfunction if the subjective indications of thyroid hypofunction are present and the following pattern is seen: A decreased TSH, a normal T-3 uptake, a decreased or normal Total T4, a normal or decreased Free T4 and a normal or decreased Free T3. The likelihood increases if serum triglycerides are elevated and total cholesterol is increased. Additional elements that may be out of range with secondary hypothyrodism include an increased BUN above the "normal" range and an increased calcium. Anterior pituitary hypofunction is a common problem and one that is frequently mistaken for thyroid hypofunction (the subjective indications are usually identical and the patient's axillary temperature will frequently be below normal).

Euthyroid Sick Syndrome

For Euthyroid Sick Syndrome we see the same patterns as in Low T3 Syndrome plus other findings on blood chem screen with evidence of liver or renal dysfunction: Decreased albumin (<4.0 or 40), Increased BUN (>16 or >5.71mmol/L), Increased creatinine (>1.1 or >97.2 µmol/L), Decreased potassium (<4.0) Increased sodium (>142) (high cortisol), and/or Increased SGPT/ALT (>30)

Selenium deficiency

Consider Selenium deficiency if the total T-3 is reduced (<90 or 1.39 nmol/L), the free T-3 is reduced (<3 or 4.61 pmol/L) or T-3 uptake (<27) is reduced along with a normal TSH and T-4 level. Inactive T-4 is converted into T-3, the active thyroid hormone, by cleaving an iodine molecule from its structure. Selenium plays an active role in this cleaving process.

Total T3 ↓ (89.00 ng/dL)

Primary hypothyroidism

With a decreased total T-3 level (<90 or 2.6 nmol/L) and/or decreased free T3 (<3.0) there is an increased association with clinical primary hypothyroidism. Some reports suggest that occasionally persons have mildly hypothyroid T-4 levels but enough T-3 secretion by the thyroid to maintain a clinically functional thyroid state.

T4 Conversion Hypothyroidism – Low T3 Syndrome

Low T3 syndrome is similar to a condition called Euthyroid sick syndrome, which is a condition of normal thyroid gland activity with a reduced peripheral 5'-deiodination conversion of T4 into T3 due to liver or renal dysfunction or disease. However, Low T3 syndrome is due to many of the conditions that affect the peripheral conversion of T4 into T3 with a rise in reverse T3 levels (stress, malnutrition, low calorie diets, lack of exercise etc.). In both cases there will be an increase in rT3. Consider this condition with Normal TSH, Low total T3 (<90), Low free T3 (<3.00), Normal total T4, Normal free T4, Increased reverse T3 (>26.7 ng/dl). With Low T3 Syndrome we don't see any liver or kidney dysfunction.

Euthyroid Sick Syndrome

For Euthyroid Sick Syndrome we see the same patterns as in Low T3 Syndrome plus other findings on blood chem screen with evidence of liver or renal dysfunction: Decreased albumin (<4.0 or 40), Increased BUN (>16 or >5.71mmol/L), Increased creatinine (>1.1 or >97.2 µmol/L), Decreased potassium (<4.0) Increased sodium (>142) (high cortisol), and/or Increased SGPT/ALT (>30)

Selenium deficiency

Consider Selenium deficiency if the total T-3 is reduced (<90 or 1.39 nmol/L), the free T-3 is reduced (<3 or 4.61 pmol/L) or T-3 uptake (<27) is reduced along with a normal TSH and T-4 level. Inactive T-4 is converted into T-3, the active thyroid hormone, by cleaving an iodine molecule from its structure. Selenium plays an active role in this cleaving process.

Total T4 ↓ (5.30 µg/dL)

Primary hypothyroidism

In primary hypothyroidism the problem is located in the thyroid gland itself, which fails to produce thyroid hormone. Primary hypothyroidism is often preceded by autoimmune thyroid disease. If you have a patient with suspected thyroid disease you should screen for thyroid antibodies. Primary hypothyroidism will present with TSH levels increased above 2.0 and you may see a normal or decreased total T4 level (<6.0 mcg/dL or 77 nmol/L) and/or T-3 (<90 ng/dl or 1.4nmol/L), free T4 (<1.0 ng/dl or 12.9 pmol/L), free T3 <3.0 ng/dl or 300 pg/dl), increased cholesterol (>180 or 4.66 mmol/L) and triglyceride level (>80 or 0.9 mmol/L)

Secondary Hypothyroidism (Anterior Pituitary Hypofunction)

Thyroid hypofunction is often secondary to an anterior pituitary hypofunction (Secondary Hypothyroidism). Suspect anterior pituitary dysfunction if the subjective indications of thyroid hypofunction are present and the following pattern is seen: A decreased TSH, a normal T-3 uptake, a decreased or normal Total T4, a normal or decreased Free T4 and a normal or decreased Free T3. The likelihood increases if serum triglycerides are elevated and total cholesterol is increased. Additional elements that may be out of range with secondary hypothyrodism include an increased BUN above the "normal" range and an increased calcium. Anterior pituitary hypofunction is a common problem and one that is frequently mistaken for thyroid hypofunction (the subjective indications are usually identical and the patient's axillary temperature will frequently be below normal).

Iodine deficiency

In an iodine deficiency the total T4 will often be decreased (<6.0 µg/dl or 77 nmol/L), Decreased free T4 (<1.0 ng/dl or 12.9 nmol/L), The total T3 is often increased (> 168 ng/dl or 2.6 nmol/L) and a Normal or mildly elevated TSH (>2.0).

T3 Uptake ↓ (24.00 %)

Primary hypothyroidism

If T-3 uptake is decreased (<27) with an increased TSH (> 2.0), a normal or decreased total T-4 (<6 or 7.2 nmol/L) and/or total T-3 level (< 90 or 1.4 nmol/L), and an increased cholesterol (>180 or 4.66 mmol/L) and triglyceride level (>80 or 0.90 mmol/L), primary hypothyroidism is probable.

Selenium deficiency

Consider Selenium deficiency if the total T-3 is reduced (<90 or 1.39 nmol/L), the free T-3 is reduced (<3 or 4.61 pmol/L) or T-3 uptake (<27) is reduced along with a normal TSH and T-4 level. Inactive T-4 is converted into T-3, the active thyroid hormone, by cleaving an iodine molecule from its structure. Selenium plays an active role in this cleaving process.

Iodine deficiency

If T-3 uptake is decreased (<27) along with a decreased total T-4 (<6 or 7.2 nmol/L) and an increased total T-3 (>168 or 2.6 nmol/L) and a usually normal or mildly elevated TSH (>2.0), then suspect an iodine deficiency.

Free Thyroxine Index (T7) ↓ (1.60 Index)

Hypothyrodisim

Decreased levels of FTI or T7 <1.7 are suggestive of hypothyrodism

Thyroid Peroxidase (TPO) Abs LABCORP ↑ (85.00 IU/ml)

Early stage Hashimoto's Thyroiditis

In the early stages of Hashimoto's Thyroiditis, Thyroid Peroxidase (TPO) Antibodies attack the gland itself causing T4 to spill into the blood stream leading to a short-lived bout of hyperthyroidism. The body reacts to the elevated T4 levels by trying to lower T4 levels. It does this by lowering the output of TSH from the anterior pituitary. This

hypermetabolic effect of increased T4 levels stresses the adrenals and causes adrenal fatigue. In early stages of Hashimoto's the TSH will be very low, Total and Free T4 will be high and Total and Free T3 will be high. Reverse T3 may be elevated. Thyroid Peroxidase (TPO) Antibodies and Thyroglobulin Antibodies will be elevated.

Late stage Hashimoto's Thyroiditis

Late stage Hashimotos is marked by decreased total and free T4 and gradual hypothyroidism because the auto-antibodies have already destroyed much of the glandular tissue and there are not many cells left to produce T4. Now there is adrenal fatigue **and** hypothyroidism. On palpation, the gland can be abnormally firm but not usually enlarged.

Thyroglobulin Abs LABCORP ↑ (1.80 IU/ml)

Hashimoto's Thyroiditis and Grave's Disease

Elevated levels of Thyroglobulin antibodies are often seen in patients with Hashimoto's thyroiditis and Grave's disease. Their absence does not rule these conditions out as there are sometimes false negatives.

Thyroid Cancer

Elevated levels of Thyroglobulin antibodies are often seen in thyroid cancer, in particular papillary or follicular thyroid cancer. Thyroglobulin is not produced in medullary or anaplastic thyroid cancer.

Hs CRP, Female ↑ (3.82 mg/L)

Increased levels of CRP are associated with the following:

- Abdominal obesity,
- Peridontal disease,
- High blood pressure
- An increased risk of cardiovascular disease and stroke
- Diabetes
- Depression
- Alzheimer's disease

Homocysteine ↑ (24.00 µmol/L)

Increased Risk for Cardiovascular Disease

Hyperhomocysteinemia, a condition of increased homocysteine levels, is a risk factor for developing cardiovascular disease, arterial disease, stroke and venous thrombosis. Homocysteine levels are affected by nutritional and genetic factors. Consider genetic testing for MTHFR gene mutations with elevated levels of homocysteine.

Additional diseases and pathological processes associated with an increased homocysteine

- Colon cancer
- Cervical cancer
- Depression
- Alzheimer's disease

- Inflammatory bowel disease

Vitamin D (25-OH) ↓ (19.80 ng/ml)

Vitamin D deficiency

A decreased Vitamin D is suggestive of a deficiency in vitamin D. Treatment should be initiated to raise the levels into the optimal range.

Vitamin D deficiency is associated with a number of diseases and disorders not limited to:

- Diabetes Mellitus
- Cancer
- Hypertension
- Cardiovascular disease
- Autoimmune/inflammatory disorders
- Vitamin D insufficiency is prevalent in patients with chronic musculoskeletal pain.

Folate ↓ (8.00 ng/ml)

Folic acid deficiency is common in pregnant women, alcoholics, in patients whose diets do not include raw fruits and vegetables, and in people with structural damage to the small intestine. Low folic acid levels, however, can also be the result of a primary vitamin B12 deficiency that decreases the ability of cells to take up folic acid.

Increased Need

All pregnant women need increased amounts of folate for proper fetal development. People with cancer that has spread (metastasized) or with chronic hemolytic anemia have increased need for folate.

Neural Tube Defect

Low serum folate during pregnancy has been associated with neural tube defects in the fetus.

DHEA-S, Female ↓ (194.00 µg/dl)

Adrenal Insufficiency

Physiological stress raises cortisol output from the adrenal glands, which causes a decrease in DHEA-S levels in the serum and an increased cortisol to DHEA ratio, a hallmark sign for stage 2 and 3 adrenal insufficiency.

Hyperinsulinemia

High levels of insulin in the blood (hyperinsulinemia)increases cortisol and epinephrine output and decreases the DHEA levels in the serum. Low DHEA-S levels are found in early and late-stage insulin resistance and Diabetes.

Immune Insufficiency & Low sIgA

Cortisol and DHEA systemically modulate the production and turnover of specialized immune cells called immunocytes (also known as plasmacytes) that produce the secretory antibodies that protect us. The primary antibody of defense is secretory IgA (sIgA). When cortisol is elevated and DHEA is low, suppression of these mucosal immune cells occurs, compromising our first-line immune defense, resulting in low sIgA output.

Low levels of DHEA are associated with many common age-related conditions

Low levels of DHEA are associated with many common age-related conditions, including diseases of the nervous, cardiovascular, and immune systems such as metabolic syndrome, coronary artery disease, osteoporosis, mood disorders and sexual dysfunction.

Testosterone, Free Female ↓ (0.70 pg/ml)

Low free testosterone levels have been linked to an increased risk for the following:

- Osteoporosis
- Decreased lean body mass
- Decreased libido
- It may also suggest ovarian insufficiency and/or adrenal insufficiency.

Testosterone levels decrease following menopause, and restoring testosterone levels may help improve well-being and libido.

Testosterone, Total Female ↓ (32.00 ng/dl)

Low total testosterone levels have been linked to an increased risk for the following:

- Osteoporosis
- Decreased lean body mass
- Decreased libido
- It may also suggest ovarian insufficiency and/or adrenal insufficiency.

Testosterone levels decrease following menopause, and restoring testosterone levels may help improve well-being and libido.

Progesterone, Female ↓ (12.40 ng/ml)

Short Luteal Phase Syndrome

A low serum progesterone may be an indication of Short Luteal Phase Syndrome, which may indicate a disruption in a woman's menstrual cycle. Short Luteal Phase Syndrome can be associated with hyperestrogenism and estrogen dominance. It's important to remember that serum progesterone testing is a spot test, i.e. you do not know what day of the cycle you're doing the test on. As such a low progesterone test may be due to a natural low point in progesterone output or a conditions such as Short Luteal Phase Syndrome. Suspicion of Short Luteal Phase Syndrome goes up with a low serum progesterone below 0.2 ng/ml or 0.64 nmol/L and an elevated serum estradiol above 352 pg/ml or 1292.2 pmol/L. Our recommendation, if you see a low serum progesterone and suspect Short Luteal Phase Syndrome, is to order a full 30 day salivary hormone check for estrogens and progesterone.

Hematocrit, Female ↑ (46.20 %)

Asthma and emphysema

An increased HCT (>44 or 0.44 in women and >48 or 0.48 in men) is by no means a definitive diagnostic marker for asthma or emphysema. Due to the lack of optimum oxygenation of the blood, the body will increase the red blood cell count to increase the number of cells that can be oxygenated. The hematocrit will go up accordingly.

Polycythemia (relative or primary)

Relative: a polycythemia that is relative to the degree of hemo-concentration, i.e. **dehydration**. **Primary**: Polycythemia vera- a myeloproliferative disease marked by an increase in all blood cells. The hematocrit will go up according to the increase in cell volume

Dehydration

If the hematocrit is increased suspect dehydration. Dehydration is a very common problem and should be factored into your blood chemistry and CBC analysis. Suspect a short-term (acute) dehydration if there is an increased HGB (>14.5 or 145 in women or 15 or 150 in men) and/or HCT (>44 or 0.44 in women and >48 or 0.48 in men) along with an increased RBC count (>4.5 in women and 4.9 in men). A relative increase in Sodium (>142) and Potassium (>4.5) can be noted as well. Suspect a long-term (chronic) dehydration if any of the above findings are accompanied by an increased Albumin (>5.0 or 50 g/L), increased BUN (>16 or 5.71 mmol/L), and/or serum Protein (> 7.4 or 74 g/L).

MCV ↑ (97.00 fL)

Anemia- Vitamin B12 and/or Folate deficiency

B12 and folate are needed for proper nucleus development. In situations of deficiency the cytoplasm of the erythrocyte continues to expand until the nucleus has reached its proper size. This leads to large red blood cells. The probability of vitamin B-12 or folate deficiency anemia increases when the MCV is increased (>90) and the MCH is above 31.9. If there is also an increased RDW (>13), MCHC (>35), and LDH (>200) (especially the LDH-1 isoenzyme fraction), and a decreased uric acid level the probability of vitamin B-12 or folic acid anemia is very high. Serum or urinary methylmalonic acid is a good test for confirming vitamin B-12 deficiency. An elevated serum homocysteine (>7.2) can help confirm folic acid and vitamin B-6 deficiency. The presence of hypersegmented neutrophils (5 or more lobes in more than 5% of all neutrophils) has been reported to be more sensitive and reliable than an elevated MCV in detecting megaloblastic anemia and is not affected by coexisting iron deficiency.

Hypochlorhydria

Hypochlorhydria is **possible** with an increased MCV, MCHC and/or MCH, especially with a low serum iron and an increased (>2.8 or 28 g/L) or decreased (<2.4 or 24 g/L) total globulin. Hypochlorhydria is **probable** if BUN is increased (>16 or 5.71 mmol/L) and/or serum phosphorous is decreased (<3.0 or 0.97 mmol/L).

Vitamin C need

Consider a vitamin C need if there's a decreased albumin (<4.0 or 40g/L) along a decreased HCT (<37 or 0.37 in women and 40 or 0.4 in men), HGB (<13.5 or 135 g/L in women and <14 or 140 in men), MCH (<28), MCHC (<32), serum iron (< 85 or 15.22 mmol/dL). There also may be an increased MCV (>89.9), alkaline phosphatase (>100), fibrinogen (>300) and RBCs (>4.5 in women and >4.9 in men).

RDW ↑ (14.70 %)

Conditions Associated with an Increased RDW

- Iron Deficiency
- Vitamin B12/folate Deficiency
- Pernicious Anemia
- Thalassemia
- Inflamamation

Neutrophils ↑ (67.00 %)

Childhood diseases (Measles, Mumps, Chicken-pox, Rubella, etc.)

The pattern seen in the Neutrophil count is as follows: **Neutrophils**: increased early (>60), decreased later (<40)

Acute, localized, and general bacterial infections

Neutrophils will be increased (>60). They are the primary cell type for fighting bacterial infections.

Acute viral infection

Neutrophils will tend to be normal

Chronic viral or bacterial infection

Frequently an increased neutrophil count (>60) is seen with a decreased total WBC count (<5.0) in chronic infection.

Inflammation

An increased neutrophil count (>60) will often be seen in acute and chronic inflammation (RA, SLE, Rheumatic fever and acute gout)

Lymphocytes ↓ (22.00 %)

Chronic viral or bacterial infection

Frequently a decreased lymphocyte count is seen with chronic infection, the classic case being the viral infection of AIDS.

Active infection

An active infection of unknown cause (i.e. not sure if it is bacterial or viral) can use up a large number of lymphocytes. Expect to see an increased total WBC count (> 7.5) and increased neutrophils (>60). Further testing should be considered (ESR, C reactive protein, etc.)

Oxidative Stress and Free Radical Activity

Suspect excess free radical activity and oxidative stress if the lymphocyte count is decreased (<20). If a decreased lymphocyte count (<20) is seen with a total cholesterol level suddenly below its historical level, a decreased albumin (<4.0 or 40 g/L) and low platelet levels (<150), an increased total globulin (>2.8 or 28 g/L) and uric acid level (>5.9 or > 351 mmol/dL), free radical pathology, which increases the risk for developing a neoplasm, should be investigated. Oxidative stress can cause an increased destruction of red blood cells; in these situations you will see an elevated bilirubin level.

Suppressed bone marrow production

Anything that affects the output of white blood cells from the bone marrow can cause a decreased lymphocyte count (aplastic anemia, chemotherapy, radiation, Hodgkin's disease)

Eosinophils ↑ (4.00 %)

Intestinal parasites

It is important to do further studies if the eosinophil count is increased (>3), i.e. a digestive stool analysis with ova and parasite, especially if the subjective indicators are present. In some cases the stool tests may be normal, especially with amoebic parasites or if the lab sample was not collected or analyzed appropriately by a qualified lab. Multiple and/or purged samples are sometimes necessary. If increased eosinophils (>3), increased basophils (>1), and increased monocytes (>7) intestinal parasites are **probable** and should be ruled out.

Food and Environmental allergy/sensitivity

An increased eosinophil count (>3) is associated with food allergies and/or sensitivities. There are a number of sophisticated and expensive tests for specific food allergies. These are often normal. In our experience a weekly diet diary can be a very helpful tool to investigate possible food allergies and sensitivities. An elimination diet for 4 weeks and a subsequent challenge of suspect foods can help determine the most common foods that a patient is allergic or sensitive to. **Foods that the patient may be sensitive to most often are**: Dairy products, Gluten containing grains, Citrus, Shell fish, Foods containing additives and food dyes. Patients should use the "Coca pulse testing" method or try an elimination challenge diet to successfully identify the main culprits. Several methods of food sensitivity testing are available.

Asthma

An increased eosinophil count (>3) is often seen in asthma due to the connection between allergies and asthma. A digestive stool analysis will frequently indicate dysbiosis in an asthmatic, and a liver detoxification panel will often indicate liver dysfunction.

Cortisol - AM ↓ (3.00 µg/dL)

Adrenal Fatigue and Adrenal Insufficiency

Adrenal fatigue and adrenal insufficiency causes a decrease in the glucocorticoid hormone cortisol. Additional findings include an increase in serum potassium (>4.5) along with a normal or decreased sodium (< 135) and/or chloride (<100). The sodium:potassium ratio will also be decreased. Other values that may be out of balance include decreased aldosterone level. Urinary chloride will be increased. Adrenal fatigue and adrenal insufficiency can be confirmed with salivary cortisol studies.

Leptin, Female ↑ (25.60 ng/ml)

Leptin Resistance

An increased leptin level is an indication that the body and cells may have become resistant to the actions of leptin. This is similar to the development of insulin resistance. The net effect of leptin resistance is a reduction in the feeling of satiation after meals, similar to the effect caused by low leptin levels. Therefore, these individuals feel like they are hungry all the time so they eat more and gain more body fat perpetuating this cycle.

Increased Risk of Developing Metabolic Syndrome, Insulin Resistance, CVD and Type II Diabetes

Leptin is pivotal in preventing ectopic lipid accumulation, which is the accumulation of fat outside the usual fat stores i.e. in places other than adipose tissue. An increased leptin level can lead to ectopic lipid accumulation in organs and tissues, especially the abdomen. When this occurs in the muscle, it leads to insulin insensitivity. Insulin insensitivity is the first step towards the development of both type 2 diabetes and heart disease. Lipid accumulation in pancreatic beta cells, the site of insulin production, contributes to the development of type 2 diabetes, and in cardiomyocytes, contributes to cardiovascular disease. In addition, in obesity the release of growth hormone declines, exacerbating the decline normally seen with aging, and perpetuating obesity through the loss of the hormone's muscle building and fat burning effects. Therefore an increased leptin level is significantly associated with an increased risk for developing metabolic syndrome, insulin resistance. cardiovascular disease and Type II Diabetes.

Gastrin ↑ (92.00 pg/ml)

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