

# **NutrEval & ION: Case-Based Interpretation for the Athletic Patient**

Warren Brown, ND



**Lahnor Powell, ND, MPH**  
Medical Education Specialist for Genova Diagnostics



## **Warren Brown, ND**

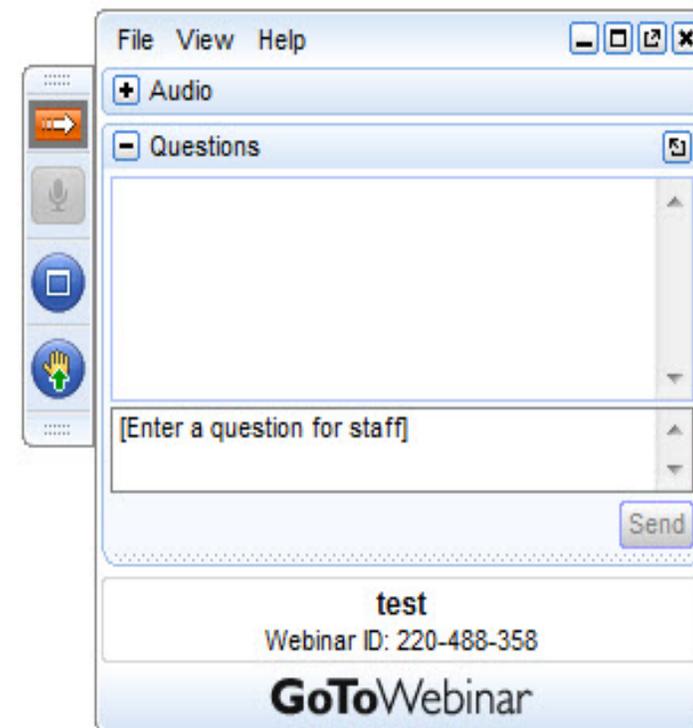
**Clinical Science Liaison for Genova Diagnostics  
Naturopathic Doctor / Owner of Clinical Advances for Sport**



# Technical Issues & Clinical Questions

Please type any technical issue or clinical question into either the “Chat” or “Questions” boxes, making sure to send them to “Organizer” at any time during the webinar.

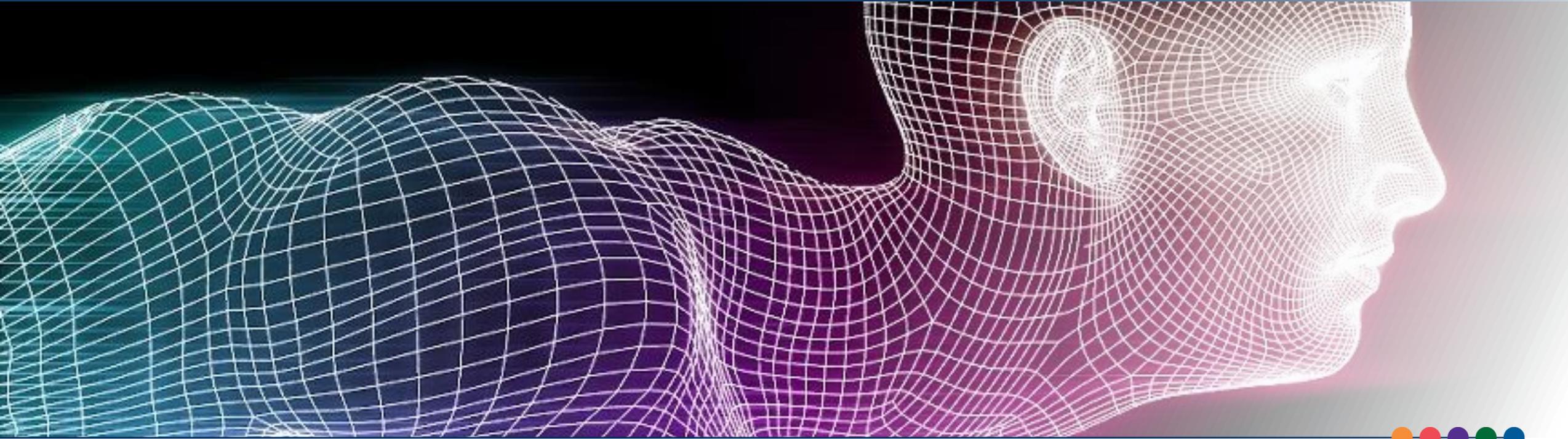
We will be compiling your clinical questions and answering as many as we can the final 15 minutes of the webinar.





# Need More Resources?

The screenshot shows the Genova Diagnostics website for the Adrenocortex Stress Profile test. The header includes the Genova Diagnostics logo, navigation links for International, About Us, Contact Us, Search, myGDX, and US, and a menu with Home, Clinicians, and Patients. The main banner features a woman at a computer and the text: "Adrenocortex Stress Profile WITH CORTISOL AWAKENING RESPONSE. A Comprehensive Tool to Assess the HPA Axis." A "LEARN MORE" button is present. Below the banner are three highlighted boxes: "Getting Started" (with a "NEW USERS" button), "Test Menu" (with a "SEARCH TESTS" button), and "myGDX Login" (with a "LOGIN" button). At the bottom, an "Online Education" section is highlighted, featuring a "LEARN NOW" button and text about free webinars and educational modules.



# **NutrEval & ION: Case-Based Interpretation for the Athletic Patient**

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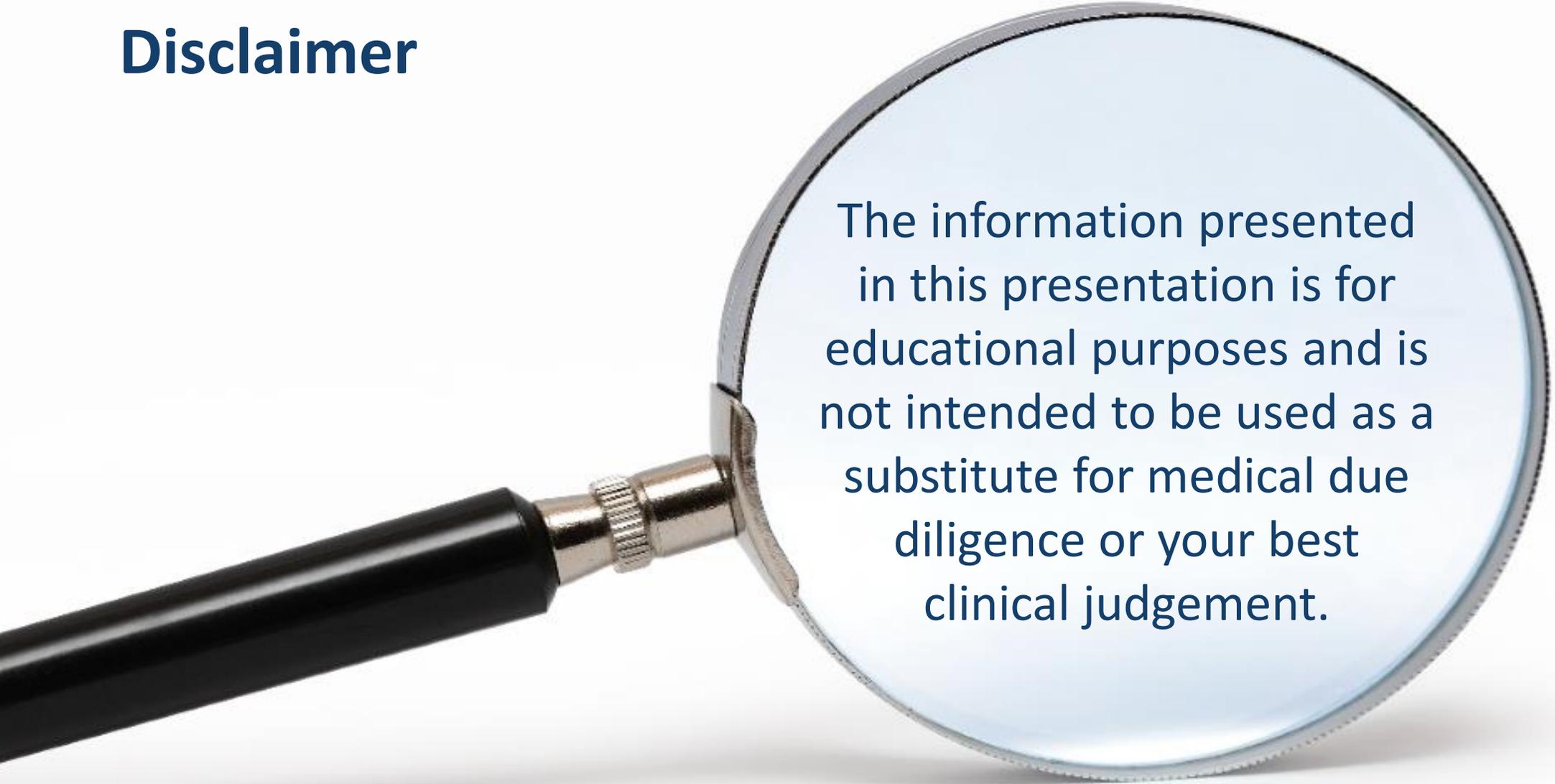
# Overview

- Highlight the relevance of nutritional testing for athletic patients
- Understand the clinical significance of functional biomarkers of nutritional status
- Identify key areas of nutritional support for athletes
- Interpret and apply laboratory results





# Disclaimer



The information presented in this presentation is for educational purposes and is not intended to be used as a substitute for medical due diligence or your best clinical judgement.



# National Geographic (July 2018)

The key to breaking performance barriers is to “keep athletes healthy... if they stay healthy, everything else falls into place.”

- Alan Ashley, the U.S. Olympic Committee’s Chief of Sport Performance

“...researchers are focusing on such key areas as physiology, **nutrition**...”

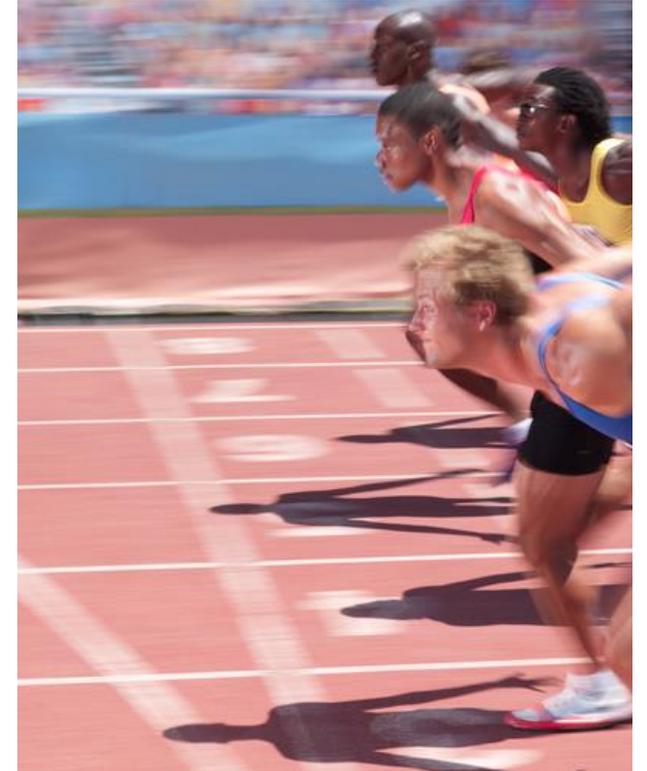
- Peter Weyand, Southern Methodist University





# The State of High-Level Competition

- Margin of victory is often exceedingly narrow
  - “Photo finish”
  - 0.024 second could separate 1<sup>st</sup> from 5<sup>th</sup> place
- Missed opportunity to finish or make a key play
  - Lack of endurance
  - Split-second lapse in concentration





# The State of the Athletic Patient



- Appear “healthy”
  - Not always “healthy” biochemistry
- Some present with symptoms or a Dx
- Motivated
- Dedicated
- Performance-oriented
- Varying degrees of nutritional knowledge
  - Often seek information from unqualified sources (internet, media, etc.)
  - Often experiment with diet and supplementation





# Objective Nutritional Assessment: NutrEval or ION

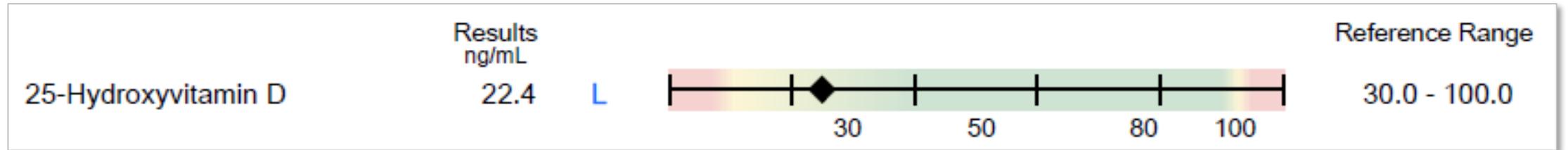
- Both Profiles:
  - Provide comprehensive info about nutritional status
  - Answer many of the same clinical questions
  - Require urine *and* blood specimen
- Key Differences
  - Results layout
  - **ION**: direct measure of Vitamin A and E; Vitamin D and homocysteine are included
  - **NutrEval**: direct measure of glutathione; option to add-on genomic markers and Vitamin D

NutrEval	ION
Organic Acids	Organic Acids
Amino Acids	Amino Acids
Fatty Acids	Fatty Acids
Nutrient Elements	Nutrient Elements
Toxic Elements	Toxic Elements
CoQ10	CoQ10
Fat Soluble Vitamins A, & E (D as add-on)	Fat Soluble Vitamins A, E, D & $\beta$ -carotene
Lipid Peroxides	Lipid Peroxides
8-OH-2DG	8-OH-2DG
Glutathione	Homocysteine
Genomic add-ons available	No genomic add-ons



# Conceptual Framework:

## *Direct* Indicators of Nutrient Deficiency



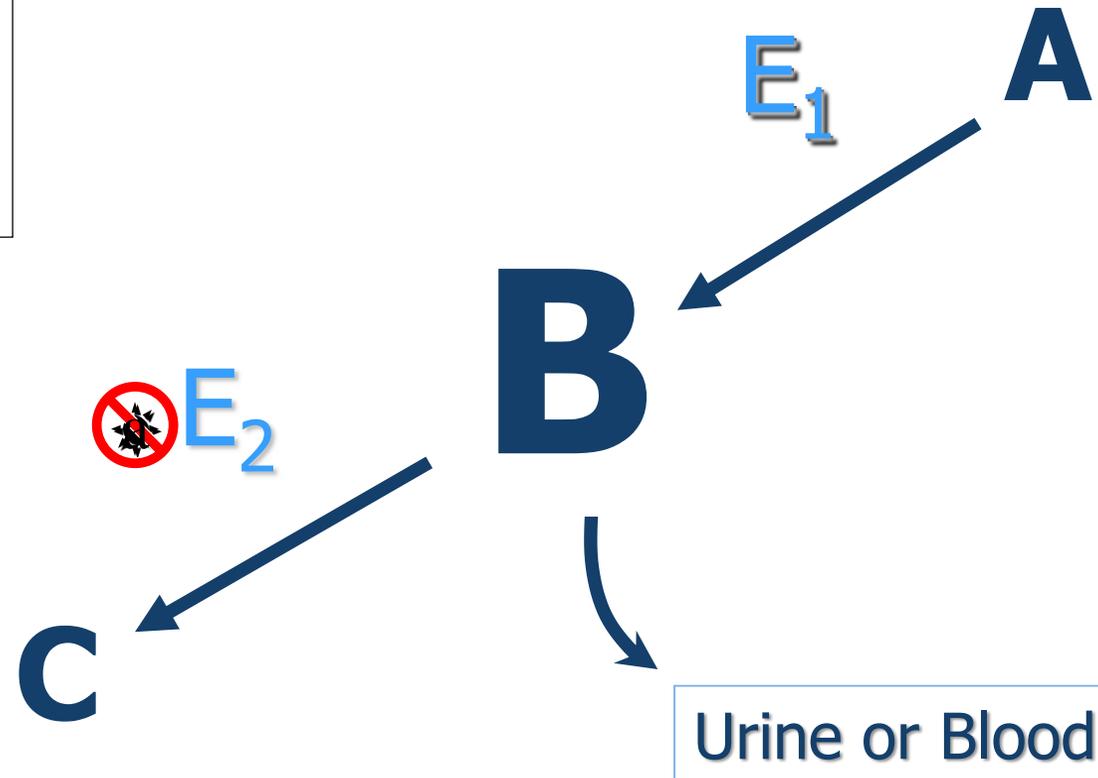
Direct measures are simple. If Vitamin D is low, support it.



# Conceptual Framework:

## *Functional* Indicators of Nutrient Deficiency

<b>A</b>	Intermediary metabolite
<b>E<sub>n</sub></b>	Enzyme
	Cofactor





# Biochemical "Highways" Analogy

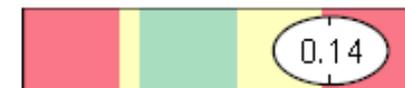
## Elongase

Vitamin and Mineral Cofactors:

- Niacin (B3)
- Pyridoxal-5-phosphate (B6)
- Pantothenic Acid (B5)
- Biotin, Vitamin C

## $\gamma$ -Linolenic Acid

*evening primrose, borage, black currant*



**Elongase Enzyme Inhibition**

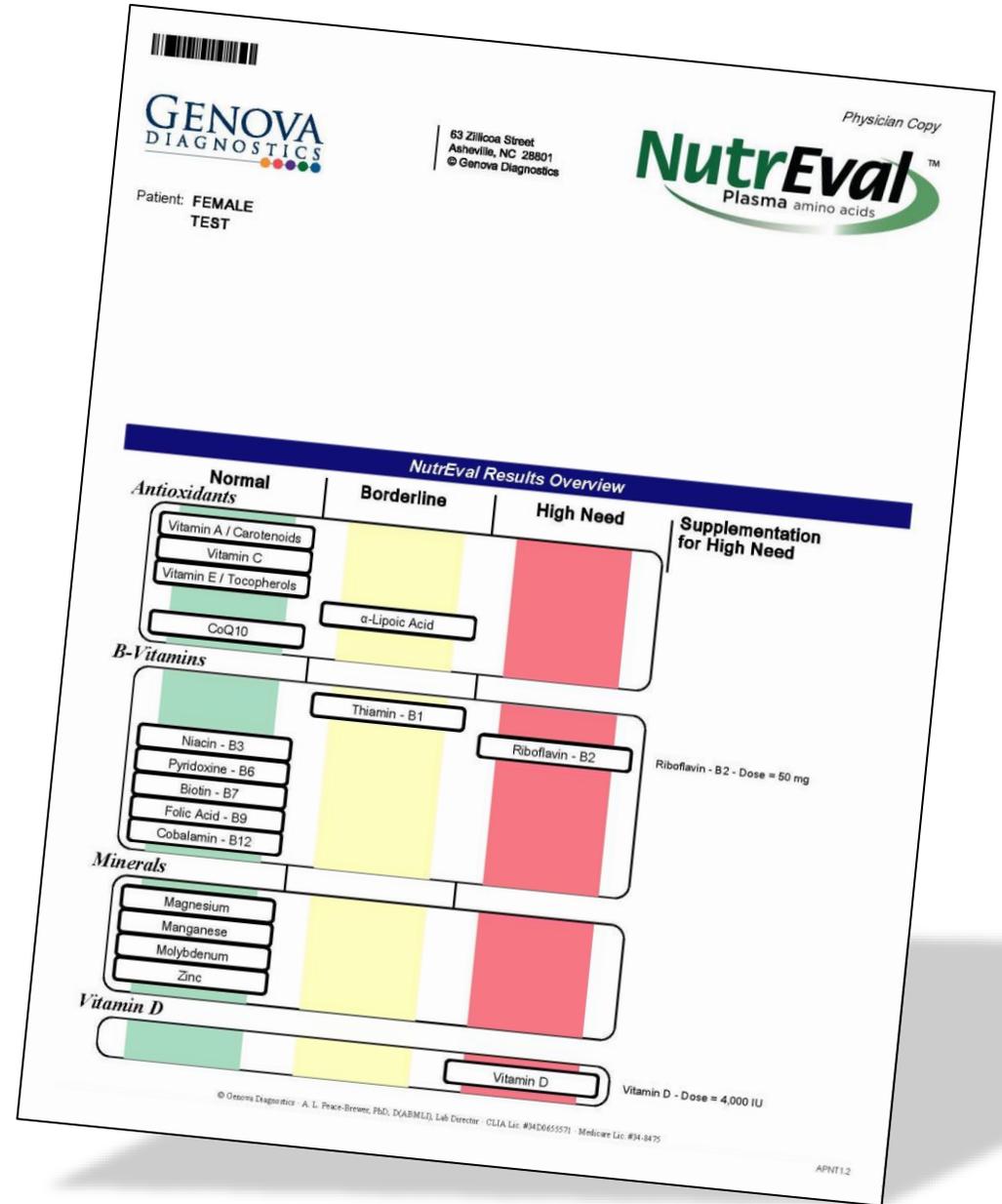
## Dihomo- $\gamma$ -Linolenic Acid



Series 1 Prostaglandins  
Anti-Inflammatory

**Omega 6 Metabolism**

# Case 1

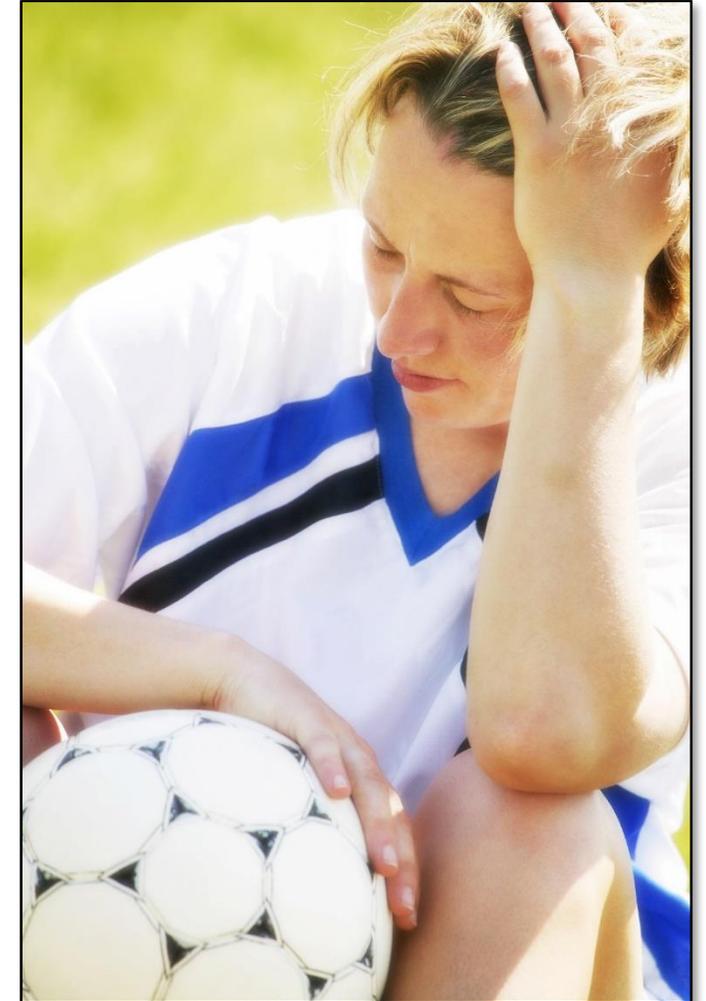


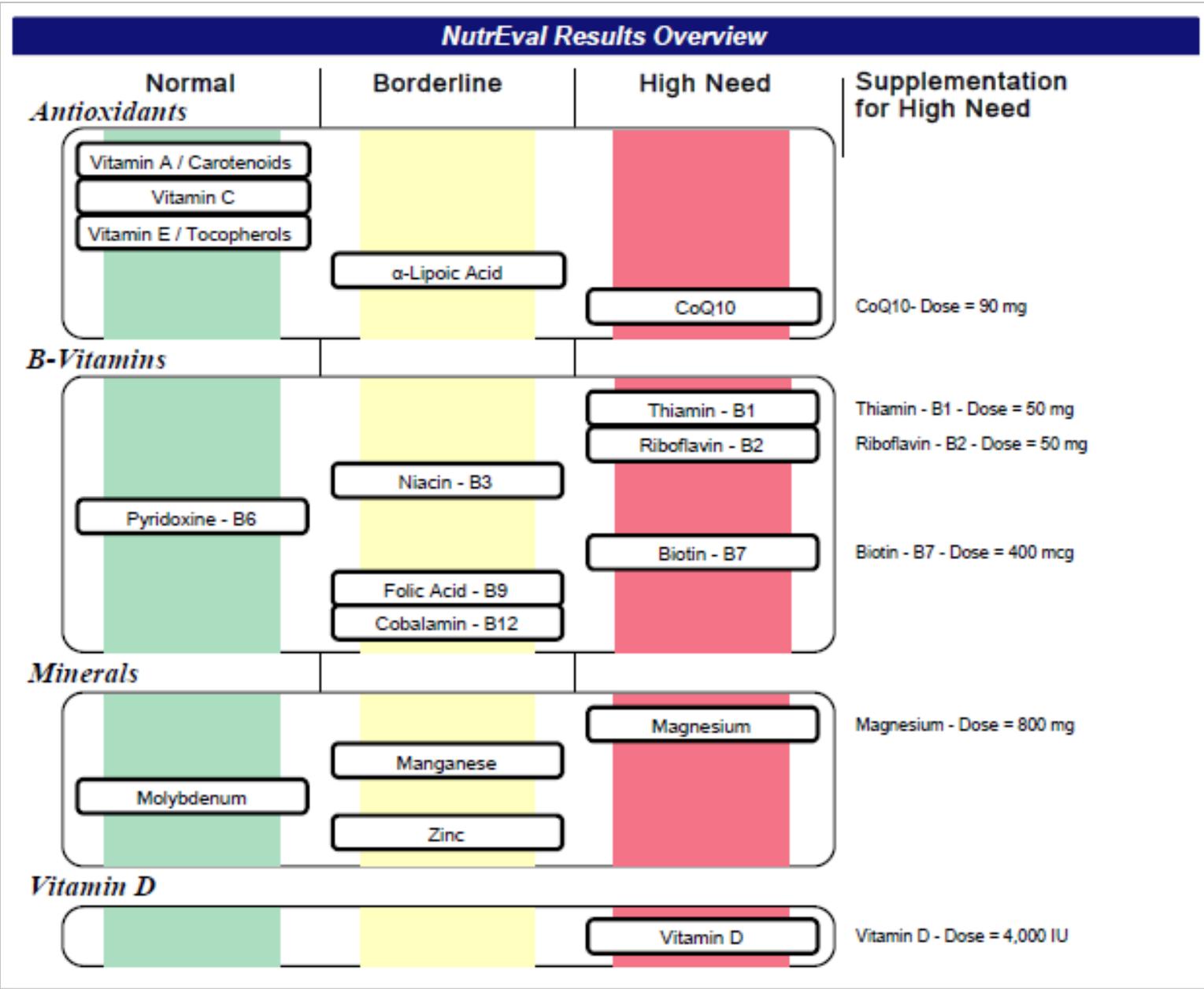


# Case 1

## 21 y/o female soccer player / college student

- CC: “wiped out” after practices and games
- Occasional loose stools, especially around game times
- Pregnancy test (-)
- Diet: college cafeteria plan, eats her vegetables, macronutrient ratios are 30% protein, 40% carb, 30% fat, occasional packaged foods
- Supplements: MVM
- Medications: NSAIDs 2-3 / week for pain
- Moderate stress
- Sleeps 6 hours per night on average







## SUGGESTED SUPPLEMENT SCHEDULE

Supplements	Daily Recommended Intake (DRI)	Patient's Daily Recommendations	Provider Daily Recommendations
<b>Antioxidants</b>			
Vitamin A / Carotenoids	2,333 IU	3,000 IU	
Vitamin C	75 mg	250 mg	
Vitamin E / Tocopherols	22 IU	100 IU	
α-Lipoic Acid		100 mg	
CoQ10		90 mg	
<b>B-Vitamins</b>			
Thiamin - B1	1.1 mg	50 mg	
Riboflavin - B2	1.1 mg	50 mg	
Niacin - B3	14 mg	30 mg	
Pyridoxine - B6	1.3 mg	10 mg	
Biotin - B7	30 mcg	400 mcg	
Folic Acid - B9	400 mcg	800 mcg	
Cobalamin - B12	2.4 mcg	500 mcg	
<b>Minerals</b>			
Magnesium	320 mg	800 mg	
Manganese	1.8 mg	5.0 mg	
Molybdenum	45 mcg	75 mcg	
Zinc	8 mg	20 mg	
<b>Essential Fatty Acids</b>			
Omega-3 Oils	500 mg	2,000 mg	
<b>Digestive Support</b>			
Probiotics		25 billion CFU	
Pancreatic Enzymes		5,000 IU	
<b>Other Vitamins</b>			
Vitamin D	600 IU	4,000 IU	



Amino Acid	mg/day	Amino Acid	mg/day
Arginine	503	Methionine	0
Asparagine	0	Phenylalanine	88
Cysteine	35	Serine	0
Glutamine	0	Taurine	74
Glycine	0	Threonine	0
Histidine	49	Tryptophan	18
Isoleucine	477	Tyrosine	0
Leucine	616	Valine	11
Lysine	33		



Digestive Support		
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'loose stools'

Digestive Support recommendations made at yellow or red status



Several amino acid recommendations present



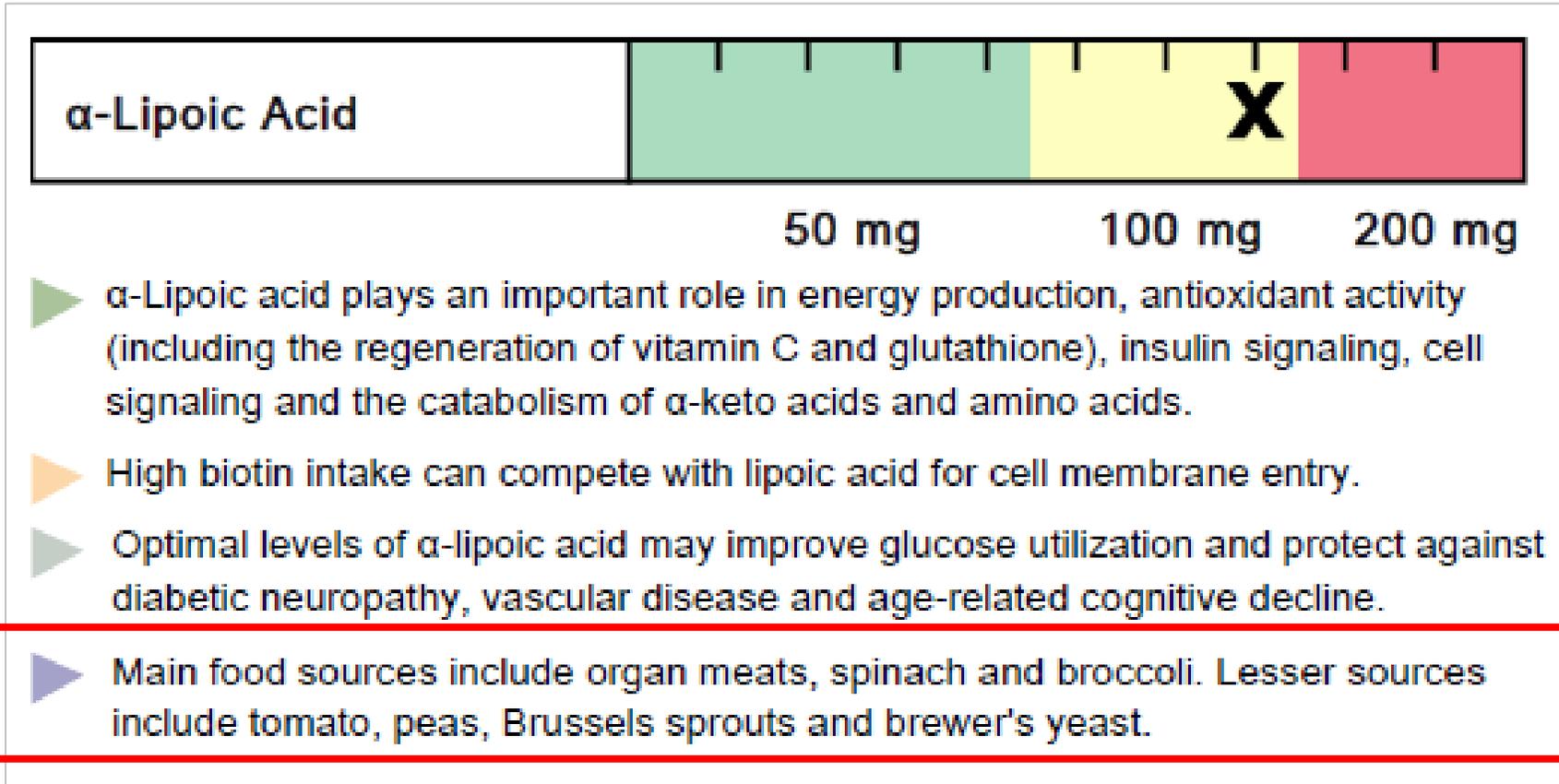
Gut symptoms reported by patient



Consider stool test for insight into digestion / absorption



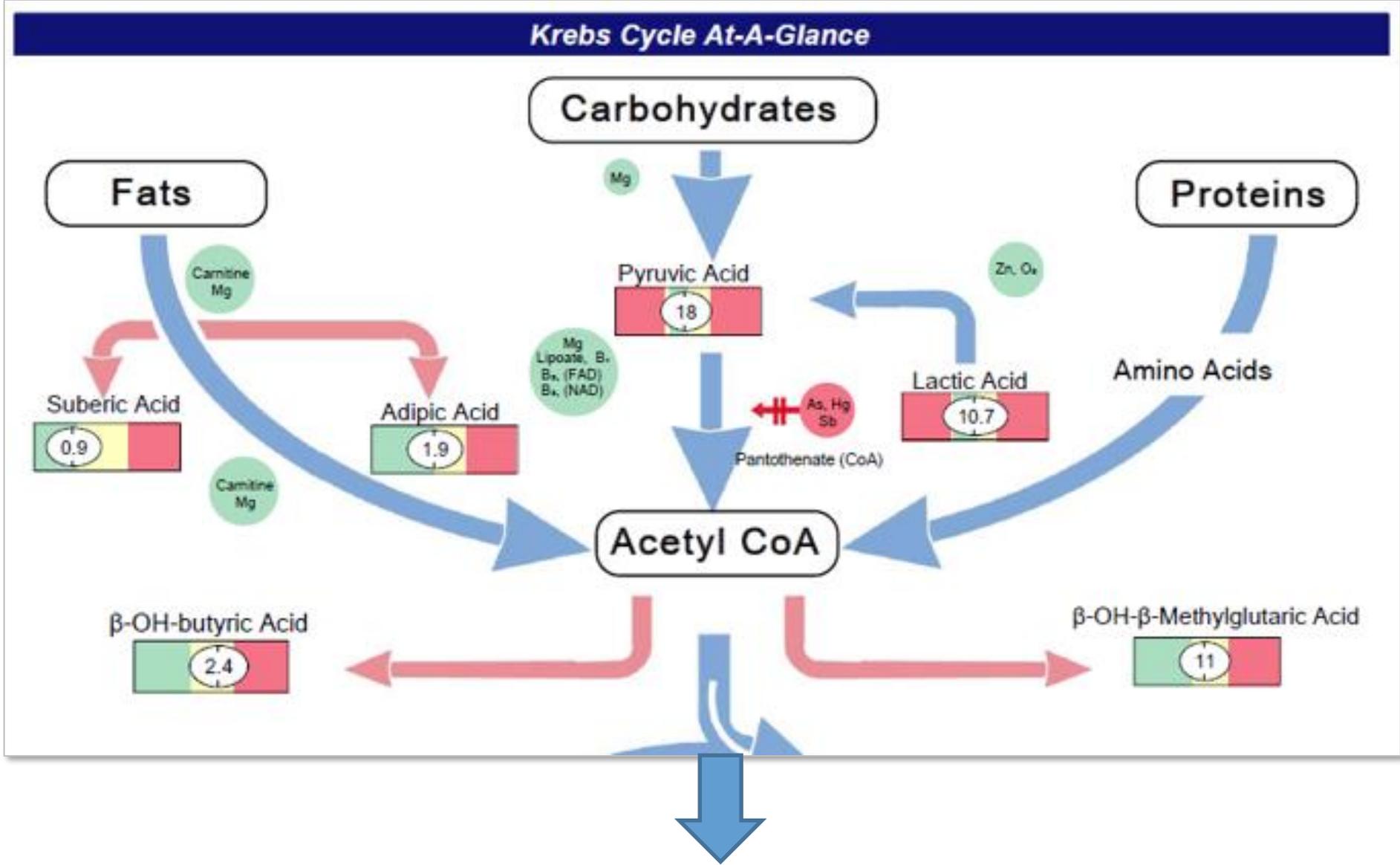
# Interpretation-at-a-Glance Pages of the NutrEval



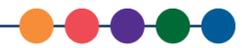
Can be used to help remind the patient that nutrients come from food



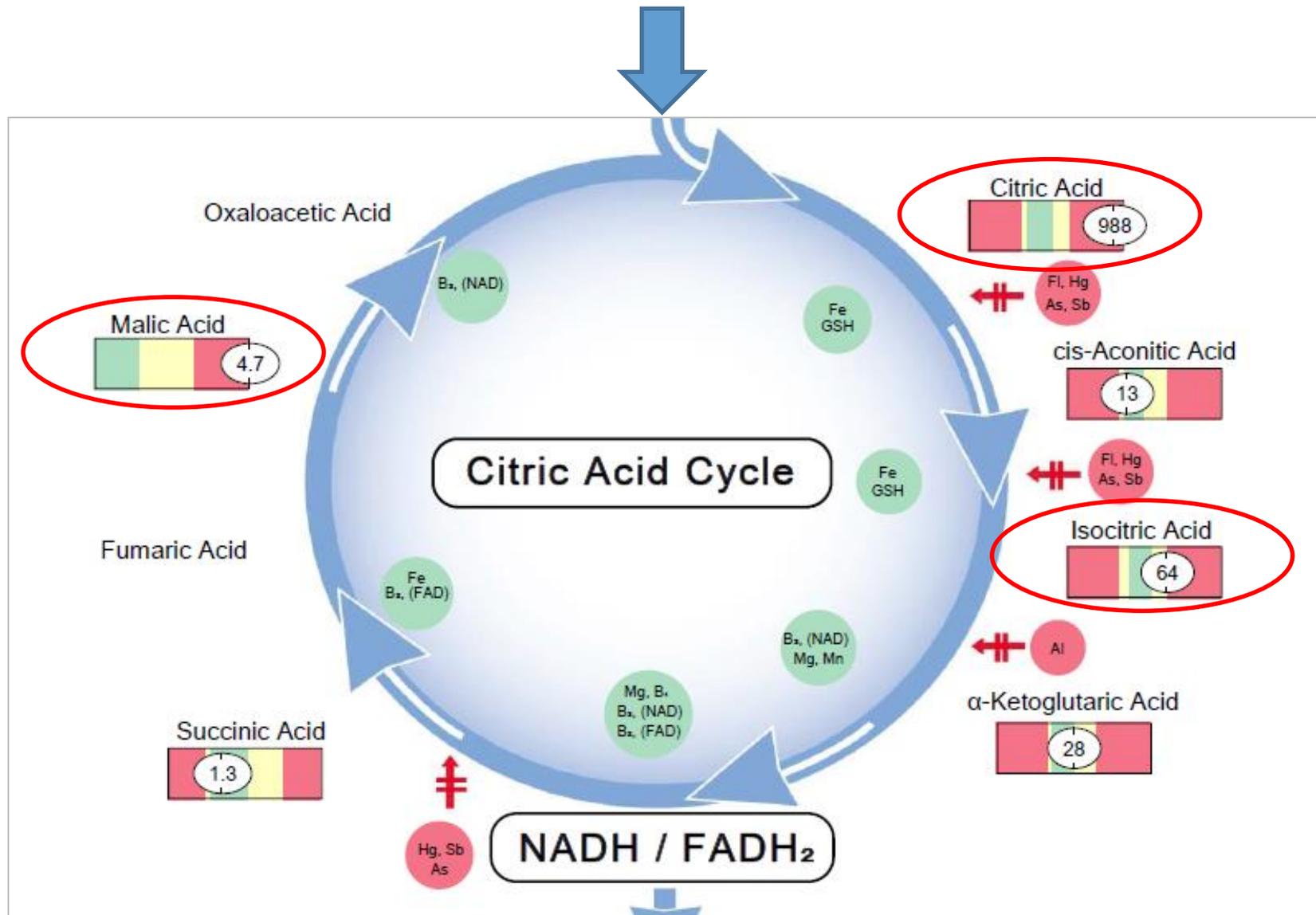
### Krebs Cycle At-A-Glance



Efficient macronutrient conversion (glycolysis and β-oxidation)



# Macronutrients



- Signs of inhibition within the cycle
- Inefficiencies in energy production (ATP generation)



# Metabolic Analysis Markers (Urine)

<b>Malabsorption and Dysbiosis Markers</b>			
<b>Malabsorption Markers</b>		<b>Reference Range</b>	
Indoleacetic Acid (IAA)	1.2	<= 4.2	
Phenylacetic Acid (PAA)	0.22	<= 0.12	
<b>Bacterial Dysbiosis Markers</b>			
Dihydroxyphenylpropionic Acid (DHPPA)	0.9	<= 5.3	
3-Hydroxyphenylacetic Acid	3.6	<= 8.1	
4-Hydroxyphenylacetic Acid	9	<= 29	
Benzoic Acid	0.14	<= 0.05	
Hippuric Acid	<dl	<= 603	
<b>Yeast / Fungal Dysbiosis Markers</b>			
Arabinose	112	<= 96	
Citramalic Acid	8.7	<= 5.8	
Tartaric Acid	<dl	<= 15	

<b>Neurotransmitter Metabolites</b>			
		<b>Reference Range</b>	
Vanilmandelic Acid	2.6	0.4-3.6	
Homovanillic Acid	2.7	1.2-5.3	
5-OH-indoleacetic Acid	14.4	3.8-12.1	
3-Methyl-4-OH-phenylglycol	0.10	0.02-0.22	
Kynurenic Acid	2.4	<= 7.1	
Quinolinic Acid	3.3	<= 9.1	
Kynurenic / Quinolinic Ratio	0.73	>= 0.44	

- Dysbiosis markers contributing to the probiotic recommendation
- 5-HIAA may be sign of unmet needs for B-vitamins, magnesium, and manganese, but can be due to other factors



# Metabolic Analysis Markers (Urine)

Vitamin Markers		Reference Range
α-Ketoadipic Acid	0.7	≤ 1.7
α-Ketoisovaleric Acid	0.73	≤ 0.97
α-Ketoisocaproic Acid	0.74	≤ 0.89
α-Keto-β-Methylvaleric Acid	2.3	≤ 2.1
Formiminoglutamic Acid (FIGlu)	0.5	≤ 1.5
Glutaric Acid	1.59	≤ 0.51
Isovalerylglycine	2.5	≤ 3.7
Methylmalonic Acid	1.5	≤ 1.9
Xanthurenic Acid	0.29	≤ 0.96
3-Hydroxypropionic Acid	13	5-22
3-Hydroxyisovaleric Acid	51	≤ 29

Toxin & Detoxification Markers		Reference Range
α-Ketophenylacetic Acid (from Styrene)	0.33	≤ 0.46
α-Hydroxyisobutyric Acid (from MTBE)	7.8	≤ 6.7
Orotic Acid	0.60	0.33-1.01
Pyroglutamic Acid	30	16-34

- Alpha-keto acid accumulation
- Glutaric elevation suggests B2 need
- Methylmalonic suggests B12 need
- A-hydroxyisobutyric acid is evidence of MTBE exposure



# Amino Acids (Plasma)

<b>Nutritionally Essential Amino Acids</b>			
Amino Acid			Reference Range
Arginine	4.5		6.0-17.5
Histidine	7.3		6.5-13.3
Isoleucine	5.00		5.79-18.69
Leucine	10.6		12.1-36.1
Lysine	16.7		13.7-34.7
Methionine	3.5		2.3-6.5
Phenylalanine	7.01		6.07-17.46
Taurine	5.12		4.41-10.99
Threonine		16.80	6.42-16.32
Tryptophan	3.18		2.65-6.67
Valine	22.0		18.3-42.6

<b>Nonessential Protein Amino Acids</b>			
Amino Acid			Reference Range
Alanine	29		23-62
Asparagine	6.9		3.5-11.6
Aspartic Acid	<dl		<= 0.67
Cyst(e)ine	7.7		5.9-19.9
γ-Aminobutyric Acid	0.03		<= 0.06
Glutamic Acid	7.3		2.0-14.5
Glutamine	63		44-111
Proline	37		15-57
Tyrosine	8.9		6.2-18.5

Unmet amino acid needs may be due to suboptimal digestion of protein



# Amino Acids (Plasma)

## Intermediary Metabolites

Urea Cycle Markers			
Citrulline	2.9	1.6-5.7	
Ornithine	9.00	4.38-15.42	
Urea	211	216-1,156	

Glycine/Serine Metabolites			
Glycine	12	5-23	
Serine	5.8	2.1-7.0	
Ethanolamine	0.39	0.19-0.78	
Phosphoethanolamine	0.16	0.15-0.64	
Phosphoserine	<dl	<= 0.39	
Sarcosine	0.12	<= 0.15	

## Dietary Peptide Related Markers

		Reference Range
1-Methylhistidine	<dl	<= 1.64
β-Alanine	0.3	<= 0.7



# Essential and Metabolic Fatty Acids Markers (RBCs)

Omega 3 Fatty Acids		
Analyte	(cold water fish, flax, walnut)	Reference Range
$\alpha$ -Linolenic (ALA) 18:3 n3	0.13	$\geq 0.09$ wt %
Eicosapentaenoic (EPA) 20:5 n3	0.27	$\geq 0.16$ wt %
Docosapentaenoic (DPA) 22:5 n3	1.31	$\geq 1.14$ wt %
Docosahexaenoic (DHA) 22:6 n3	3.4	$\geq 2.1$ wt %
% Omega 3s	5.1	$\geq 3.8$

Omega 9 Fatty Acids		
Analyte	(olive oil)	Reference Range
Oleic 18:1 n9	12	10-13 wt %
Nervonic 24:1 n9	3.3	2.1-3.5 wt %
% Omega 9s	15.7	13.3-16.6

Omega 6 Fatty Acids		
Analyte	(vegetable oil, grains, most meats, dairy)	Reference Range
Linoleic (LA) 18:2 n6	9.4	10.5-16.9 wt %
$\gamma$ -Linolenic (GLA) 18:3 n6	0.13	0.03-0.13 wt %
Dihomo- $\gamma$ -linolenic (DGLA) 20:3 n6	0.94	$\geq 1.19$ wt %
Arachidonic (AA) 20:4 n6	21	15-21 wt %
Docosatetraenoic (DTA) 22:4 n6	4.19	1.50-4.20 wt %
Eicosadienoic 20:2 n6	0.24	$\leq 0.26$ wt %
% Omega 6s	35.8	30.5-39.7

Common pattern: higher intake of omega-6, than omega-3



# Essential and Metabolic Fatty Acids Markers (RBCs)

Saturated Fatty Acids		
Analyte	(meat, dairy, coconuts, palm oils)	Reference Range
Palmitic C16:0	18	18-23 wt %
Stearic C18:0	18	14-17 wt %
Arachidic C20:0	0.36	0.22-0.35 wt %
Behenic C22:0	1.11	0.92-1.68 wt %
Tricosanoic C23:0	0.21	0.12-0.18 wt %
Lignoceric C24:0	2.9	2.1-3.8 wt %
Pentadecanoic C15:0	0.09	0.07-0.15 wt %
Margaric C17:0	0.34	0.22-0.37 wt %
<b>% Saturated Fats</b>	<b>41.9</b>	<b>39.8-43.6</b>

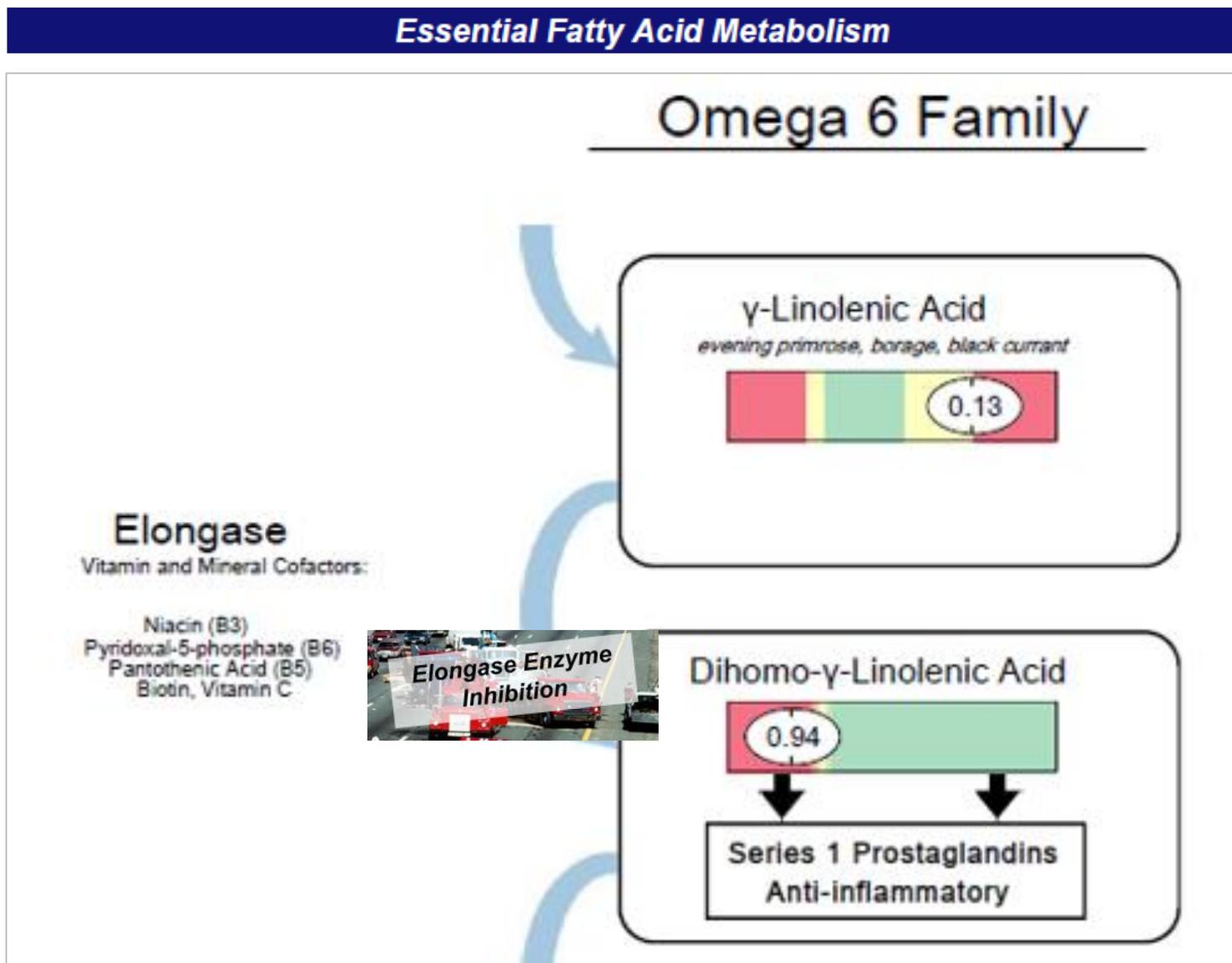
Monounsaturated Fats		
Analyte		Reference Range
<b>Omega 7 Fats</b>		
Palmitoleic 16:1 n7	0.26	<= 0.64 wt %
Vaccenic 18:1 n7	0.95	<= 1.13 wt %
<b>Trans Fat</b>		
Elaidic 18:1 n9t	0.31	<= 0.59 wt %
Delta - 6 Desaturase Activity		
	Upregulated Functional Impaired	
Linoleic / DGLA 18:2 n6 / 20:3 n6	10.1	6.0-12.3
Cardiovascular Risk		
Analyte		Reference Range
Omega 6s / Omega 3s	7.0	3.4-10.7
AA / EPA 20:4 n6 / 20:5 n3	79	12-125
Omega 3 Index	3.7	>= 4.0

Another reason to consider omega-3 support for an athletic patient





# Essential and Metabolic Fatty Acids Markers (RBCs)



Inhibition at the Elongase enzyme, resulting in low DGLA → less protection against inflammation



# Ox Stress & Vitamin D

Oxidative Stress Markers			
Reference Range			
Methodology: Colorimetric, thiobarbituric acid reactive substances (TBARS), Alkaline Picrate, Hexokinase/G-6-PDH, LC/MS/MS, HPLC			
Glutathione (whole blood)		1,170	>=669 micromol/L
Lipid Peroxides (urine)		6.7	<=10.0 micromol/g Creat.
8-OHdG (urine)		3	<=15 mcg/g Creat.
Coenzyme Q10, Ubiquinone (serum)		0.35	0.43-1.49 mcg/mL

The Oxidative Stress reference ranges are based on an adult population. The performance characteristics of the Oxidative Stress Markers have been verified by Genova Diagnostics, Inc. They have not been cleared by the U.S. Food and Drug Administration.

Vitamin D (Serum)			
	Inside Range	Outside Range	Reference Range
Methodology: Chemiluminescent			
25 - OH Vitamin D *			50-100 ng/mL

- CoQ10 is involved in antioxidant processes, as well as ATP synthesis
- Vitamin D has many functions important to the athlete, including muscle function and injury recovery



# Elemental Markers

## Nutrient Elements

Element	Reference Range	Reference Range
Copper (plasma)	106.9	75.3-192.0 mcg/dL
Magnesium (RBC)	36.5	30.1-56.5 mcg/g
Manganese (whole blood)	7.7	3.0-16.5 mcg/L
Potassium (RBC)	2,289	2,220-3,626 mcg/g
Selenium (whole blood)	181	109-330 mcg/L
Zinc (plasma)	82.0	64.3-159.4 mcg/dL

The Elemental reference ranges are based on an adult population.

## Toxic Elements\*

Element	Reference Range	Reference Range
Lead	<DL	<= 2.81 mcg/dL
Mercury	<DL	<= 4.35 mcg/L
Arsenic	<DL	<= 13.7 mcg/L
Cadmium	0.14	<= 1.22 mcg/L
Tin	<DL	<= 0.39 mcg/L

\* All toxic Elements are measured in whole blood.

Methodology: ICP-MS

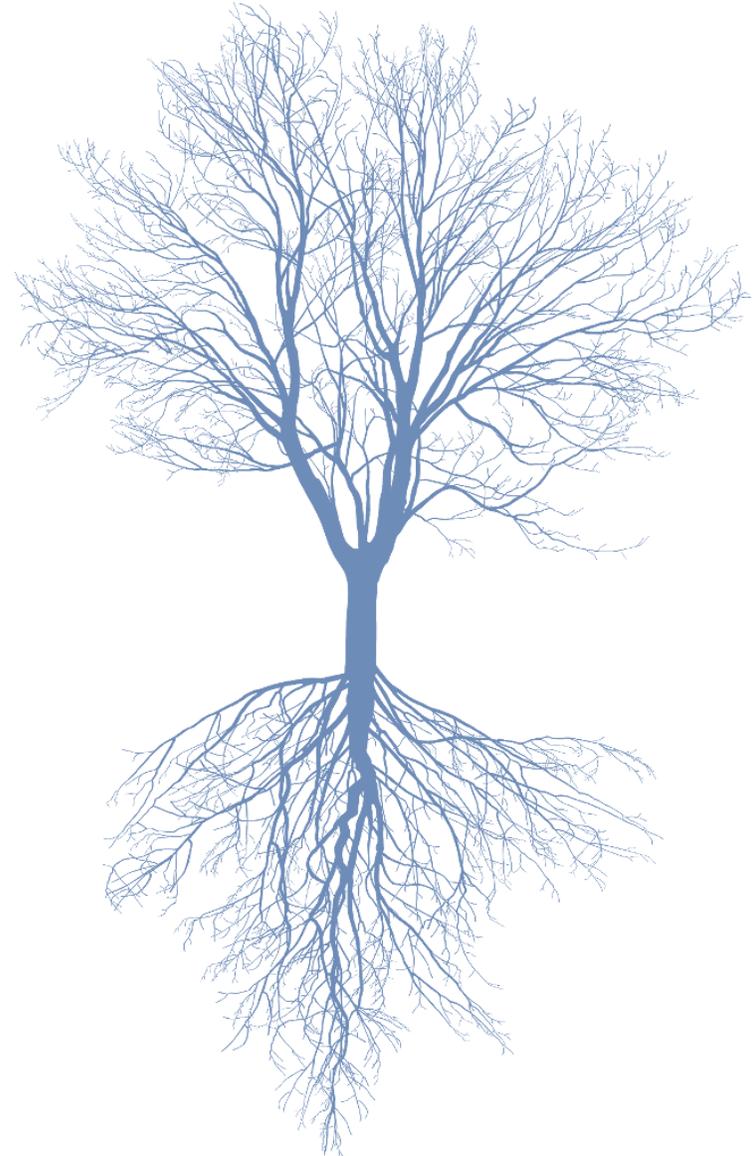
- RBC potassium *does not* equate to serum potassium
- If RBC potassium is low, consider foods sources: beet greens, swiss chard, spinach, brussels sprouts, tomatoes, asparagus, cabbage, crimini mushrooms, turnip greens, celery



# The Root Cause of Nutrient Needs

## If many borderline or high needs, consider:

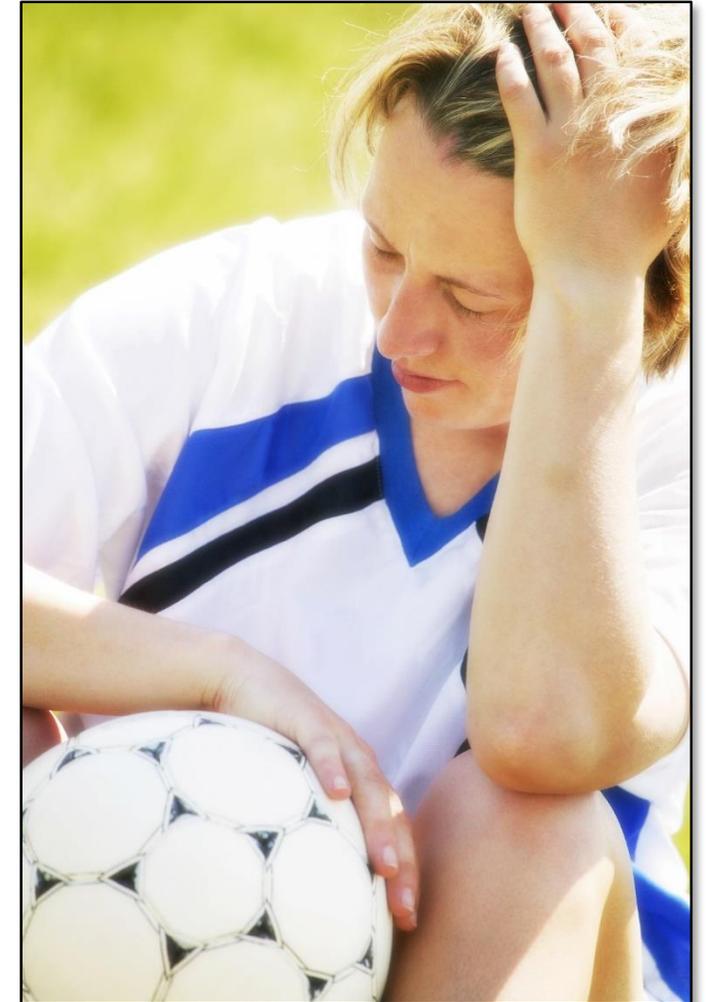
- Low dietary intake of nutrients
- Digestion/Absorption impairment
- Increased utilization of nutrients
  - Biochemical “burn though” (i.e. athletes)
  - High stress levels
  - Medications that deplete nutrients
  - Autoimmune conditions or other active disease processes
  - Toxic exposures (i.e. smoking, alcohol, environmental)
  - Genetic polymorphisms (i.e. COMT, MTHFR)



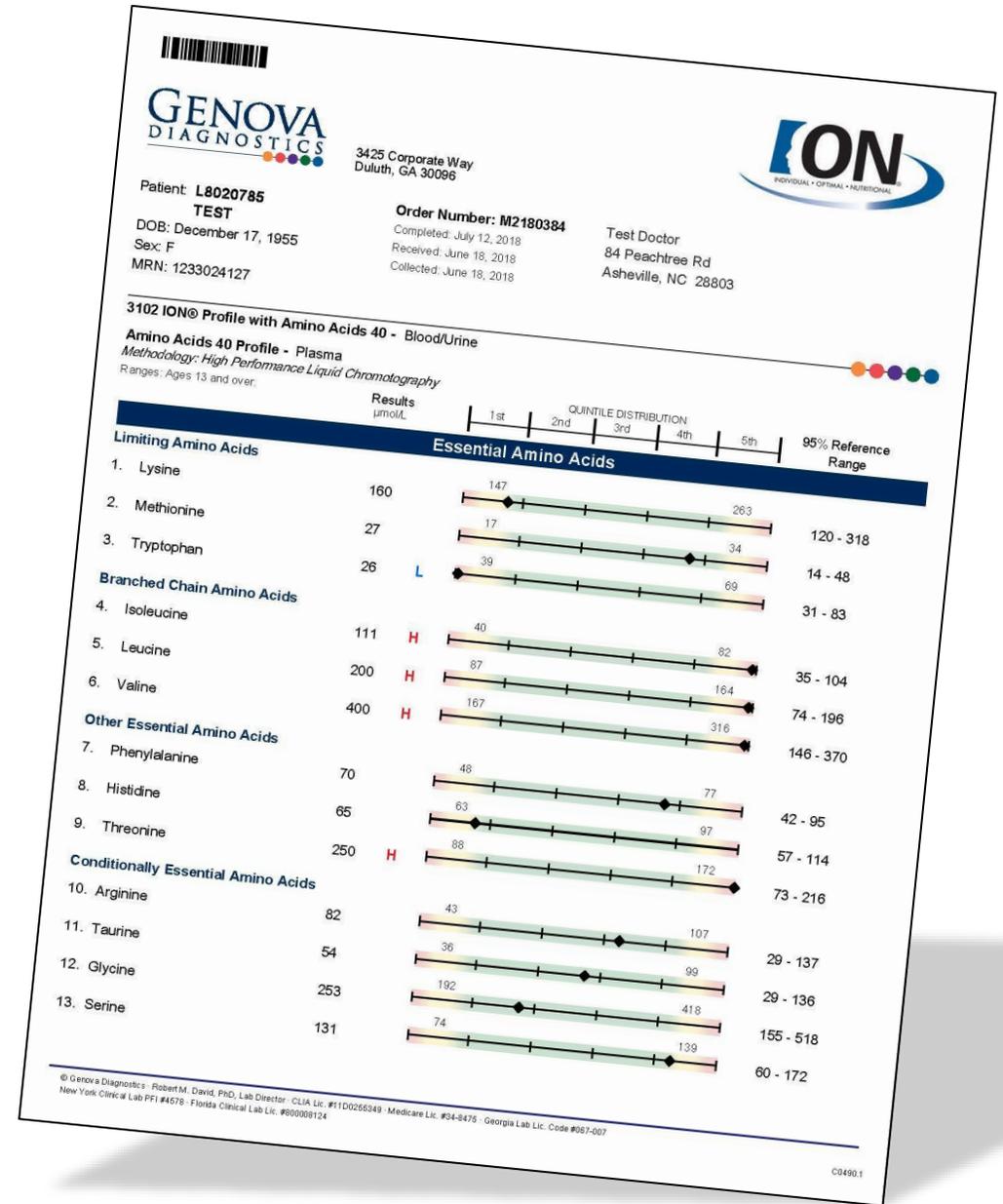


# Case 1: Treatment Considerations

- Diet and Lifestyle
  - Increase omega-3 containing foods (flax, walnut, fish)
  - Encourage stress management practices
  - Increase sleep to 8 hours per night
  - Consider **Adrenocortex Stress Profile** with CAR to assess
- Switch to high quality multivitamin, ensuring robust B-vitamins and magnesium
- Vitamin D
- CoQ10
- Broad spectrum probiotic
- Digestive enzymes with protein-containing meals
  - Consider **GI Effects Comprehensive** if loose stools persist
- Follow up with **NutrEval Plasma** in 6-12 months



# Case 2





## Case 2

### 32 y/o male cyclist / sales associate

- CC: “the bonk” / diminishing endurance
- Diet: high protein, moderate fat, low carb, vegetables sparsely present, convenience foods, energy bars, 3 large cups coffee daily
- Constipation with gas/bloating, averages 3-5 BMs per week
- Supplements: whey protein powder, sports drinks, sporadic use of men’s multivitamin
- Medications: none
- Stress at work is 8 of 10 on average
- Sleeps 5.5 hours per night on average, difficulty falling asleep and staying asleep

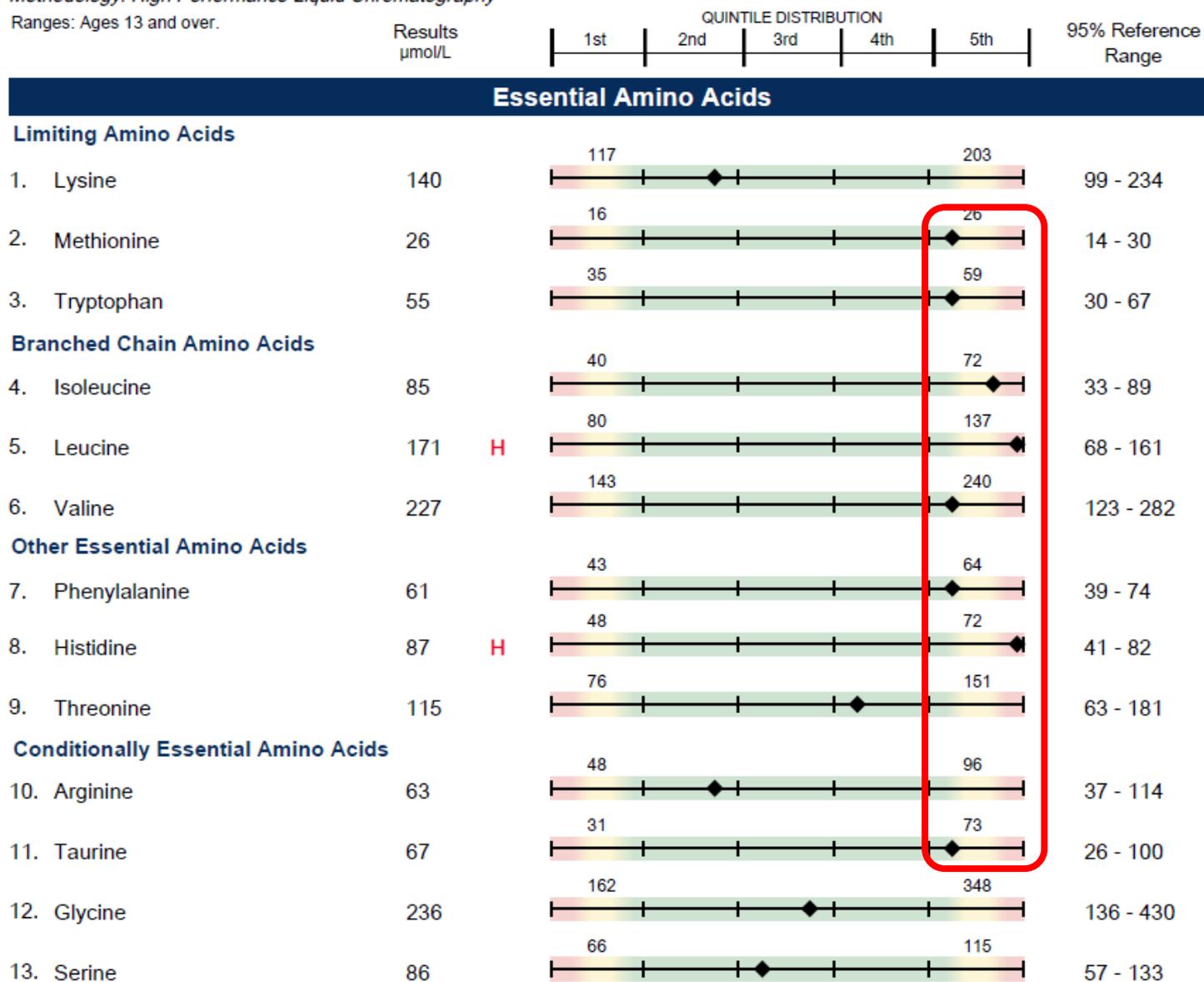




### Amino Acids 20 Profile - Plasma

Methodology: High Performance Liquid Chromatography

Ranges: Ages 13 and over.



Robust protein  
intake: 8 of 13  
amino acids in 5<sup>th</sup>  
quintile



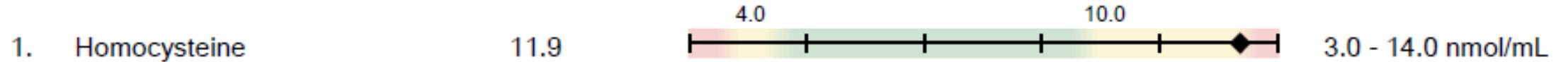
Robust protein intake



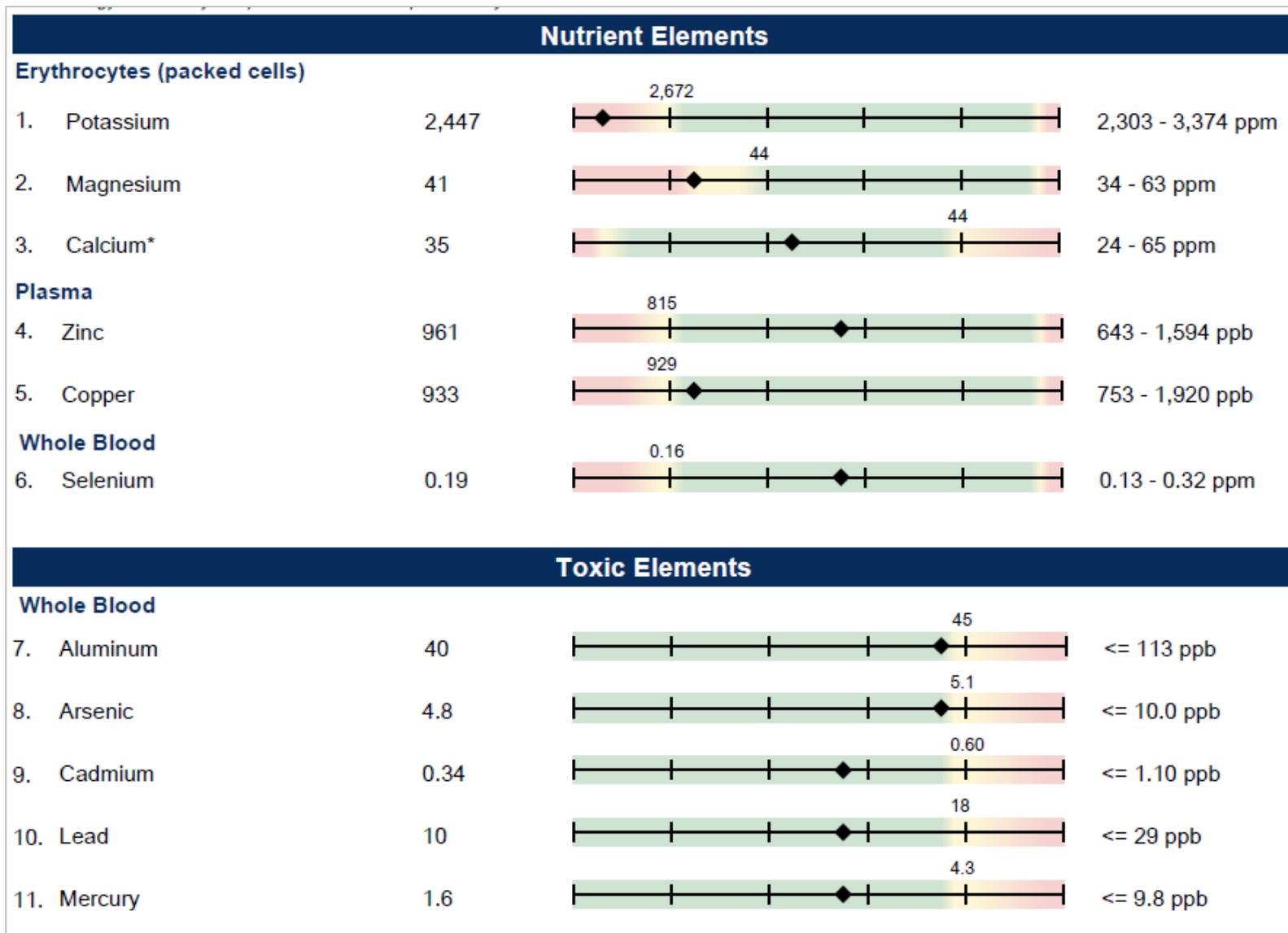
## Homocysteine Assay - Plasma

Methodology: Enzymatic Assay

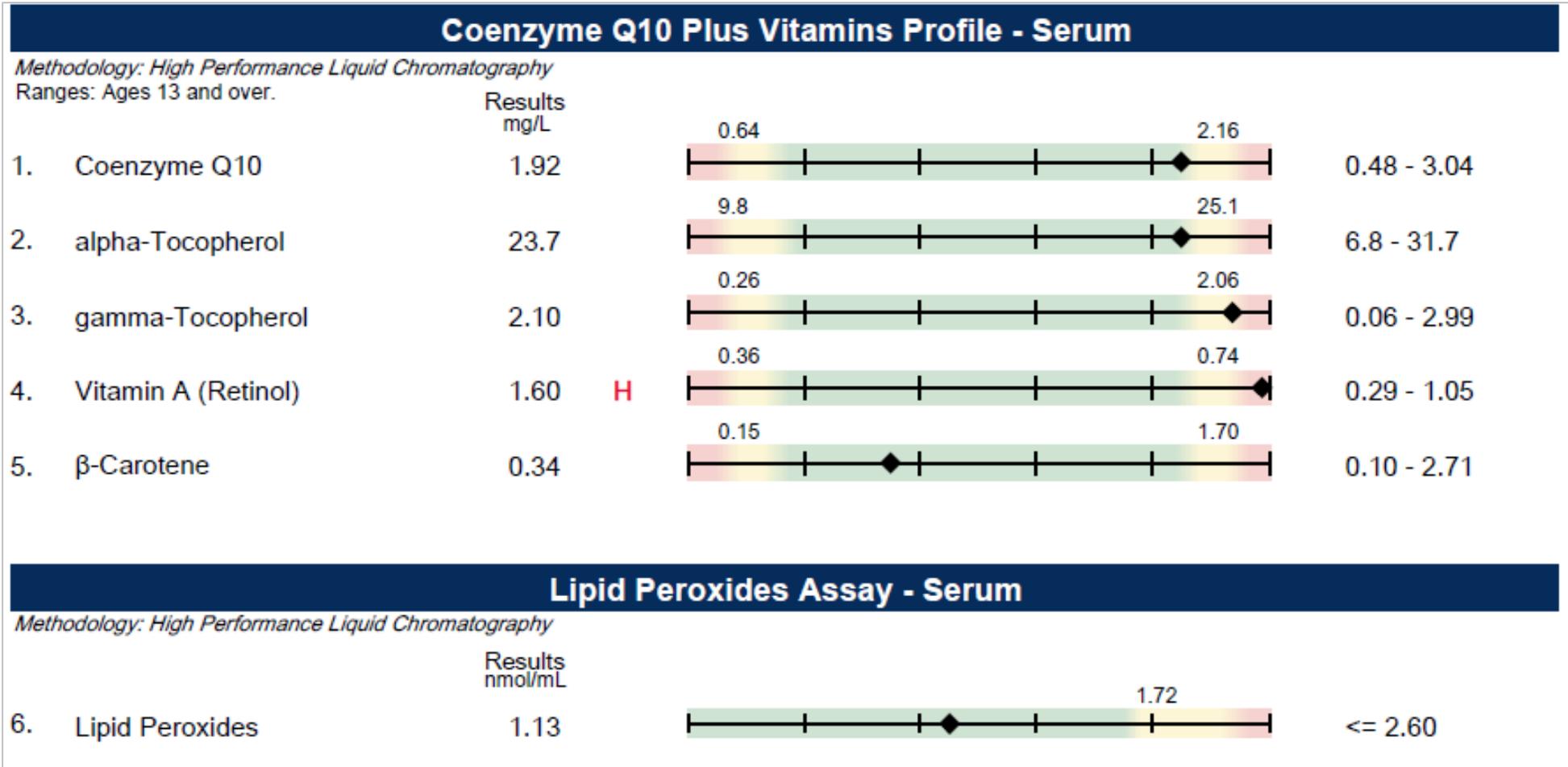
Ranges: Ages 13 and over.



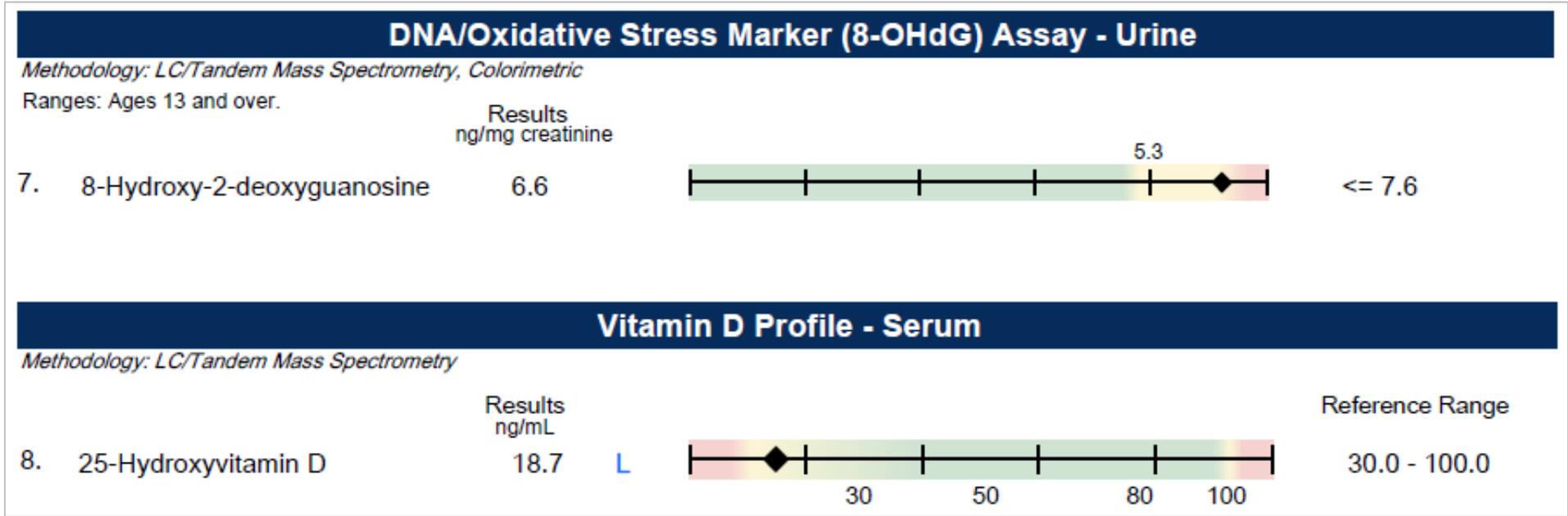
- ↑ Hcy linked to ↑ risk for CVD (stroke, heart attack, and atherosclerosis)
- This is an example of someone who looks “healthy” from the outside, but not inside
- High/normal result may be related to oxidative stress, diminished total antioxidant capacity, lack of dietary antioxidants, chronic inflammation, and/or B-vitamin needs



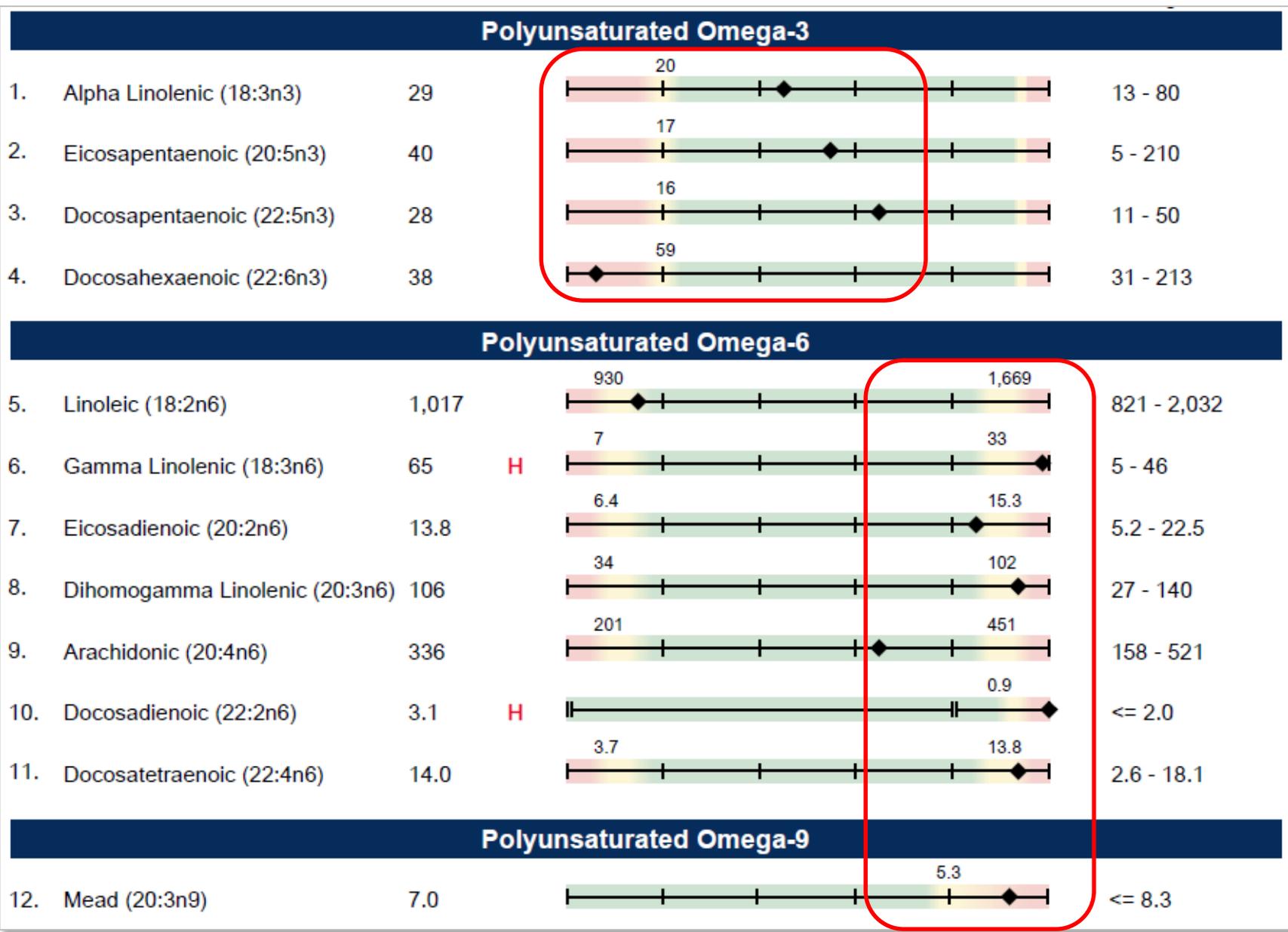
- RBC potassium low/normal
- RBC magnesium: consider support whenever low or low/normal – it's a required cofactor for 300+ biochemical reactions in the body



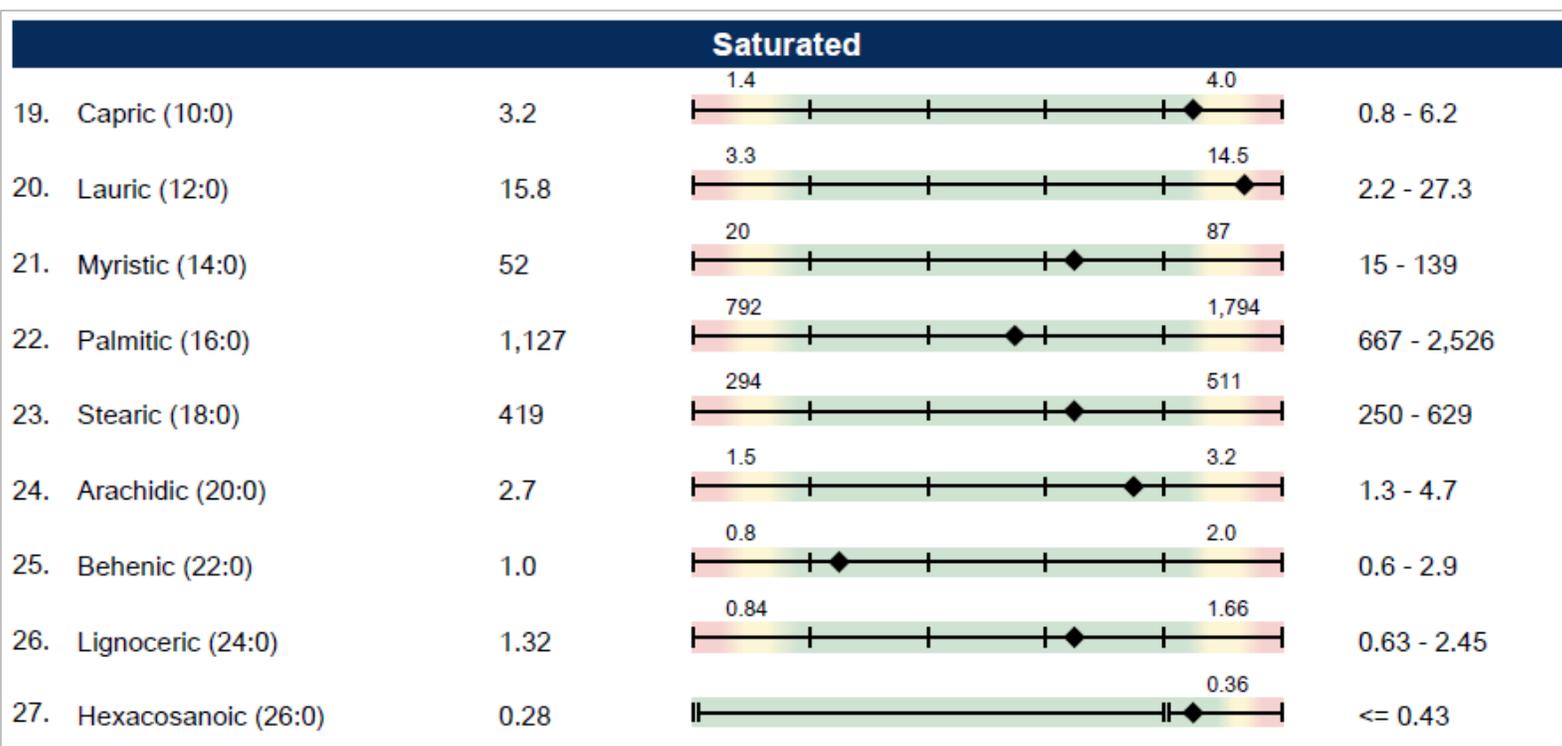
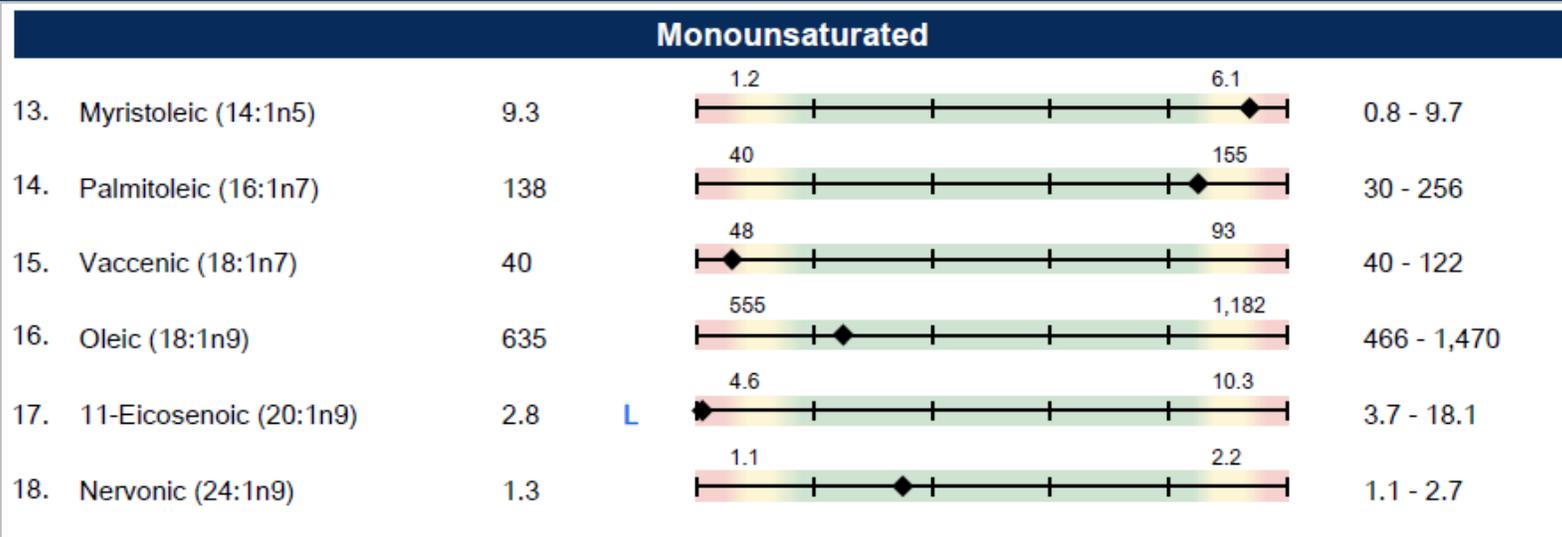
Some persistence in levels of fat soluble vitamins,  
likely coming from patient's multivitamin

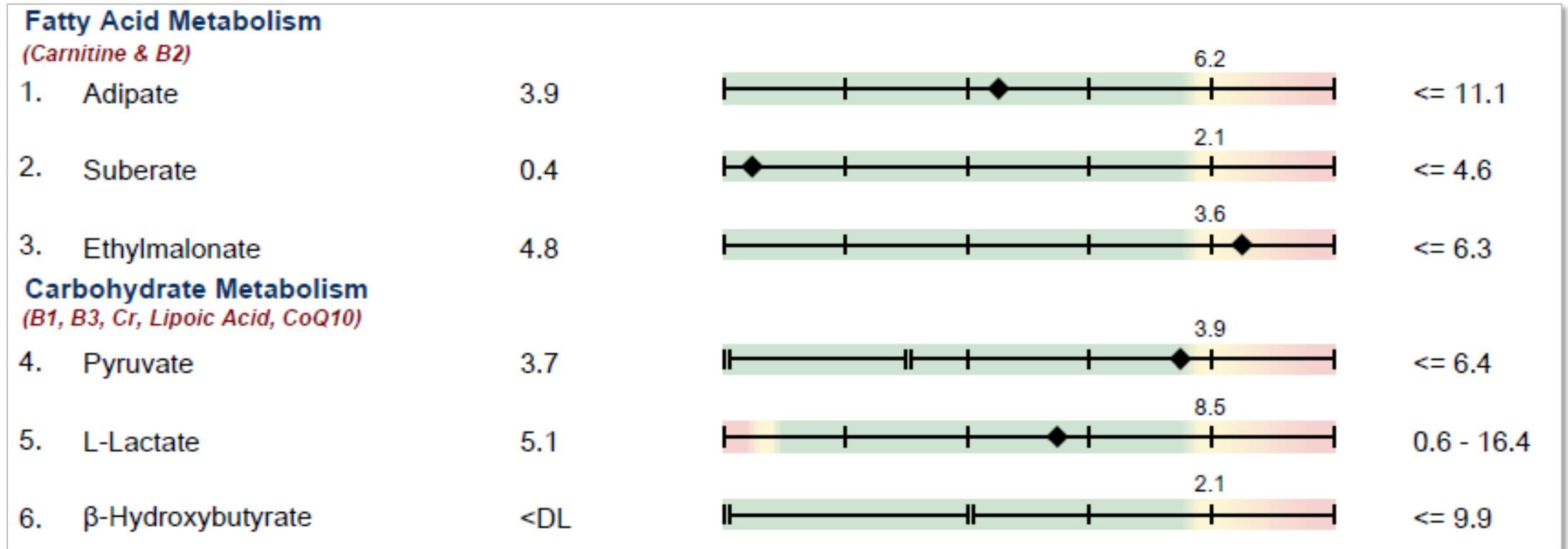


- 8-OhdG shows oxidative damage to DNA in response to free radicals → need for antioxidant support
- Studies are mixed on whether there is a performance benefit to supplementing with antioxidants; however, this is evidence of free radical damage to DNA, so consider addressing it for the sake of overall health and longevity
- Unmet needs for Vitamin D3

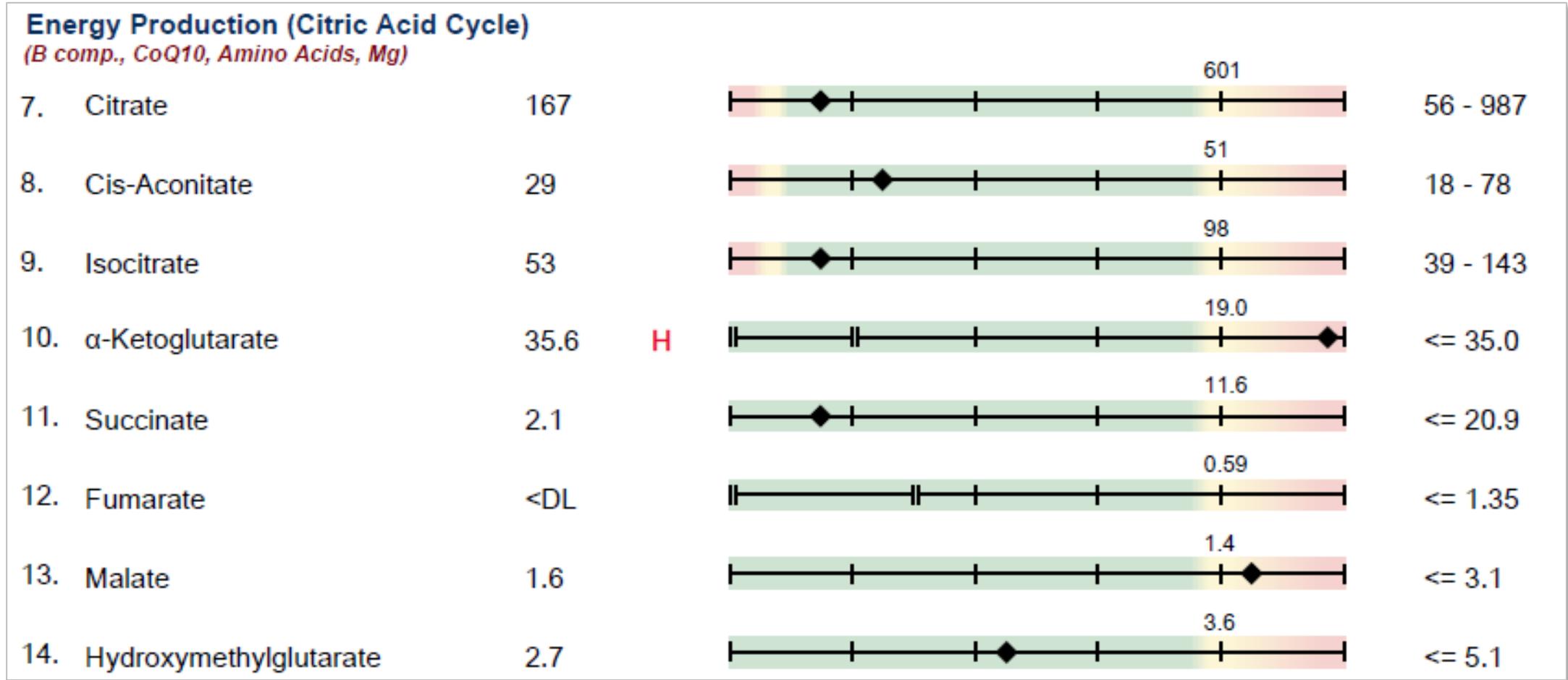


Suboptimal omega 3-6-9 balance  
Support with omega-3 needed

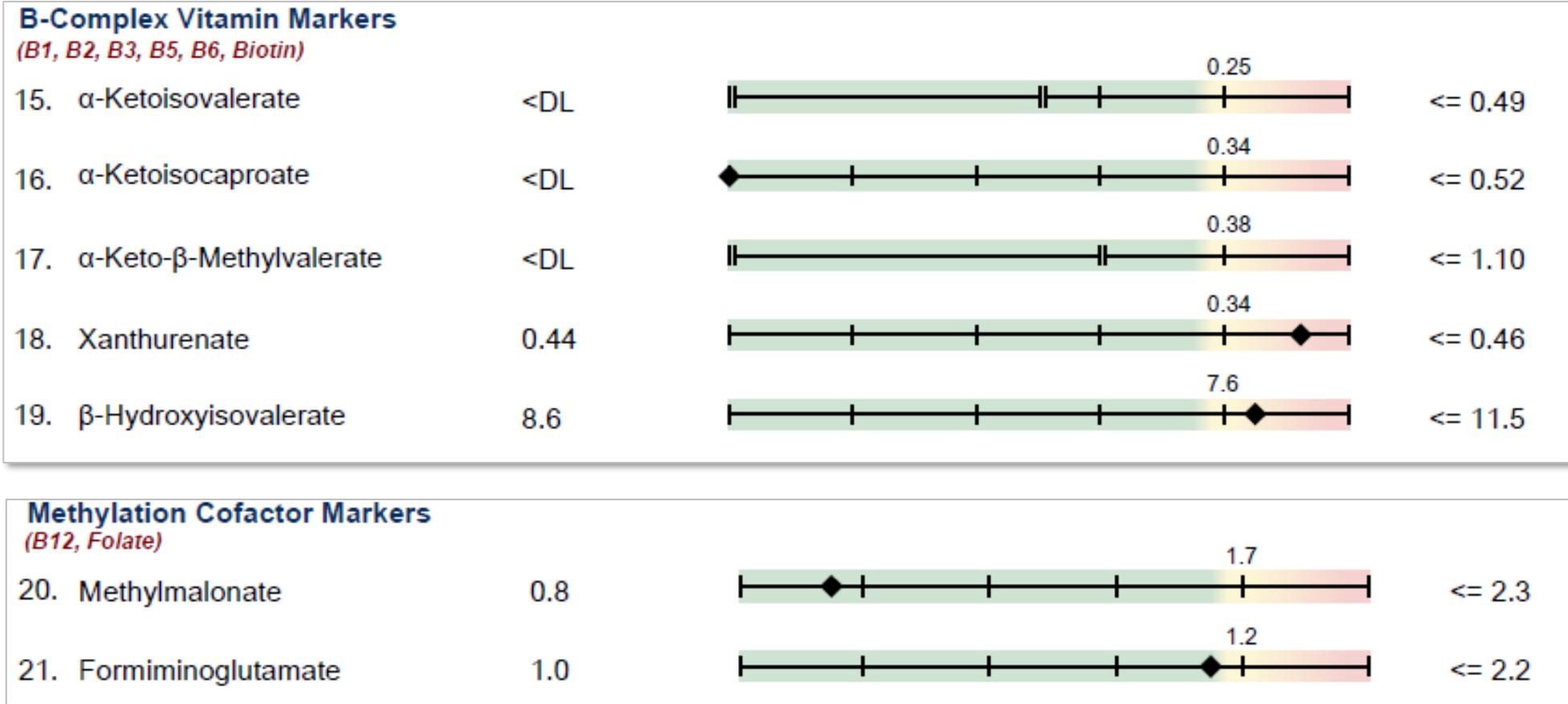




- $\beta$ -oxidation pathway appears to be OK, but high/normal ethylmalonate suggests possible need for B2 and/or carnitine
- Normal pyruvate and lactate indicate that glycolysis is functioning well



- Inhibition in energy production pathways, ATP synthesis
- $\alpha$ -Ketoglutarate is converted with the help of a dehydrogenase enzyme which requires vitamin B1, B2, B3, B5, and lipoic acid to convert to succinate



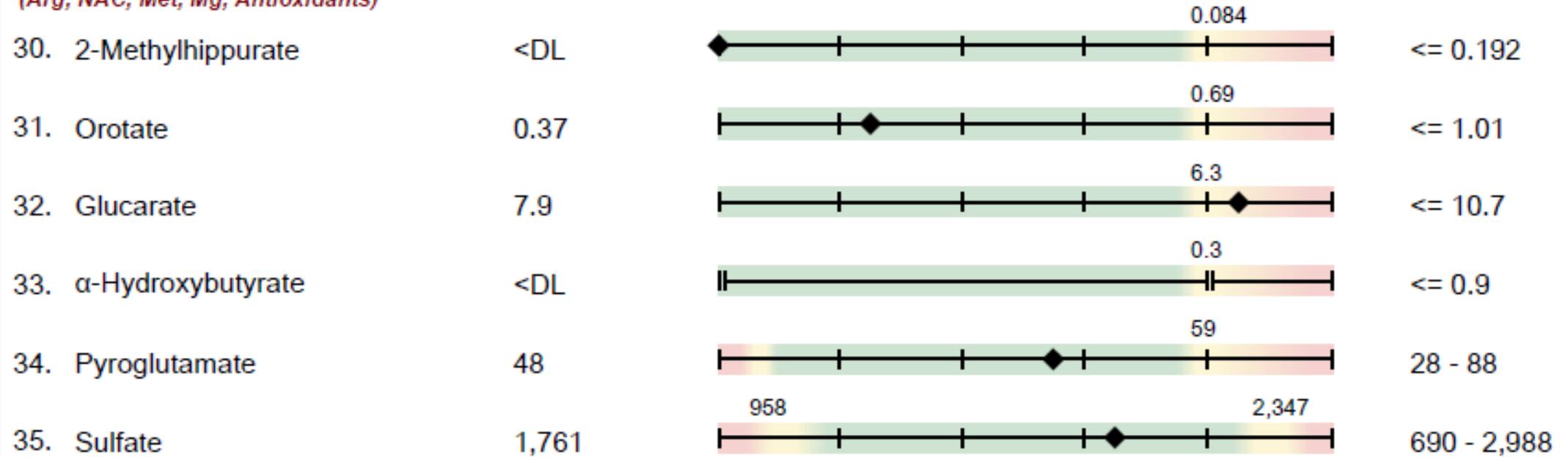
- When elevated, Xanthurenate and  $\beta$ -Hydroxyisovalerate suggest needs for B6 and B7, respectively
- Formiminoglutamate (FIGLU) builds up when there are unmet needs for folate; result here is close to the 80<sup>th</sup> percentile (5<sup>th</sup> quintile)



Neurotransmitter metabolites provide insight about neurotransmitter pathways, which have vitamin cofactor requirements for B-vitamins (especially B6) and some minerals

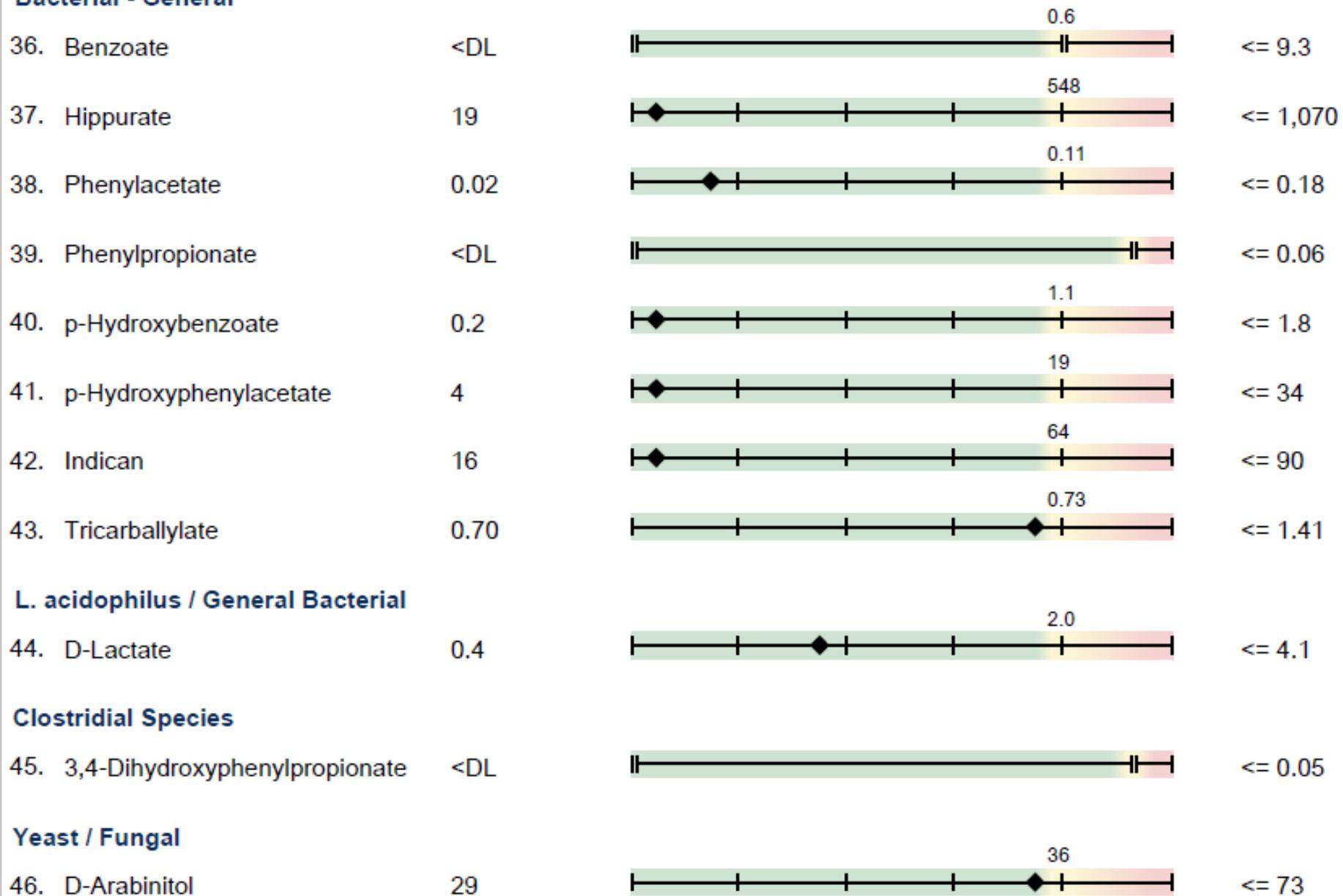


**Detoxification Indicators**  
*(Arg, NAC, Met, Mg, Antioxidants)*





### Bacterial - General





## Additional Considerations

This page is provided as a starting point that may guide decisions about medical treatment based on the test results. It is derived only from the laboratory results included in this report. Final recommendations should be based on consideration of the patient's medical history and current clinical condition.

Nutrient	Nutrient Need
Vitamin D	High
Vitamin B-1 (Thiamin)	Low
Vitamin B-2 (Riboflavin)	Low
Vitamin B-3 (Niacin)	Low
Vitamin B-5 (Pantothenic Acid)	Low
Vitamin B-6 (Pyridoxine)	Low
Magnesium	Low
Coenzyme Q10	Low
Lipoic Acid	Low

Nutrient considerations identified by a complex, weighted algorithm that takes into account all markers from the test



## Case 2: Treatment Considerations

- Diet and Lifestyle
  - Increase intake of colorful fruits and vegetables; increase dietary fiber
  - Incorporate stress management practices
  - Aim for 8 hours of sleep
  - Consider **Adrenocortex Stress Profile** with CAR and melatonin to assess HPA axis
  - Reduce coffee intake, green tea as substitute
- Vitamin D
- Antioxidant support (alpha lipoic acid)
- B-complex
- Switch to protein powder with multivitamin incorporated
- Consider **GI Effects Comprehensive**
- Follow up with **ION** in 6-12 months





# Review

- Highlighted the relevance of nutritional testing for athletic patients
- Looked at clinical significance of functional biomarkers of nutritional status
- Identified some key areas of nutritional support for athletes
- Interpreted a NutrEval and ION





# Other Clinical Considerations & Resources



## NutrEval *or* ION

The **NutrEval** and **ION** answer many of the same clinical questions about nutritional status for your athletic patients. There's no need to do both.

## Sporting Rules and Regulations

When supplementing competitive athletes, ensure that your recommendations do not include any banned substances.





	General Findings	Specific Findings	Linked Profile	Rationale
Strong probiotic or pancreatic enzyme recommendations		<ul style="list-style-type: none"> <li>↑Malabsorption/Dysbiosis markers</li> <li>↑Dietary Peptide markers</li> <li>↓Amino Acids</li> </ul>	<i>GI Effects Comprehensive or CDSA 2.0</i>	Detailed assessment of gut bacteria is provided.
		If protein digestion is impaired, amino acids may be less accessible. Checking Pancreatic Elastase can provide insight into pancreatic exocrine function.		
Elevated toxic elements or detoxification indicators		<ul style="list-style-type: none"> <li>↑Toxic Elements</li> </ul>	<i>Comprehensive Urine Elements Profile</i>	Identifies additional toxic metals that may also be a problem for the patient.
			<i>Toxic Elements Clearance Profile</i>	
			Genomics add-on: APOE	APO E4 has been linked to dementia via increased uptake of metals in the brain.
Oxidative Stress Markers abnormal		<ul style="list-style-type: none"> <li>↑MTBE metabolite</li> <li>↑Styrene metabolite</li> <li>↑2-methylhippurate (<i>ION</i>)</li> </ul>	<i>Toxic Effects CORE</i>	Helps to identify other non-metal toxins that contribute to a patient's toxic burden.
		<ul style="list-style-type: none"> <li>↓Glutathione</li> <li>↑Lipid Peroxides</li> <li>↑8-OHdG</li> </ul>		<i>Ox Stress Analysis 2.0 (blood)</i>
Elevations in neurotransmitter metabolites		<ul style="list-style-type: none"> <li>↑Vanilmandelic Acid</li> <li>↑Homovanillic Acid</li> <li>↓Kynurenic/Quinolinic ratio</li> </ul>	<i>Adrenocortex Stress Profile with CAR</i>	Provides additional insight into adrenal function (salivary cortisol and DHEA) to assess stress hormones.
		<ul style="list-style-type: none"> <li>↑5-Hydroxy-idoleacetic Acid with ↑ in dysbiosis markers</li> </ul>		<i>GI Effects Comprehensive or CDSA 2.0</i>
Overall high needs, even when patient is taking vitamins/supplements			Genomics add-ons: (COMT & MTHFR)	SNPs in MTHFR suggest methylation problems. A COMT SNP can indicate potential problems in deactivating catecholamines.
				<i>GI Effects Comprehensive or CDSA 2.0</i>
		Many high nutrient needs indicated in the Suggested Supplement Schedule	<i>GI Effects Comprehensive or CDSA 2.0</i>	



Strong probiotic or pancreatic enzyme recommendations

Elevated toxic elements or detoxification indicators

Oxidative Stress Markers abnormal

Elevations in neurotransmitter metabolites

Overall high needs, even when patient is taking vitamins/supplements

**Note:** These are general considerations. They may not be applicable to some patients. All testing decisions are the responsibility of the ordering clinician.



# Resources for Clinicians

- PubMed
  - [www.ncbi.nlm.nih.gov/pubmed](http://www.ncbi.nlm.nih.gov/pubmed)
- Google Scholar
  - [scholar.google.com](http://scholar.google.com)
- Europe PMC
  - [europepmc.org](http://europepmc.org)
- Human Metabolome Database
  - [www.hmdb.ca](http://www.hmdb.ca)
- Linus Pauling Micronutrient Information Center
  - <https://lpi.oregonstate.edu/mic>

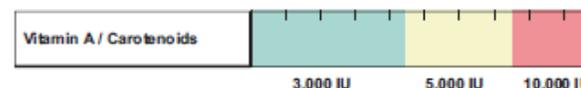


## Interpretation At-A-Glance Key



### NutrEval Interpretation At-A-Glance

#### Nutritional Needs



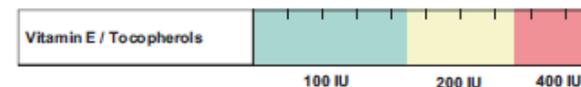
#### Biomarkers Evaluated:

β-Alanine    Taurine  
Cysteine    8-OHdG  
Cystine    Lipid Peroxides  
Glycine



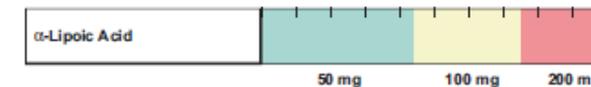
#### Biomarkers Evaluated:

Cysteine    Glutathione  
Cystine    8-OHdG



#### Biomarkers Evaluated:

β-Alanine    8-OHdG  
Cysteine    Lipid Peroxides  
Cystine  
Glycine  
Taurine



#### Biomarkers Evaluated:

Glutathione    Taurine  
Pyroglutamic Acid    8-OHdG  
Methionine    Lipid Peroxides



**Lahnor Powell, ND**  
Moderator



**Warren Brown, ND**  
Presenter

Explore  
**WWW.GDX.NET**

*for more information and  
educational resources, including...*

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**LIVE GDX** – Previous webinar recordings

**GI University** – Focused learning modules

**Conferences** – Schedule of events we attend

**Test Menu** – Detailed test profile information

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**MY GDX** – Order materials and get results

# Questions?



# Additional Questions?

**US Client Services: 800-522-4762**

**UK Client Services: 020-8336-7750**

**Please schedule a complimentary appointment with one of our Medical Education Specialists for questions related to:**

- Diagnostic profiles featured in this webinar
- How Genova's profiles might support patients in your clinical practice
- Review a profile that has already been completed on one of your patients

***We look forward to hearing from you!***



# Upcoming <sup>LIVE</sup> GDX Webinar Topics

**September 26, 2018**

**Functional Medicine Approach to Osteoporosis**

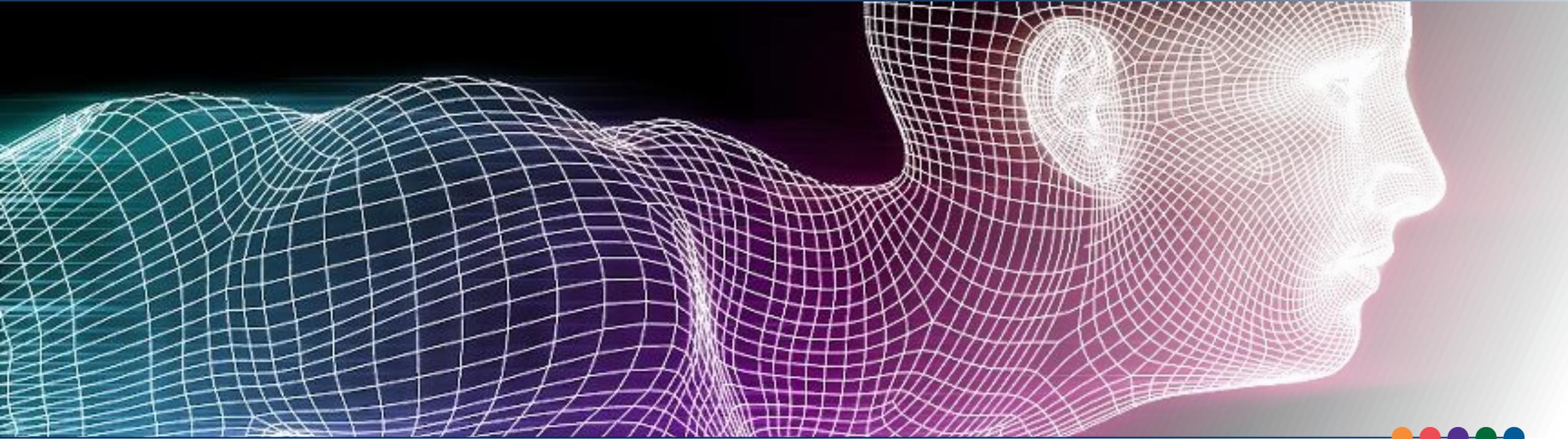
**Prevention and Treatment**

Elizabeth Board, MD

Register for upcoming <sup>LIVE</sup> GDX Webinars online at [WWW.GDX.NET](http://WWW.GDX.NET)

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# NutrEval & ION: Case-Based Interpretation for the Athletic Patient

Warren Brown, ND