Functional Approach to Postnatal Depletion Syndrome

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Overview of this Presentation

- Define what is the postnatal depletion syndrome, common symptoms, and how long it can impact women
- Review literature as it relates to nutritional demands during the postnatal time-frame
- Using a NutrEval Profile case, discuss common patterns viewed with nutrition testing

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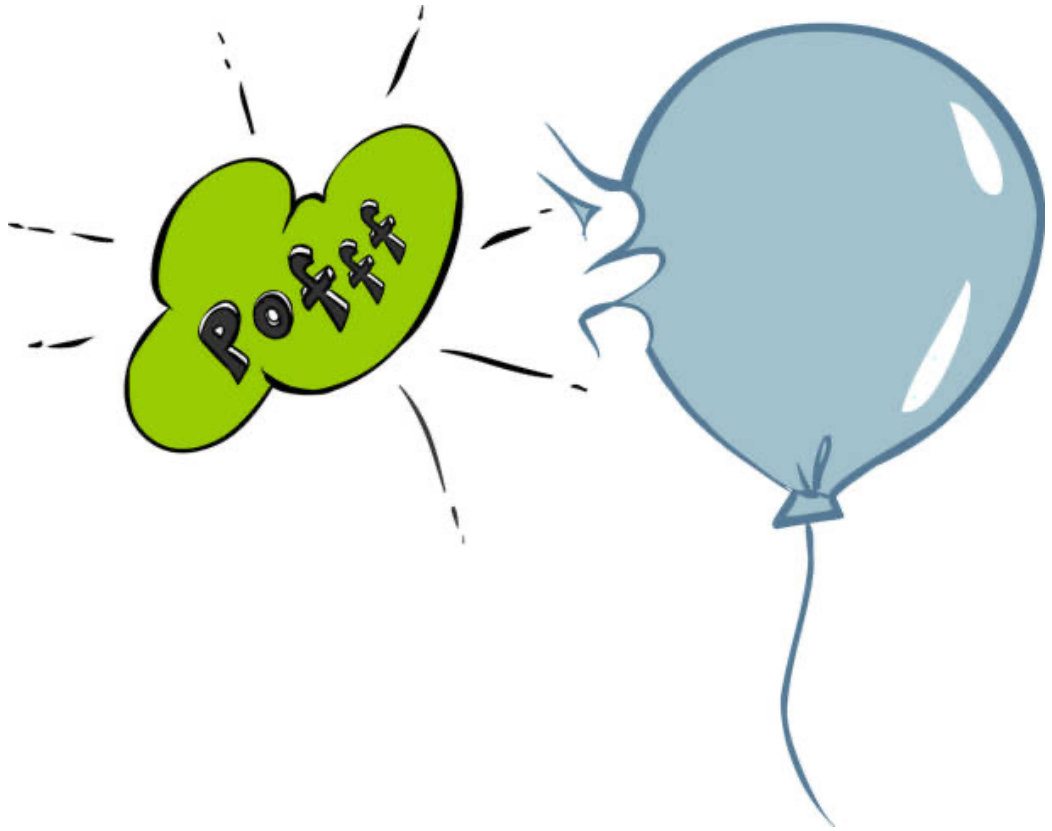
Postnatal Depletion Syndrome

Defined by Dr. Oscar Serrallach as a constellation of symptoms affecting all spheres of a mother's life after she gives birth

1. Nutrient insufficiency
2. Sleep deprivation
3. New mother's role change



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Serrallach O. (2018). New York, NY: Hachette Book Group.
https://www.istockphoto.com/illustrations/deflated-balloon

Symptoms of Postnatal Depletion

- Anxiety
- Baby Brain
- Depression
- Easily Bruised
- Fatigue
- Hair loss and brittle nails
- Inflammation
- Insomnia
- Irritable
- Joint aches and pains
- Loss of self-confidence
- Low libido
- Overweight
- Sensitivity to light and sound
- Thinning and loose skin
- “Tired but wired”

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Serrallach O. (2018). New York, NY: Hachette Book Group.

Postnatal Depletion Duration

- If not properly managed, can last up to **10 YEARS**
- Many considerations
  - Babies' health status
  - Breastfeeding
  - Diet and nutrition
  - Pregnancy related complications
  - Social support system
  - Sleep
  - Stress management

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Serrallach O. (2018). New York, NY: Hachette Book Group.

Postnatal Nutrition

Iron

Zinc

Vitamin B12

Vitamin D

Copper

B-Vitamins

Magnesium

Trace Elements

Vitamin C

Fat-Soluble Vitamins

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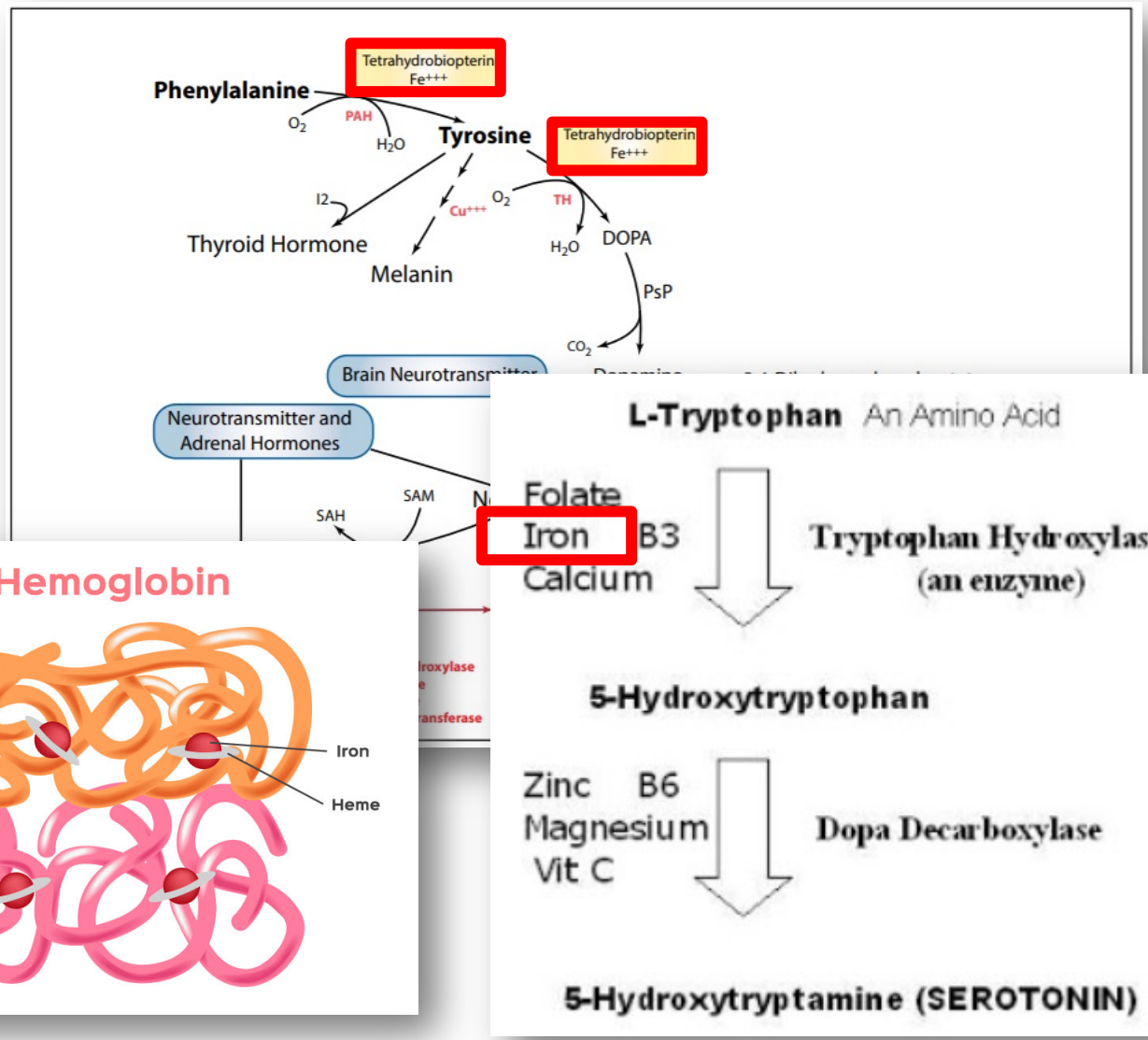
Serrallach O. (2018). New York, NY: Hachette Book Group.

Postnatal Nutrition - Iron

- Nutrient need typically decreases after pregnancy, but some may remain iron deficient
- Symptoms of iron deficiency
  - Altered cognition
  - Depressive symptoms (PPD)
  - Fatigue



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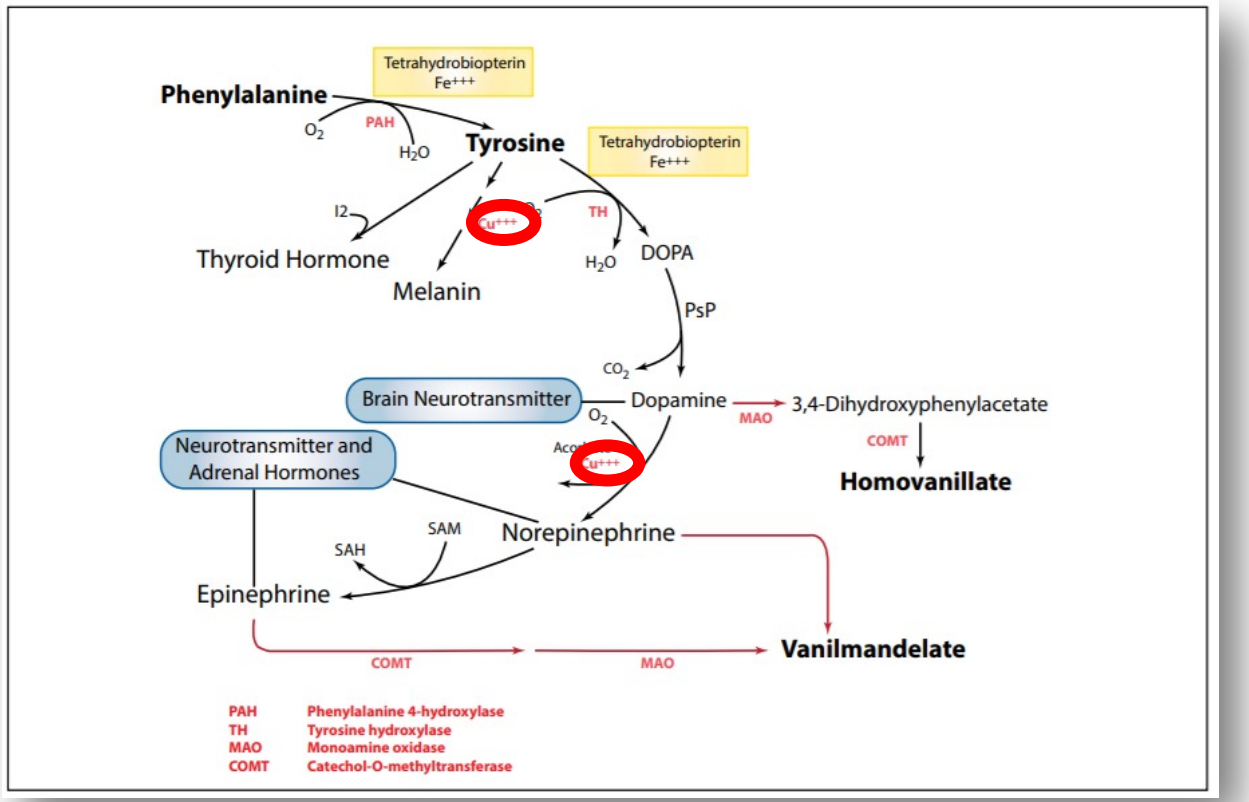
Postnatal Nutrition - Copper

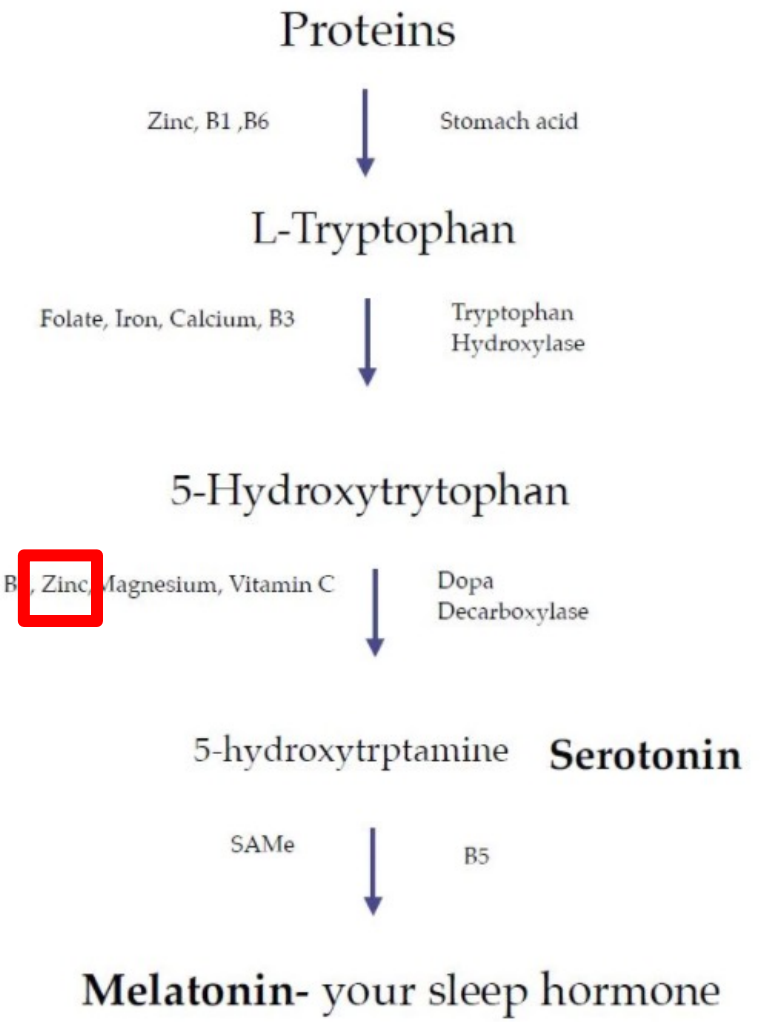
- During pregnancy, copper nearly doubles and drops after delivery
  - Red blood cell and vessel formation
- Copper excess
  - Increased Norepinephrine (vigilant)
  - Reduce Dopamine (pleasure)
  - Pro-oxidant causing inflammation
  - Fatigue



Etebary S, et a. *Iran J Psychiatry. 2010;5(2):40-46.*
Serrallach O. (2018). New York, NY: Hachette Book Group.

Postnatal Nutrition - Zinc

- Promotes immune system health
- Synthesizes DNA
- Serotonin production
- Regulates hormones
- Symptoms of Zinc deficiency
  - Depression
  - Low stomach acid



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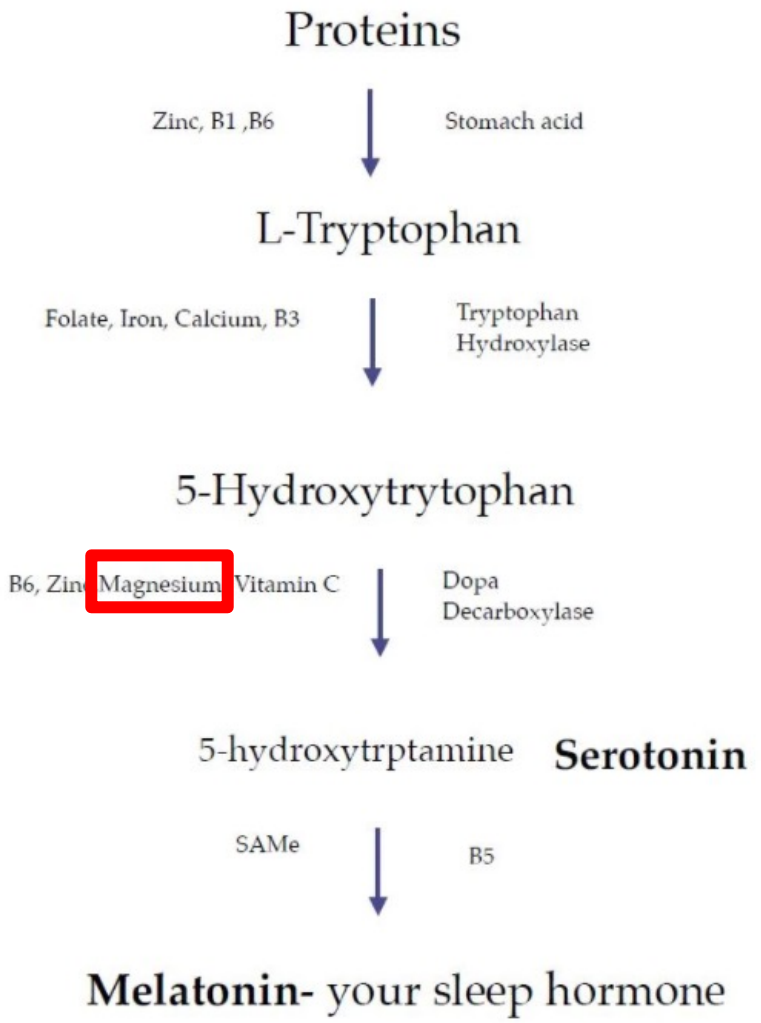
https://www.blockbluelight.com.au/blogs/news/guide-to-get-good-sleep

Postnatal Nutrition - Magnesium

- Mama-Mineral
- Important in the function of other minerals
- Symptoms of Magnesium deficiency
  - Headaches
  - Constipation
  - Depression
  - Irritability
  - Muscle Tightness
  - Poor concentration
  - Fatigue



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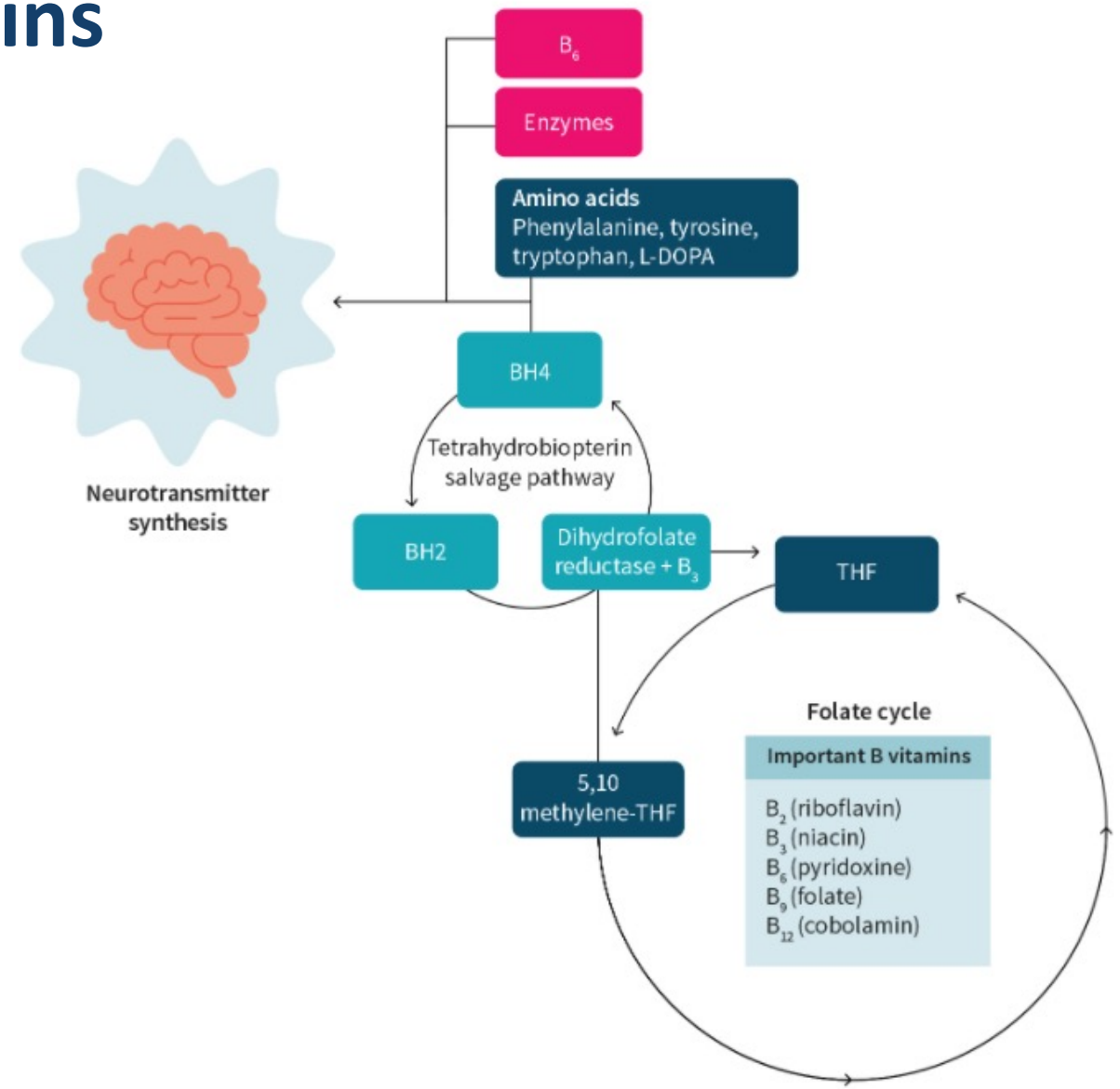
Postnatal Nutrition – B Vitamins

- Vitamin B12 Derived from food and gut bacteria
- Vitamins B-6, 9, and 12 needed for red blood cell formation
- Methylation
- Energy production
- Healthy mood



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Postnatal Nutrition – Fat Soluble Vitamins

- Vitamin A: Immune system
- Vitamin D: Bone Health
  - Deficiency linked to Postpartum Depression
  - Deficiency and Excess linked to sex hormone imbalances
- Vitamin E: Antioxidant
- Vitamin K: Bone Health

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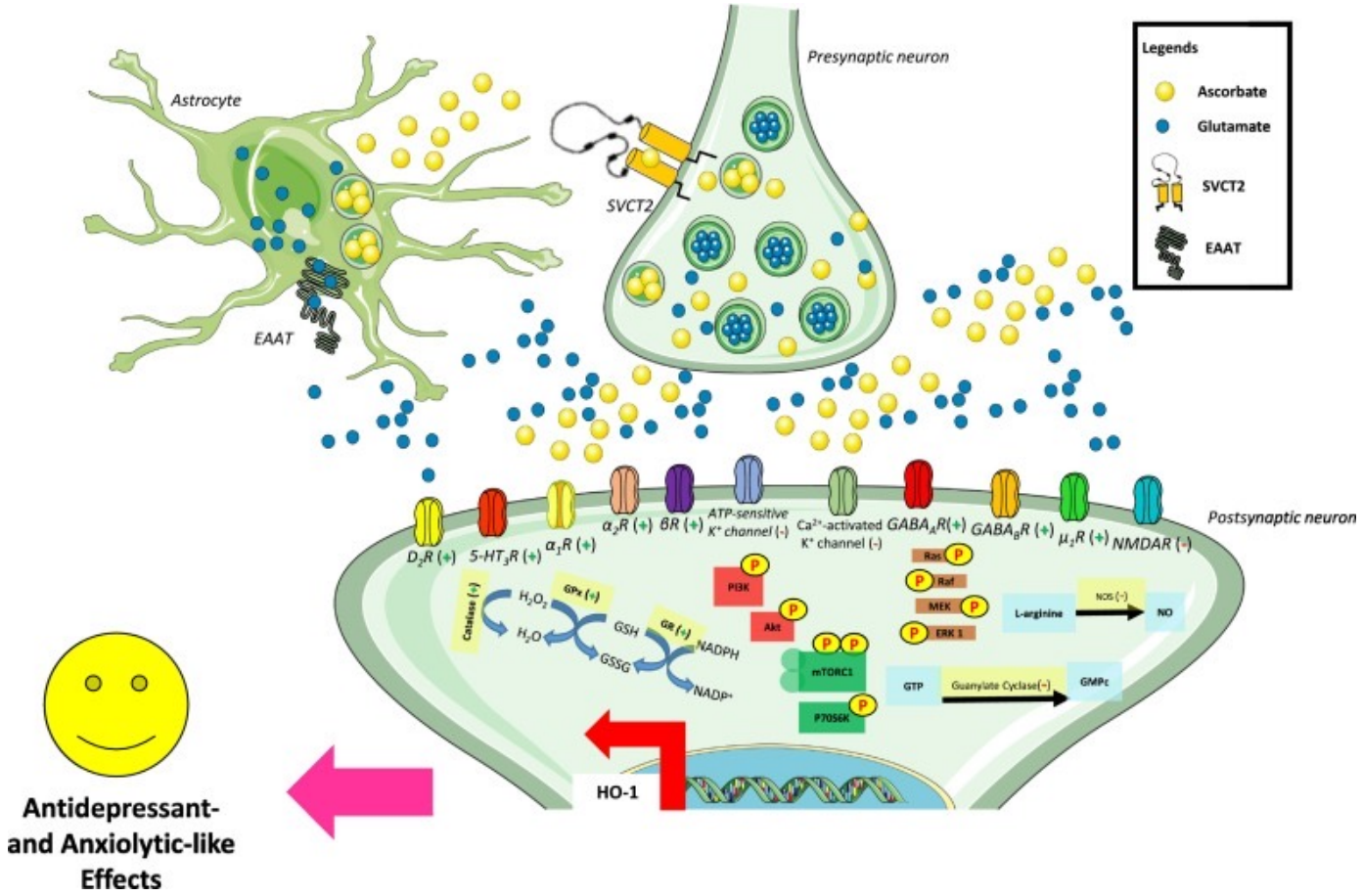
Serrallach O. (2018). New York, NY: Hachette Book Group.

Postnatal Nutrition – Vitamin C

- Boost Immune System
- Important for collagen synthesis
- Antioxidant
- Supports cognitive function
- Anti-depressant and anxiety
- Cortisol management



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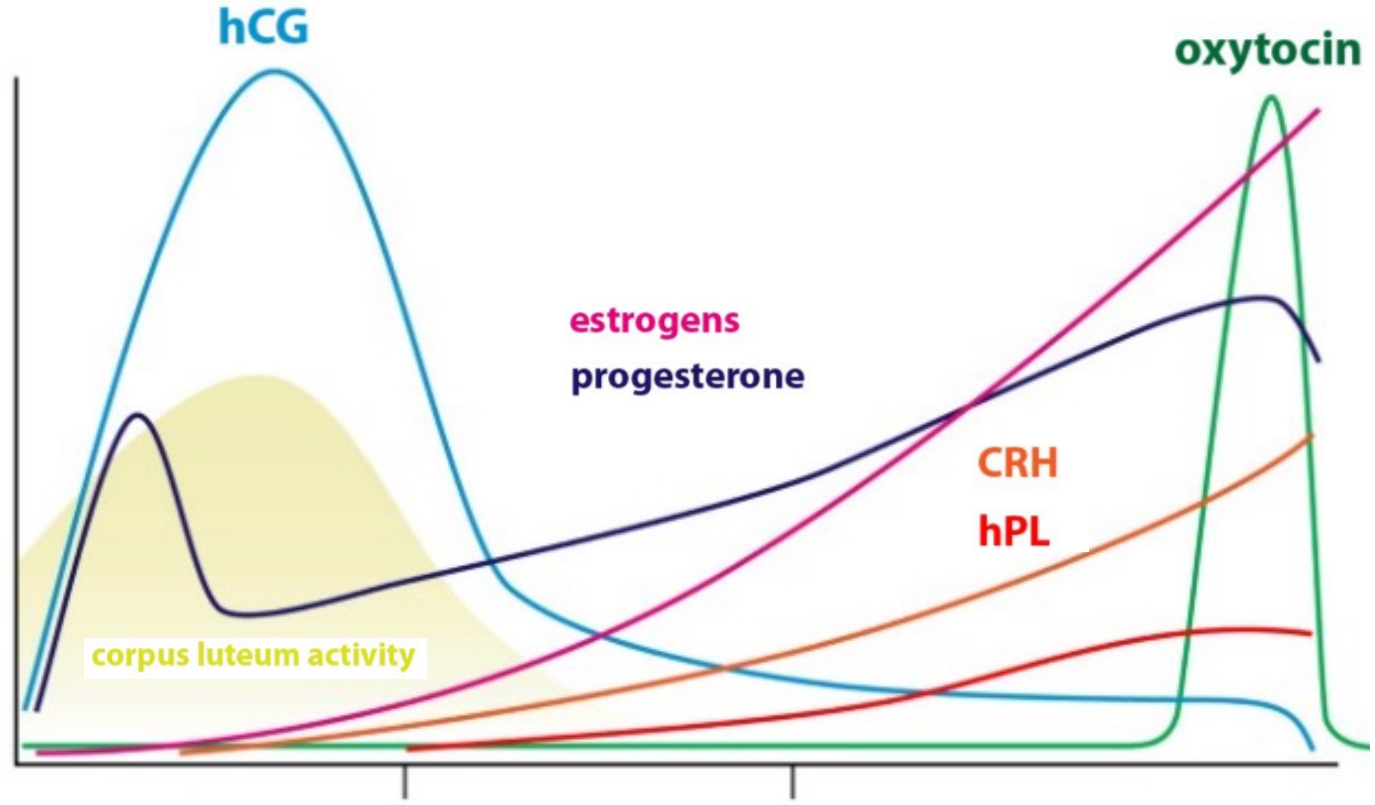
Pregnancy and Postnatal Hormones

- Estrogen and Progesterone
  - Increases in pregnancy and decreases within 48 hours of baby delivery
- CRH, hPL, and oxytocin
  - Increase postnatal
- Thyroid Hormone
  - Increases 50% by the third trimester
  - Can shift to over or underactive
  - 1:12 diagnosed with Hashimottos postnatal



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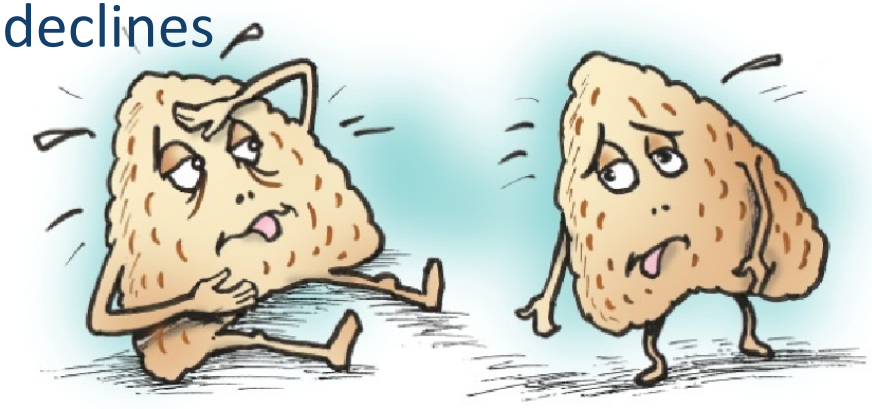
Postnatal Cortisol

- Cortisol production is controlled by mother until the last trimester when the placenta takes over
  - Thought to contribute to ‘nesting’ or surges in energy during the third trimester
- Stress On/Stress Off
  - Contributing factor of baby brain
  - Too many simultaneous and multiplying demands
- After Stress On/Stress Off bodies cortisol production declines



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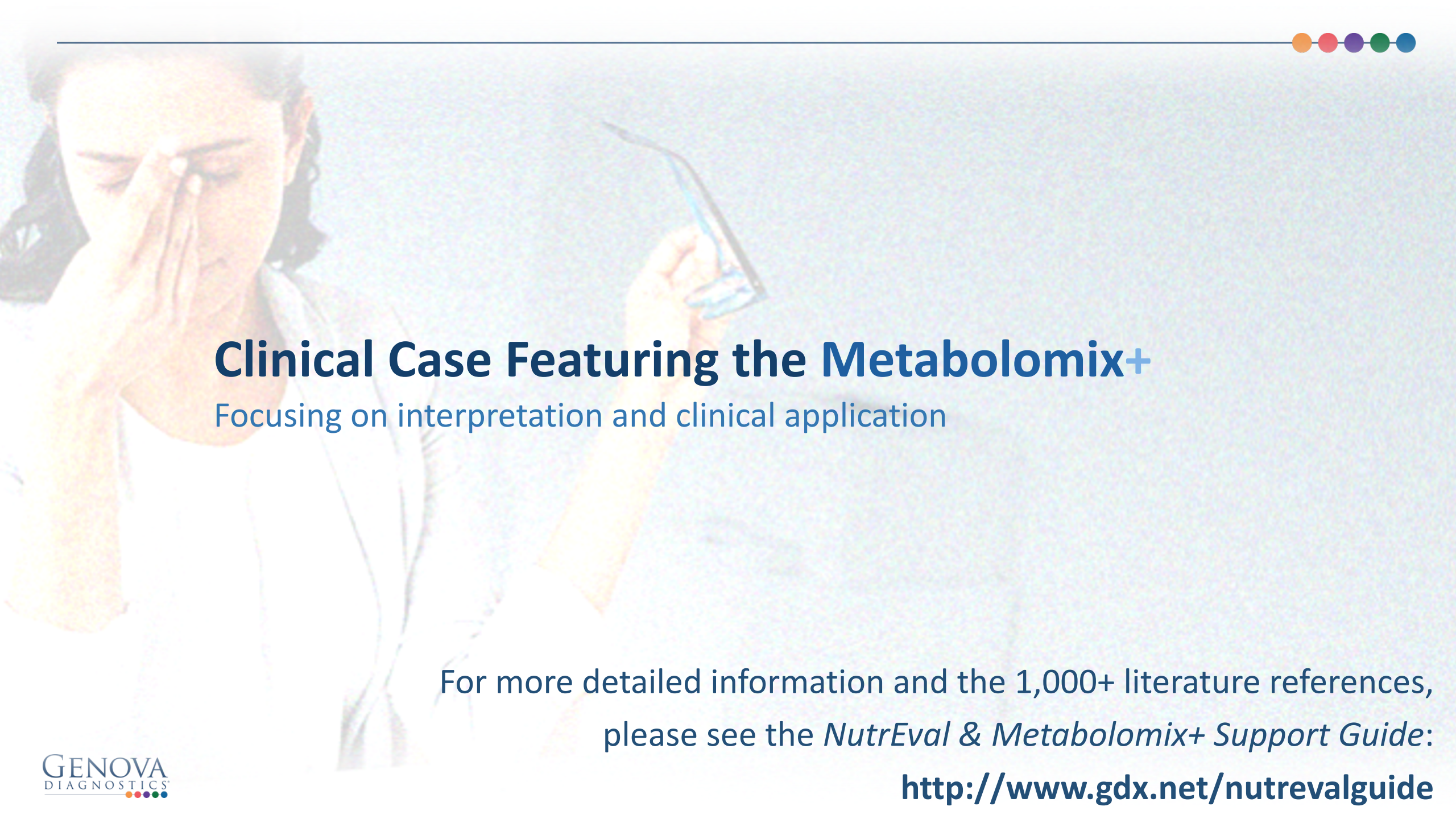

Clinical Case Featuring the Metabolomix+

Focusing on interpretation and clinical application

For more detailed information and the 1,000+ literature references, please see the *NutrEval & Metabolomix+ Support Guide*:

http://www.gdx.net/nutrevalguide

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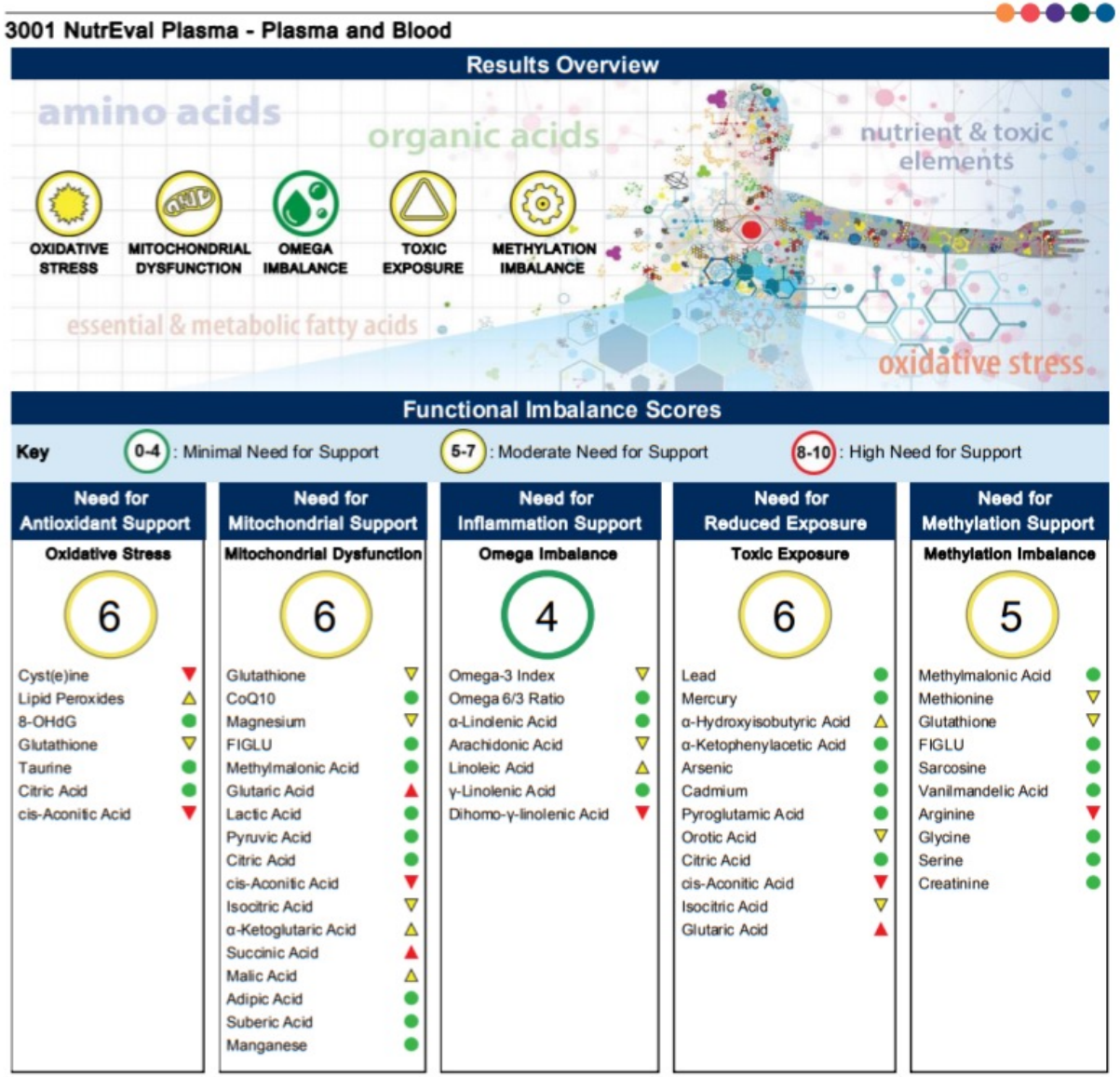
34 y/o Stay-at-Home Mother of 3 Young Children

- CC – anxiety and new onset of panic attacks, joint aches and pains, exhausted, poor sleep, headaches, sugar cravings, GI problems, and low blood pressure
- DIET – cooks all meals and several cups of coffee
- MEDICATIONS/SUPPLEMENTS – hormonal birth control
- EXERCISE – 3 times per week (light cardio for 20 minutes) and morning meditation
- SOCIALLY – little local support and husband travels for work



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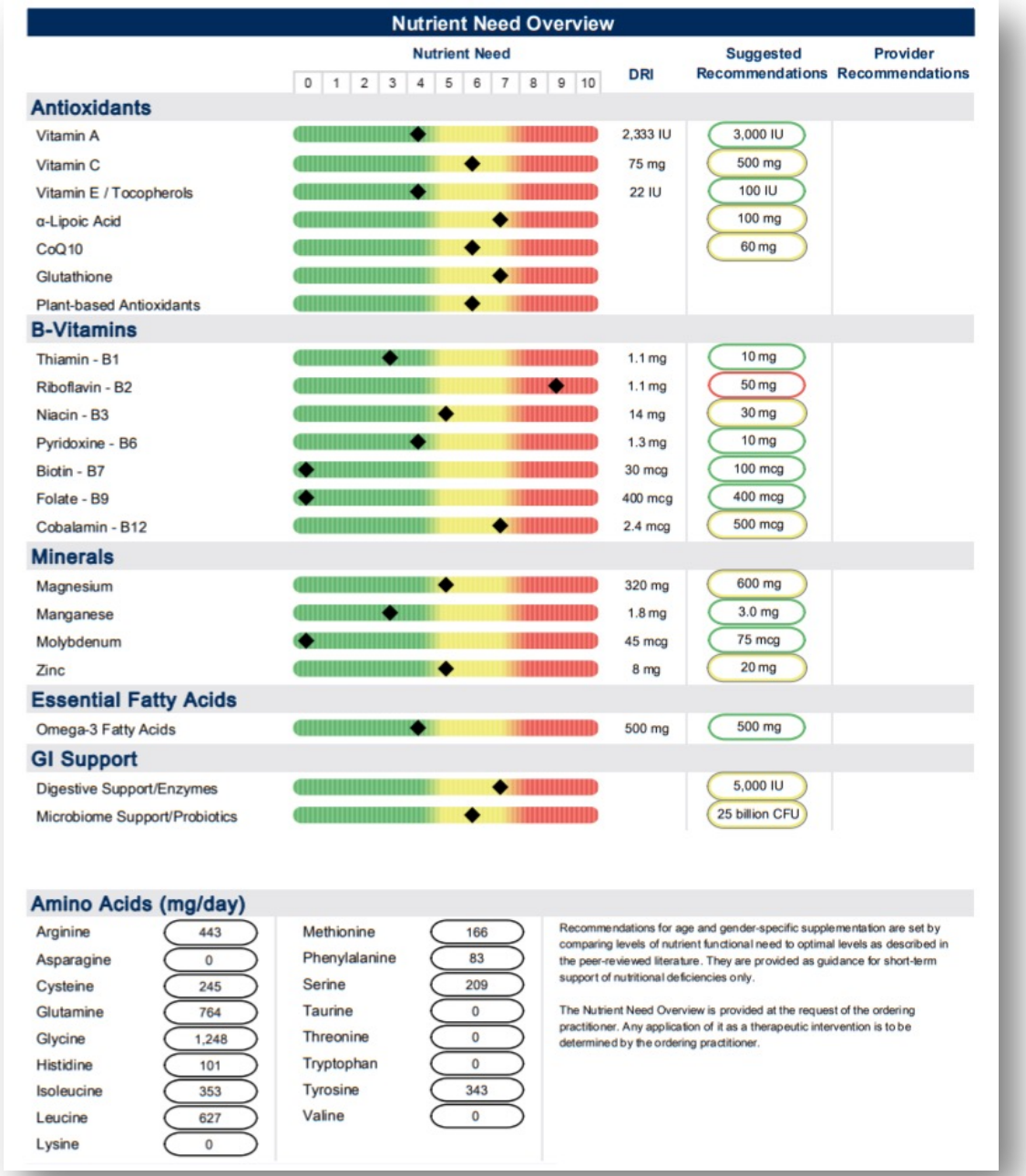
Nutrient Need Overview

- Algorithm-derived nutrient needs based on patient results
  - Antioxidants
  - B-Vitamins
  - Minerals
  - Essential Fatty Acids
  - GI Support
  - Amino Acids



Nutrient Need Overview

	Nutrient Need (0 1 2 3 4 5 6 7 8 9 10)	DRI	Suggested Recommendations	Provider Recommendations
Antioxidants				
Vitamin A		2,333 IU	3,000 IU	
Vitamin C		75 mg	500 mg	
Vitamin E / Tocopherols		22 IU	100 IU	
α-Lipoic Acid			100 mg	
CoQ10			60 mg	
Glutathione				
Plant-based Antioxidants				
B-Vitamins				
Thiamin - B1		1.1 mg	10 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	100 mcg	
Folate - B9		400 mcg	400 mcg	
Cobalamin - B12		2.4 mcg	500 mcg	
Minerals				
Magnesium		320 mg	600 mg	
Manganese		1.8 mg	3.0 mg	
Molybdenum		45 mcg	75 mcg	
Zinc		8 mg	20 mg	
Essential Fatty Acids				
Omega-3 Fatty Acids		500 mg	500 mg	
GI Support				
Digestive Support/Enzymes			5,000 IU	
Microbiome Support/Probiotics			25 billion CFU	

Amino Acids (mg/day)

Arginine	443	Methionine	166
Asparagine	0	Phenylalanine	83
Cysteine	245	Serine	209
Glutamine	764	Taurine	0
Glycine	1,248	Threonine	0
Histidine	101	Tryptophan	0
Isoleucine	353	Tyrosine	343
Leucine	627	Valine	0
Lysine	0		

Recommendations for age and gender-specific supplementation are set by comparing levels of nutrient functional need to optimal levels as described in the peer-reviewed literature. They are provided as guidance for short-term support of nutritional deficiencies only.

The Nutrient Need Overview is provided at the request of the ordering practitioner. Any application of it as a therapeutic intervention is to be determined by the ordering practitioner.

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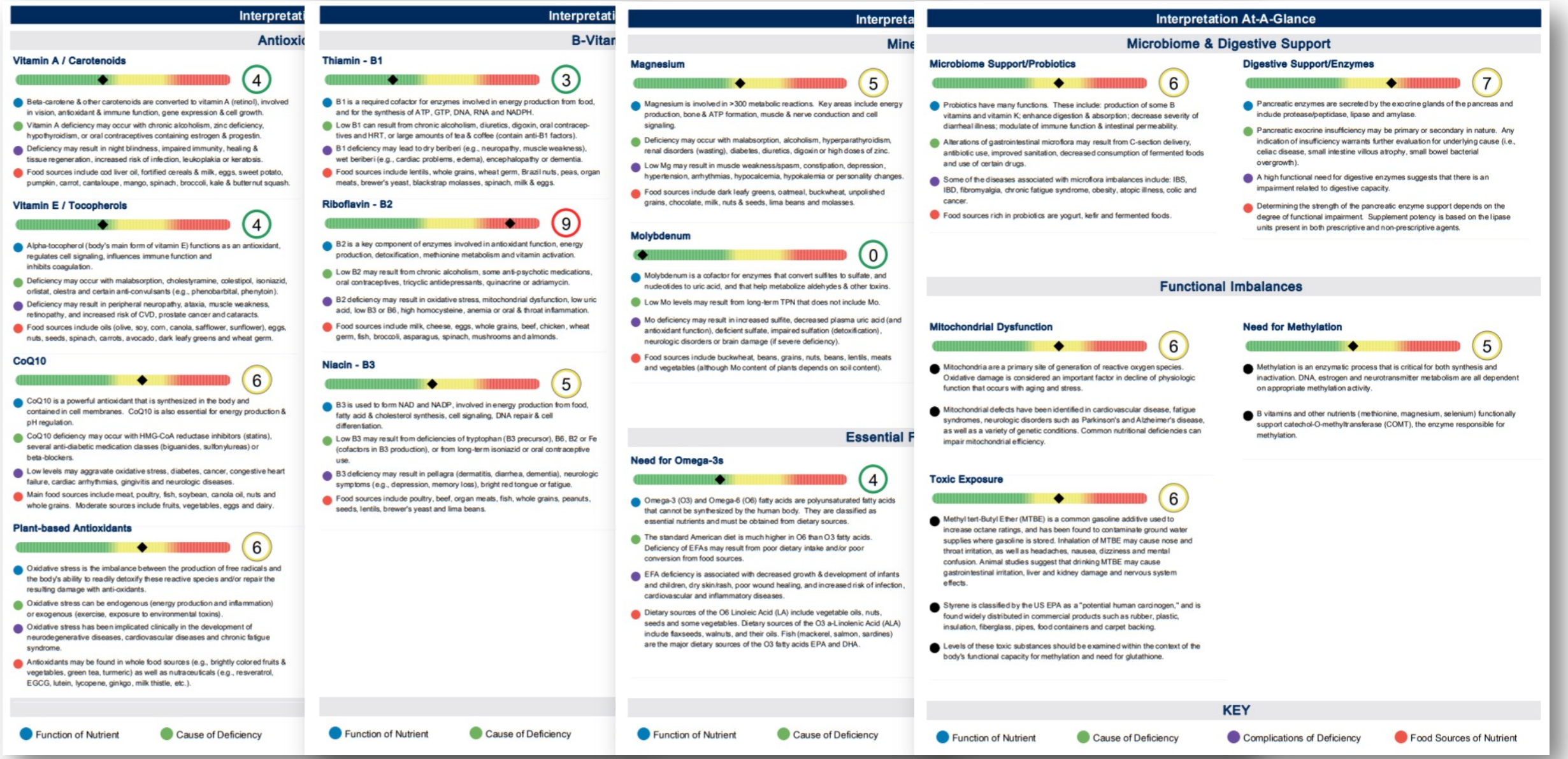

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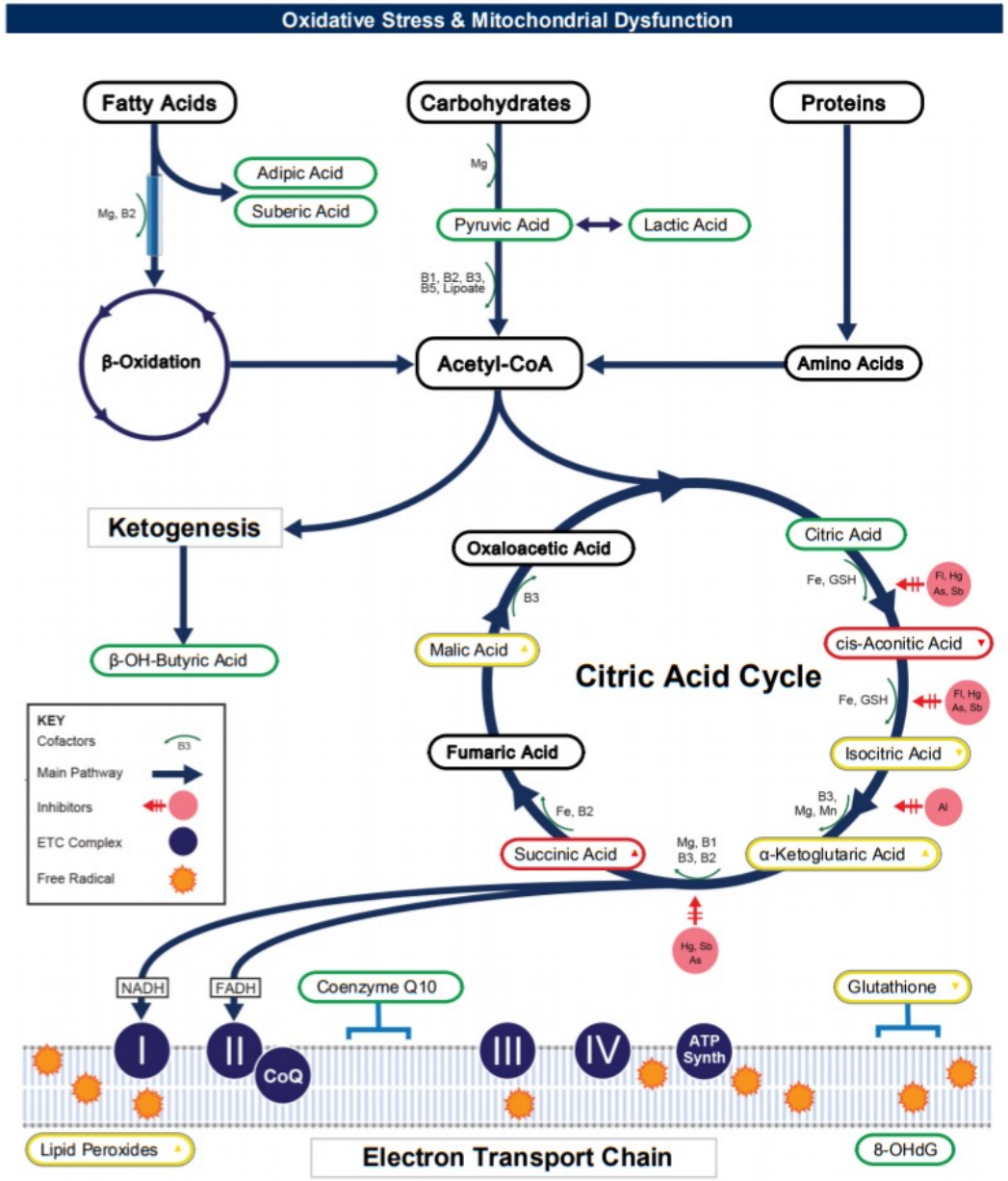
Organic Acids

- Macronutrients are ultimately metabolized into ATP
- Cellular metabolism backups or blockages
  - Low intermediates could be macronutrient deficiency
  - Elevations could be insufficient cofactors or heavy metal presence
- Electron Transport Chain
  - Oxidative stress/damage = imbalanced antioxidants and free radicals



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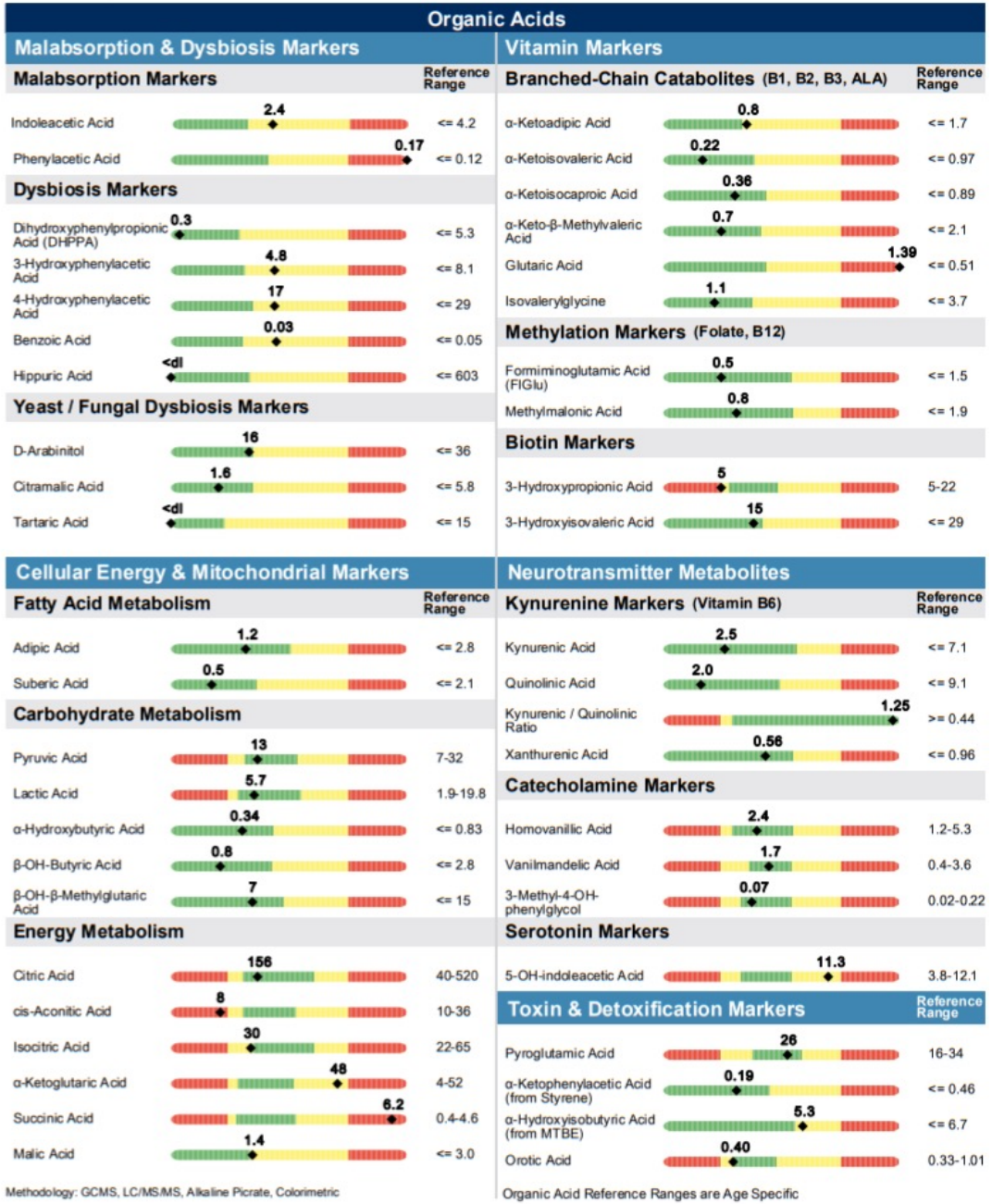
Malabsorption & Dysbiosis

- Malabsorption Markers
  - Highs suggest incomplete digestion
- Dysbiosis / Yeast Fungal
  - Bacterial and fungal metabolites
  - Consider stool test
- Vitamin Markers
  - Glutaric Acid indicates B2 Deficiency
- Neurotransmitter Metabolites
  - 5-HIAA indicates Mg, Mn, B-vitamin deficiency
- Toxin & Detoxification Markers
  - High MTBE metabolite



Organic Acids

Malabsorption & Dysbiosis Markers

Malabsorption Markers		Reference Range
Indoleacetic Acid	2.4	<= 4.2
Phenylacetic Acid	0.17	<= 0.12
Dysbiosis Markers		
Dihydroxyphenylpropionic Acid (DHPPA)	0.3	<= 5.3
3-Hydroxyphenylacetic Acid	4.8	<= 8.1
4-Hydroxyphenylacetic Acid	17	<= 29
Benzoic Acid	0.03	<= 0.05
Hippuric Acid	<dl	<= 603
Yeast / Fungal Dysbiosis Markers		
D-Arabinitol	16	<= 36
Citramalic Acid	1.6	<= 5.8
Tartaric Acid	<dl	<= 15

Vitamin Markers

Branched-Chain Catabolites (B1, B2, B3, ALA)		Reference Range
α-Ketoadipic Acid	0.8	<= 1.7
α-Ketoisovaleric Acid	0.22	<= 0.97
α-Ketoisocaproic Acid	0.36	<= 0.89
α-Keto-β-Methylvaleric Acid	0.7	<= 2.1
Glutaric Acid	1.39	<= 0.51
Isovalerylglycine	1.1	<= 3.7
Methylation Markers (Folate, B12)		
Formiminoglutamic Acid (FIGlu)	0.5	<= 1.5
Methylmalonic Acid	0.8	<= 1.9
Biotin Markers		
3-Hydroxypropionic Acid	5	5-22
3-Hydroxyisovaleric Acid	15	<= 29

Cellular Energy & Mitochondrial Markers

Fatty Acid Metabolism		Reference Range
Adipic Acid	1.2	<= 2.8
Suberic Acid	0.5	<= 2.1
Carbohydrate Metabolism		
Pyruvic Acid	13	7-32
Lactic Acid	5.7	1.9-19.8
α-Hydroxybutyric Acid	0.34	<= 0.83
β-OH-Butyric Acid	0.8	<= 2.8
β-OH-β-Methylglutaric Acid	7	<= 15
Energy Metabolism		
Citric Acid	156	40-520
cis-Aconitic Acid	8	10-36
Isocitric Acid	30	22-65
α-Ketoglutaric Acid	48	4-52
Succinic Acid	6.2	0.4-4.6
Malic Acid	1.4	<= 3.0

Neurotransmitter Metabolites

Kynurenine Markers (Vitamin B6)		Reference Range
Kynurenic Acid	2.5	<= 7.1
Quinolinic Acid	2.0	<= 9.1
Kynurenic / Quinolinic Ratio	1.25	>= 0.44
Xanthurenic Acid	0.56	<= 0.96
Catecholamine Markers		
Homovanillic Acid	2.4	1.2-5.3
Vanilmandelic Acid	1.7	0.4-3.6
3-Methyl-4-OH-phenylglycol	0.07	0.02-0.22
Serotonin Markers		
5-OH-indoleacetic Acid	11.3	3.8-12.1

Toxin & Detoxification Markers		Reference Range
Pyroglutamic Acid	26	16-34
α-Ketophenylacetic Acid (from Styrene)	0.19	<= 0.46
α-Hydroxyisobutyric Acid (from MTBE)	5.3	<= 6.7
Orotic Acid	0.40	0.33-1.01

Methodology: GCMS, LC/MS/MS, Alkaline Picrate, Colorimetric

Organic Acid Reference Ranges are Age Specific

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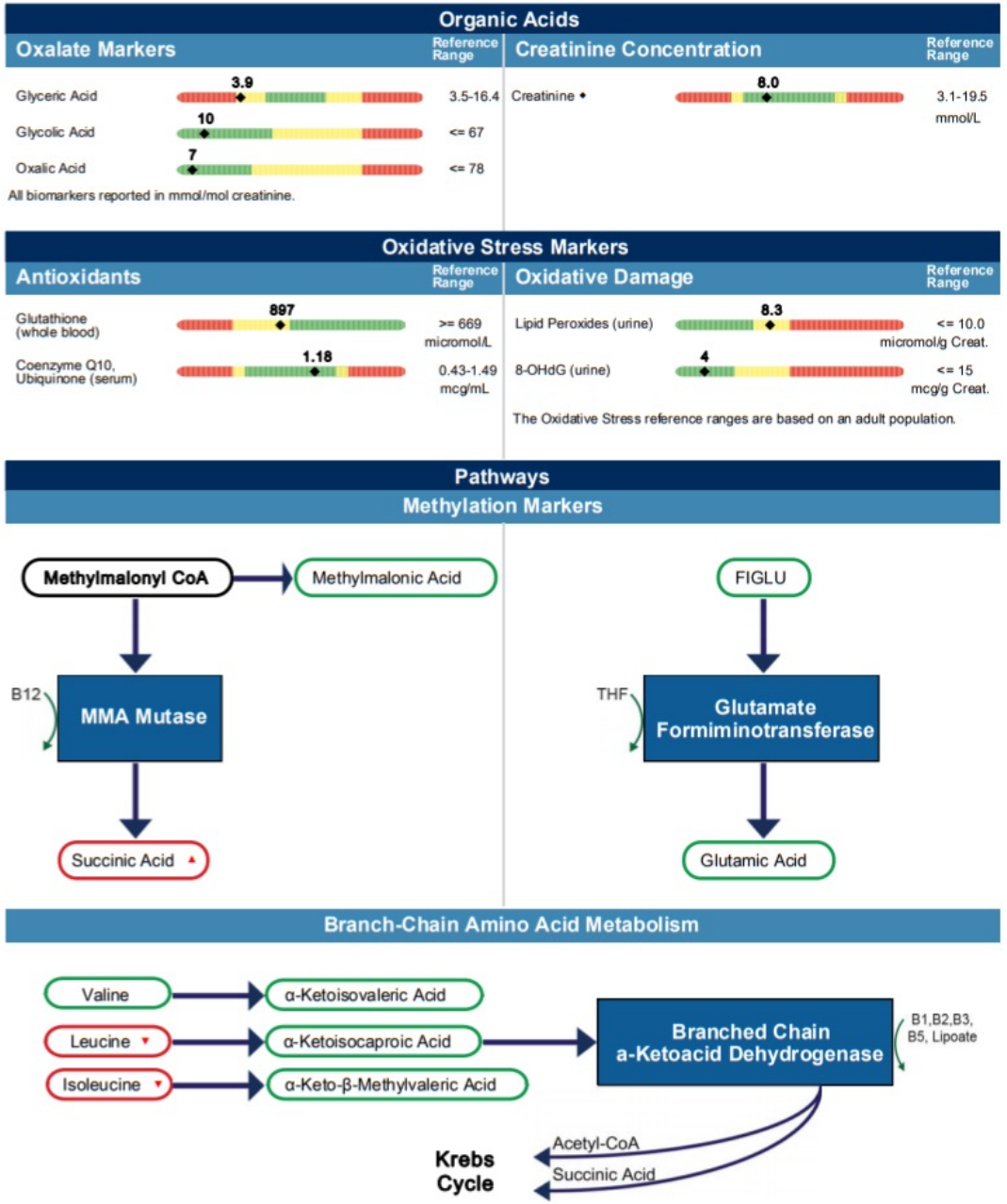
Oxalate & Oxidative Stress

- Oxalate
  - Glyceric acid is derived from serine (AA) and fructose
- Oxidative Stress
  - Low glutathione (glutamine, glycine, and cysteine)
  - Elevated lipid peroxides



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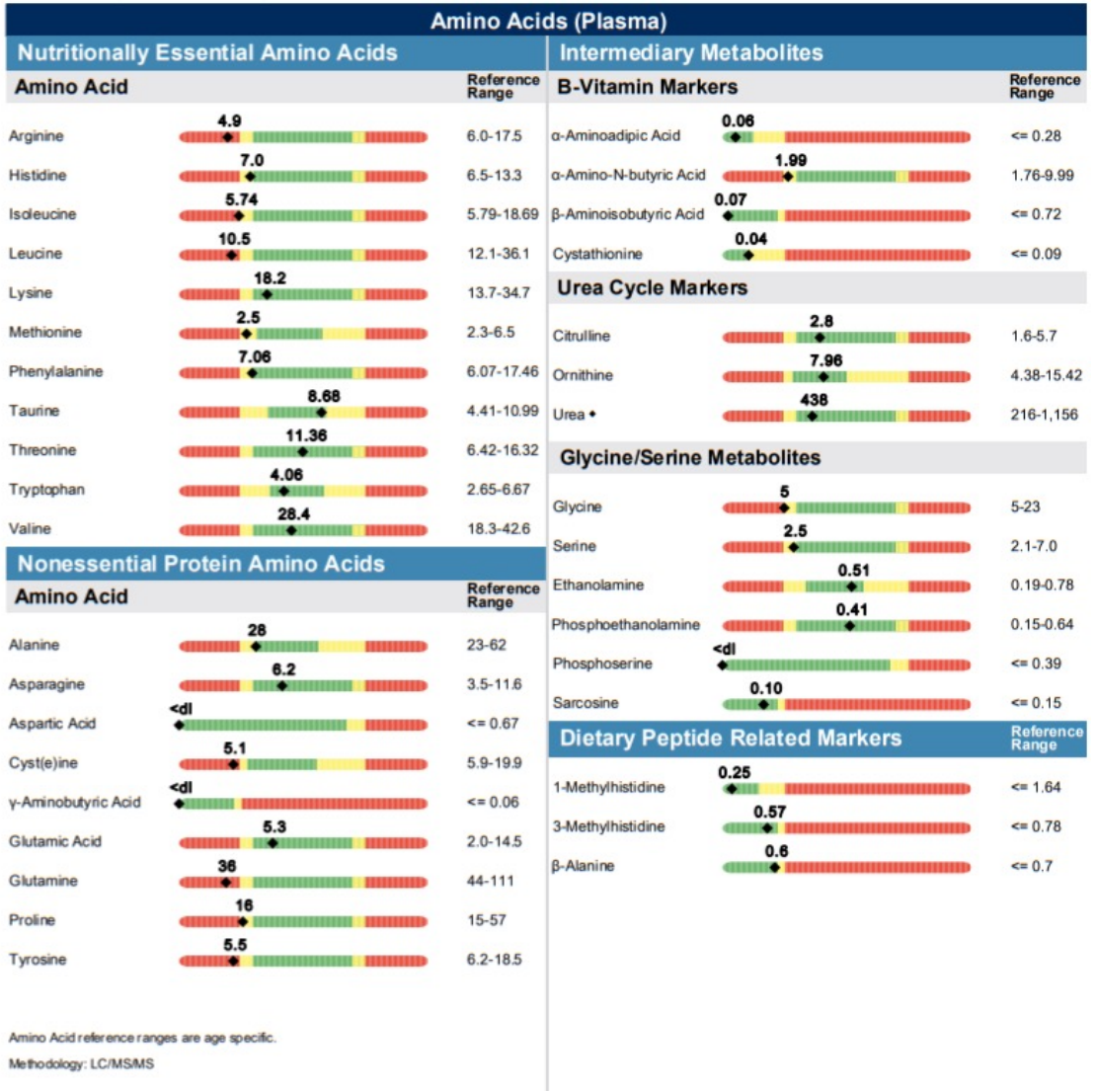
Amino Acids

- Essential and Non-Essential AAs
  - Low trend
    - Intake, increased utilization, and/or maldigestion/malabsorption



Amino Acids (Plasma)

Nutritionally Essential Amino Acids

Amino Acid		Reference Range
Arginine	4.9	6.0-17.5
Histidine	7.0	6.5-13.3
Isoleucine	5.74	5.79-18.69
Leucine	10.5	12.1-36.1
Lysine	18.2	13.7-34.7
Methionine	2.5	2.3-6.5
Phenylalanine	7.06	6.07-17.46
Taurine	8.68	4.41-10.99
Threonine	11.36	6.42-16.32
Tryptophan	4.06	2.65-6.67
Valine	28.4	18.3-42.6

Nonessential Protein Amino Acids

Amino Acid		Reference Range
Alanine	28	23-62
Asparagine	6.2	3.5-11.6
Aspartic Acid	<dl	<= 0.67
Cyst(e)ine	5.1	5.9-19.9
γ-Aminobutyric Acid	<dl	<= 0.06
Glutamic Acid	5.3	2.0-14.5
Glutamine	36	44-111
Proline	16	15-57
Tyrosine	5.5	6.2-18.5

Amino Acid reference ranges are age specific.

Methodology: LC/MS/MS

Intermediary Metabolites

B-Vitamin Markers		Reference Range
α-Aminoadipic Acid	0.06	<= 0.28
α-Amino-N-butyric Acid	1.99	1.76-9.99
β-Aminoisobutyric Acid	0.07	<= 0.72
Cystathionine	0.04	<= 0.09

Urea Cycle Markers		
Citrulline	2.8	1.6-5.7
Ornithine	7.96	4.38-15.42
Urea •	438	216-1,156

Glycine/Serine Metabolites		
Glycine	5	5-23
Serine	2.5	2.1-7.0
Ethanolamine	0.51	0.19-0.78
Phosphoethanolamine	0.41	0.15-0.64
Phosphoserine	<dl	<= 0.39
Sarcosine	0.10	<= 0.15

Dietary Peptide Related Markers		Reference Range
1-Methylhistidine	0.25	<= 1.64
3-Methylhistidine	0.57	<= 0.78
β-Alanine	0.6	<= 0.7

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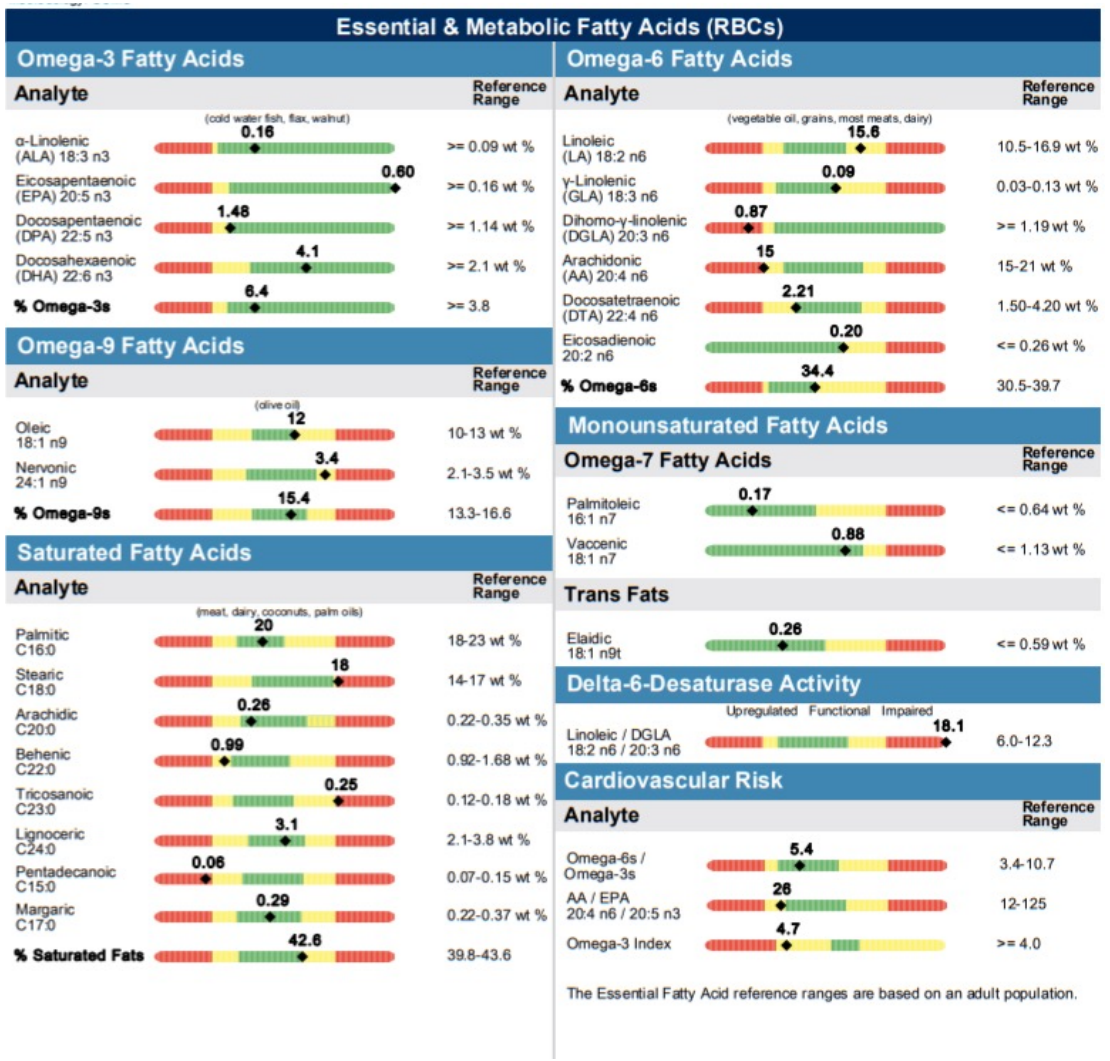
Fatty Acids

- Omega 3
  - Low omega 3-Index
  - Low DGLA
    - Elongase Enzyme requires B3/5/6/7 and Vitamin C



Essential & Metabolic Fatty Acids (RBCs)

Omega-3 Fatty Acids

Analyte		Reference Range
	(cold water fish, flax, walnut)	
α-Linolenic (ALA) 18:3 n3	0.16	>= 0.09 wt %
Eicosapentaenoic (EPA) 20:5 n3	0.60	>= 0.16 wt %
Docosapentaenoic (DPA) 22:5 n3	1.48	>= 1.14 wt %
Docosahexaenoic (DHA) 22:6 n3	4.1	>= 2.1 wt %
% Omega-3s	6.4	>= 3.8

Omega-9 Fatty Acids

Analyte		Reference Range
	(olive oil)	
Oleic 18:1 n9	12	10-13 wt %
Nervonic 24:1 n9	3.4	2.1-3.5 wt %
% Omega-9s	15.4	13.3-16.6

Saturated Fatty Acids

Analyte		Reference Range
	(meat, dairy, coconuts, palm oils)	
Palmitic C16:0	20	18-23 wt %
Stearic C18:0	18	14-17 wt %
Arachidic C20:0	0.26	0.22-0.35 wt %
Behenic C22:0	0.99	0.92-1.68 wt %
Tricosanoic C23:0	0.25	0.12-0.18 wt %
Lignoceric C24:0	3.1	2.1-3.8 wt %
Pentadecanoic C15:0	0.06	0.07-0.15 wt %
Margaric C17:0	0.29	0.22-0.37 wt %
% Saturated Fats	42.6	39.8-43.6

Omega-6 Fatty Acids

Analyte		Reference Range
	(vegetable oil, grains, most meats, dairy)	
Linoleic (LA) 18:2 n6	15.6	10.5-16.9 wt %
γ-Linolenic (GLA) 18:3 n6	0.09	0.03-0.13 wt %
Dihomo-γ-linolenic (DGLA) 20:3 n6	0.87	>= 1.19 wt %
Arachidonic (AA) 20:4 n6	15	15-21 wt %
Docosatetraenoic (DTA) 22:4 n6	2.21	1.50-4.20 wt %
Eicosadienoic 20:2 n6	0.20	<= 0.26 wt %
% Omega-6s	34.4	30.5-39.7

Monounsaturated Fatty Acids

Omega-7 Fatty Acids

		Reference Range
Palmitoleic 16:1 n7	0.17	<= 0.64 wt %
Vaccenic 18:1 n7	0.88	<= 1.13 wt %

Trans Fats

		Reference Range
Elaidic 18:1 n9t	0.26	<= 0.59 wt %

Delta-6-Desaturase Activity

	Upregulated Functional Impaired	Reference Range
Linoleic / DGLA 18:2 n6 / 20:3 n6	18.1	6.0-12.3

Cardiovascular Risk

Analyte		Reference Range
Omega-6s / Omega-3s	5.4	3.4-10.7
AA / EPA 20:4 n6 / 20:5 n3	26	12-125
Omega-3 Index	4.7	>= 4.0

The Essential Fatty Acid reference ranges are based on an adult population.

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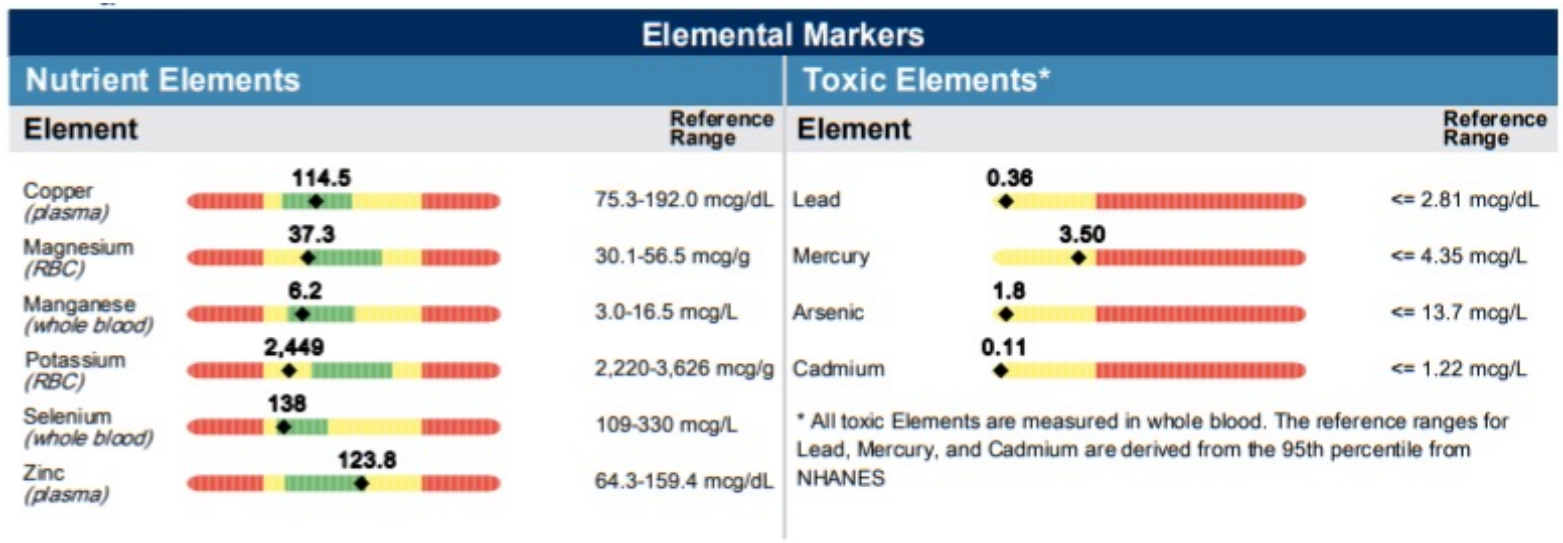
Elemental Markers

- Nutrient Elements
  - Low Magnesium
  - Low Potassium
  - Low Selenium
- Toxic Elements
  - Current Exposures



Elemental Markers

Nutrient Elements			Toxic Elements*		
Element		**Reference Range**	**Element**		**Reference Range**
Copper *(plasma)*	114.5	75.3-192.0 mcg/dL	Lead	0.36	<= 2.81 mcg/dL
Magnesium *(RBC)*	37.3	30.1-56.5 mcg/g	Mercury	3.50	<= 4.35 mcg/L
Manganese *(whole blood)*	6.2	3.0-16.5 mcg/L	Arsenic	1.8	<= 13.7 mcg/L
Potassium *(RBC)*	2,449	2,220-3,626 mcg/g	Cadmium	0.11	<= 1.22 mcg/L
Selenium *(whole blood)*	138	109-330 mcg/L	* All toxic Elements are measured in whole blood. The reference ranges for Lead, Mercury, and Cadmium are derived from the 95th percentile from NHANES		
Zinc *(plasma)*	123.8	64.3-159.4 mcg/dL			

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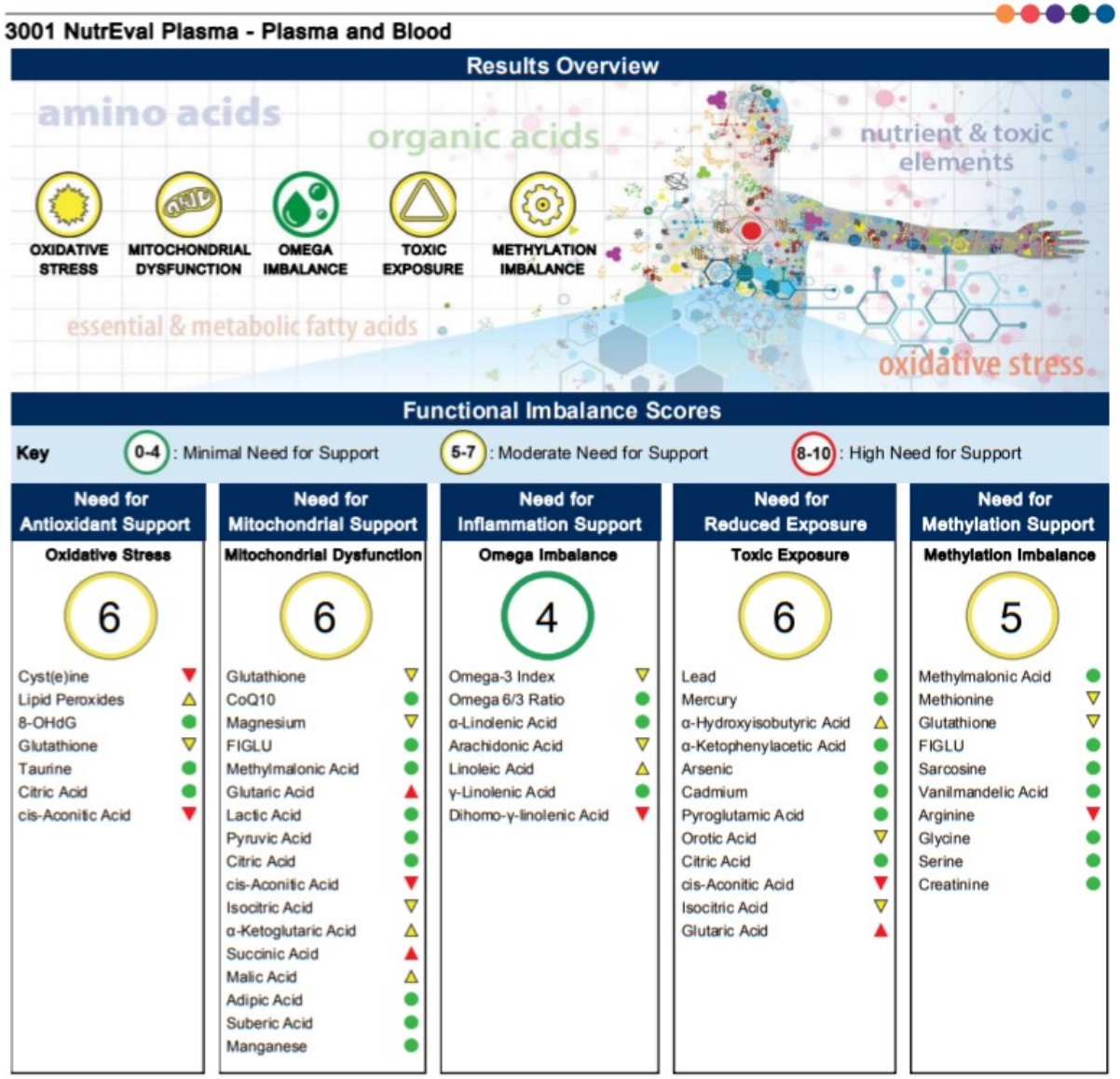
Treatment Plan

- Multivitamin
- Fish Oil
- Protein Powder daily
  - Assist in making GSH
- GI Microbiome Support
  - Probiotics
  - Consider stool testing
- Encourage iron rich foods
  - Get serum Hemoglobin



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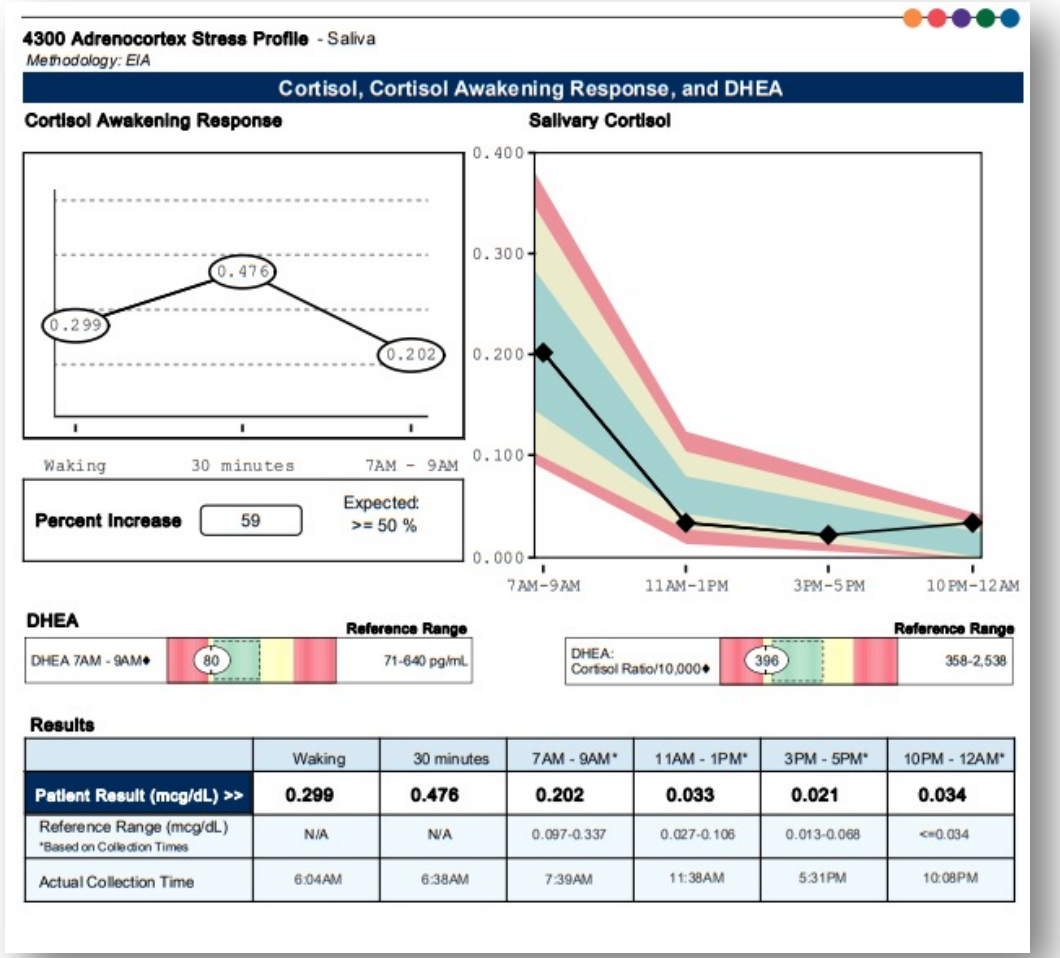
Adrenocortex Stress Profile



4300 Adrenocortex Stress Profile - Saliva

Methodology: EIA

Cortisol, Cortisol Awakening Response, and DHEA

Cortisol Awakening Response

Percent Increase 59 Expected: >= 50 %

Salivary Cortisol

DHEA

		Reference Range
DHEA 7AM - 9AM◆	80	71-640 pg/mL

		Reference Range
DHEA: Cortisol Ratio/10,000◆	396	358-2,538

Results

	Waking	30 minutes	7AM - 9AM*	11AM - 1PM*	3PM - 5PM*	10PM - 12AM*
Patient Result (mcg/dL) >>	**0.299**	**0.476**	**0.202**	**0.033**	**0.021**	**0.034**
Reference Range (mcg/dL) *Based on Collection Times	N/A	N/A	0.097-0.337	0.027-0.106	0.013-0.068	<=0.034
Actual Collection Time	6:04AM	6:38AM	7:39AM	11:38AM	5:31PM	10:08PM

- Cortisol Awakening Response
  - Continue morning meditation
- Treatment considerations
  - Vitamin C (1-2 grams daily)
  - Ashwagandha (1 gram BID)
  - Licorice (150-400 mg daily)
  - Thyroid evaluation

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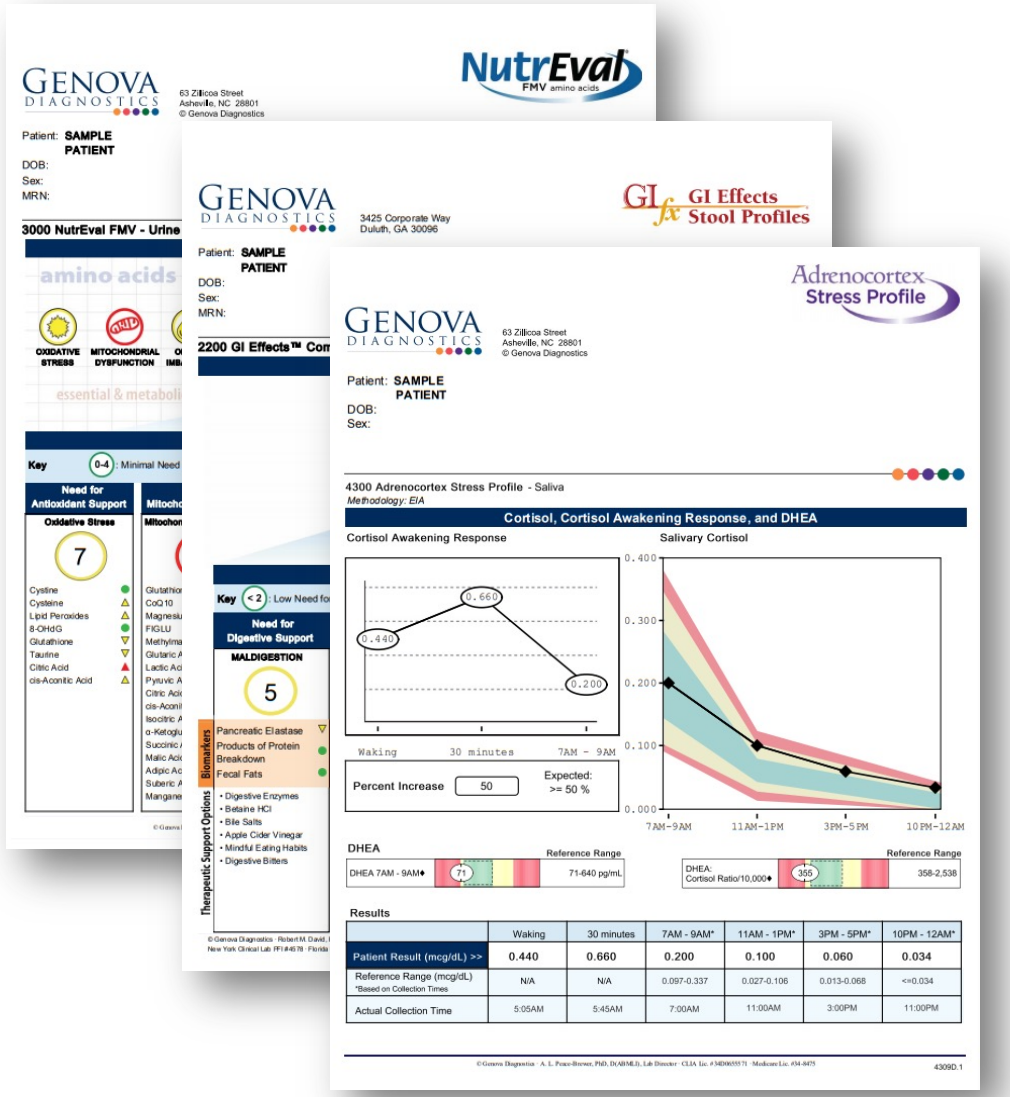
Special Considerations at the Postnatal Visit

- Evaluate emotional lability
- Assess diet, sleeping habits, and support system
- Discuss exercise regimen
- Pregnancy complications follow up
  - Gestational Diabetes: Fasting Blood Glucose and Insulin
  - Preeclampsia: Blood Pressure
  - Heavy Bleeding: Iron
- Functional Medicine Testing
  - Nutrition/Micronutrient
  - GI Function (stool test)
  - Hormones (sex hormone, thyroid, and adrenal health)



Serrallach O. (2018). New York, NY: Hachette Book Group.

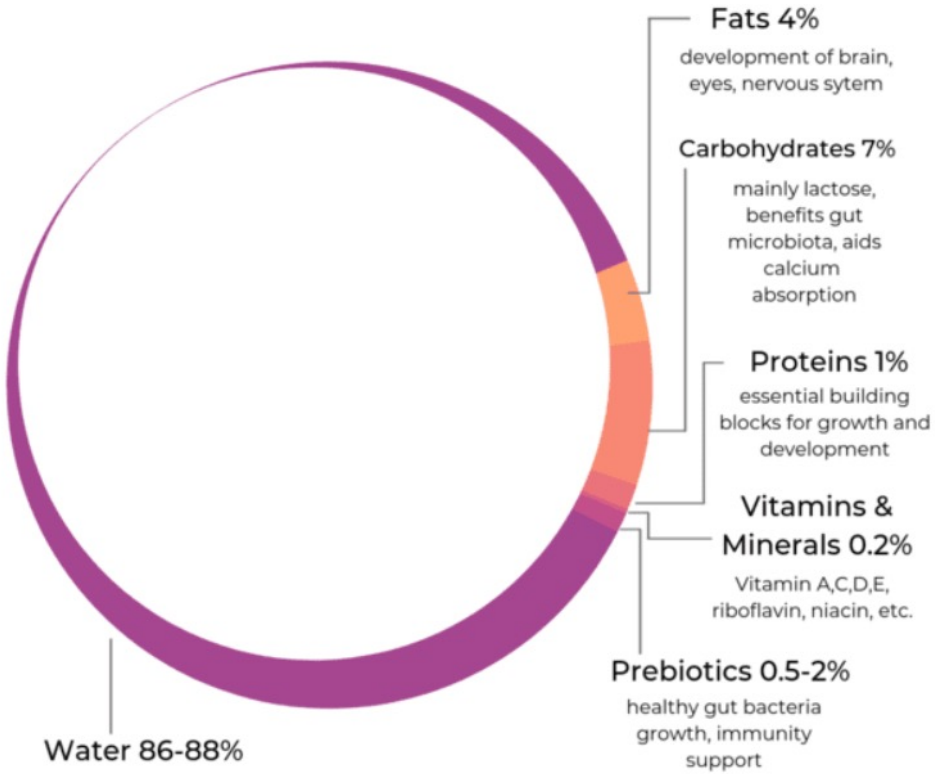
Maternal Nutritional Needs During Lactation

BONUS TOPIC

https://www.mamatheexplorer.com/index.php/tag/newborn-stomach-size-guide/

Breast Milk Composition Changes As Baby Grows

- **Colostrum**: first few days
  - Antibodies, good bacteria, and other protective cells
- **Transitional Milk:** first few weeks
  - Higher fat and lactose (carbohydrate)
- **Mature Milk:** after the first 4 weeks
  - High in proteins, lactose (carbohydrate), and other vitamins/minerals



The nutritional content of the breast milk changes as baby grows to ensure all nutrient needs are met!

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https://www.nanobebe.com/blogs/bebe-blog/can-mothers-diet-change-breast-milk-nutrients
https://familyandconutrition.com/breastmilk/

Mother's Breastfeeding Demand

- Women who breastfeed require approximately 500 additional kcal/day beyond what is recommended for non-pregnant women
- The recommended daily allowance for protein during lactation is an additional 25 g/day
- Both fat (vitamins A, D, K) and water-soluble vitamins (vitamins C and B) are secreted into breast milk and their levels are reduced in breast milk when there is a maternal vitamin deficiency
- The quantitative and caloric value of breast milk does not change with dieting and exercise

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Kominiarek MA, et al. *Med Clin North Am.* 2016;100(6):1199-1215.
https://livingwithlowmilksupply.com/how-milk-is-produced-in-breast

Nutrients Passed from Mother into Breast Milk

Mother's Diet to Breast Milk

- Fat (DHA and Lauric Acid)
  - DHA and Lauric Acid
- B-complex
- Vitamin A
  - 4000 to 10000 IU daily
- Vitamin D
  - 600 to 4000 IU daily
- Vitamin C
  - 120 to 2000 mg daily
- Iodine
  - 290 to 1100 mcg daily

Mother to Breast Milk (despite diet)

- Calcium
  - 1300 to 3000 mg daily
- Iron
  - 10 to 45 mg daily
- Zinc
  - 13 to 40 mg daily
- Copper
  - 1.3 to 10 mg daily
- Folate
  - 500 to 1000 mcg daily

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Kominiarek MA, et al. *Med Clin North Am.* 2016;100(6):1199-1215.
https://lpi.oregonstate.edu/mic/life-stages/pregnancy-lactation.
https://www.nanobebe.com/blogs/bebe-blog/can-mothers-diet-change-breast-milk-nutrients.

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We look forward to hearing from you!

Questions?

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