

SHEICON2107

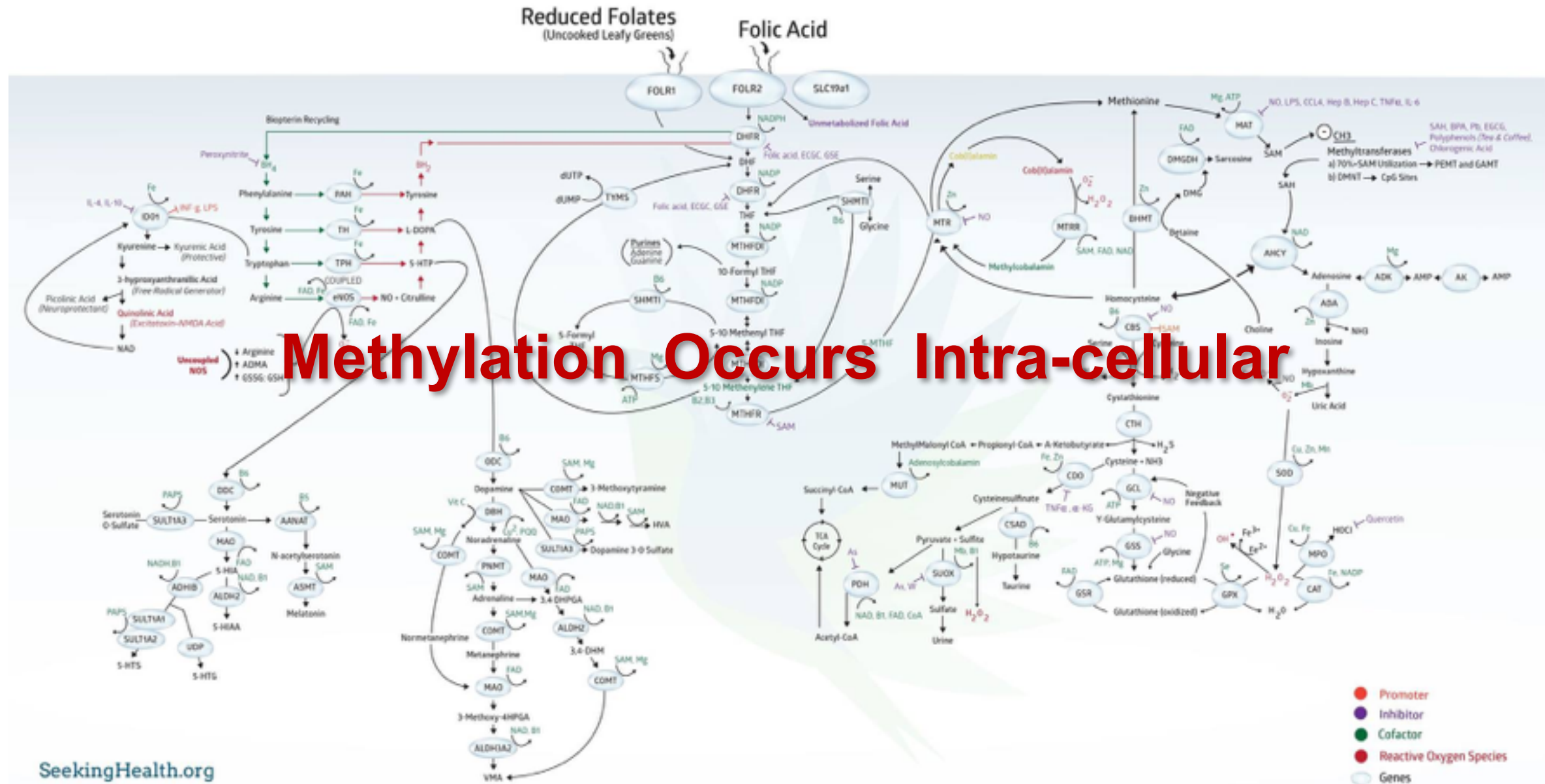
Assessing Cofactors & Precursors

Disclaimer

- Consultant, Spectracell Laboratory
- Speaker, Spectracell Laboratory
- Speaker, Xymogen Nutraceuticals

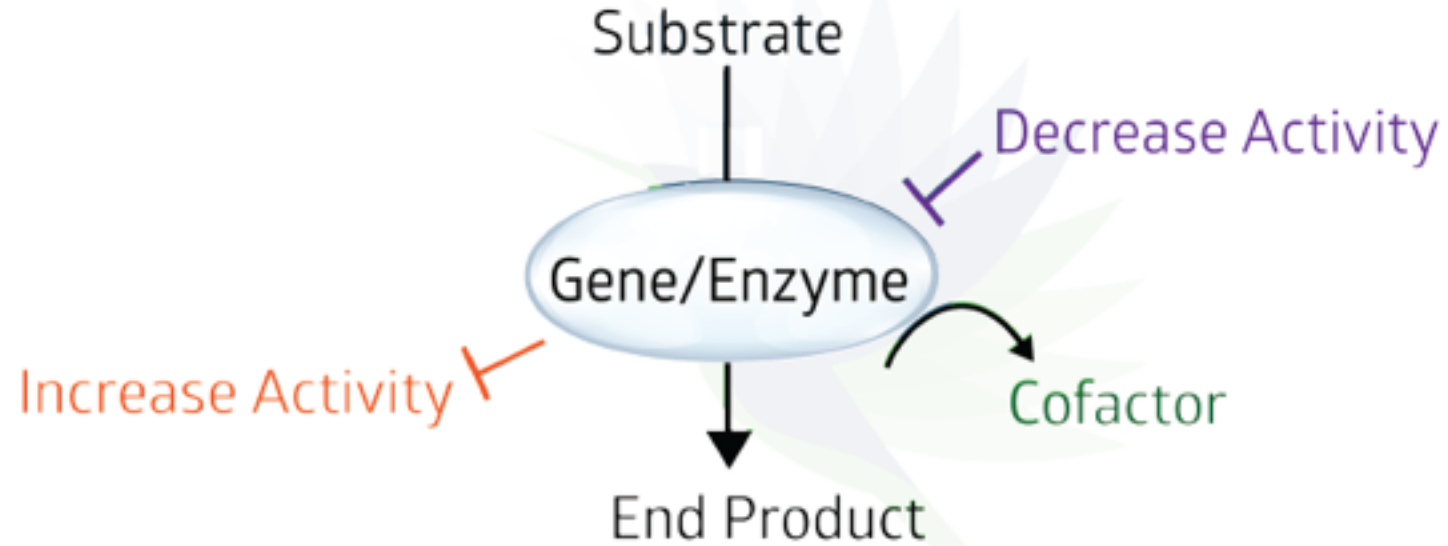
Objectives

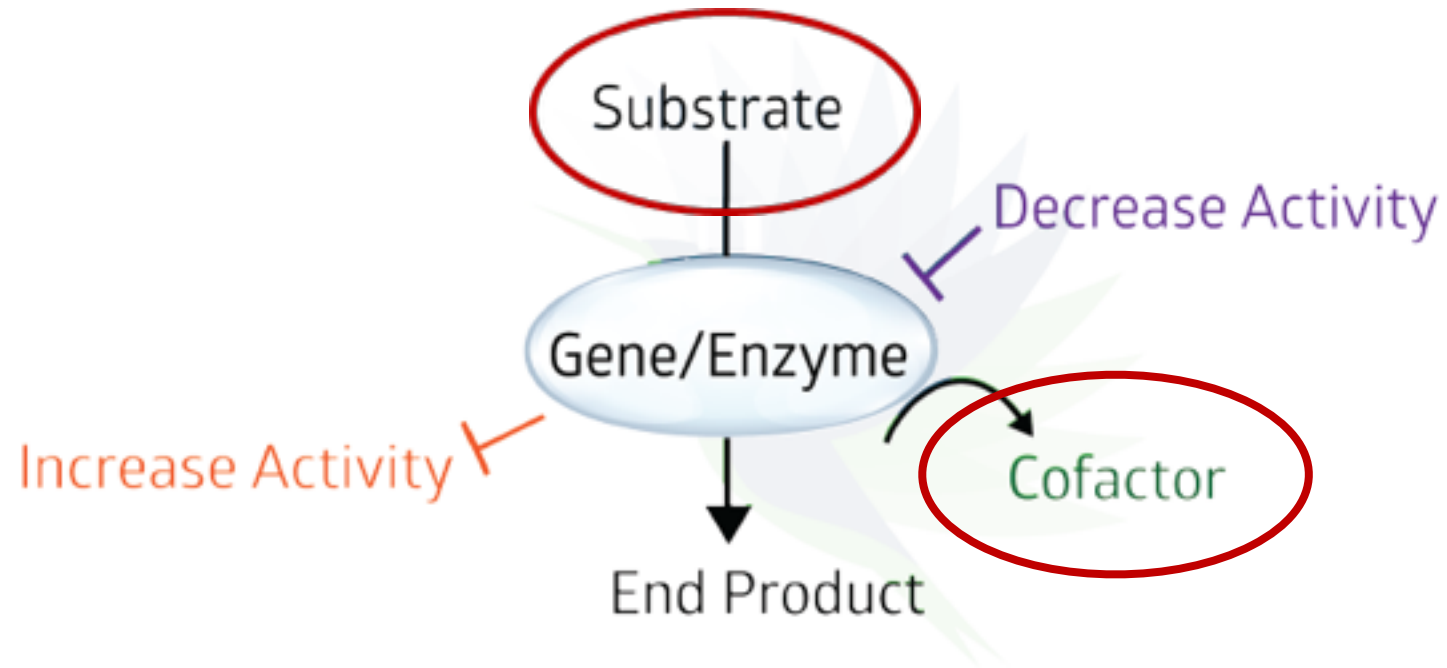
- 1. Participants will learn nutrient cofactors for enzyme function.
- 2. Participants will learn differences, limitations and benefits of different types of nutrient testing.
- 3. Participants will learn the importance of evaluating the sufficiency of intracellular nutrients.
- 4. Participants will appreciate nutrients can influence other nutrients.



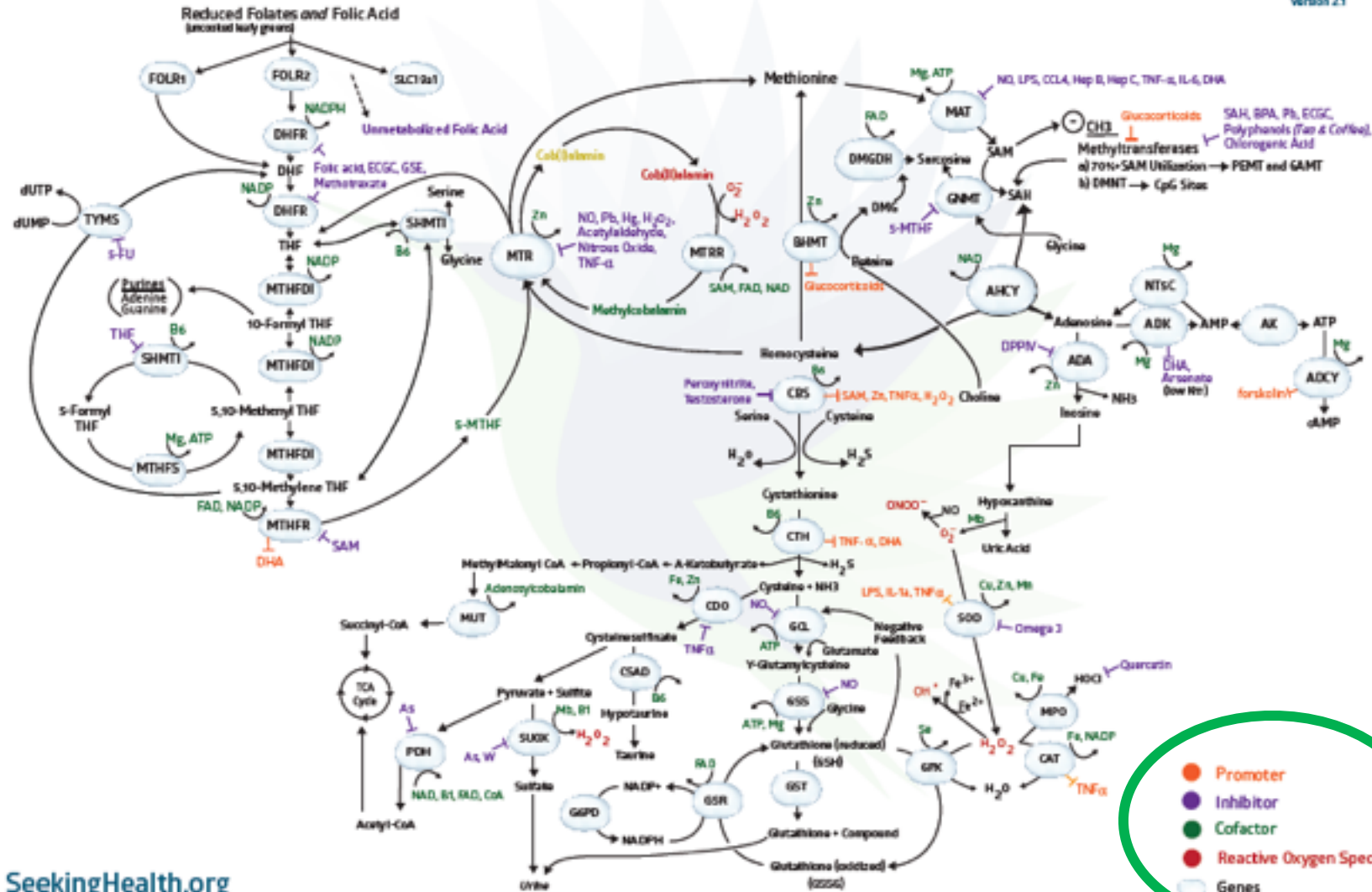
NOTE: Using *Pathway Planner*
4.0
and Pathway Planner 4.1

- these are already out of date!
- more inhibitors will be known next year,
- and in 5 years,
- and even more in 10 years.



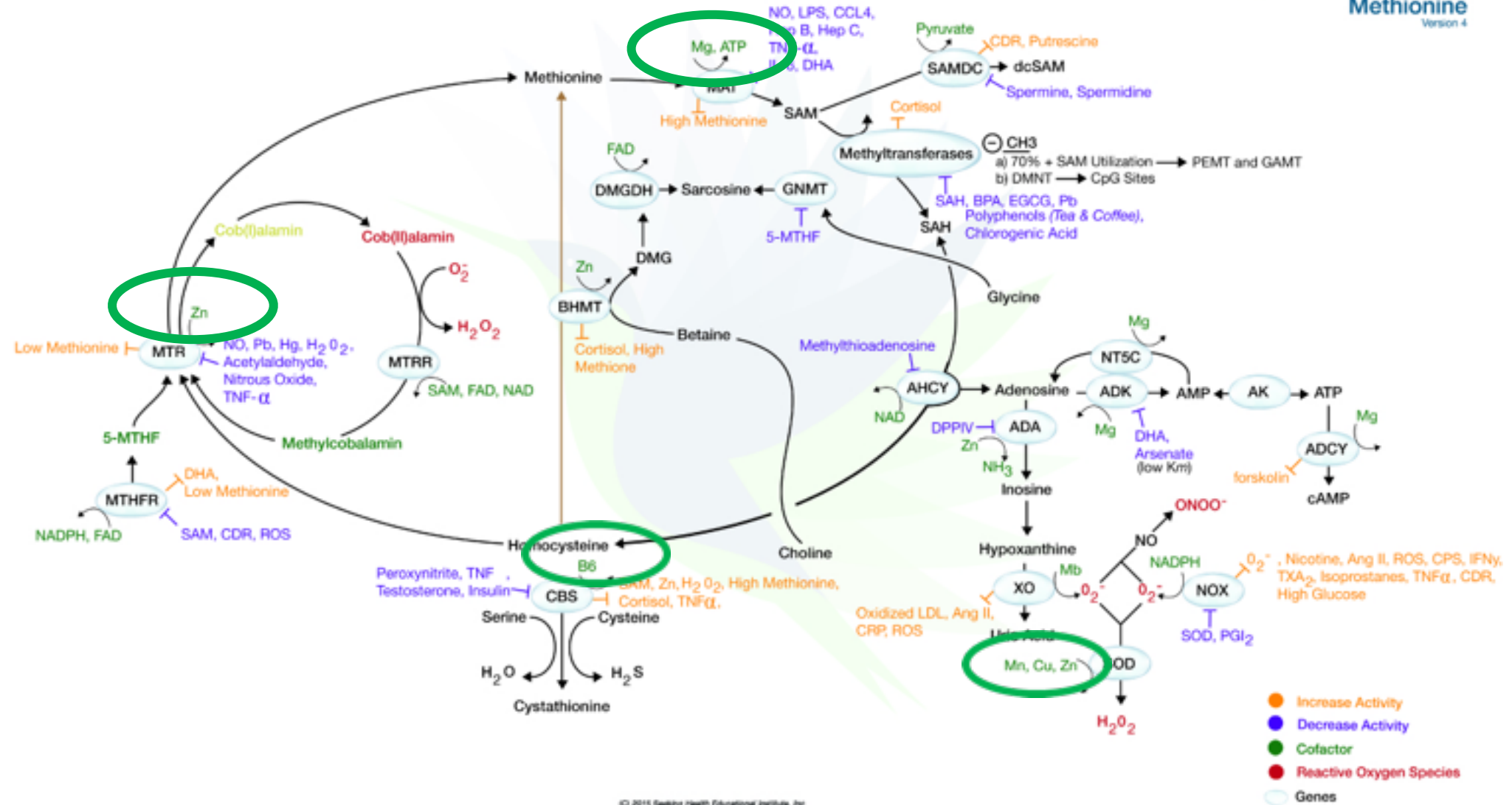


- Increase Activity
- Decrease Activity
- Cofactor
- Reactive Oxygen Species
- Genes



Pathway Planner

Methionine
Version 4



An Example: **Homocysteine**

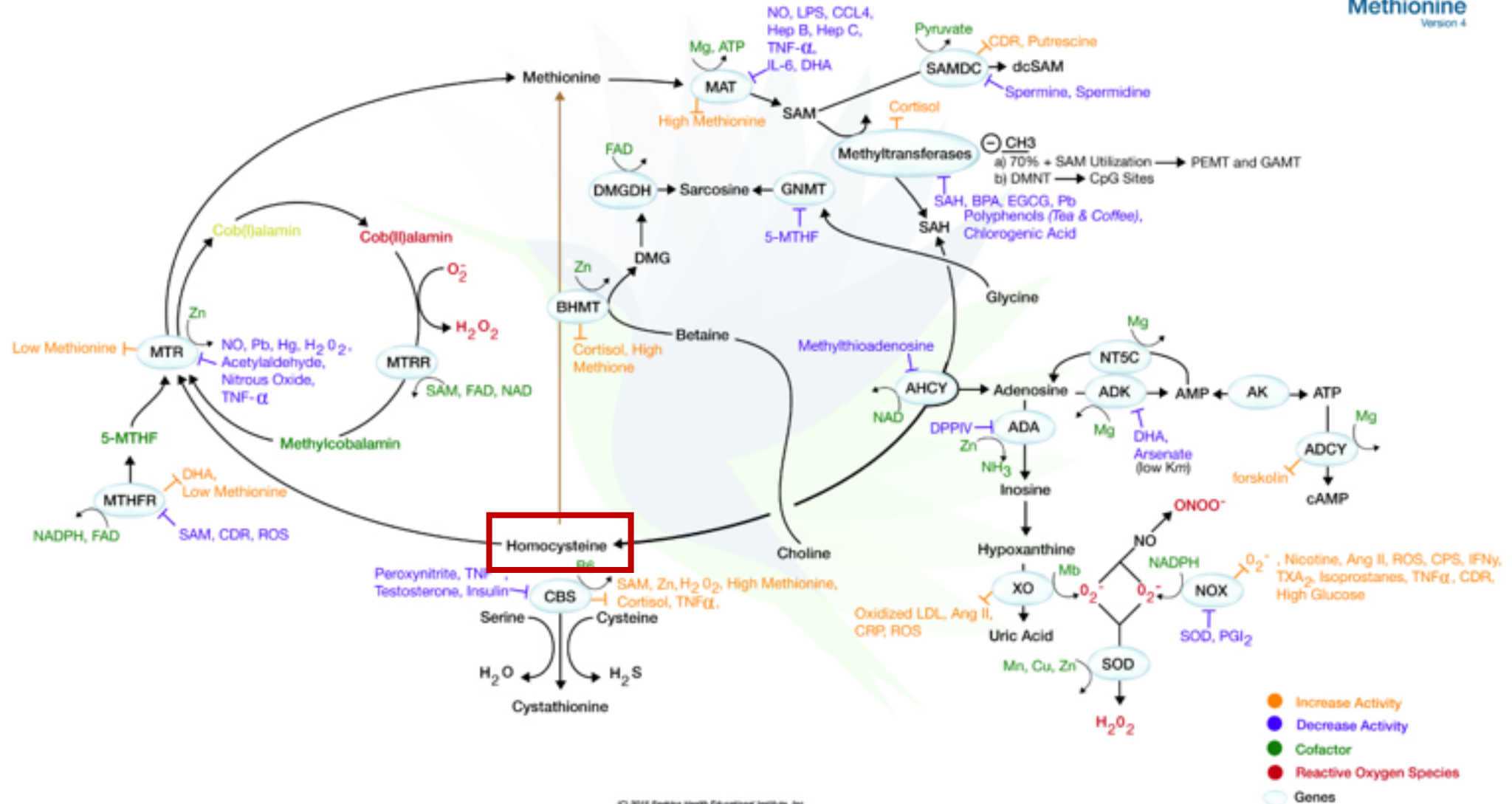
High Homocysteine: Cardiac Risk

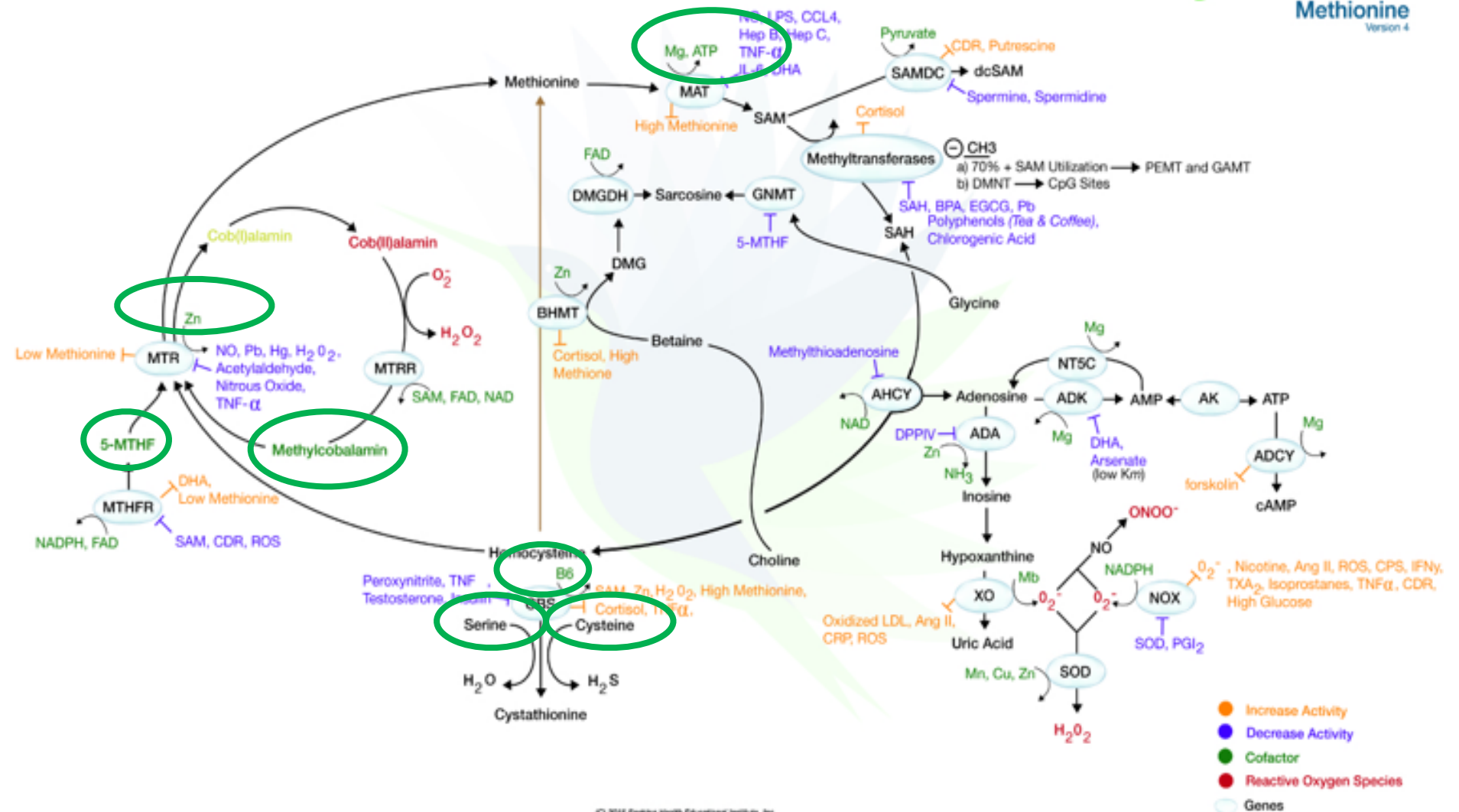
High Homocysteine: Dementia Risk

Pathway Planner

Methionine

Version 4

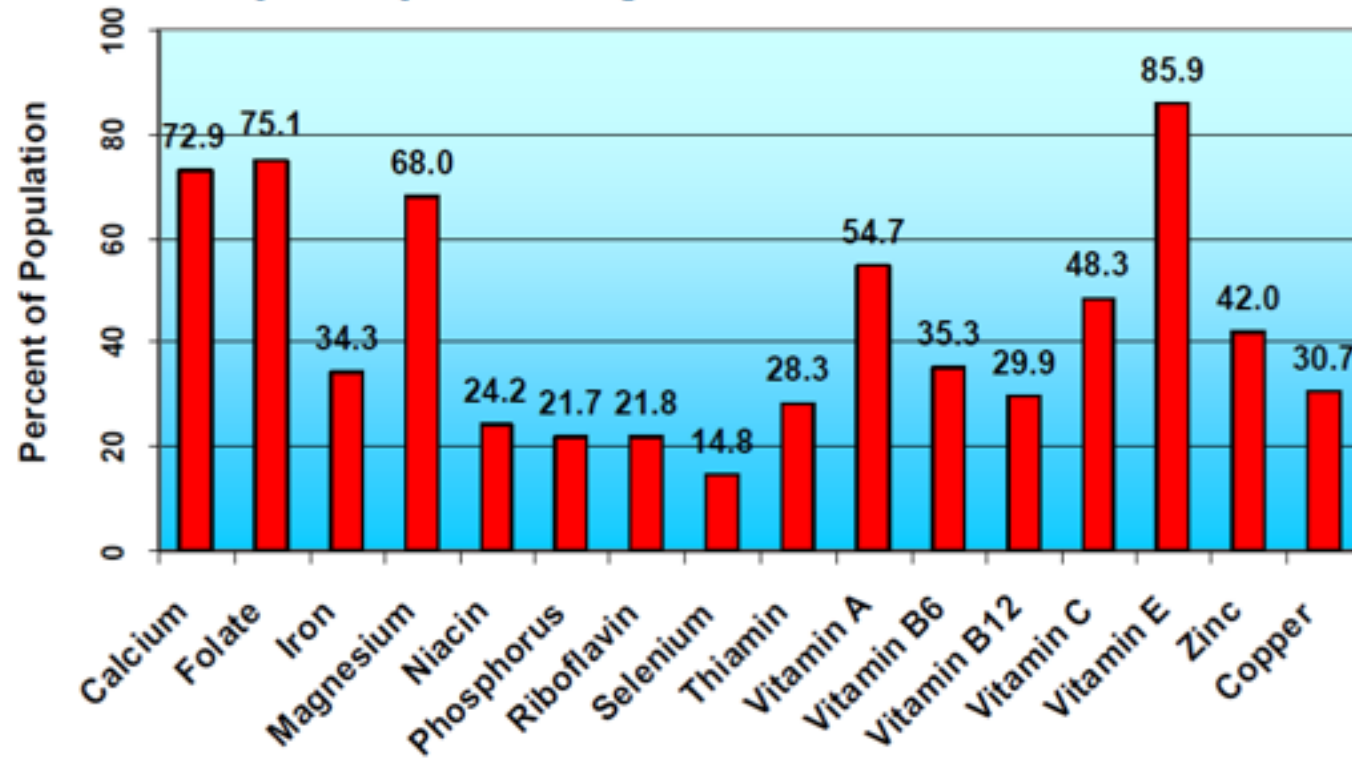




Nutrients
needed for
Homocysteine:
Methylfolate
Vitamin B₁₂
Zinc
Vitamin B₆/
or P-5-P
Cysteine
Serine
Magnesium

How do we know if
Methylation is working?

Percent of U.S. Population **NOT** Meeting the Dietary Reference Intake (DRI) for Specific Nutrients



Essential Nutrient Insufficiencies Linked with Top Causes of Death in U.S.

	CVD	Cancer	HTN	Respiratory Diseases	T2DM	Alzheimers	Kidney Disease	Liver Disease
Ca	✓	✓	✓		✓			
Cu	✓	✓	✓			✓		
Cr	✓		✓		✓			
Vit D	✓	✓	✓		✓			
K	✓		✓					
Mg	✓	✓	✓	✓	✓	✓		
Se	✓	✓	✓	✓	✓	✓	✓	✓
Zn	✓	✓	✓		✓		✓	✓

Lord RS, Bralley JA. *Laboratory Evaluations for Integrative and Functional Medicine*, 2nd edition. Duluth, GA: Metametrix Institute; 2008. Adapted from Table 3.4 -reports showing associations of essential element insufficiency with the top causes of death in the United States (2005). P.71.

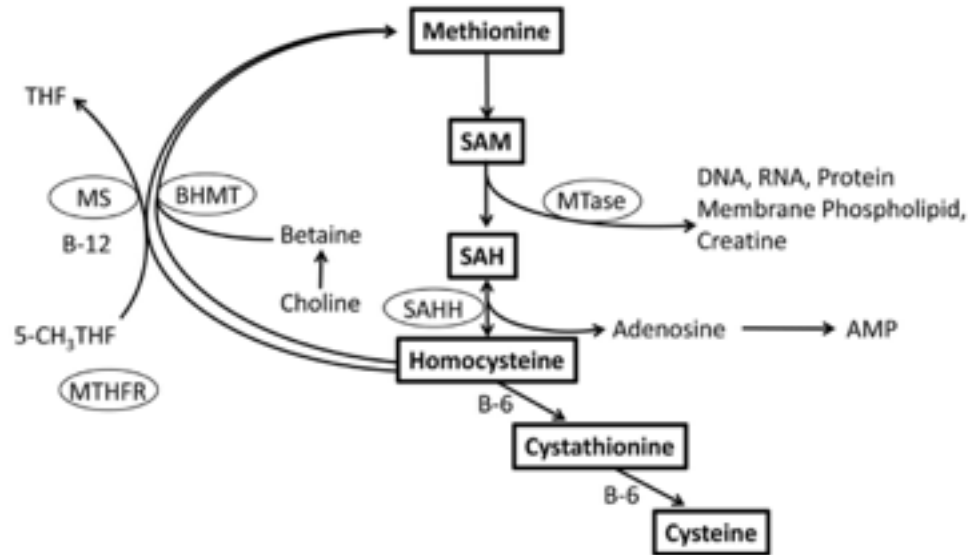
**Are there sufficient Nutrients for
Methylation?**

Methylation Status: SAM/SAH Ratio Example

Methylation Profile; plasma

PRIMARY & INTERMEDIATE METABOLITES							
	RESULT/UNIT	REFERENCE INTERVAL	PERCENTILE				
			2.5 th	16 th	50 th	84 th	97.5 th
Methionine	1.4 μmol/dL	1.6– 3.6					
Cysteine	28 μmol/dL	20– 38					
S-adenosylmethionine (SAM)	76 nmol/L	86– 145					
S-adenosylhomocysteine (SAH)	18.6 nmol/L	10– 22					
			68 th 95 th				
Homocysteine	4.7 μmol/L	< 11					
Cystathionine	0.01 μmol/dL	< 0.05					

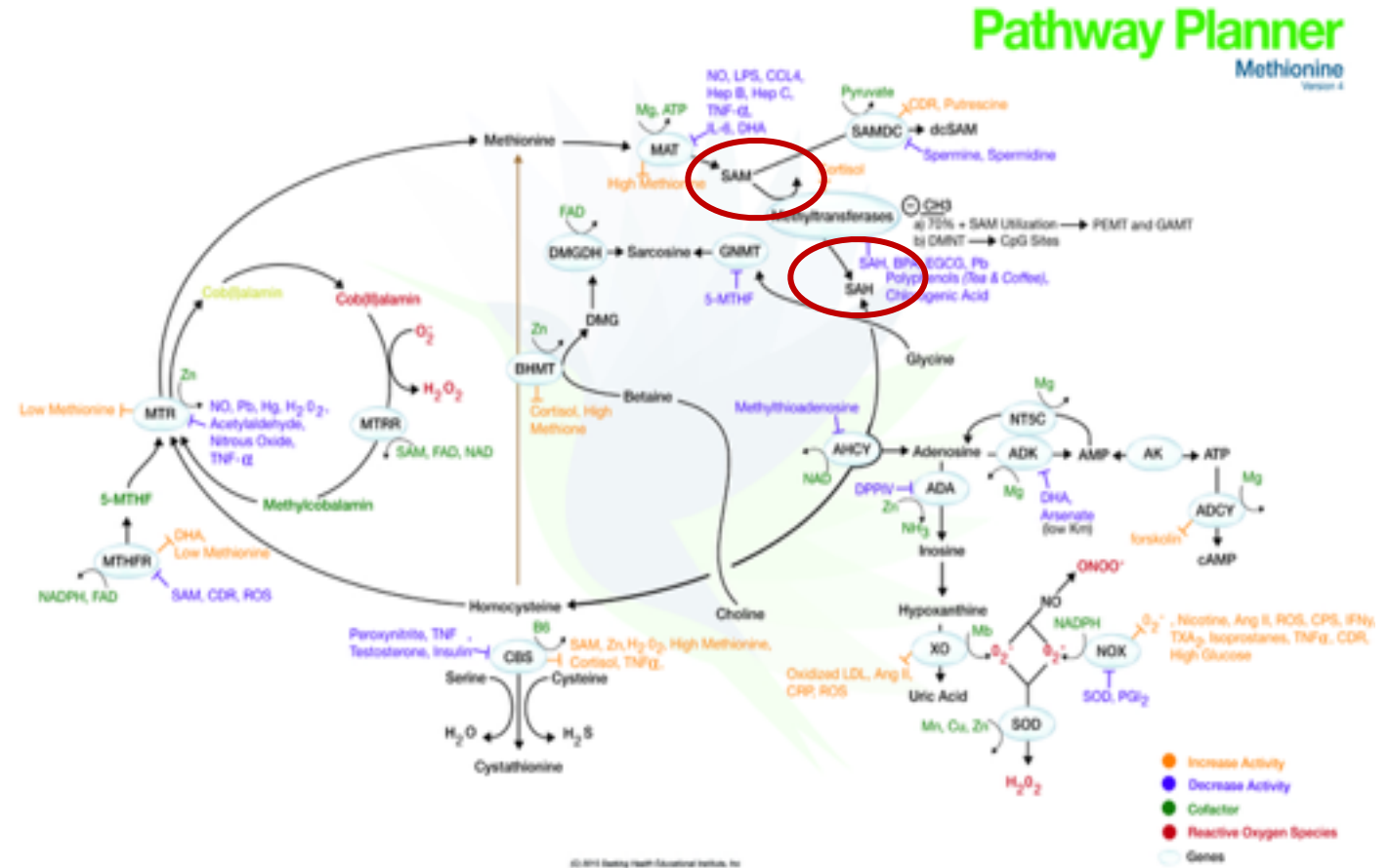
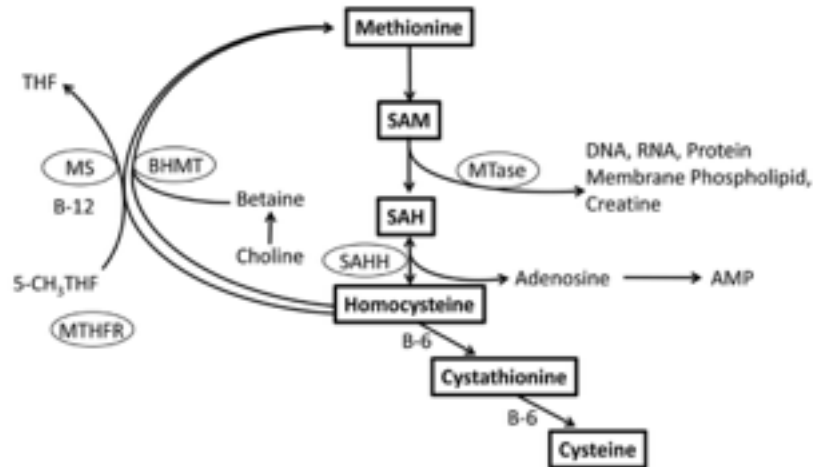
METHYLATION INDEX			
	RESULT	REFERENCE INTERVAL	PERCENTILE
			68 th 95 th
SAM : SAH	4.1	> 4	



Methylation Status: SAM/SAH Ratio Example

Methylation Profile: plasma

PRIMARY & INTERMEDIATE METABOLITES							
	RESULT/UNIT	REFERENCE INTERVAL	PERCENTILE				
			2.5 th	16 th	50 th	84 th	97.5 th
Methionine	1.4 $\mu\text{mol/dL}$	1.6~ 3.6					
Cysteine	28 $\mu\text{mol/dL}$	20~ 38					
S-adenosylmethionine (SAM)	76 nmol/L	86~ 145					
S-adenosylhomocysteine (SAH)	18.6 nmol/L	10~ 22					
			66 th 95 th				
Homocysteine	4.7 $\mu\text{mol/L}$	< 11					
Cystathionine	0.01 $\mu\text{mol/dL}$	< 0.05					
			66 th 95 th				
METHYLATION INDEX							
	RESULT	REFERENCE INTERVAL	PERCENTILE				
			66 th 95 th				
SAM : SAH	4.1	> 4					



What is the best laboratory
assessment to assess
Nutrient Cofactor Sufficiency
for enzyme function?

Examples of Important Nutrients

Zinc

Magnesium

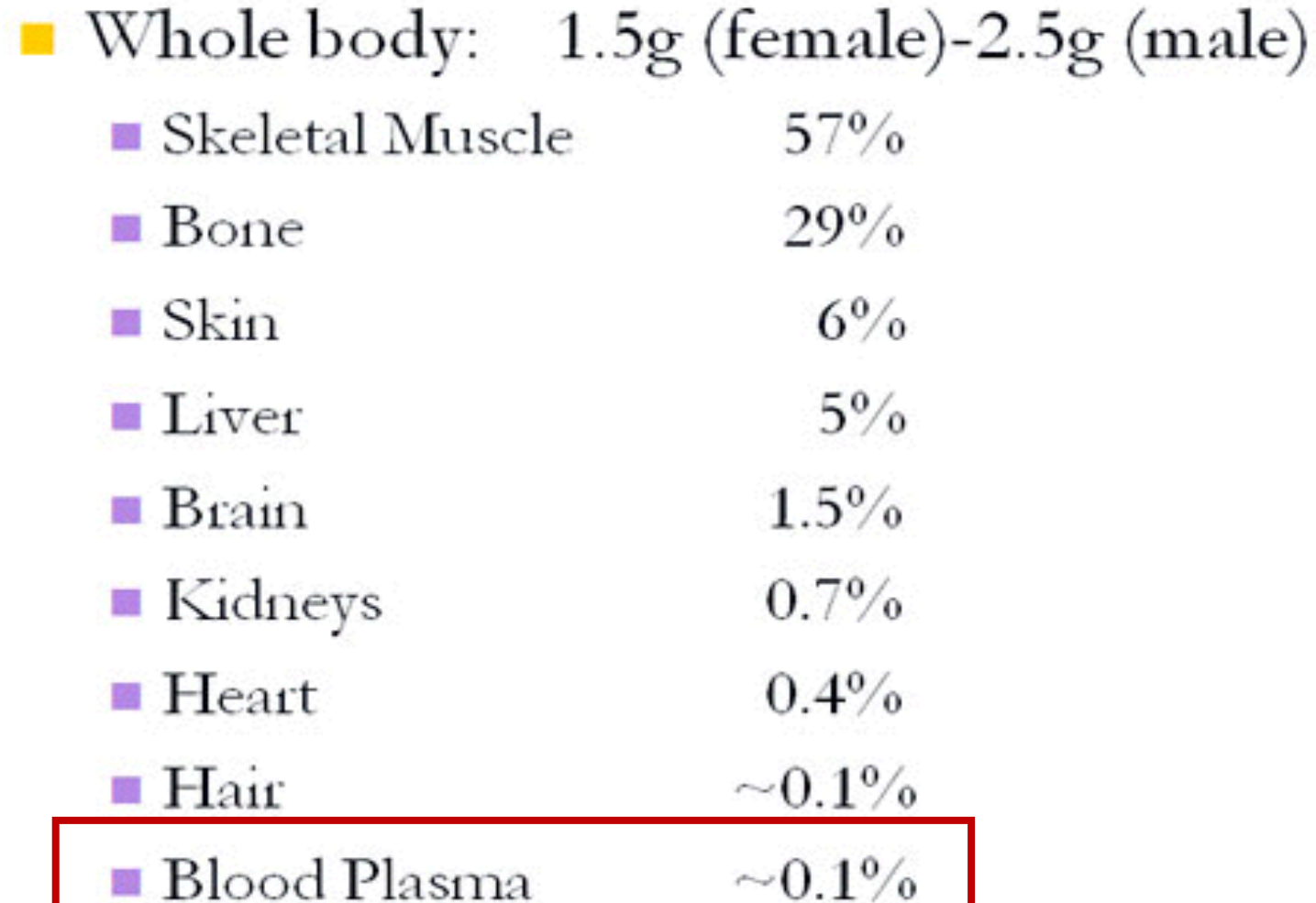
B1, B2, B3, B7, B9

Zinc: Body Distribution

- Whole body: 1.5g (female)-2.5g (male)
 - Skeletal Muscle 57%
 - Bone 29%
 - Skin 6%
 - Liver 5%
 - Brain 1.5%
 - Kidneys 0.7%
 - Heart 0.4%
 - Hair ~0.1%
 - Blood Plasma ~0.1%

http://images.engormix.com/E_articles/2529_605.jpg

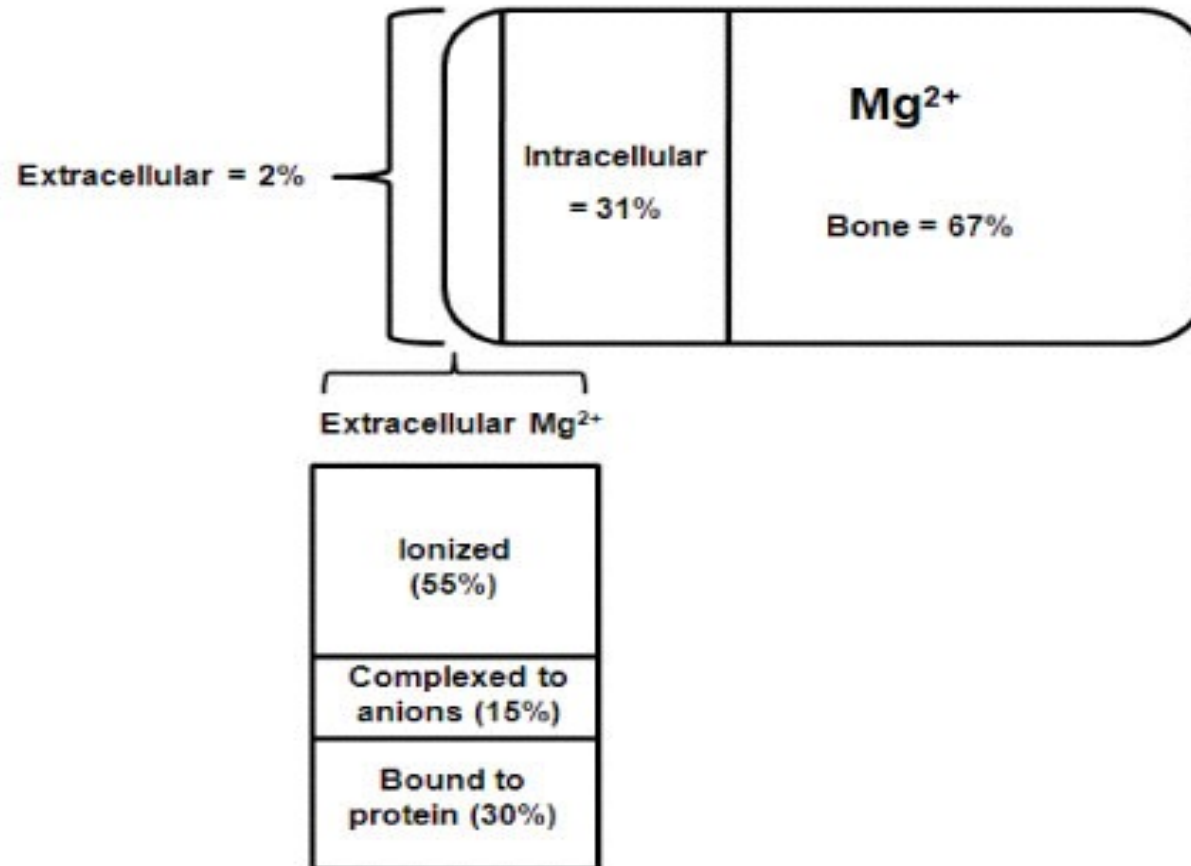
Zinc: Body Distribution



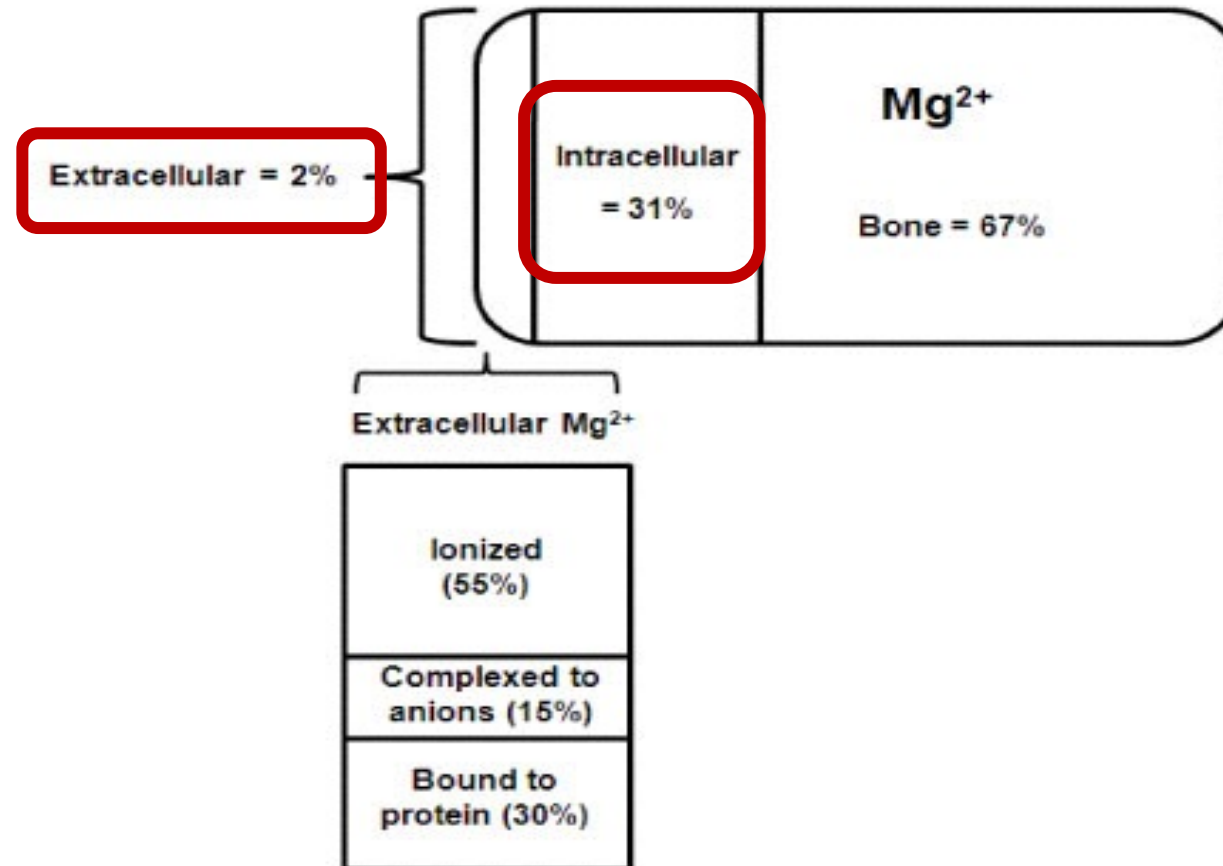
A list of zinc body distribution percentages. The items are listed vertically, each preceded by a small purple square. The last item, 'Blood Plasma', is enclosed in a red rectangular box.

■ Whole body:	1.5g (female)-2.5g (male)
■ Skeletal Muscle	57%
■ Bone	29%
■ Skin	6%
■ Liver	5%
■ Brain	1.5%
■ Kidneys	0.7%
■ Heart	0.4%
■ Hair	~0.1%
■ Blood Plasma	~0.1%

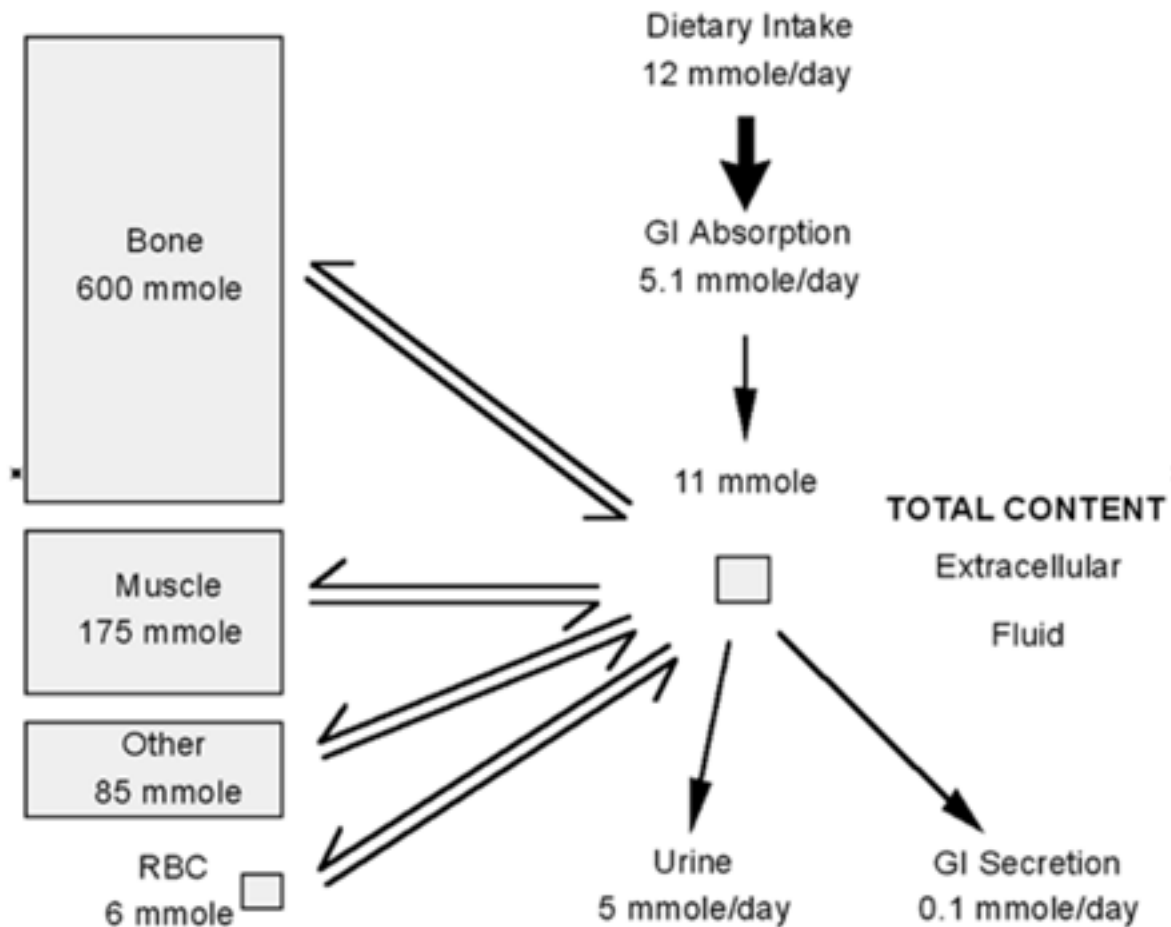
Magnesium: Body Distribution



Magnesium: Body Distribution

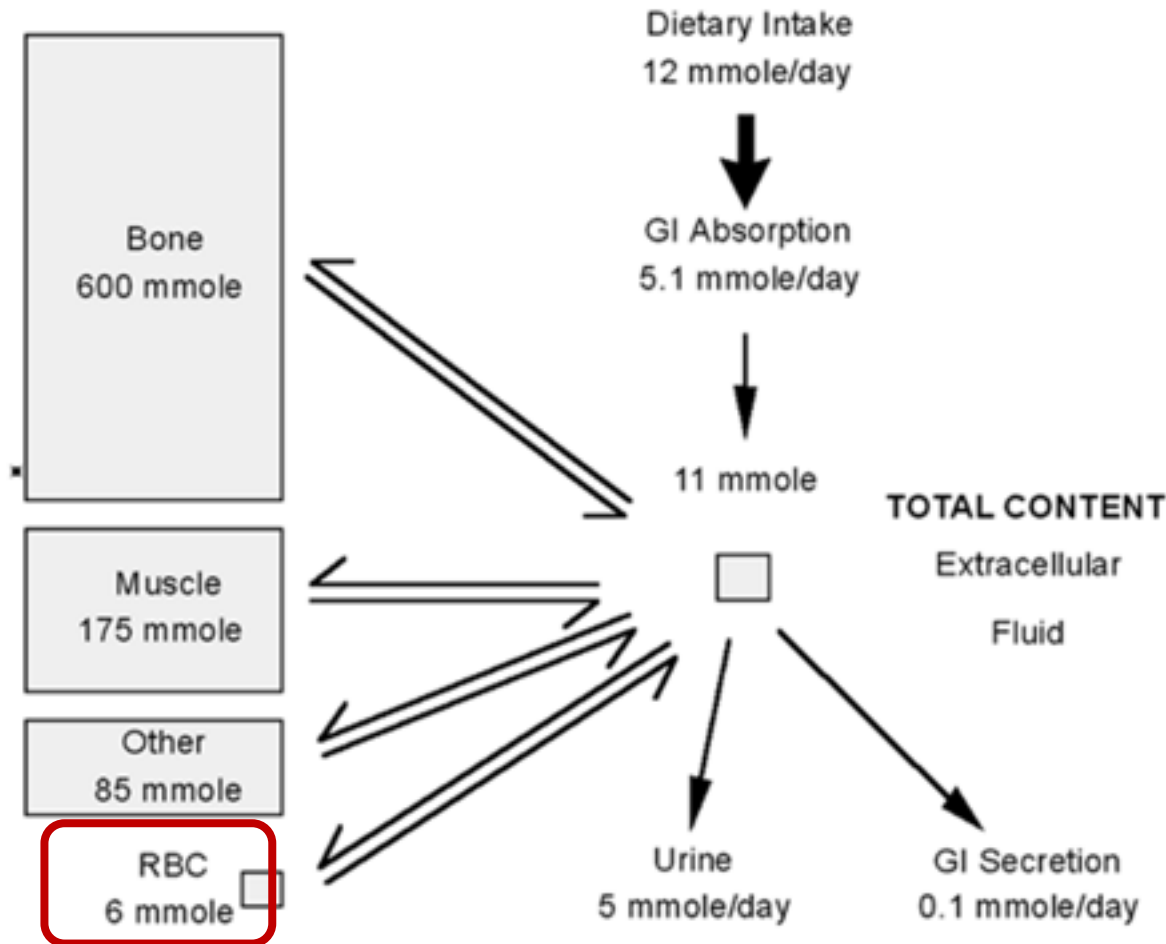


Magnesium: Body Distribution



<http://www.bioscience.org/2000/v5/d/quamme/fig1.gif>

Magnesium: Body Distribution: <1% RBC



<http://www.bioscience.org/2000/v5/d/quamme/fig1.gif>

Vitamin B1, B2, B3, B7, B9 Example

- Water Soluble.
- None directly tested.
- “Need” determined by amount of *downstream metabolites*.
- *No consideration of inhibitors* causing “downstream metabolite” deficiencies.
- Nutrients may be sufficient, and inhibitors can be giving false impression of insufficiency.

Normal	Borderline	High Need	Supplementation for High Need
<i>Antioxidants</i>			
Vitamin A / Carotenoids			
	Vitamin C		
Vitamin E / Tocopherols			
	α-Lipoic Acid		
	CoQ10		
<i>B-Vitamins</i>			
		Thiamin - B1	Thiamin - B1 - Dose = 50 mg
		Riboflavin - B2	Riboflavin - B2 - Dose = 50 mg
		Niacin - B3	Niacin - B3 - Dose = 50 mg
	Pyridoxine - B6		
		Biotin - B7	Biotin - B7 - Dose = 400 mcg
		Folic Acid - B9	Folic Acid - B9 - Dose = 1,200 mcg
	Cobalamin - B12		
<i>Minerals</i>			
	Magnesium		
	Manganese		
Molybdenum			
	Zinc		

Conclusions: For Nutrient Sufficiency for Methylation...

1. RBC Magnesium is Useless
2. Plasma Zinc is Meaningless
3. B-Vitamin assessments, based on down-stream metabolites, is poor.

Must know what each test evaluates.

Must know **how** each value is determined.

Ask: Is the test evaluating what you want to know?

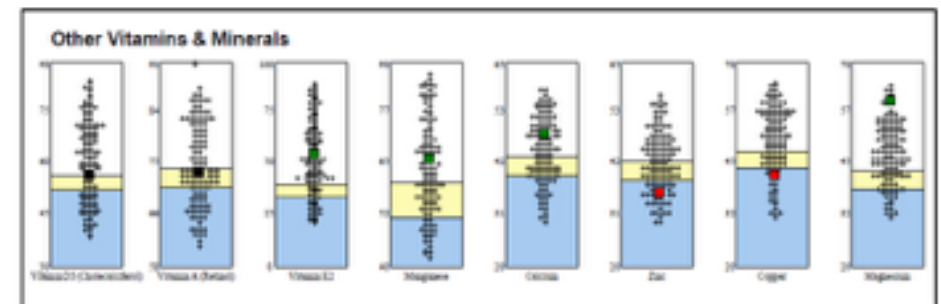
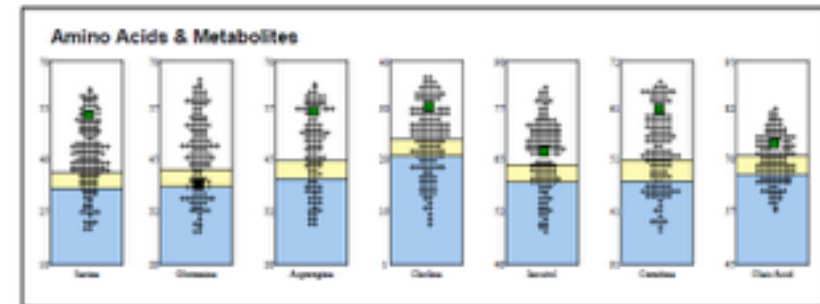
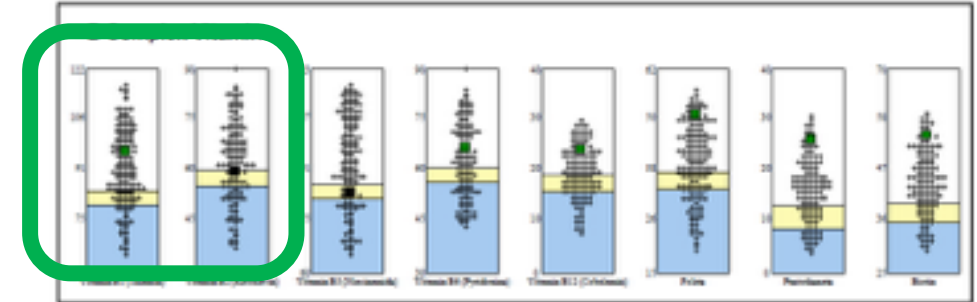
Read the fine print.

Be discerning.

Patient Case: 54 y.o. female, CC: Fatigue

Example: (labs drawn simultaneously)

Normal	Borderline	High Need	Supplementation for High Need
Antioxidants			
Vitamin A / Carotenoids			
Vitamin E / Tocopherols	Vitamin C		
	α-Lipoic Acid		
CoQ10			
B-Vitamins			
		Thiamin - B1	Thiamin - B1 - Dose = 50 mg
		Riboflavin - B2	Riboflavin - B2 - Dose = 50 mg
	Niacin - B3		
Pyridoxine - B6	Biotin - B7		
Folic Acid - B9			
Cobalamin - B12			
Minerals			
	Magnesium		
Manganese			
Molybdenum			
	Zinc		
Vitamin D			
	Vitamin D		



Types of cells used in Nutrient evaluation

Mature Red Blood Cells

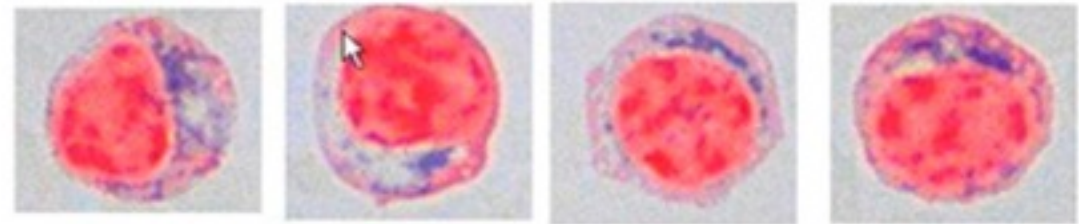
- No Nuclei
- No Mitochondria
- No Endoplasmic Reticulum



Red Blood Cells
image1.jpeg

Lymphocytes

- Have Nuclei
- Have Mitochondria
- Have Endoplasmic Reticulum



<https://www.intechopen.com/source/html/40939/media/>

Patient Case: Consider the Minerals: **Example** RBC's vs Lymphocyte (Intracellular) Sufficiency

Elemental Markers (RBCs)

Nutrient Elements

Element	Reference Range	Reference Range
Copper	0.617	0.466-0.721 mcg/g
Magnesium	40.6	30.1-56.5 mcg/g
Manganese	0.026	0.007-0.038 mcg/g
Potassium	3,175	2,220-3,626 mcg/g
Selenium	1.19	0.25-0.7 mcg/g
Zinc	11.3	7.8-13.1 mcg/g

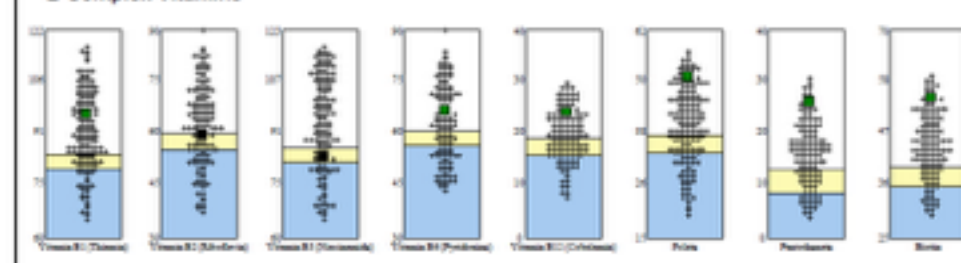
Toxic Elements

Element	Reference Range	Reference Range
Lead	0.012	<= 0.048 mcg/g
Mercury	<dl	<= 0.0039 mcg/g
Antimony	0.001	<= 0.002 mcg/g
Arsenic	0.020	<= 0.071 mcg/g
Cadmium	0.000	<= 0.001 mcg/g
Tin	<dl	<= 0.0009 mcg/g

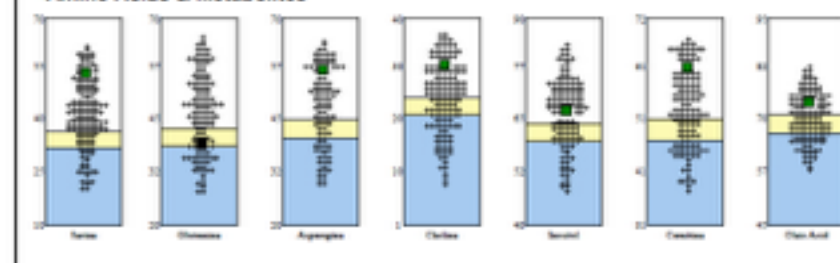
The Elemental reference ranges are based on an adult population.

Lab Comments

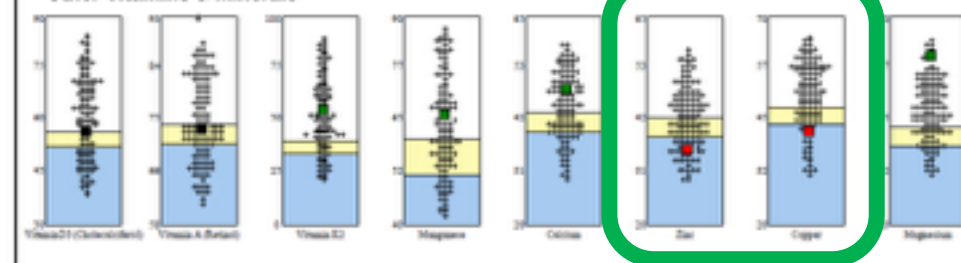
B Complex Vitamins



Amino Acids & Metabolites



Other Vitamins & Minerals



An Example: Homocysteine

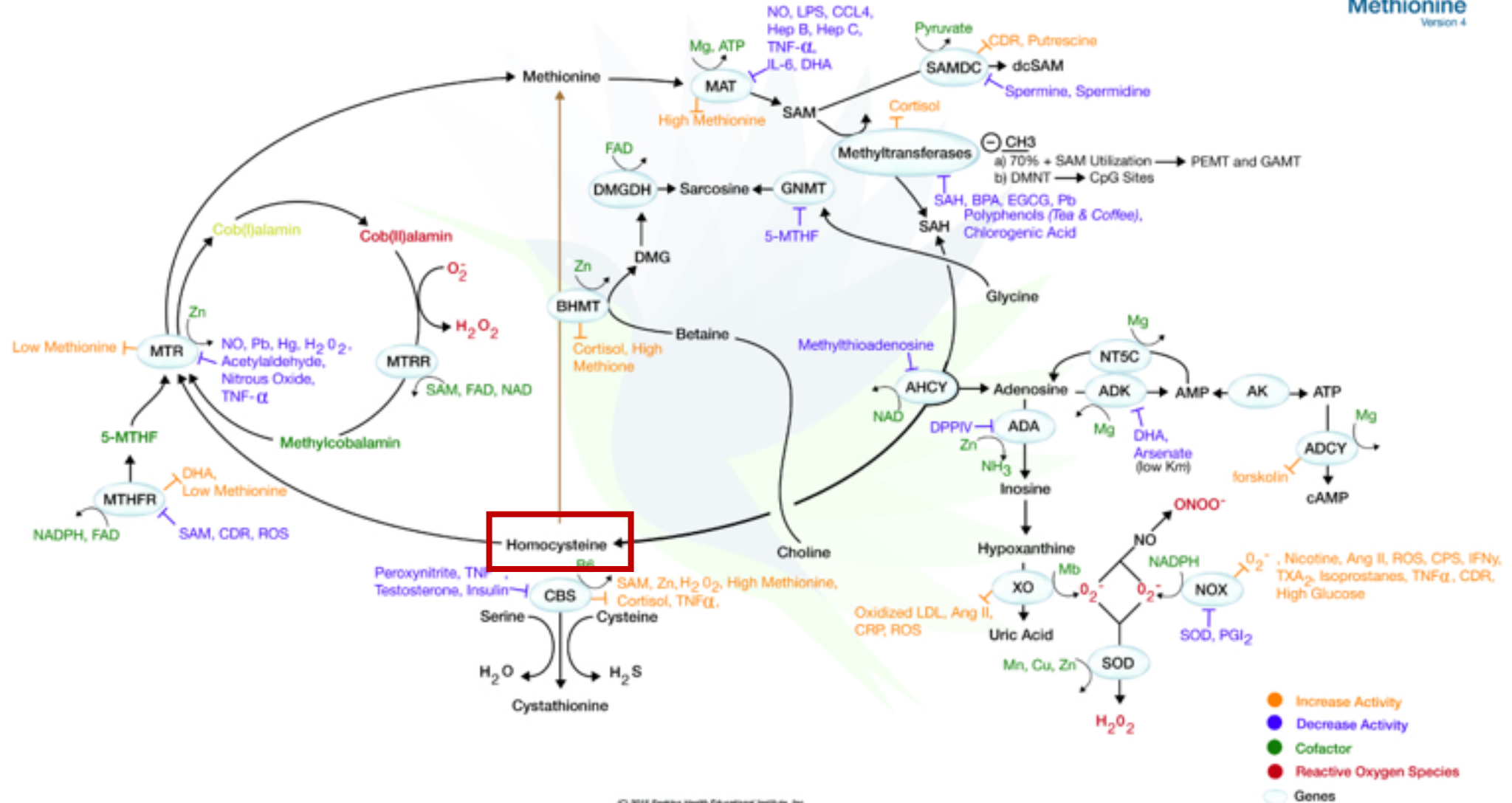
High Homocysteine: Cardiac Risk

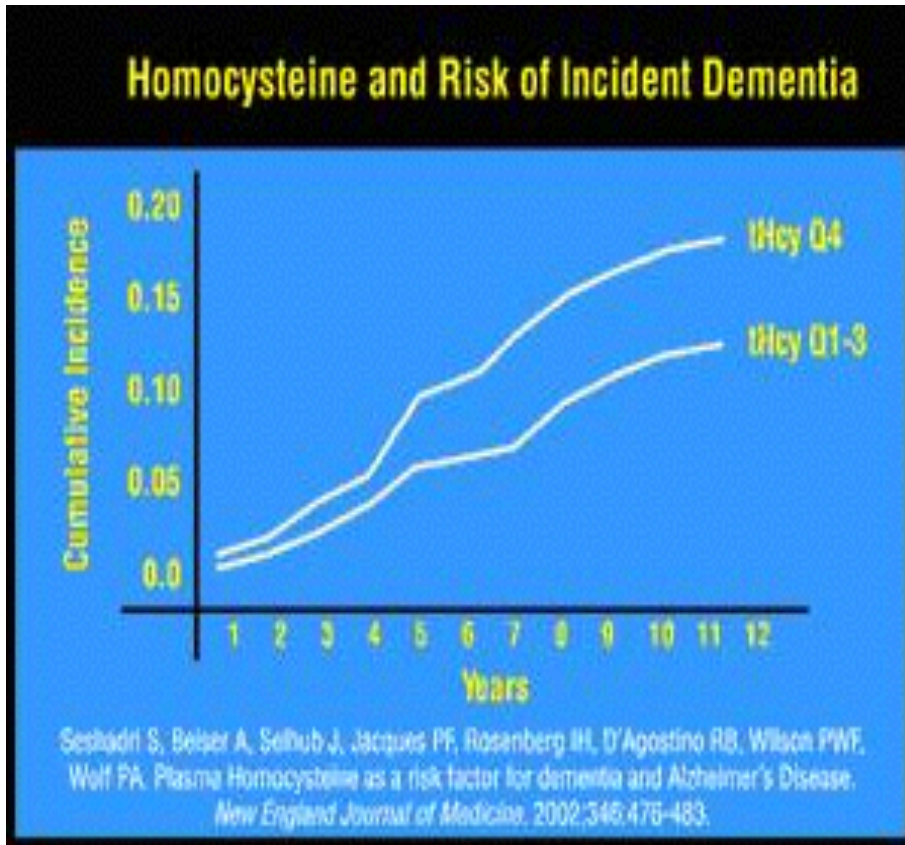
High Homocysteine: Dementia Risk

Pathway Planner

Methionine

Version 4

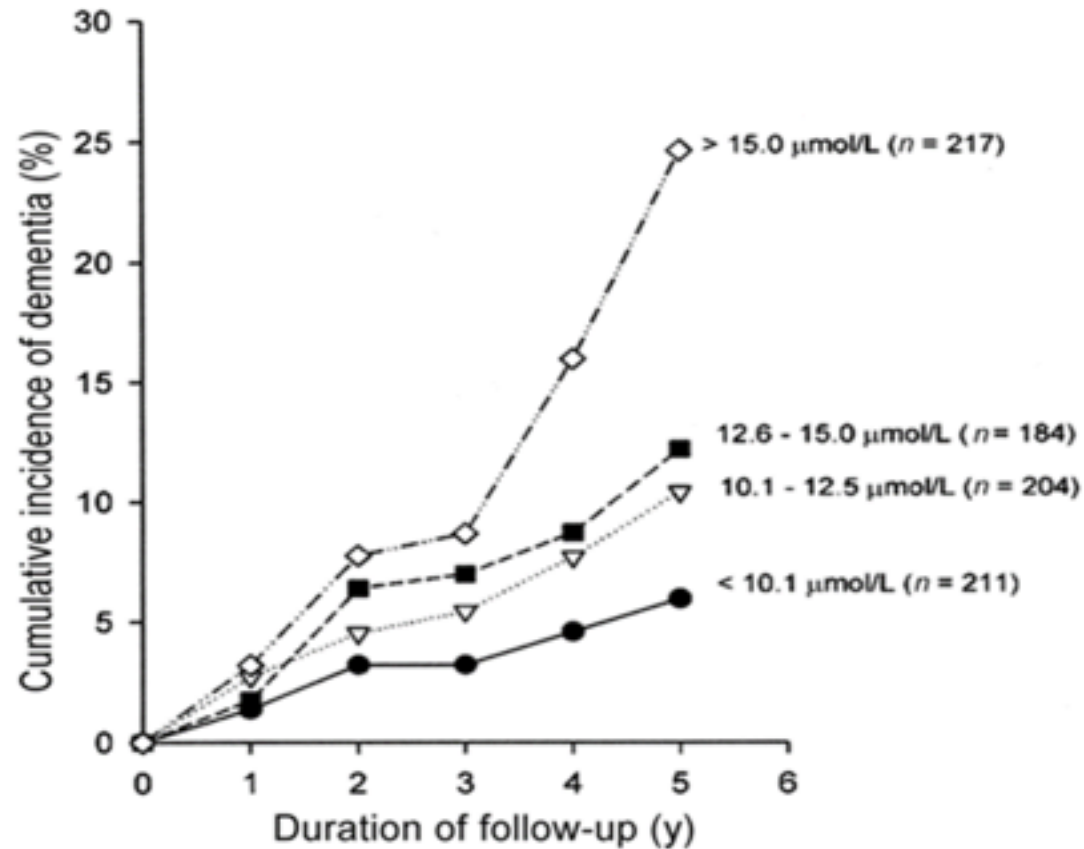




“Earlier in this decade, data released from the famed Framingham Longitudinal Study revealed a shocking finding: People with elevated level of homocysteine have higher risk of developing dementia, particularly Alzheimer’s disease. To be exact, **100% of subjects with homocysteine level above 14 came down with dementia....**



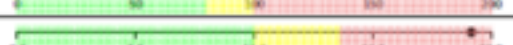

Only in recent years, did researchers realize that this **methylation cycle carries huge impact on the function and plasticity of neuron synapses in the Central Nervous System (CNS)** and elevated homocysteine is just a marker of the cycle’s malfunction. “

Dementia Increased with Increased Homocysteine





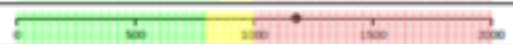
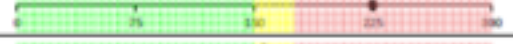

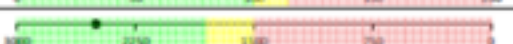


Homocysteine = 21.1 Accurate help needed...

Example

Test		Vascular Inflammation and Biomarkers		Patient Results	Reference Value
CRP-hs	mg/L			16.87	<3.00
Lipoprotein(a)	mg/dL		[1]	221.5	6.0 - 29.9
Apolipoprotein B	mg/dL			121	40 - 100
Homocysteine	μmol/L		[2]	21.1	<11.0

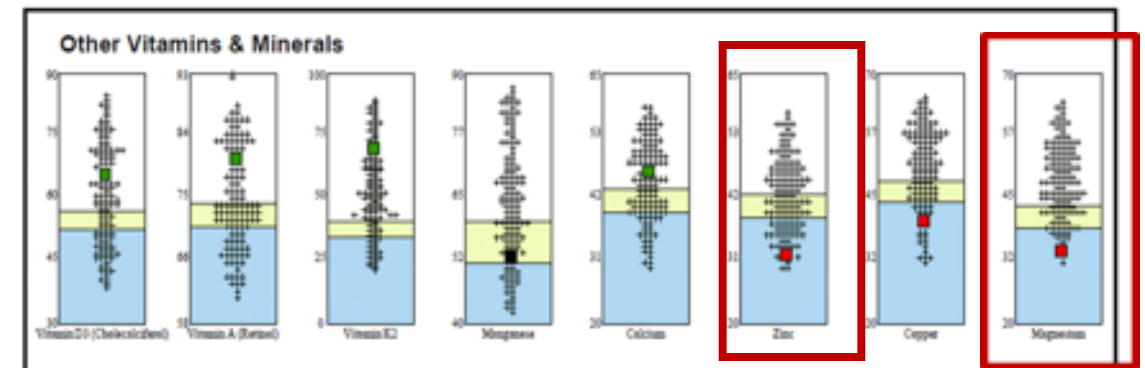
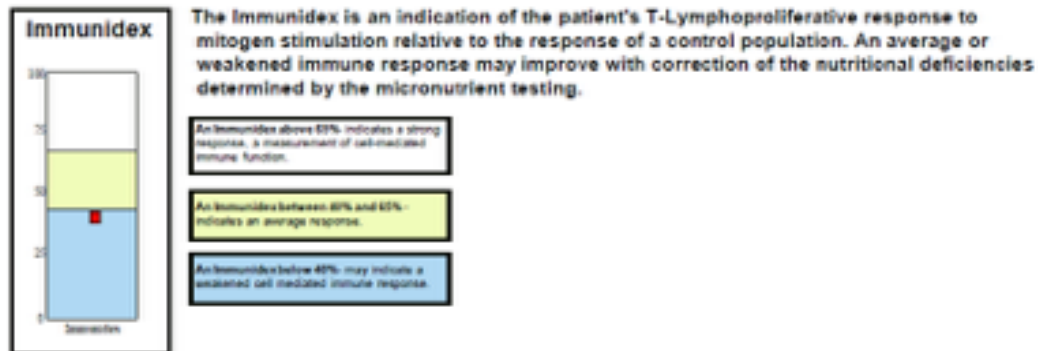
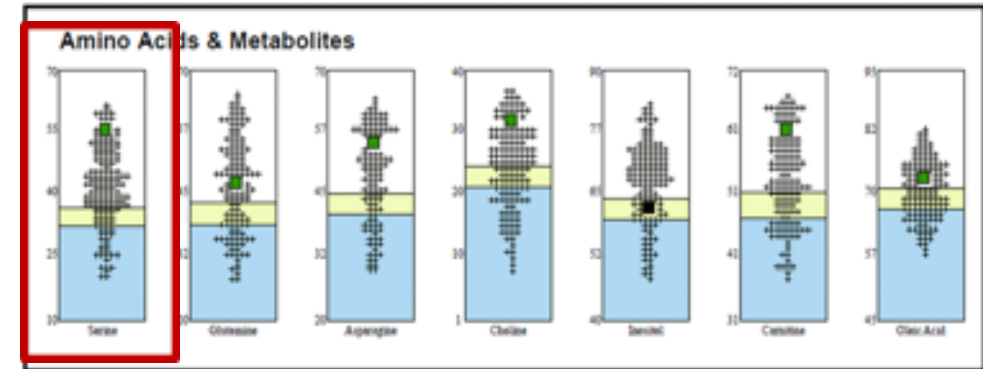
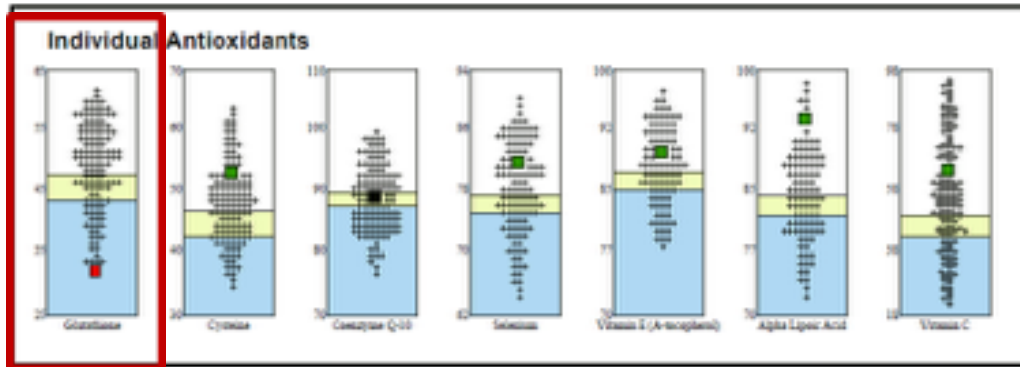
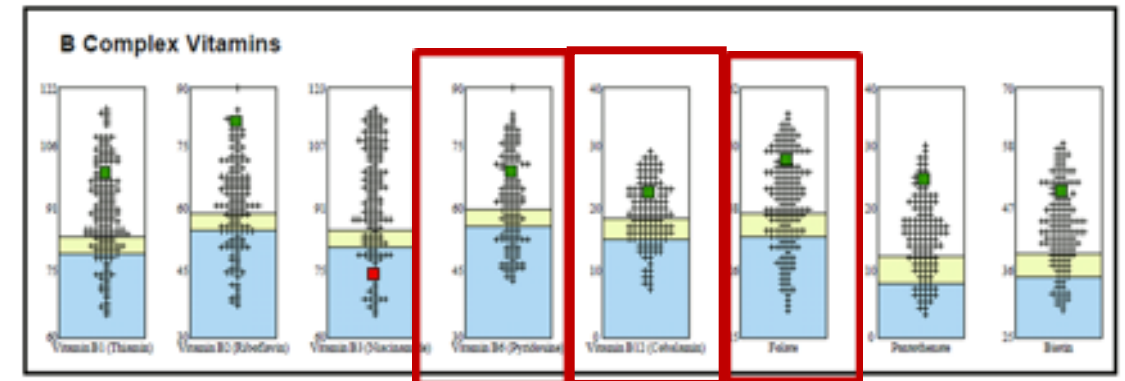
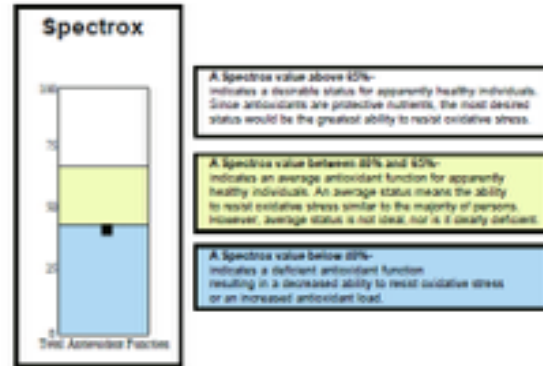
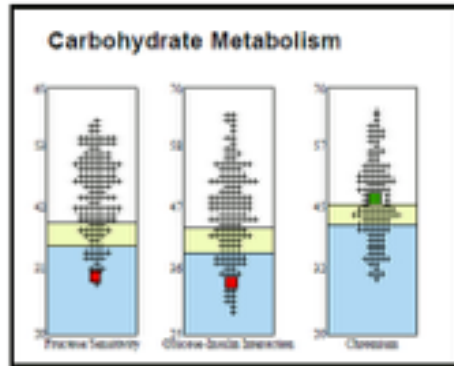
Clinical Indications: Vascular Inflammation and Biomarkers

These factors are important determinants of cardiometabolic risk, particularly with respect to vascular + inflammation (health of blood vessels). Apo-B (apolipoprotein B100) is a measure of all atherogenic (harmful) lipoprotein particles in the blood. Lp(a) is an extremely atherogenic lipoprotein that is strongly linked to developing thrombosis (blood clots). C-reactive protein (CRP) is an indicator of inflammation throughout the body, including the cardiovascular system. Regardless of the cause, both physical and mental stressors, infections and low grade chronic inflammation can all raise CRP, which increases cardiometabolic risk. Finally, homocysteine is a harmful protein that indicates a person's ability to methylate (detoxify) substances in the body. Elevated homocysteine is linked to thrombosis, thyroid dysfunction and Alzheimers disease (dementia).

Test		Lipoprotein Particle Numbers (nmol/L)		Patient Results	Reference Value
VLDL Particles	nmol/L			33	<85
Total LDL Particles	nmol/L			1143	<900
Total HDL Particles	nmol/L			7214	>7000
Non-HDL Particles	nmol/L			1176	<1000
Remnant Lipoprotein	nmol/L			225	<150
Dense LDL III	nmol/L			312	<300
Dense LDL IV	nmol/L			102	<100
Buoyant HDL 2b	nmol/L			2504	>1500

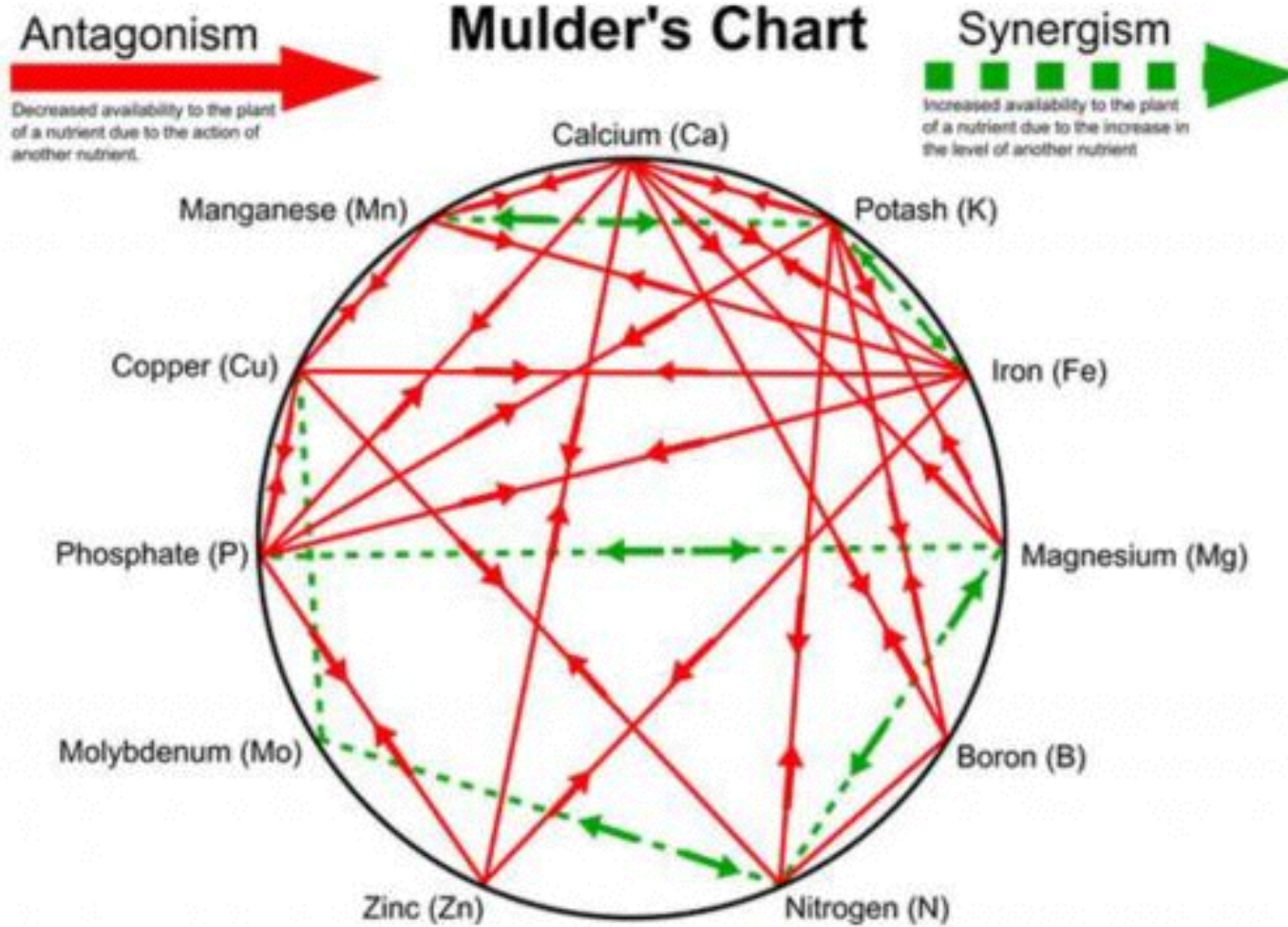
[illegible]

Measuring Intracellular Nutrient Sufficiency example



Giving 1 Nutrient Can
Affect Other Nutrients.

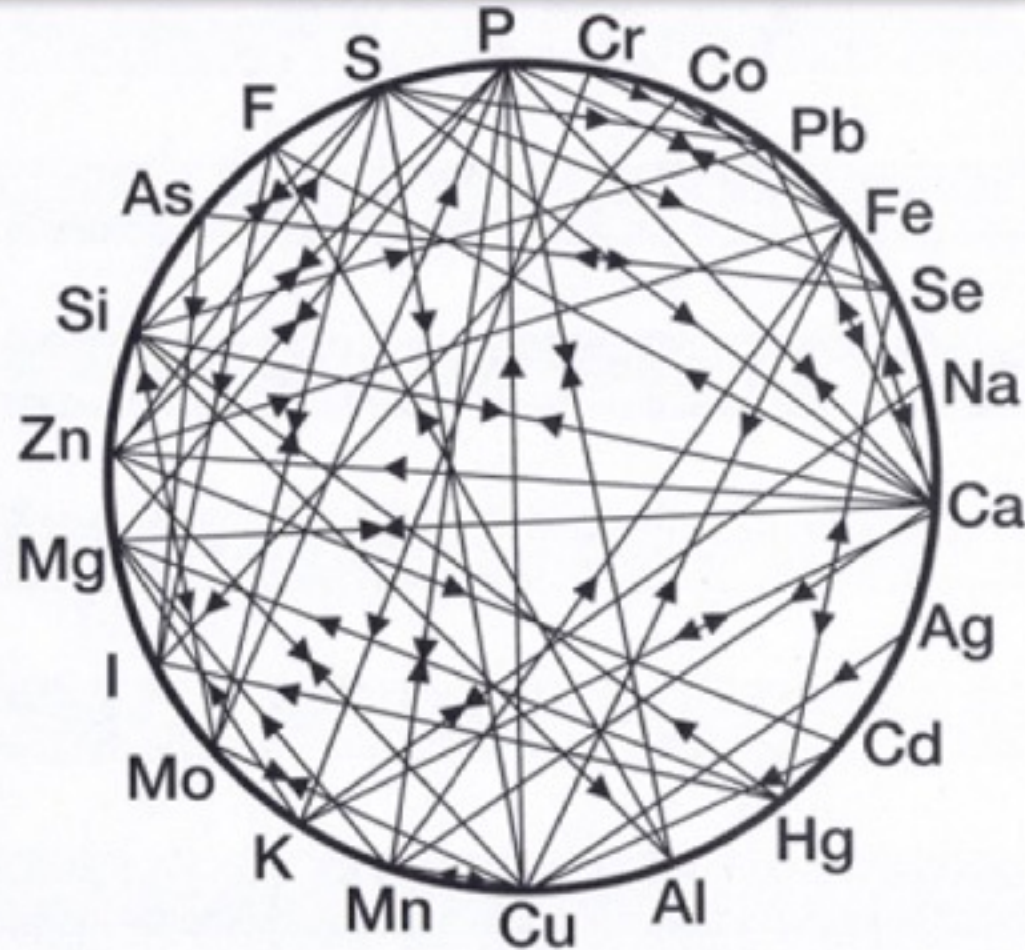
Think Relationships.



<https://s-media-cache-ak0.pinimg.com/originals/65/ee/62/65ee621ee26109f4ddef7751b5a4eca0.jpg>

Mineral Interactions

P - Phosphorus
Cr - Chromium
Co - Cobalt
Pb - Lead
Fe - Iron
Se - Selenium
Na - Sodium
Ca - Calcium
Ag - Silver
Cd - Cadmium
Hg - Mercury
Al - Aluminum
Cu - Copper
Mn - Manganese
K - Potassium
Mo - Molybdenum
I - Iodine
Mg - Magnesium
Zn - Zinc
Si - Silica
As - Arsenic
F - Fluorine
S - Sulfur



<http://www.robkalmeijer.nl/voedingsleer/nutrienten/mineralen/mineralen-wiel.jpg>

Thank you!