

UPCOMING EVENTS

Saliva, Urine, or Blood?

*Choosing the Right Hormone Test
for Your Patients*

Presented by Dr. Brandon Lundell, DC
May 13, 2026 at 12 PM Pacific

Harnessing the Microbiome to Boost GLP-1:

Insights from the GI360™

Presented by Jeannie Gorman, MS, CCN
June 3, 2026 at 12 PM Pacific

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WILL BEGIN SHORTLY



MORE WEB EVENTS

Medication, Nutrient Depletion and Mental Wellness

Krista Anderson-Ross, ND



Learning Objectives

- 🌱 Mechanisms by which commonly used medications contribute to nutrient depletions that impact neurotransmitter synthesis and mitochondrial function.
- 🌱 Identify the key nutrients essential for mental health—including B-vitamins, magnesium, zinc, and CoQ10—and explain their roles in mitochondrial energy production, methylation, and neurotransmission.
- 🌱 Apply functional testing strategies, including neurotransmitter analysis and DNA methylation profiling, to guide personalized interventions for patients experiencing mood symptoms associated with iatrogenic nutrient depletion.



The State of the Union U.S. Mental Health Statistics

Mental Health in U.S. Adults (2023–2024)

Category	Women (18+)	Men (18+)
Any Mental Illness (AMI)	~26% annually	~18% annually ¹
Anxiety Disorders (12-month prevalence)	~23.4%	~14.3%
Depression (MDD, past year)	~10.4%	~6.2%
MDD Lifetime Risk	~21% (2x more likely than men)	~10%
Medication Use for Mental Health (2020 data)	21.2% reported use of meds for emotional/mental health	11.5% reported use of meds for emotional/mental health

COVID Impacts on Mental Health

- 🌱 Post-COVID, global rates of anxiety and depression increased by 25%!
- 🌱 Antidepressant prescriptions surged - increasing by 66% in 12-25 yr olds (2016-2022), and continue to rise for women (male adolescent rates declined ~7.1%)
- 🌱 After March 2020 there was a 129.6% increase in antidepressant use in females aged 12-17; and a 56.5% increase in women 18-25
- 🌱 Women outpace men in antidepressant prescriptions 2:1 (28%:14%)
- 🌱 Young men aged 15–24 saw one of the largest increases in the suicide rate during 2021, roughly 4x the female rate

Medications and Nutrient Impact



Top 5 Medications Used by U.S. Women and Men (by Age)

Women

1. Statins

40–75 - 25.5%

2. ACE Inhibitors (Angiotensin-Converting Enzyme)

Adults 40–79 - 21.3%

3. Antidepressants

18–39 - 10.3%

40–59 - 20.1%

60+ - 24.3%

4. Proton Pump Inhibitors (PPIs)

all adult women - 14.4%

5. Progestin-Containing Contraceptives and HRT*

- 15–19 - 38.7% - 20–29 - ~70–90%

- 30–39 - ~70–90% - 40–49 - 74.8%

- 45–64 - ~5–10% - 18–49 overall - ~82%

Men

1. Statins

40–75: 30.5%

2. ACE Inhibitors

Adults 40–79: ~25%

3. Antidepressants

18–39: 5.5%

40–59: 10.8%

60+: 13.6%

4. PPIs

all adult men: 10.5%

5. Beta Blockers

Middle-aged & older adults: ~15–18%

Citations for Top 5 Medications Used by U.S. Women and Men (by Age)

- 🌐 Olfson M, et al. *JAMA Psychiatry*. 2014;71(1):81–90. doi:10.1001/jamapsychiatry.2013.3074. PMID: 24285382
- 🌐 Brody DJ, Gu Q. *NCHS Data Brief*. 2020;(377). <https://www.cdc.gov/nchs/products/databriefs/db377.htm>
- 🌐 Salami JA, et al. *JAMA Cardiol*. 2017;2(1):56–65. doi:10.1001/jamacardio.2016.4700. PMID: 27842171
- 🌐 Gu Q, et al. *NCHS Data Brief*. 2014;(177). <https://www.cdc.gov/nchs/products/databriefs/db177.htm>
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- 🌐 Sarantis H, et al. *Gastroenterol Hepatol (N Y)*. 2020;16(7):368–375. PMID: 32753547
- 🌐 Gu Q, et al. *NCHS Data Brief*. 2010;(42). <https://www.cdc.gov/nchs/products/databriefs/db42.htm>
- 🌐 Fitzgerald M, et al. *J Hypertens*. 2022;40(4):691–702. doi:10.1097/HJH.0000000000003101
- 🌐 Daniels K, Abma JC. *NCHS Data Brief*. 2020;(388). <https://www.cdc.gov/nchs/products/databriefs/db388.htm>
- 🌐 KFF Women's Health Survey. *KFF*; 2021. <https://www.kff.org/womens-health-policy/report/2021-kff-womens-health-survey/>

Honorable Mentions

- 🌱 **ADHD stimulants** (Adderall, Vyvanse, methylphenidate) — ~4–6% adults; higher in younger adults
- 🌱 **Metformin** — ~5–8% adults, 30-60% use in women w PCOS
- 🌱 **NSAIDs** (intermittent/chronic) — ~20–30% intermittent; ~8–10% frequent³
- 🌱 **Beta blockers** — ~10–15% adults ≥40
- 🌱 **Benzodiazepines** — ~5–10% adults; higher ≥65
- 🌱 **Thyroid hormone (levothyroxine)** — ~10–15% women; ~3–5% men

GLP-1 / GIP Agonists in U.S. Adults (Women & Men)

Rapid Growth in Past Year

- 📈 2024: ~6% of U.S. adults current users
- 📈 Late 2025 / 2026: ~12% current users
- 📈 Doubled in ~18 months

Group	Estimated Use
U.S. Adults Overall	~12%
Women Overall	~13–15%
Men Overall	~9–11%
Women 50–64	~18–20% (highest)
Adults 30–64	Highest uptake zone
Men 40–64	Fastest male growth segment

Polypharmacy

Number of Medications Used	~% of US Women / Men 20yrs+	Implication
1 medication	~70-75% / 65-70%	Single medication nutrient impact
2 medications	~40-45% / 40-45%	Increased risk of multiple deficiencies
3 medications	~20-25% / 20-25%	Significant cumulative depletion
4 medications	~10-15% / 10-15%	High risk of multi-nutrient depletion
5 or more medications	~23% / 21% (40-79) ~5-8% 18-40	Severe nutrient depletion risk and complex interactions

Beware These “Rx Cascades” In Older Adults

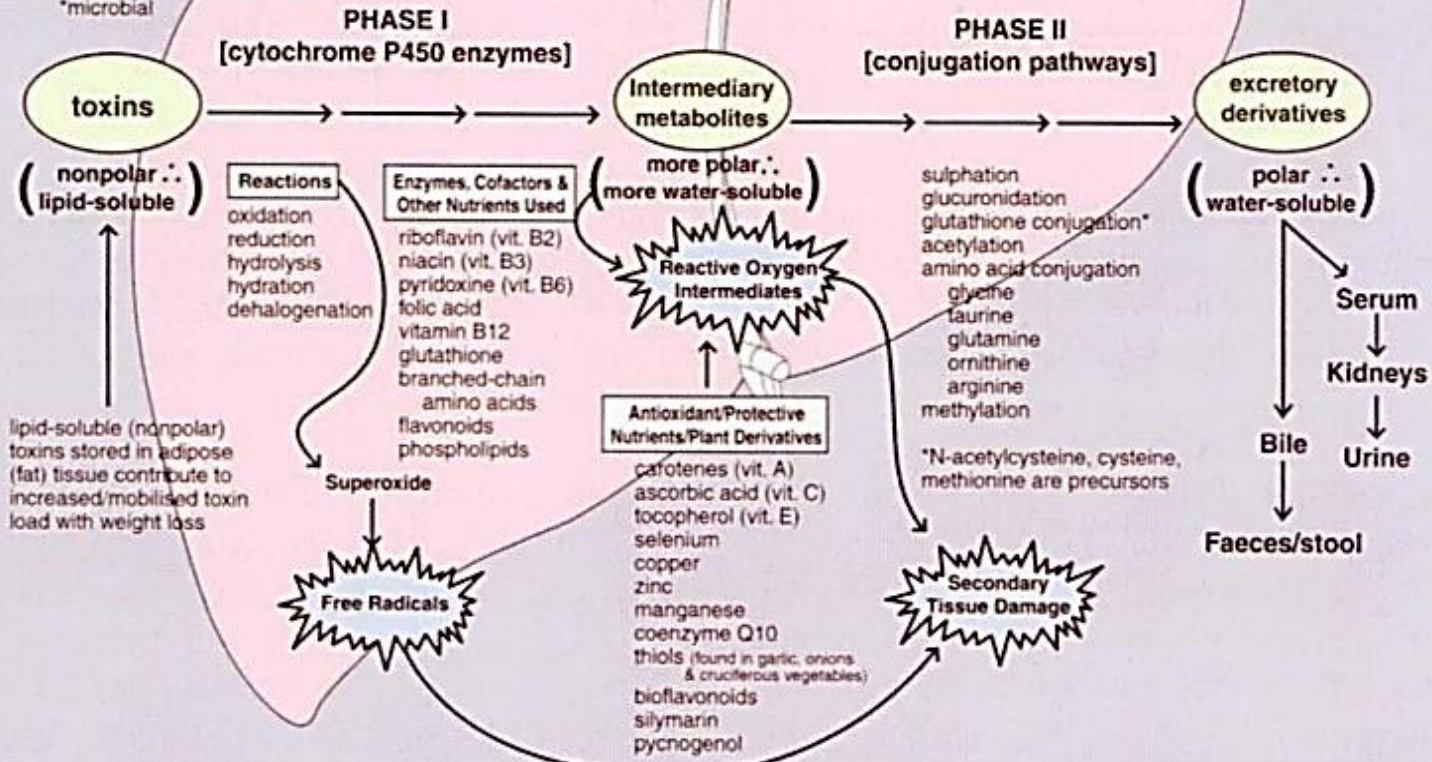


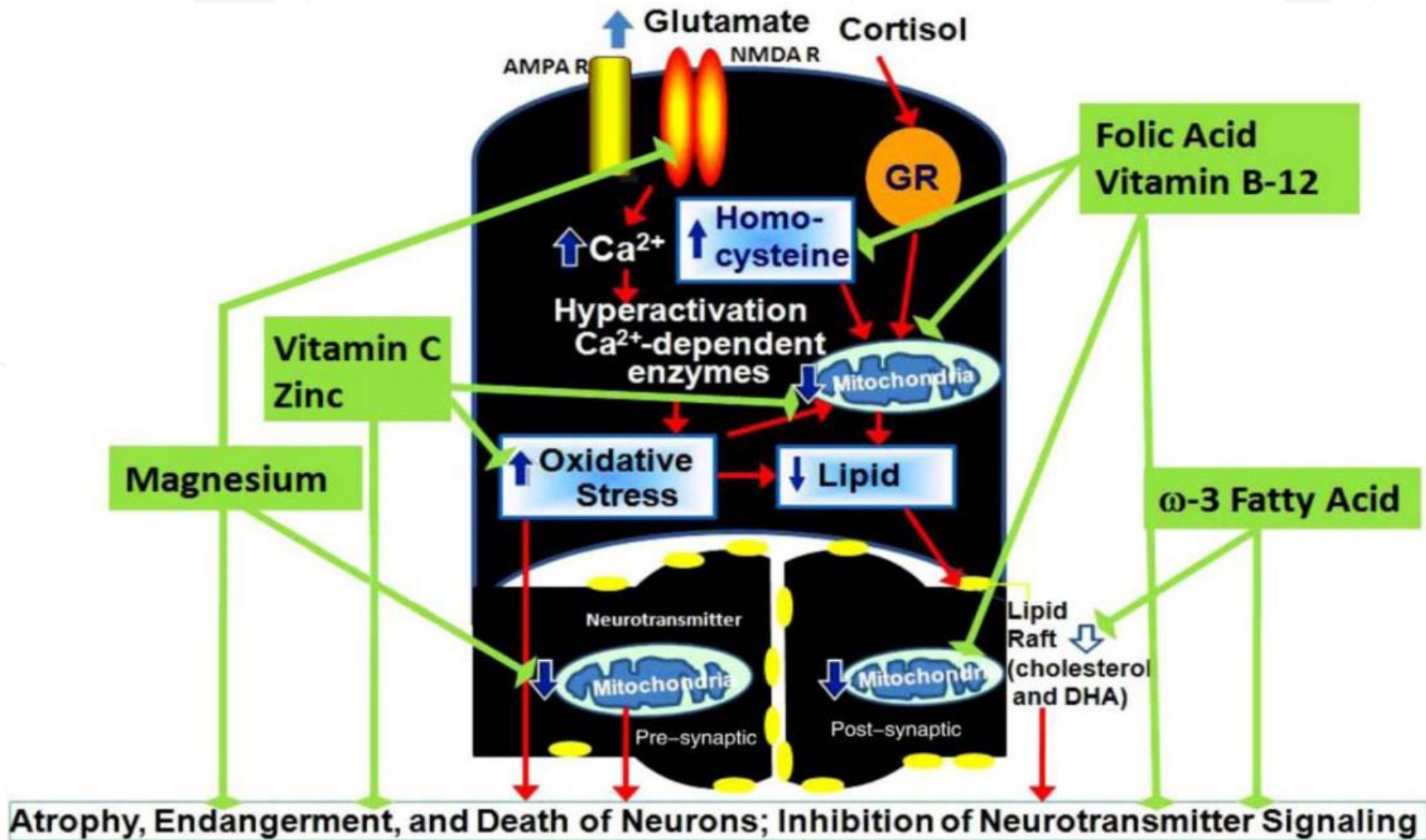
1. Benzodiazepines → Antipsychotic – 3.2%
 2. Calcium Channel Blocker → Diuretic – 2.6%
 3. SSRI's/SNRI's → Sleep Medication – 2.5%
 4. Alpha-1 receptor blocker (prostate) → Vestibular Sedative (vertigo/dizziness) – 3%
 5. Antipsychotic → Antiparkinsonian Agent – .4%
- Additionally – During inpatient stays – 5% of older adults are prescribed a new sedative (Ativan/Valium/Xanax) or anticholinergic medication (antihistamine/antidepressant/antipsychotic/bladder meds)
 - Initiation of these medications is associated with 60% higher odds of post-discharge fall-related injuries

Liver Detoxification Pathways & Supportive Nutrients

Endotoxins
 *end products of metabolism
 *bacterial endotoxins

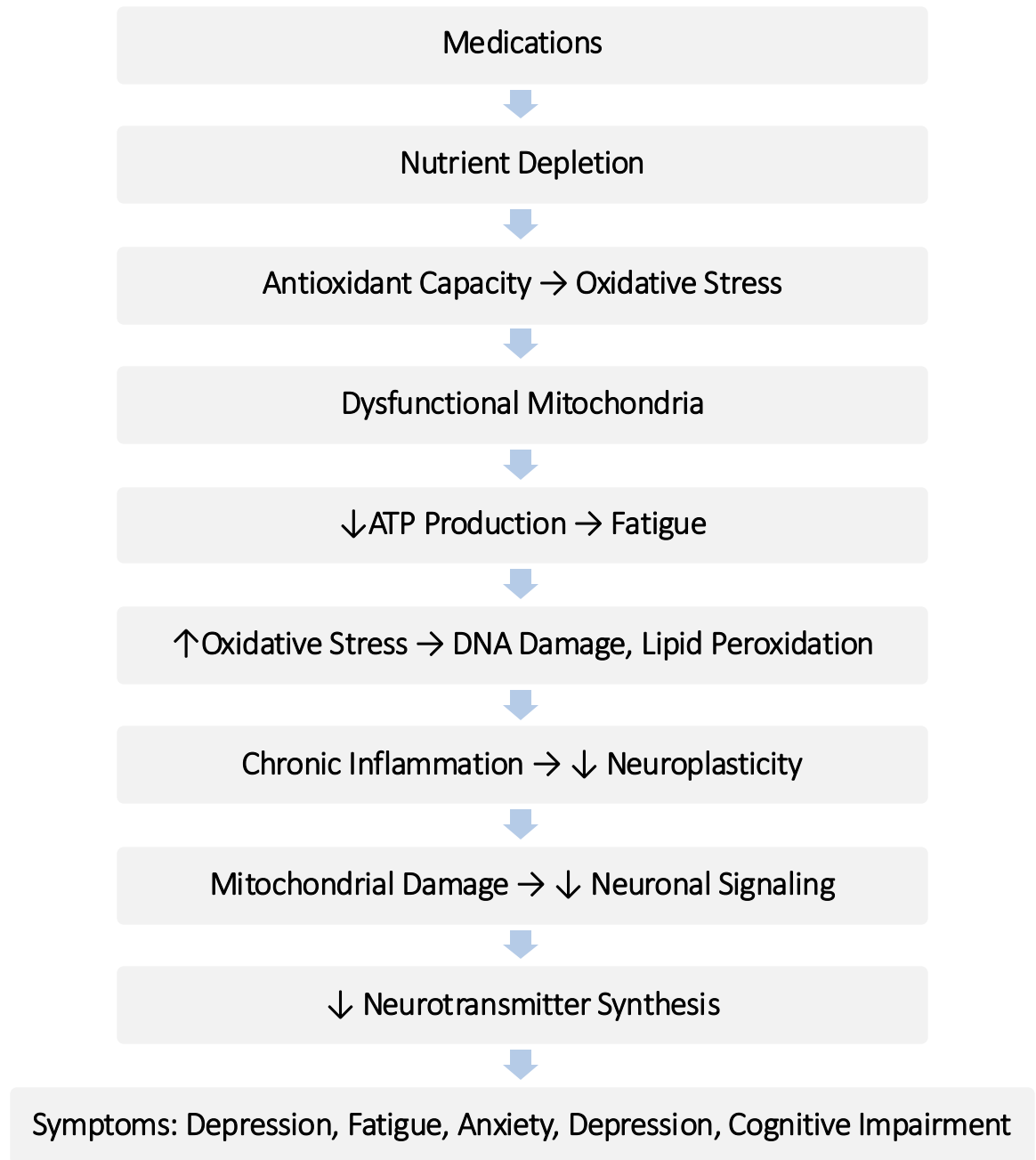
Exotoxins
 *drugs, (prescription, OTCs, recreational, etc)
 *chemicals
 - agricultural
 - food additives
 - household
 - pollutants/contaminants
 *microbial





Mechanism of Mitochondrial Breakdown in Mental Health

Palmer CM. *Brain Energy: A Revolutionary Breakthrough in Understanding Mental Health—and Improving Treatment for Anxiety, Depression, OCD, PTSD, and More.* BenBella Books; 2022.



Nutrients Essential for Mitochondrial Health

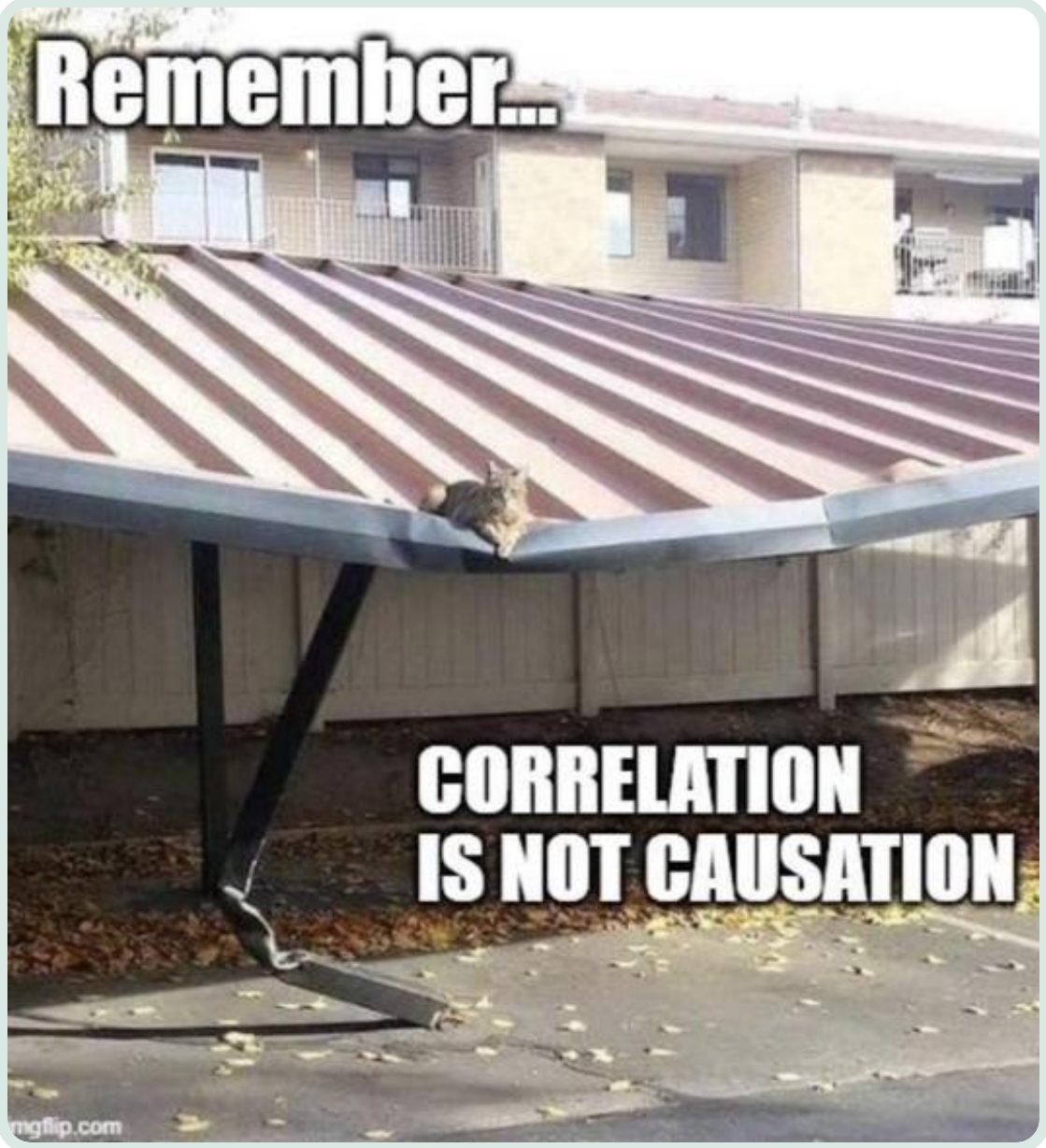
Nutrient	Mitochondrial Function
B Vitamins (B1, B2, B3, B5, B6, B12, Folate)	Cofactors in energy metabolism & TCA cycle
Magnesium	ATP synthesis & enzyme cofactor
CoQ10	Electron transport chain cofactor
L-Carnitine	Fatty acid transport into mitochondria
Alpha-Lipoic Acid	Antioxidant & mitochondrial redox support
Zinc	Enzyme activity & antioxidant function
Iron	Oxygen transport & cytochrome function
Omega-3 Fatty Acids	Membrane fluidity & neuroprotection
Vitamin C	Antioxidant, reduces oxidative stress
Vitamin D	Gene expression & mitochondrial biogenesis

Framework for Drug Class Exploration

Many drug–nutrient interactions arise from hepatic metabolism, absorption/impaired absorption, and increased cellular demand, all of which rely on micronutrients - especially B vitamins, minerals, and antioxidants.

- 🔗 With chronic medication use, these demands can shift nutrient balance and deplete reserves over time, contributing to downstream effects.
- 🔗 For each medication class, we'll explore:
 - 🔗 Which nutrients are affected
 - 🔗 How those changes show up clinically, especially in mental health
 - 🔗 How these patterns relate to mitochondrial function and energy production

Remember...



**CORRELATION
IS NOT CAUSATION**

Top 5 - Mechanism of Nutrient Depletion & Mitochondrial Impact

Medication Class	Mechanism of Nutrient Depletion	Mitochondrial Impact
1. Antidepressants (SSRIs/SNRIs)	Alter gut microbiota and increase oxidative stress → ↑ demand for B vitamins & antioxidants such as CoQ10 ¹²	↑ Oxidative stress and ↓ CoQ10 → Impaired electron transport chain (ETC) ⁸
2. Statins	Inhibit HMG-CoA reductase in cytosol/endoplasmic reticulum → ↓ synthesis of CoQ10 & fat-soluble vitamins ³	↓ CoQ10 → Reduced mitochondrial ATP synthesis; may worsen statin-induced myopathy ⁹
3. Proton Pump Inhibitors (PPIs)	Reduced gastric acidity → impaired absorption of nutrients absorbed in small intestine: Mg, B12, Fe, Zn ⁴	↓ Mg and B12 impair mitochondrial enzymes (ATP synthase); ↓ Fe affects cytochrome enzymes ¹⁰
4. ACE Inhibitors / ARB's Angiotensin Converting Enzyme/Angiotensin II Receptor Blocker	Alter renal electrolyte handling / RAAS balance → ↓ Zn, Mg, Na; ↑K; may impact CoQ10 transport ⁵⁶	↓ Zn and CoQ10 → ↑ oxidative stress → ↓ ETC efficiency → ↓ ATP ¹¹
5. Progestin-Containing Contraceptives & HRT	↑ Hepatic metabolism & ↑ oxidative stress → ↓ B6, B12, Folate, Mg, Zn, Se ⁷	↓ B6, Mg, Folate impair mitochondrial enzyme function and neurotransmitter synthesis ¹²

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Honorable Mentions – Mechanism of Nutrient Depletion and Mitochondrial Impact

Medication Class	Mechanism of Nutrient Depletion	Mitochondrial Impact
ADHD Stimulants (Adderall, Vyvanse, methylphenidate)	↓ appetite → ↓ intake of protein, Mg, Zn, B vitamins; ↑ catecholamine turnover → ↑ nutrient demand	↑ oxidative stress; ↑ mitochondrial demand from sustained sympathetic activation
Metformin	↓ B12 absorption (intrinsic factor–calcium dependent uptake); possible ↓ folate	↓ B12 impairs mitochondrial methylation and energy metabolism
NSAIDs	↓ gastric mucosal integrity → impaired B12, iron, folate absorption	↓ iron and CoQ10 may impair electron transport chain and ATP production
Beta Blockers	↓ CoQ10 synthesis; ↓ melatonin → oxidative stress, fatigue	↓ CoQ10 reduces ETC efficiency → ↓ ATP, ↑ oxidative stress
Benzodiazepines / Sleep Meds	↓ B6 activity (via GABA metabolism); altered nutrient intake patterns	↓ B6 impairs mitochondrial enzyme activity and neurotransmitter balance
Levothyroxine	↑ metabolic rate → ↑ demand for B vitamins (B2, Mg, iron, selenium)	↑ mitochondrial biogenesis & ATP production demand ↓ cofactors → fatigue, impaired energy production, oxidative stress

Progestin-Based Contraceptives and HRT

Evidence of Depletion:

- 🌿 B6
- 🌿 B12
- 🌿 Folate
- 🌿 Magnesium
- 🌿 Vitamin C
- 🌿 Vitamin E
- 🌿 Zinc
- 🌿 Selenium

Mental Health Effects:

- 🌿 ↓ B6 → depression, irritability¹
- 🌿 ↓ B12 → apathy, fatigue, cognitive decline³
- 🌿 ↓ Folate → antidepressant resistance⁵
- 🌿 ↓ Mg → anxiety, insomnia⁶
- 🌿 ↓ Vit C → fatigue, mood swings⁸
- 🌿 ↓ Vit E → neuroinflammation⁸
- 🌿 ↓ Zinc → low mood, anhedonia⁸
- 🌿 ↓ Selenium → irritability, low mood⁸

Medication Associated Conditions:

- 🌿 Depression^{1 2 4 5 7}
- 🌿 Mood lability^{2 8}
- 🌿 Anxiety^{6 7}
- 🌿 Sleep Problems⁷
- 🌿 Fatigue^{7 8}

Progestin-Based Contraceptives & Mental Health Risk

Increased Risk of Mental Health Conditions

📌 Depression:

- 📌 1.8× increased first diagnosis risk (ages 15–34)¹
- 📌 2.2× risk in adolescents (15–19)¹
- 📌 49% increased risk postpartum⁴

📌 Mood Lability, Anxiety, Negative Affect:

- 📌 Reported emotional instability and increased anxiety vs non-users^{2 3}

📌 Fatigue & Sleep Problems:

- 📌 Common with levonorgestrel IUD & other progestin methods⁵

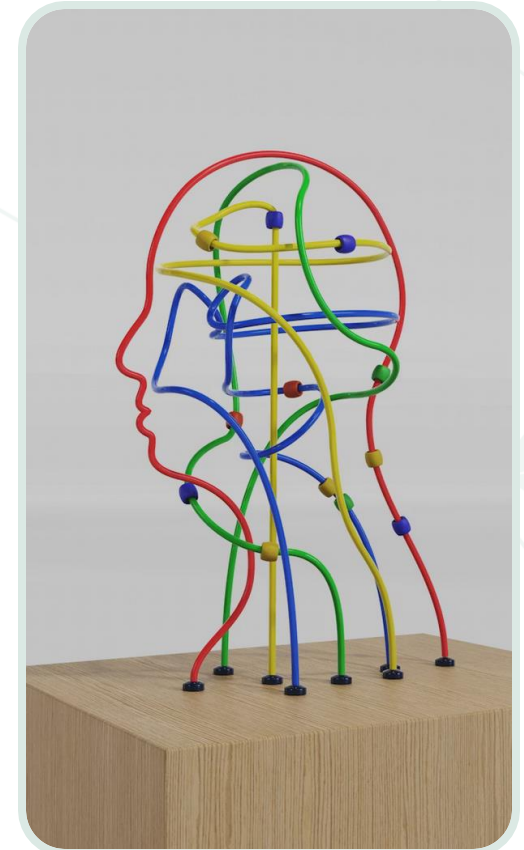
📌 Suicidality:

- 📌 2–3× higher suicide risk in first year of use³

📌 Trends in Psychotropic Use

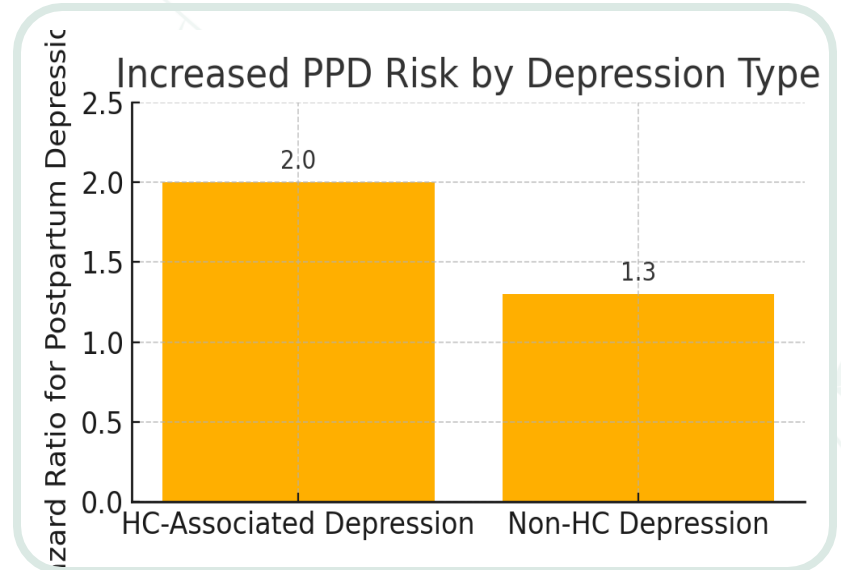
📌 Swedish/Finnish data (2010–2018):

- 📌 Increased psychotropic drug use (SSRI's anxiolytics) in adolescent hormonal contraceptive users^{2 6}



Postpartum Depression (PPD) after History of Contraception-Associated Depression

- Women who developed depression after initiating hormonal contraception (HC) had a higher risk of PPD compared to those with a depression history unrelated to HC.
- The increased risk was consistent regardless of timing of initiation in adolescence or adulthood.
- *Postpartum mothers who initiated HC within 12 months had a 49% higher risk of developing depression



Skovlund et al., JAMA Psychiatry, 2023.
Zhu et al., JAMA Netw Open. 2025;8(1):e2256876

Activation of Hepatic Metabolism: Contraception and HRT

Route/Formulation	Hepatic Metabolism?	Oxidative/Nutrient Risk
Oral Estrogens (CEE, Ethinyl Estradiol, Oral Estradiol, OCPs)	Yes /1 st pass/ CYP450	High - oxidative stress, ROS; ↑ B-vitamin and antioxidant demand; ↑ SHBG/CRP/clotting factors
Oral synthetic progestins (OCPs, emergency contraception)	Yes/1 st pass/CYP450	High – ↑ oxidative stress, ↑ ROS, ↑ depletion of B6, zinc, selenium, CoQ10
Injectable (IM/SC) - Depot Medroxyprogesterone)	Yes	Moderate – avoids first-pass but prolonged hepatic metabolism → ↑ oxidative stress, mild nutrient turnover
Vaginal Ring (EE/Progestin) & Progestin IUD	Partial	Moderate – partial hepatic exposure over time; less oxidative demand than oral route
Oral Micronized Progesterone (Bioidentical)	Yes	Low – hepatic metabolism produces neuroprotective allopregnanolone; minimal nutrient loss
Transdermal Estradiol/Progesterone/Test	Minimal	Very Low – bypasses liver; negligible oxidative or nutrient impact

SSRIs: Nutrient Depletion & Mental Health Impact

Evidence of Nutrient Depletion from SSRI Use:

- 📌 Vitamin B12^{1 2}
- 📌 Folate^{3 4}
- 📌 Coenzyme Q10⁵
- 📌 Sodium(in adults ≥65)⁶

Mental Health Effects of Depletion:

- 📌 B12 → apathy, fatigue, cognitive decline^{1 2}
- 📌 Folate → poor antidepressant response, fatigue, depression^{3 4}
- 📌 CoQ10 → fatigue, mood instability, cognitive decline⁵
- 📌 Sodium → confusion, fatigue, depression⁶

Medication Associated Conditions:

- 📌 Depression^{7 8}
- 📌 Anxiety or agitation⁹
- 📌 Suicidal ideation of behavior^{10 11}
- 📌 Emotional blunting or apathy¹²
- 📌 Sleep disturbances¹³
- 📌 Fatigue or sedation¹⁴
- 📌 Sexual dysfunction¹⁵

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SSRIs, Gut Health, and Nutrient Absorption

SSRIs disrupt gastrointestinal terrain—where ~90% of serotonin is produced—via:

🌿 Gut Microbiota Disruption*:

- Antimicrobial effects due to lipophilic nature: reduce microbial diversity; increases Firmicutes : Bacteroidetes ratio contributing to dysbiosis.^{1 2}
- Dysbiosis → ↓ folate, B12, SCFAs & precursors like tryptophan & tyrosine.^{1 3}
- ↓ Folate & B12 → ↓ methylation & neurotransmitter synthesis.³
- Dysbiosis → ↑ permeability, ↓ mucosal integrity, ↓ absorption (Mg, Zn, B vits).⁴

*Primarily Sertraline, Fluoxetine, Paroxetine; less-so Citalopram/Escitalopram

🌿 Oxidative Stress/Mitochondrial Impact/Nutrient Deficiency:

- SSRIs ↑ ROS in mitochondria, ↑ oxidative stress in enterocytes.⁵
- Oxidative damage disrupts nutrient transporters, tight junctions.⁶
- Resulting depletions: B12, folate, selenium, CoQ10.⁷

🌿 **Key Takeaway: SSRI use may trigger a cycle of dysbiosis, oxidative stress, impaired absorption, nutrient depletion & neurotransmitter dysfunction. Meds w the greatest potential for this action: fluoxetine, sertraline, paroxetine, citalopram, escitalopram, velafaxine, duloxetine**

Proton Pump Inhibitors (PPIs): Nutrient Depletion & Mental Health Impact

Evidence of Nutrient Depletion from PPI Use:

- 📌 Vitamin B12¹
- 📌 Magnesium²
- 📌 Iron³
- 📌 Zinc⁴

Mental Health Effects of Depletion:

- 📌 ↓ B12 → fatigue, cognitive decline, mood changes¹
- 📌 ↓ Mg → anxiety, neuromuscular excitability²
- 📌 ↓ Iron → fatigue, brain fog³
- 📌 ↓ Zinc → depression, apathy, irritability⁴

Associated Conditions:

- 📌 Depression⁵
- 📌 Anxiety⁵
- 📌 Suicidal Ideation⁵
- 📌 Cognitive decline⁶

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Statins: Nutrient Depletion & Mental Health Impact

Clinical Associations: Fatigue, cognitive impairment, mood changes, depression^{1 2 3}

Evidence of Nutrient Depletion from Statin Use:

- 🔗 Coenzyme Q10¹
- 🔗 Vitamin D²
- 🔗 Selenium³

Mental Health Effects of Depletion:

- 🔗 ↓ CoQ10 → fatigue, muscle weakness, brain fog¹
- 🔗 ↓ Vitamin D → depression, anxiety, seasonal affective disorder²
- 🔗 ↓ Selenium → low mood, irritability, cognitive effects³

Associated Conditions:

- 🔗 Mitochondrial impairment^{4 5}
 - ↓ CoQ10 → ↓ ATP
 - Myopathy^{6 7}
 - Fatigue
 - Sleep^{8 9}

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ACE Inhibitors/ARB's: Nutrient Depletion & Mental Health Impact

Evidence of Nutrient Depletion from Use:

- 🌿 Zinc¹
- 🌿 Magnesium²
- 🌿 CoQ10^{9 10}

Mental Health Effects of Depletion:

- 🌿 ↓Zinc → low mood, anhedonia, apathy³
- 🌿 ↓Magnesium → anxiety, agitation, insomnia, ↓stress resilience⁴
- 🌿 ↓ CoQ10 → fatigue, low energy

Associated Conditions:

- 🌿 Fatigue⁵
- 🌿 Cognitive changes⁶
- 🌿 Depression⁷
- 🌿 Sleep disruption⁸

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GLP-1 Receptor Agonists

Nutrient Depletion & Mental Health Effects	Mechanism of Depletion	Mitochondrial Impact
↓ Protein / Amino Acids → ↓ tryptophan → ↓ serotonin → low mood, anxiety ¹	↓ Gastric emptying and appetite → ↓ amino acid and micronutrient intake ¹	↓ Protein & amino acid availability → ↓ mitochondrial enzymes and energy production
↓ Vitamin B12 → fatigue, cognitive decline, mood changes ¹	↓ Intrinsic factor stimulation and gastric acid → impaired B12 absorption ¹	↓ B12 → impaired methylation & mitochondrial DNA repair; cognitive and energy effects
↓ Iron – fatigue, brain fog, cognitive slowing ¹	↓ Gastric acid and duodenal absorption → ↓ Fe absorption ¹	↓ Iron-dependent mitochondrial enzymes (cytochromes) → ↓ ATP, exercise intolerance
↓ Zinc – depression, apathy, irritability ¹	↓ Food intake and intestinal absorption; altered gut microbiota ¹	↓ Zinc-dependent antioxidant defense → ↑ oxidative stress; mood dysregulation
↓ Calcium / Vitamin D – depressive symptoms, cognitive slowing ^{1 2}	↓ Fat absorption and food intake → ↓ vitamin D intake and availability	↓ Vitamin D → impaired mitochondrial signaling and biogenesis → mood and immune effects

GLP-1 RA Mechanisms & Clinical Presentation

Key Mechanisms

- 🌿 ↓ Gastric acid + delayed gastric emptying → ↓ absorption of B12, iron, folate
- 🌿 ↓ Appetite / food intake → ↓ overall nutrient intake
- 🌿 Rapid weight loss → ↑ oxidative stress and ↑ CoQ10 turnover
- 🌿 ↑ Metabolic demand → ↑ need for B vitamins, magnesium, selenium to support energy and redox balance

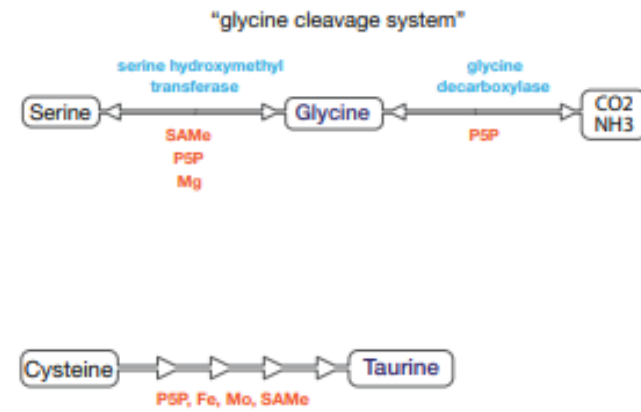
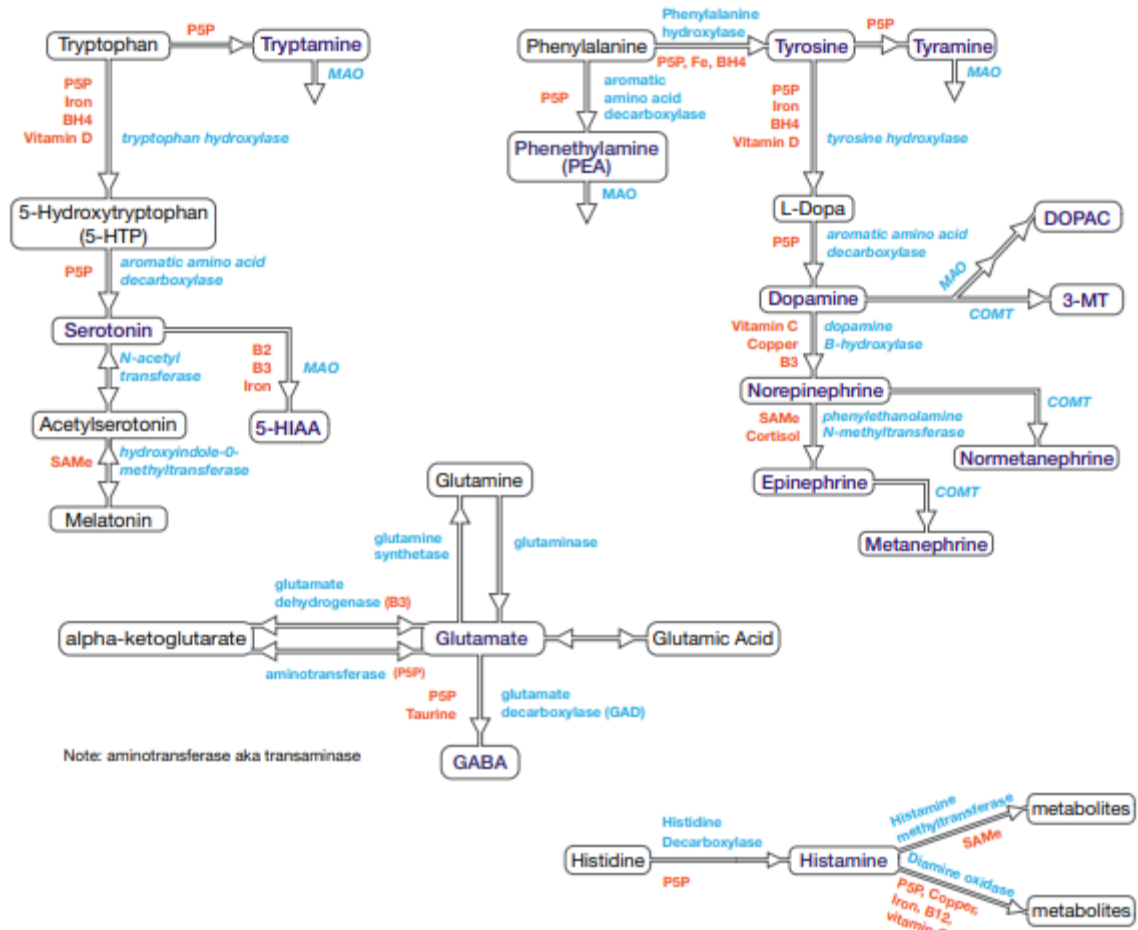
Clinical Presentation

- 🌿 Fatigue, mood changes, hair loss, cognitive slowing
- 🌿 Nutrient insufficiency may occur despite weight loss or metabolic improvement
- 🌿 Consider targeted repletion to support energy, mood, and resilience
- 🌿 **Remember: Metabolic gains ≠ nutritional sufficiency**

Testing



NT Neurotransmitter Pathways



KEY

MAO = monoamine oxidase
 Cofactors for MAO: B2, B3, P5P, Fe, Mg

COMT = catechol-o-methyl-transferase
 Cofactors for COMT: SAMe, Mg

P5P = (pyridoxal-5-phosphate) activated form of vitamin B6

BH4 = (tetrahydrobiopterin)

Endogenous levels can be supported with SAMe, vitamin B3, C, Mo, Zn

MTHF = (methyltetrahydrofolate) active form of folate.

SAME = endogenous levels can be supported with Mg, MTHF, and methylcobalamin supplementation.

Cofactors = ■ Enzymes = ■

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Neurobasic Profile, Urine

Analyte	Result	Unit per Creatinine	L	WRI	H	Reference Interval
Serotonin	86.5	µg/g				69 – 175
Dopamine	172	µg/g				150 – 375
Norepinephrine	22.1	µg/g				25 – 60
Epinephrine	2.5	µg/g				1.8 – 12.9
Norepinephrine / Epinephrine ratio	6.0					< 13
Glutamate	20	µmol/g				12.0 – 55.0
Gamma-aminobutyrate (GABA)	2.3	µmol/g				2.2 – 7.0
Glycine	610	µmol/g				450 – 2200
Histamine	31.2	µg/g				14 – 44
Phenethylamine (PEA)	6	nmol/g				37 – 140
Creatinine	137	mg/dL				30 – 225

Analyte	Result	Unit per Creatinine	L	WRI	H	Reference Interval
Phenethylamine (PEA)	20	nmol/g	▲			42 – 160
Tyrosine	48	µmol/g	▲			70 – 180
Tyramine	3.4	µmol/g	▲	▲		2.8 – 8.5
Dopamine	258	µg/g		▲		175 – 500
3,4-Dihydroxyphenylacetic acid (DOPAC)	1520	µg/g			▲	540 – 1850
3-Methoxytyramine (3-MT)	151	nmol/g		▲		122 – 278
Norepinephrine	17.6	µg/g	▲			29 – 69
Normetanephrine	195	µg/g		▲		112 – 400
Epinephrine	1.9	µg/g	▲			2.1 – 14.5
Metanephrine	84	µg/g		▲		60 – 158
Norepinephrine / Epinephrine ratio	9.3			▲		< 13
Tryptamine	0.4	µmol/g	▲			0.65 – 1.6
Serotonin	84.4	µg/g		▲		79 – 235
5-Hydroxyindoleacetic acid (5-HIAA)	5913	µg/g		▲		2500 – 9000
Glutamate	23	nmol/g		▲		18.0 – 70.0
Gamma-aminobutyrate (GABA)	5	nmol/g			▲	2.6 – 8.0
Glycine	966	nmol/g		▲		700 – 2500
Histamine	12	µg/g	▲			14 – 51
Taurine	428	µmol/g		▲		420 – 1400
Creatinine	73.1	mg/dL		▲		25 – 180

Comprehensive Neurotransmitter Profile



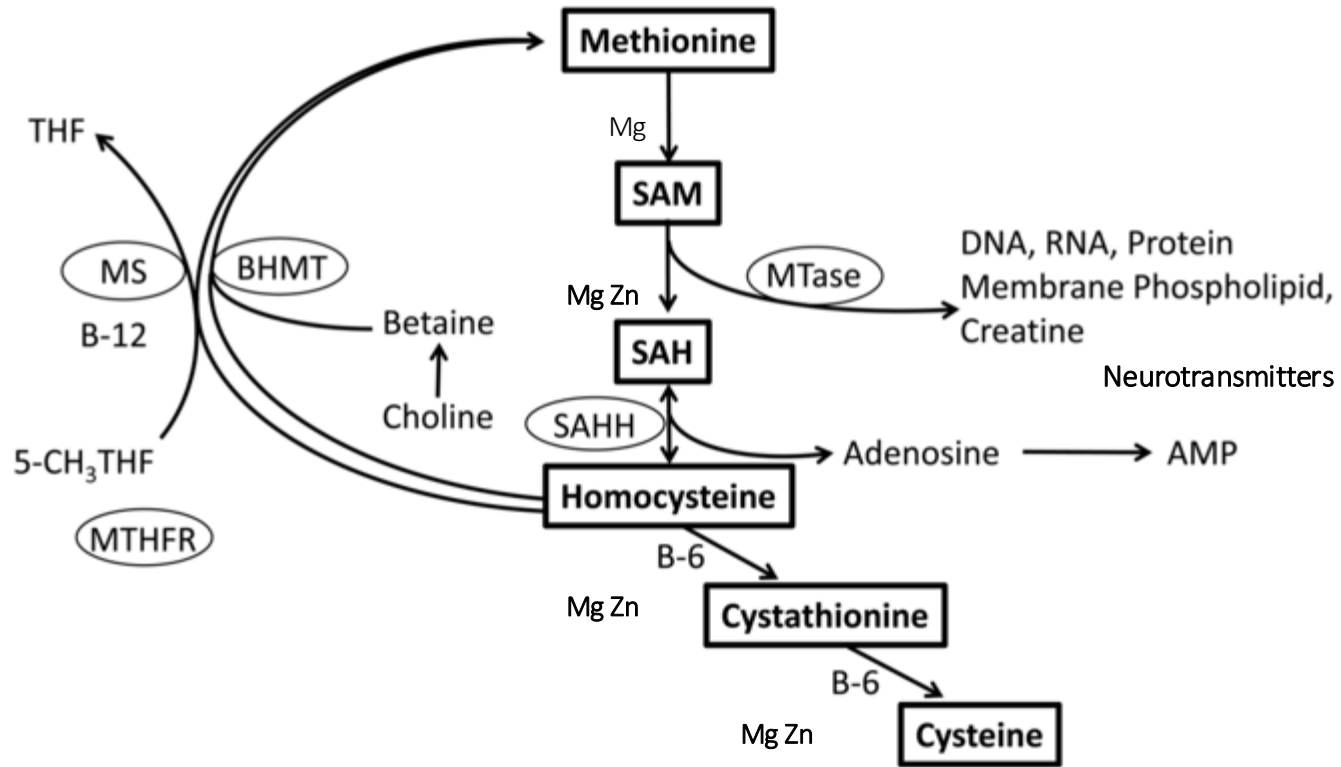
Neurotransmitter Support Supplementation Considerations

Neurobasic Profile

<p>High Serotonin</p> <ul style="list-style-type: none"> L-theanine 100-500 mg bid Rhodiola (Rhodiola rosea) root extract (4% Rosavins, 1% Salidroside) 1,000-2,000 mg Co-factors (to support metabolism and conversion) <ol style="list-style-type: none"> Vitamin B2: 50 mg Vitamin B3: 100 mg Iron: 25-50 mg SAMe: 100-500 mg 	<p>Low Serotonin</p> <ul style="list-style-type: none"> Tryptophan 500-2,000 mg Rhodiola (Rhodiola rosea) root extract (4% Rosavins, 1% Salidroside) 100-300 mg 5 HTP 50-600 mg L-theanine 100-500 mg bid Co-factors <ol style="list-style-type: none"> Vitamin D: 1,000-10,000 IU Iron: 25-50 mg P5P: 10-50 mg BH4 <ol style="list-style-type: none"> Vitamin B3: 50 mg Vitamin C: 1000-3000 mg SAMe: 100-500 mg Molybdenum: 250-500 mcg Zinc: 15-30 mg
<p>High GABA</p> <ul style="list-style-type: none"> L-theanine 100-500 mg bid 	<p>Low GABA</p> <ul style="list-style-type: none"> L-theanine 100-500 mg bid GABA 500-2,000 mg qd Taurine 500-1,500 mg Glutamine 1,000-3,000 mg Co-factors <ol style="list-style-type: none"> P5P: 10-50 mg
<p>High Dopamine</p> <ul style="list-style-type: none"> L-theanine 100-500 mg bid Rhodiola (Rhodiola rosea) root extract (4% Rosavins, 1% Salidroside) 1,000-2,000 mg Co-factors (to support MAO/COMT) <ol style="list-style-type: none"> Vitamin B2: 50 mg Vitamin B3: 100 mg Iron: 25-50 mg SAMe: 100-500 mg Co-factors (if norepi low or low range) <ol style="list-style-type: none"> Vitamin C: 1,000-3,000 mg Copper: 0.5-1 mg Vitamin B3: 50 mg 	<p>Low Dopamine</p> <ul style="list-style-type: none"> N-acetyl L-tyrosine 250-1,500 mg Rhodiola (Rhodiola rosea) root extract (4% Rosavins, 1% Salidroside) 100-300 mg Mucuna pruriens 200-800 mg L-theanine 100-500 mg bid Co-factors <ol style="list-style-type: none"> Vitamin D: 1,000-10,000 IU Iron: 25-50 mg P5P: 10-50 mg BH4 <ol style="list-style-type: none"> Vitamin B3: 50 mg Vitamin C: 1000-3000 mg SAMe: 100-500 mg Molybdenum: 250-500 mcg Zinc: 15-30 mg
<p>High Norepinephrine</p> <ul style="list-style-type: none"> L-theanine 100-500 mg bid Rhodiola (Rhodiola rosea) root extract (4% Rosavins, 1% Salidroside) 1,000-2,000 mg Co-factors (to support MAO/COMT) <ol style="list-style-type: none"> Vitamin B2: 50 mg Vitamin B3: 100 mg Iron: 25-50 mg SAMe: 100-500 mg Co-factors (if epi low or low range) <ol style="list-style-type: none"> SAMe: 100-500 mg Arenal support 	<p>Low Norepinephrine</p> <ul style="list-style-type: none"> N-acetyl L-tyrosine 250-1,500 mg Rhodiola (Rhodiola rosea) root extract (4% Rosavins, 1% Salidroside) 100-300 mg Mucuna pruriens 200-800 mg L-theanine 100-500 mg bid Co-factors <ol style="list-style-type: none"> Vitamin C: 1,000-3,000 mg Copper: 0.5-1 mg Vitamin B3: 50 mg P5P: 10-50 mg

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Methylation cycle

Methylation & Neurotransmitters:

Why This Test Follows

- 🌱 The **neurotransmitter test (urine)** provides a snapshot of neuroendocrine status.
- 🌱 The **methylation profile (plasma)** indicates how efficiently methylation is occurring.
- 🌱 The **genetic SNP profile (buccal swab)** indicates what predispositions might be *driving those patterns*—or making them worse under medication-induced stress.

DNA Methylation Pathway Profile; Buccal Swab

GENE NAME / VARIATION	MUTATION NOT PRESENT	MUTATION(S) PRESENT	CALL
SHMT/C1420T	-/-		G
AHCY/1	-/-		A
AHCY/2	-/-		T
AHCY/19	-/-		A
MTHFR/C677T		+/+	T
MTHFR/A1298C	-/-		A
MTHFR/3	-/-		C
MTR/A2756G	-/-		A
MTRR/A66G		+/-	Hetero
MTRR/H595Y	-/-		C
MTRR/K350A	-/-		A
MTRR/R415T		+/-	Hetero
MTRR/S257T		+/-	Hetero
MTRR/11		+/-	Hetero
BHMT/1		+/+	T
BHMT/2	-/-		C
BHMT/4	-/-		A
BHMT/8		+/+	T
CBS/C699T	-/-		C
CBS/A360A		+/+	T
CBS/N212N	-/-		C
COMT/V158M		+/+	A
COMT/H62H		+/+	T
COMT/61		+/-	Hetero
SUOX/S370S	-/-		C
VDR/Taq1	-/-		C
VDR/Fok1	-/-		C
MAOA		+/+	T
NOS/D298E		+/-	Hetero
ACAT/1-02	-/-		G

Minus "-/-" represents no mutation
 Plus "+/+" represents a mutation
 "-/-" indicates there is no mutation
 "+/-" indicates there is one mutation
 "+/+" indicates there is a double mutation

Targeted Functional Blood Testing

🔗 Methylation overlap / nutrient status

- 🔗 Homocysteine – methylation demand / folate-B12-B6 signal
- 🔗 MMA – functional B12 status
- 🔗 B12
- 🔗 Folate (prefer RBC folate if available)
- 🔗 CBC + MCV/RDW – macrocytosis / anemia clues

🔗 Core nutrient / medication depletion

- 🔗 25-OH Vitamin D
- 🔗 Ferritin + Iron panel
- 🔗 RBC Magnesium
- 🔗 Zinc (serum/plasma)

🔗 Mitochondrial support / energetics

- 🔗 CoQ10 (if statins, fatigue, CV risk)
- 🔗 CMP
- 🔗 Whole blood thiamine (B1)

Liver function / inflammation / blood sugar

🔗 Consider:

- 🔗 Omega-3 Index
- 🔗 hsCRP (inflammation)
- 🔗 HgbA1c
- 🔗 AST, ALT, GGT, ALP, bilirubin
- 🔗 Fasting insulin

Neurotransmitters, Methylation Profiles & Targeted Blood Work: Functional Comparison

Test	What It Measures	Represents	Clinical Utility	Medication Depletion Relevance
Neurotransmitters	Output levels of neurotransmitter metabolites	Snapshot of neurochemical activity	Helps guide mood, sleep, focus support	Detects downstream effects of meds altering NTs (SSRIs, stimulants, OCPs)
Methylation Profile (Plasma)	Folate/B12 pathway intermediates; methylation markers	Current methylation function	Tracks methylation efficiency & response to treatment	Useful for PPIs, metformin, OCPs, SSRIs
DNA Methylation (Buccal)	SNPs in methylation-related genes	Genetic potential / susceptibility	Identifies vulnerability patterns	Suggests higher risk for B12/folate depletion or poor detox tolerance
Targeted Functional Blood Testing	Vitamin D, MMA, ferritin, iron panel, RBC Mg, zinc ± CoQ10, B1	Current nutrient status / reserves	Cost-effective first-line nutrient screening	Best for common medication depletions (PPIs, metformin, GLP-1s, diuretics, statins)

Support Suggestions



Nutrient Repletion Shown to Improve Mental Health

Mental Health Disorder	Nutrient(s)	Clinical Impact of Repletion
Depression	L-methylfolate ¹	Augments antidepressant response in treatment-resistant cases
	B12 + folate ²	Improves mood, especially in deficient or elderly patients
	Magnesium ³	Rapid improvement in mild-to-moderate depression
	Zinc ⁴	Enhances antidepressant effects; lowers depressive symptoms
	SAMe ⁵	Comparable to antidepressants in some studies
Bipolar Disorder	Omega-3 (EPA/DHA) ⁶	Reduces depressive symptoms in bipolar II and mixed states

Nutrient Repletion Shown to Improve Mental Health (continued)

Mental Health Disorder	Nutrient(s)	Clinical Impact of Repletion
Bipolar Disorder	N-acetylcysteine (NAC) ⁷	Reduces depressive and functional symptoms as adjunct therapy
Schizophrenia	NAC ⁸	Improves negative symptoms and functioning
	Glycine / Sarcosine ⁹	Enhances NMDA receptor function; improves negative symptoms
	Folate + B12 ¹⁰	Improved treatment response in folate-deficient patients
Anxiety	Magnesium ¹¹	Reduces subjective anxiety in stress-induced and mild/moderate cases
	L-theanine ¹²	Lowers anxiety; improves calm focus without sedation

Supplementation Support Suggestions

- 🌿 **Vitamin D (1,000–5,000 IU)** – depending on levels
- 🌿 **Magnesium (200–400 mg)** – glycinate, malate, threonate, citrate, etc
- 🌿 **Omega-3s (1–2 g EPA/DHA)**
- 🌿 **Protein (1.0–1.6 g/kg – RDA = .8g/kg)** (Consider +Creatine 3-5g/day)
- 🌿 **CoQ10 (100–200 mg)** – up to 300mg if statins/fatigue
- 🌿 **B-complex / B12 / P5P**
- 🌿 **Multivitamin**



Questions?