
TRULY HEAL
Academy

Nutritional Deficiencies

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We will discuss:

- What are nutritional deficiencies?
- What causes nutritional deficiencies?
- How to address these causes?
- What is the difference between essential and non essential nutrients?
- Factors increasing nutrient requirements
- Difference between RDA and SR
- Bioavailability of certain nutritional supplements
- Difference between oral and IV supplementation
- What to look for when choosing a good supplement

Supplements aren’t a magic bullet; they work synergistically with other healthy habits.

We need to make sure that sleep, diet, and physical activity — whether formal exercise or another activity and mental help are looked after otherwise supplement will not have the affect people are searching for.

Definition of a nutrient is:

“A biological active, organic compound, a controlling agent essential for normal homeostasis, health and growth (its absence causing deficiency, disease and disorder) either synthesised in the body or taken in through diet.”

Macronutrients versa Micronutrients

Macronutrients:

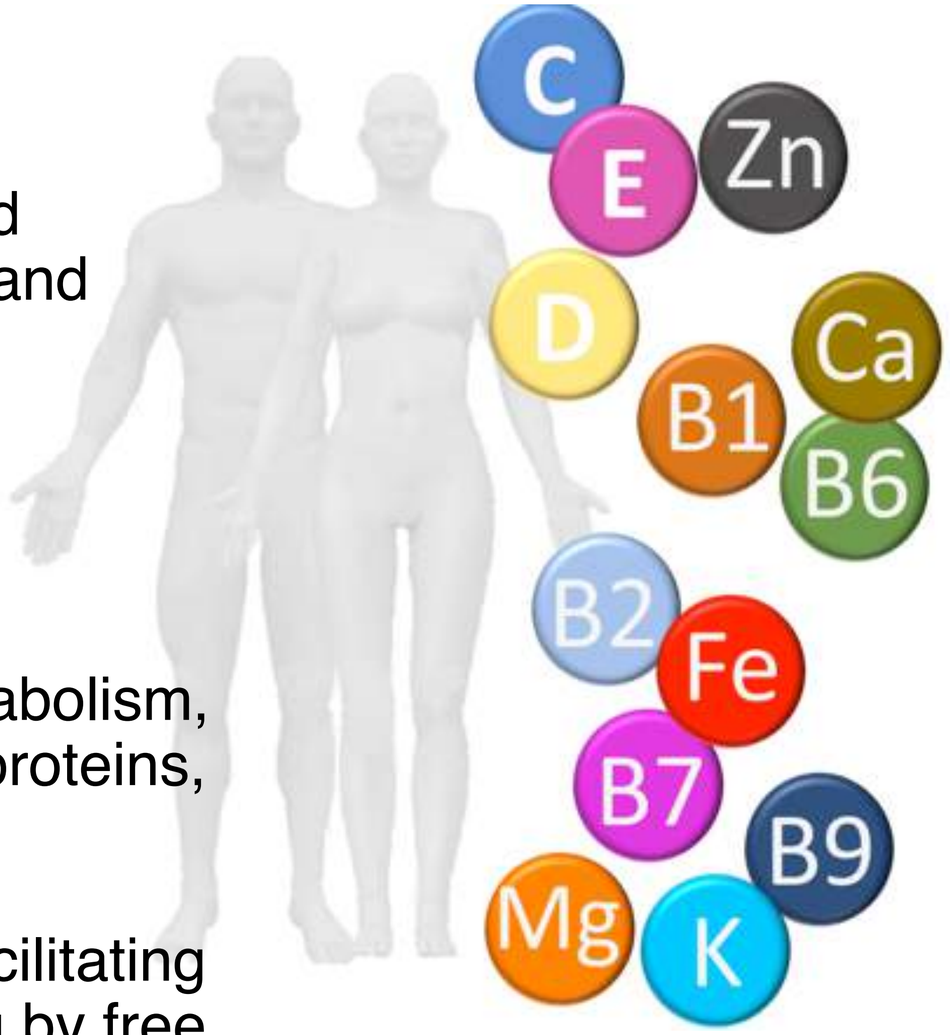
- 3 main groups: Carbohydrates, Proteins, Fats
- More than one present in food
- Used to classify calories in foods
- More familiar because they are how we classify foods
- We need them in larger quantities

Micronutrients:

- 3 main groups: Vitamins, Minerals, Antioxidants
- More than one present in food
- Found in trace amounts in food
- Less familiar as they can't be easily pinpointed
- We need them in smaller quantities

The role of Micronutrients

Dozens of different micronutrient chemicals are used constantly to keep us energised, produce enzymes and hormones and prevent deficiencies.



The job of Micronutrients

Producing digestive enzymes, keeping a strong metabolism, protecting the brain, breaking down carbs, fats and proteins, helping with hormone production, aiding in bone mineralisation, synthesising DNA, allowing cells to regenerate, allowing movement and tissue repair, facilitating growth, slowing oxidation damage or signs of ageing by free radicals

Micronutrient Deficiencies

Not Enough of These

- Diabetes
- Inflammation
- Dyslipidemia
- Gastrointestinal Health
- ADHD
- Fibromyalgia

- Weight Management
- Hypothyroidism
- Depression
- Headaches
- Autism
- Hypertension
- Adrenal Fatigue
- Fatigue
- Fertility
- Anxiety……..

Nutrients are Best Derived from Food

Pesticide and antibiotic-free organic whole foods are the best source of vitamins, minerals and most nutrients.

- Sourcing
- Financial hardship
- Poor soil quality (mineral deficiency)
- Physiological conditions
- Knowledge

Two time Nobel Prize winner Dr. Linus Pauling declared,

“Nearly all disease can be traced to a nutritional deficiency.”

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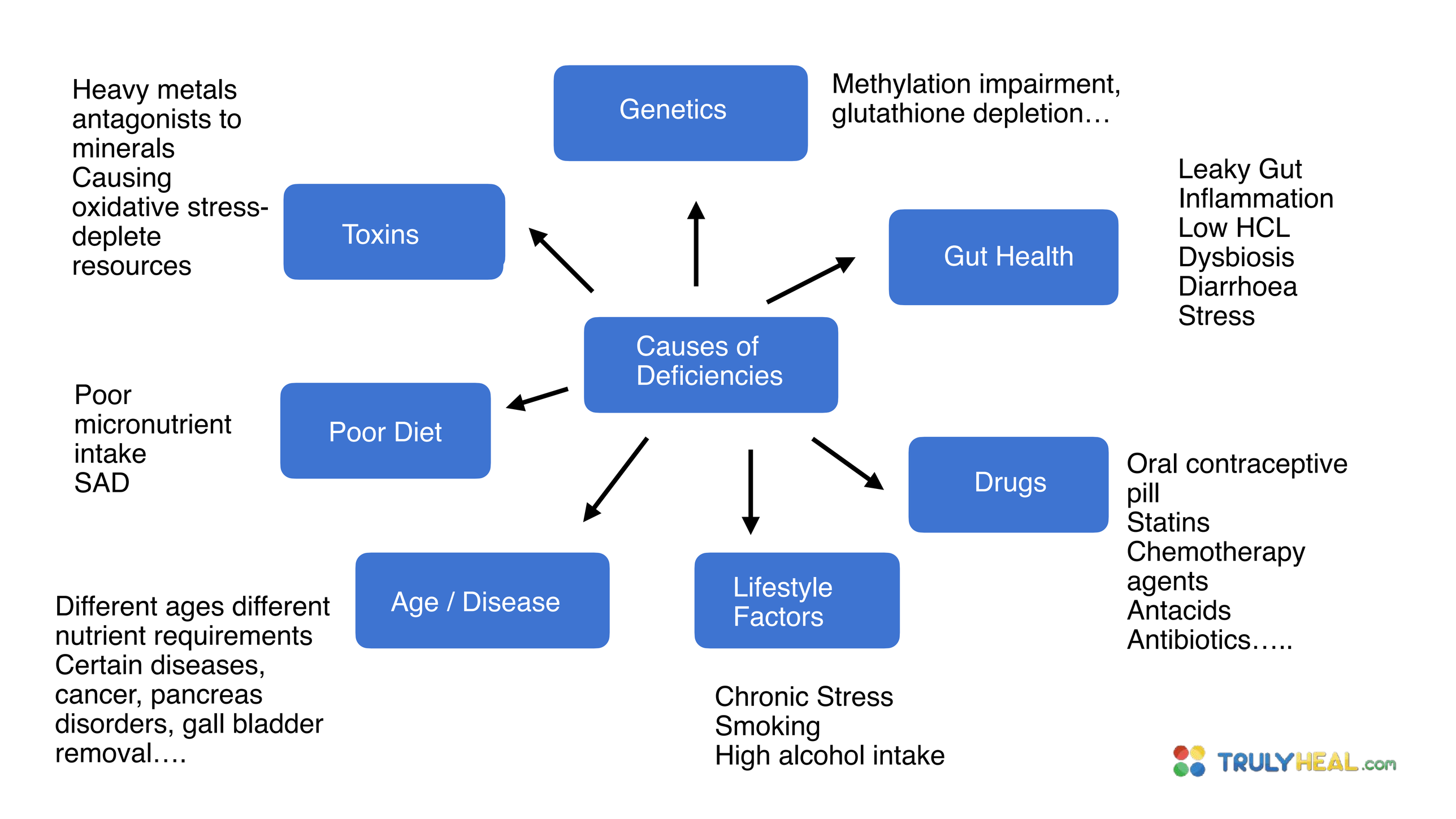
Heavy metals antagonists to minerals Causing oxidative stress- deplete resources
Genetics
Methylation impairment, glutathione depletion…
Toxins
Gut Health
Leaky Gut
Inflammation
Low HCL
Dysbiosis
Diarrhoea
Stress
Causes of Deficiencies
Poor micronutrient intake
SAD
Poor Diet
Drugs
Oral contraceptive pill
Statins
Chemotherapy agents
Antacids
Antibiotics…..
Different ages different nutrient requirements
Certain diseases, cancer, pancreas disorders, gall bladder removal….
Age / Disease
Lifestyle Factors
Chronic Stress
Smoking
High alcohol intake
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DRUG CATEGORY	Drug Category Brief Description	Drug-Induced Nutrient Depletions	Additional Suggested Supplements for Nutritional Support*	Dietary Supplements that have Potential for Interactions with Drug (or Drug Class)**
1. ACID-SUPPRESSING DRUGS and ANTACIDS[1–5] Ex: Nexium®, Pepcid®, Prevacid®, Prilosec®, Tagamet® and others	1. H2 antagonists block histamine (H2) receptors on gastric mucosal cells and decrease the production and secretion of acid. 2. Proton-Pump Inhibitors block the acid transporter pump on the luminal surface preventing acid from entering the gastric lumen. 3. Antacids directly neutralize existing acid in the stomach.	**DND:** **H2 antagonists deplete calcium, folic acid, iron, vitamin B_{12}, and vitamin D.** **Proton-pump inhibitors deplete magnesium and vitamin B_{12}.** **RECOMMENDED SUPPLEMENTATION:** • **H2 antagonists and proton-pump inhibitors:** * **Vitamin B_{12}: 25–1000 mcg/day** * **Magnesium: 250–400 mg/day**	Calcium: 500 mg daily Iron[a]: discuss with healthcare provider. Vitamin D[b]: 1000–2000 IU daily Zinc[c]: 11 mg daily	**Goldenseal and Ginger:** These supplements may increase stomach acid and thus might interfere with antacids, H2 antagonists, and proton pump inhibitors. **Green Tea:** Tagamet® (cimetidine) can inhibit the metabolism of caffeine in green tea and significantly reduce its clearance.
2. ANTIBIOTICS[1–4,6] Ex: Amoxil®, Bactrim®, Ceclor®, Cipro®, Levaquin® and others	Antibiotics are used to treat bacterial infections.	**DND:** **Antibiotics deplete calcium, magnesium, potassium as well as certain B vitamins (B_1-thiamin, B_2-riboflavin, B_3-niacin, B_5-pantothenic acid, B_6, B_9-folic acid, B_{12}) and vitamin K.** **RECOMMENDED SUPPLEMENTATION:** • **Calcium: 500–1000 mg daily in divided doses** • **Magnesium: 250–400 mg daily**		**Calcium, Iron, Magnesium, and Zinc:** When taken concurrently with antibiotics, absorption of both can be affected due to formation of insoluble complexes. **Green Tea Catechins:** Certain antibiotics (fluoroquinolones) reduce clearance of some green tea constituents (caffeine and theophylline) and may increase the risk of their side effects: nervousness, palpitations, and insomia. **St. John's wort:** It causes photosensitivity and may exacerbate the photosensitizing effects of certain antibiotics.
3. ANTIDEPRESSANTS[1–3, 6–7] *(continued page 2)* Ex: Cymbalta®, Lexapro®, Paxil®, Prozac®, Zoloft® and others	This class of medications increases the levels of one or more of the biogenic amines (e.g. norepinephrine, serotonin, dopamine) in the central nervous system. Clinical improvement from antidepressant therapy generally takes 3–6 weeks.		Folic acid: 240 mcg daily	**Melatonin:** Melatonin may interact with medications that inhibit serotonin reuptake including a number of antidepressant medications. Endogenous melatonin levels are reduced by SSRI medications.

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3. ANTIDEPRESSANTS[1–3, 6–7] *(continued from page 1)*				**SAM-e:** Studies suggest SAM-e may augment the actions of anti-depressant drugs in individuals who are refractory to, or do not get full remission from their anti-depressants. **St. John's wort and 5-HTP:** St. John's wort and other supplements such as 5-HTP, in combination with drugs that increase CNS serotonin levels, can increase the risk of serotonergic side effects, including serotonin syndrome.
4. ANTIEPILEPTICS[1–3] **(Anticonvulsants)** Ex: Dilantin®, Lyrica®, Mysoline®, Tegertol®, Trileptal® and others	These drugs work by decreasing the firing of aberrant neurons in the brain and/or decreasing the spread of abnormal activity to the surrounding regions of the brain.		Calcium[c]: 500 mg daily Vitamin B_{12}[e]: 25–1000 mcg daily Vitamin D[d]: 1000–2000 IU daily	Use caution with the following supplements since they may interfere with the effectiveness of antiepileptic drugs. **Folic acid** **Gingko biloba** **Niacin** **St. John's wort**
5. ANTIPSYCHOTICS[1–3] *(continued page 3)* Ex: Abilify®, Haldol®, Seroquel®, Risperdal®, Zyprexa® and others	Antipsychotics block receptors for neurotransmitters (i.e. dopamine, serotonin). They can reduce the symptoms of schizophrenia, decrease agitation and/or aggression associated with other psychiatric conditions and may stabilize mood in bipolar disease.	**DND:** **Vitamin B_2 (Riboflavin)** **RECOMMENDED SUPPLEMENTATION:** • **Daily Multivitamin** • **B Vitamins**	Vitamin C[f]: 250–500 mg daily	**Echinacea:** Echinacea may inhibit the human drug metabolizing enzyme CYP1A2 leading to decreased clearance (increased blood levels) of Zyprexa®, and this increases potential for side effects. **Evening Primrose Oil:** Seizures have been reported in people with schizophrenia treated concomitantly with phenothiazine drugs and evening primrose oil. **Ginkgo biloba:** Ginkgo has been report to cause seizures or lower seizure threshold. Thus, in combination with drugs that lower seizure threshold (including antipsychotics), there may be a significant increase in risk of seizures. **Ginseng:** Ginseng may exacerbate some psychiatric conditions including hysteria, mania, and schizophrenia and thus compromise the therapeutic benefit of antipsychotics. It may also inhibit some of the drug metabolizing enzymes responsible for clearance of antipsychotic drugs.

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5. ANTIPSYCHOTICS[1-3] *(continued from 3)*				**Goldenseal:** Goldenseal can inhibit cytochrome P450 2D6 (CYP2D6) and might affect effectiveness of several antipsychotics as well as impact potential for side effects. **St. John's wort:** St. John's wort in combination with antipsychotic drugs may lead to unpredictable effects. It is also known to cause photosensitivity and this risk may be increased in combination with certain antipsychotics (phenothiazines), which also can cause photosensitivity.
6. ANXIETY MEDICATION[1-3] **(Benzodiapezines)** Ex: Ativan®, Prosom®, Restoril® Valium®, Xanax® and others	Benzodiazepines are a class of drugs primarily used to treat anxiety.	**DND:** **Calcium** **These medications decrease calcium absorption by increasing metabolism of vitamin D, which is needed for calcium absorption.** **RECOMMENDED SUPPLEMENTATION:** • **Calcium: 500–1000 mg daily in divided doses**	Melatonin[9]: 1–3 mg daily	**Kava:** The combination of kava and benzodiazepines is not recommended due to their similar effects.
7. BIRTH CONTROL[1-3] **(Oral Contraceptives)**	Synthetic and semi-synthetic analogs of estrogen and/or progesterone are used to prevent pregnancy by (1) inhibiting ovulation, (2) thickening cervical mucus and/or (3) diminishing endometrial integrity.	**DND:** **Folic acid** **Magnesium** **Vitamin B_6** **RECOMMENDED SUPPLEMENTATION:** • **Folic acid: 240 mcg daily** • **Magnesium: 250–400 mg daily** • **Vitamin B_6: 5 mg daily**	Calcium[n]: 500 mg daily	**Copper and Iron:** Oral contraceptives may increase serum copper and iron levels. **Garlic and St. John's wort:** Garlic and St. John's wort supplements may decrease effectiveness of oral contraceptives. St. John's wort also causes photosensitivity which may be exacerbated by oral contraceptives. **Green Tea:** Use caution with green tea and oral contraceptives. Oral contraceptives can decrease caffeine clearance by 40–65% and may increase adverse effects of caffeine in green tea. Adjust dose or discontinue if necessary.

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8. BLOOD PRESSURE MEDICATION[1–3,8] **(Anti-hypertensives)** Ex: ACE Inhibitors, Angiotensin Receptor Blockers (ARBs), Beta Blockers, Calcium Channel Blockers.	The major classes of anti-hypertensive drugs include: ACE inhibitors, ARBs, beta blockers, and calcium channel blockets. These drugs help reduce blood pressure by either decreasing total peripheral resistance, or cardiac output or both.	**DND:** **ACE inhibitors deplete zinc.** **Calcium channel blockers deplete potassium.** **RECOMMENDED SUPPLEMENTATION:** • **ACE inhibitors- Zinc: 11 mg daily** • **Calcium channel blockers-Potassium: ≤ 100 mg daily**	CoQ10[i]: 100–200 mg daily Iron: Take as directed by healthcare provider	**Calcium** (with calcium channel blockers only)**:** Calcium supplements may interfere with the blood pressure lowering activity of these drugs. **CoQ10 and Fish Oil:** These supplements may decrease blood pressure in combination with anti-hypertensive drugs. Monitor blood pressure regularly. **Garlic, Ginkgo biloba & St. John's wort:** These supplements have the potential to interfere with the cytochrome P450 system and therefore affect the metabolism and/or clearance of drugs. **Green Tea and Goldenseal:** These supplements may affect therapeutic benefits of anti-hypertensive drugs. **Melatonin:** Melatonin may impair the efficacy of some calcium channel blockers. Monitor for changes in therapeutic efficacy and adjust doses as necessary and/or avoid use of melatonin with this drug class. **Potassium** (with ACE inhibitors and ARBs only)**:** Taking these drugs along with potassium supplements increases risk for hyperkalemia due to a decrease in renal potassium excretion. **Vitamin D:** Vitamin D supplements interfere with the activity of a calcium channel blocker (verapamil).

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10. CHOLESTEROL LOWERING MEDICATION (Statins)[1–3] Ex: Crestor®, Lescol®, Lipitor®, Mevacor®, Zocor® and others	Statins inhibit the HMG CoA reductase enzyme–a key step in the hepatic synthesis of cholesterol. The reduction of cholesterol synthesis subsequently increases the liver's removal of circulating LDL cholesterol. Note: HMG CoA reductase is also a key enzyme in the synthesis of coenzyme Q10 (CoQ10)	**DND:** **Fat soluble vitamins (vitamins A, D, E, K) may be affected by medication use.** **RECOMMENDED SUPPLEMENTATION:** • **Vitamin D: 1000–2000 IU daily**	CoQ10[k]: 100–200 mg daily Fish Oil[l]: 500–1000 mg EPA + DHA daily	**Garlic (containing allicin) and St. John's wort:** These supplements may impact cytochrome P450 metabolism of some statins and affect their effectiveness. **Red Yeast Rice:** Red yeast rice contains lovastatin which also lowers blood cholesterol levels. This supplement should not be taken with cholesterol-lowering drugs unless under the supervision of healthcare professional. **Vitamin A:** Long term use of cholesterol lowering drugs may increase vitamin A levels in the blood. Vitamin A levels may need to be monitored in some individuals.
11. CORTICORSTEROIDS[2–3] Ex: Prednisone	Corticosteroids are synthetic compounds that mimic the effects of hormones naturally produced in the body by adrenal glands. They are known for relieving inflammation, pain and discomfort resulting from various health conditions	**DND:** **Calcium** **Magnesium** **RECOMMENDED SUPPLEMENTATION:** • **Calcium: 500 mg daily** • **Magnesium: 250–400 mg daily**		Use caution with the following supplements as they may interact with and/or affect effectiveness of medication. **Herbal Supplements** **Licorice** **St. John's wort**
12. DIABETES MEDICATION (Oral Hypoglycemics)[1–3,10–11] Ex: Avandia®, Diabeta®, Glucophage® (Metformin), Prandin®, and others		**DND:** **Folic acid** **Vitamin B_{12}** **RECOMMENDED SUPPLEMENTATION:** • **Folic acid: 120–240 mcg daily** • **Vitamin B_{12}: 25–1000 mcg daily**		Use caution with the following supplements as they may interfere with the effectiveness of oral hypoglycemic drugs and/or cause additive blood glucose lowering effects and increase risk of hypoglycemia when used in combination. **Alfalfa** **Aloe Vera** **Alpha Lipoic Acid** **Bilberry** **CoQ10** **Chromium** **Garlic** **Ginkgo biloba** **Ginseng** **Green Tea** **Melatonin** **Milk Thistle** **Niacin** **St. John's wort** **Vitamin K_1**

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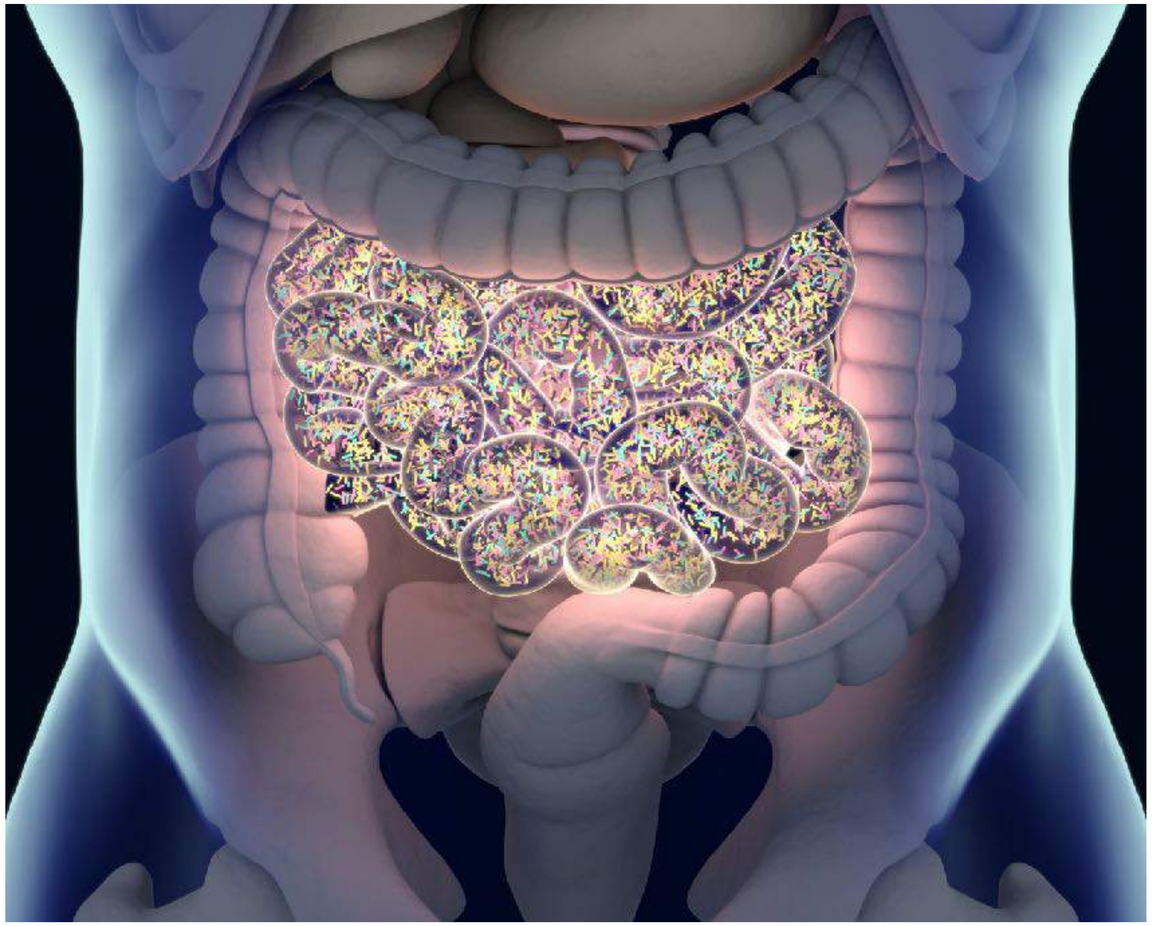
13. DIGIOXIN[1–3] Ex: Cardoxin®, Digitek®, Lanoxicaps®, Lanoxin® and others	Digoxin is derived from the leaves of the Digitalis lantata plant (a variety of foxglove). It is used to treat heart failure and atrial fibrillation.	**DND:** **Calcium** **Magnesium** **Phosphorus** **Potassium** **Vitamin B_1 (Thiamin)** **RECOMMENDED SUPPLEMENTATION:** • **Calcium: 500–1000 mg daily in divided doses** • **Magnesium: 250–400 mg daily** • **Potassium: ≤ 100 mg daily**		**Calcium:** High levels of calcium increase the likelihood of a toxic reaction to digoxin. Low levels of calcium interfere with the function of digoxin. Consistent intake of calcium and monitoring of calcium levels by a healthcare professional is recommended. **Hawthorn:** The activity of digoxin may be enhanced by hawthorn supplements. **St. John's wort:** St. John's wort supplements may reduce serum levels of digoxin.
14. DIURETICS[1–3,9] Ex: Aldactone®, Diamox®, Lasix®, Microzide® (HCTZ), Zaroxolyn® and others		**DND:** **Loop and thiazide diuretics deplete magnesium, potassium, and zinc.** **Potassium sparing diuretics deplete folic acid.** **RECOMMENDED SUPPLEMENTATION:** • **Loop and Thiazide Diuretics-** **Magnesium: 250–400 mg daily** • **Potassium: ≤ 100 mg daily** • **Zinc: 11 mg daily** • **Potassium-Sparing Diuretics-** **Folic Acid: 240 mcg daily**		**Calcium:** Thiazide diuretics reduce calcium excretion by the kidneys and may increase risk for hypercalcemia, metabolic alkalosis, and possible renal failure. **CoQ10 and Fish Oil:** When taken together with diuretics, these supplements may have additive blood pressure lowering effects and increase risk for hypotension. **Ginkgo biloba:** Ginkgo may reduce the effectiveness of some diuretics.
15. HORMONE REPLACEMENT THERAPY (Estrogens)[3] Ex: Estrace®, Premarin®, Prempro®	Hormone replacement therapy is used to replace female hormones that are no longer produced after menopause.	**DND:** **Folic acid** **Magnesium** **Vitamin B_6** **Vitamin B_{12}** **RECOMMENDED SUPPLEMENTATION:** • **Folic acid: 240 mcg daily** • **Magnesium: 250–400 mg daily** • **Vitamin B_6: 5 mg daily** • **Vitamin B_{12}: 25–1000 mcg daily**		**Caffeine:** The stimulating effects of caffeine may be increased due to inhibition of metabolism or clearance of caffeine by hormone replacement therapy. **Calcium and Vitamin D:** Calcium and vitamin D may increase absorption of hormone replacements. These supplements are recommended to improve bone mineral density during estrogen therapy. **Red Clover Extract and Soy Isoflavones:** These supplements may interfere with the activity or absorption of hormone replacement therapy. **St. John's wort:** St. John's wort may alter hormone metabolism including estrogen and progesterone. This supplement is not recommended during hormone replacement therapy. **Zinc and Magnesium:** Excretion of these minerals is reduced by hormone replacement therapy.

Age

Nutritional needs vary from one life stage to another (in optimal situation)

- **Pregnancy**: require increased amounts of calcium, phosphorus, magnesium, iron, zinc, potassium, selenium, copper, chromium, manganese, and molybdenum
- **Infancy and early childhood**: Requirements for fatty acids on a per-kilogram basis are higher in infants than adults
- **Adolescence and adulthood**: Micronutrient needs in adults 19 to 50 years of age differ slightly according to gender. Males require more vitamin C, K, B1, B2, and B3; choline; magnesium; zinc; chromium; and manganese. Menstruating females require more iron, compared with males of similar age.
- **Later years**: Frequent deficiencies in Vitamin D, selenium, Vitamin B12, Vitamin CoQ10, zinc (less enzyme production)

Gut Health



- Healthy Microbiome: significant contributor to the body’s ability to effectively absorb nutrients from food
- Inflammation: Reducing the ability of the hair-like microvillies from absorbing nutrients
- Inflammatory conditions supporting the growth of pathogenic bacteria
- Reduced stomach acid: reduced absorption of Vitamin B12, zinc and iron.

Effects of stress on digestion

Stressed Mind And Body

Sleep Disturbance

Reduced Digestive Juice Production (stomach acid bile, enzymes)

Reduced Gut Motility Often constipation

Dysbiosis

Over Fermentation and Endotoxin Formations

Gut Inflammation and Intestinal Permeability

Inflammation Impacting Whole Body

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Poor Diet

- Excess intake of macronutrients such as carbohydrates and refined foods
- Over-nutrition
- Poor micronutrient intake
- Inflammatory food
- Food allergens

Toxins

- Toxins poison enzymes so they don’t work properly.
- Toxins displace structural minerals, resulting in weaker bones.
- Toxins damage DNA, which increases the rate of aging and degeneration.

- Toxins interfere with hormones and cause imbalances.
- Toxins modify gene expression.
- Toxins damage the organs.
- Toxins damage cell membranes so they don’t respond properly.
- Last but not least, toxins actually impair your ability to detoxify—and this is the worst problem of all.

Lead

Sources:

Leaded paint in old houses, ceramic pottery, lead crystal, cosmetics, heavy industry eg. electroplating, smelters, leaded petroleum, lead water pipes, soil,

Mineral Antagonists:

Calcium, Iron, Zinc

Chelation of Lead:

Zinc 25-75mg/day
Chlorella
Modified Citrus Pectin
Zeolite
Cilantro (mobilising cadmium out of tissue)
Alpha Lipoic Acid
Vitamin C
If low in tissue calcium, a calcium supplement may assist the removal of lead.

Toxic effects:

Abdominal pain, constipation, deep bone pain, fatigue, fibromyalgia, headache, difficulty falling asleep, immune system supression, iron deficienct anemia, muscle weakness/ peripheral neuropathy, poor memory, poor concentration and judgement, susceptibility to brain tumours, delayed development/ learning..

In addition to disrupting calcium metabolism, lead can mimic and displace magnesium and iron from certain enzymes that construct the building blocks of DNA (nucleotides) and disrupt the activity of zinc in the synthesis of heme (the carrier of oxygen in red blood cells)

Signs of Nutritional Deficiencies

Eyes 

Dark circles or bags under eyes: Allergies, food intolerances
Poor night vision: Vitamin A
Ruptured blood vessels in the eyes: Vitamin C
Nearsightedness: Vitamin D, Zinc
Pale lower eyelid: Iron

Teeth & Gums 

Bleeding gums: Vitamin C, Folate
Crowded teeth: Calcium, Vitamin K

Nails 

Spoon shaped nails: B12, Iron
White marks: Calcium or Zinc
Pail nails: Iron, Biotin
Brittle nails: Calcium, magnesium, Iodine
Cuticles tear easily: Protein

Muscle and Joints 

Muscle cramping: Magnesium, B1, B2, B6
Twitching: B1, B2, B3, B6, B9, Vitamin D
Magnesium, Calcium
Edema / Swelling: B1, B6, Potassium
Numbness or tingling: B12, B5
Clicking Joints: Manganese

Hair 

Hair loss: B2, B5, Biotin, D, Zinc
Dry hair: Vitamin A, E, Omega 3, Protein, Iodine, Selenium, Biotin
Dandruff: Selenium, Omega3, Vitamin A

Skin 

Bumps of the back of the arm: Vitamin A
Dr or rough skin: Vitamin A, E
Unusual nosebleeds: Vitamin C
Easy bruising: Vitamin C
Acne during menstruation: B6
Dermatitis: B2, B3, Biotin
Red stretch marks: Zinc

Mouth 

Canker sores: B3, B12, Folate, calcium
Cracks in the corner of the mouth: B2: Magnesium, Calcium
Weak tooth enamel: Vitamin A, D, K, Calcium
Painful tongue: B2, B3, folate
Loss of smell or taste: Zinc

RDA / UL / SR

Recommended Dietary Allowance (RDA): average daily level of intake sufficient to meet the nutrient requirements of nearly all (97%-98%) healthy people.

Tolerable Upper Intake Level (UL): maximum daily intake unlikely to cause adverse health effects.

Supplementary Range (SR): is a safe therapeutic dose for a range of disease states.
A twenty fold or more of the RDA is often required for individuals depending on genetics and physiological state.

Recommended Dietary Allowance of Nutrients for Women

Age	11 – 14	15 – 18	19 – 24	25 – 50	+ 51	Pregnant	Lactating (First 6 months)	Lactating (Second 6 months)
Calories (kCal)	2200	2200	2200	2200	1900	+ 300	+ 500	+ 500
Protein (g)	46	44	46	50	50	60	65	62
Vitamin A (ug)	800	800	800	800	800	800	1300	1200
Vitamin D (ug)	10	10	10	5	5	10	10	10
Vitamin E(mg)	8	8	8	8	8	10	12	11
Vitamin K (ug)	45	55	60	60	60	65	65	65
Vitamin C (mg)	50	60	60	60	60	70	95	90
Thiamin (mg)	1.1	1.1	1.1	1.1	1	1.5	1.6	1.6
Riboflavin (mg)	1.3	1.3	1.3	1.3	1.2	1.6	1.8	1.7
Niacin (mg)	15	15 – 18	15	15	13	17	20	20
Vitamin B6 (ug)	1.4	1.5	1.6	1.6	1.6	2.2	2.1	2.1
Folate (ug)	150	180	180	180	180	400	280	260
Vitamin B12 (mg)	2.0	2.0	2.0	2.0	2.0	2.2	2.6	2.6
Calcium (mg)	1200	1200	1200	800	800	1200	1200	1200
Phosphorous (mg)	1200	1200	1200	800	800	1200	1200	1200
Magnesium (mg)	280	300	280	280	280	320	355	340
Iron (mg)	15	15	15	15	10	30	15	15
Zinc (ug)	12	12	12	12	12	15	19	16
Iodine (ug)	150	150	150	150	150	175	200	200
Selenium (ug)	45	50	55	55	55	65	75	75

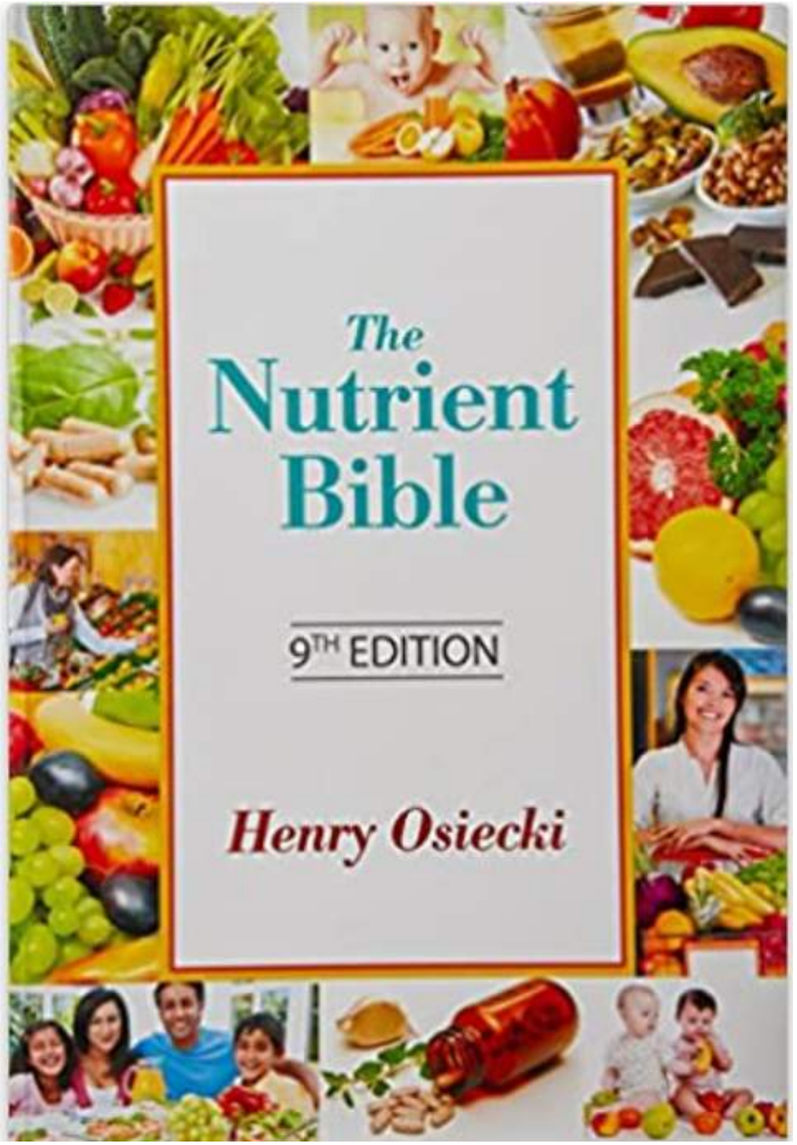
RDA and SR

Example for RDA and SR

RDA: Vitamin C 60 mg per day (75-125 mg)
SR: Vitamin C 250-2000 mg and even higher for liposomal Vitamin C

RDA: Zinc 15 mg or 0.2 mg/kg
SR: 10-90 mg

Excellent book: The Nutrient Bible by Henry Osiecki



Bioavailability of certain nutrients

Bioavailability includes gastrointestinal (GI) digestion, absorption, metabolism, tissue distribution, and bioactivity. However, it has several meanings depending on the research area used to.

For instance, from a pharmacological point of view, bioavailability is the rate and extent to which the therapeutic moiety is absorbed and becomes available at the drug action site.

From the nutritional point of view (that is of particular interest in the current book), bioavailability refers to the fraction of the nutrient that is stored or being available in physiological functions.

Bioavailability of Magnesium

Comparison of element fractions from different magnesium sources

Magnesium source	Magnesium content	Solubility	Bioavailability
Oxide	60%	Insoluble	Low
Sulfate	20%	Moderately soluble	Low
Hydroxide	41%	Insoluble	Low
Carbonate	28.5%	Insoluble	Low
Chloride	25%	Soluble	High
Citrate	16%	Soluble	High
Gluconate	6%	Soluble	High
Glycinate	10%	Soluble	High
Aspartate	8%	Soluble	High
Taurinate	6.5%	Soluble	High

Many cheap competitive products will use oxide or blends of oxide, with the focus on delivering a product with a high elemental fraction, while disregarding its extremely poor bioavailability estimated at ~4%.

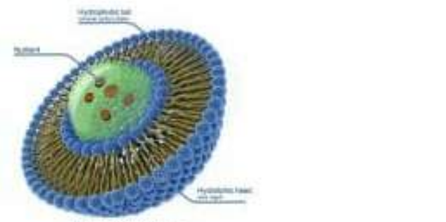
Bioavailability of Glutathione

“Clinical efforts to boost glutathione levels in the body have historically focused not on directly supplying glutathione but rather on increasing endogenous production by providing precursor molecules and cofactors,” according to Sarah Cook, ND, the author of a 2017 Natural Medicine Journal Research Guide on the topic of oral availability of glutathione.

The results of a particular ’92 study conducted at the University of Bern in Switzerland indicate that digestive processes will render a single 3 g dose of glutathione almost entirely useless within a 270-minute period following administration. The study indicates that plasma GSH levels of its participants did increase, but only to a negligible degree.

Bioavailability of Glutathione

One of the primary reasons for the low oral bioavailability of glutathione is its fragility in standing up to standard digestive processes. The molecules are simply too weak in isolation to withstand the heavy exposure to digestive peptidases (enzymes) and hydrolysis (a reaction where water breaks chemical bonds) which inevitably occurs in the very earliest stages of digestive tract.



Structure of liposome

This diagram depicts exactly how liposomes are able to encapsulate and protect nutrients.

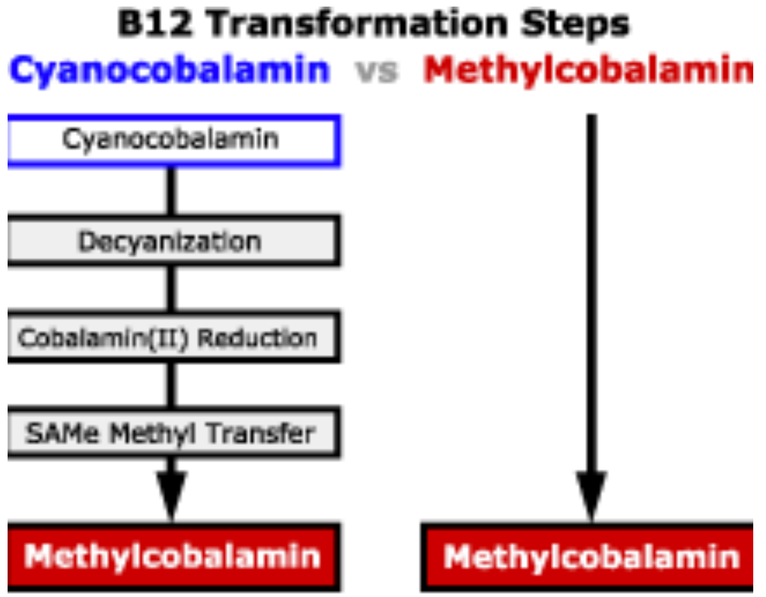
Liposomal Glutathione: Du to a protective layer of lipids more molecules will survive the initial stages of digestion.
Best product: Contains reduced glutathione (L-glutathione), phospholipids

Natural versus Synthetic

Vitamin B12

Synthetic: Cyanocobalamin, not found in nature, used because it is cheaper, needs to be converted by the body into methylcobalamin or adenosylcobalamin, contains a cyanide molecule.

Natural: Methylcobalamin, contained in food, readily available for body to use, more expensive, contains a methyl group.



Types of Vitamin B12 Compared

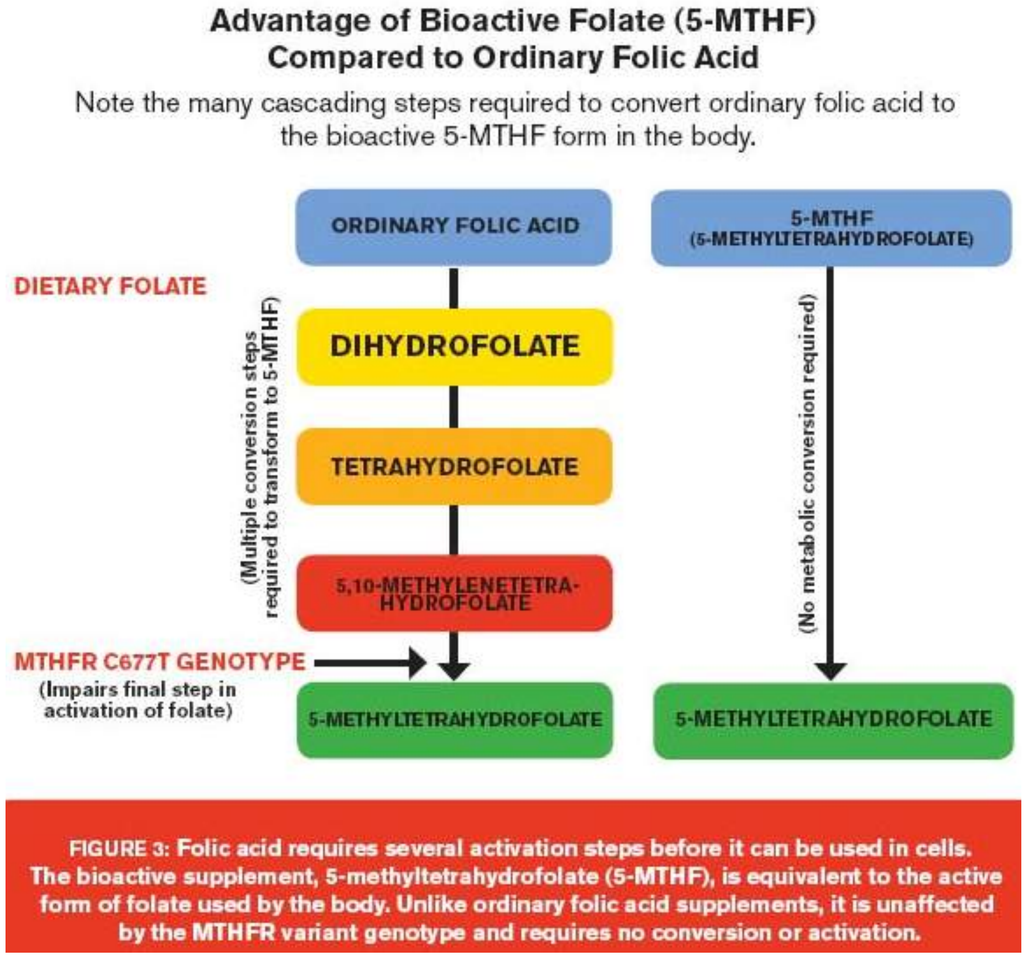
Cobalamin	Natural Form?	Bioactive Coenzyme?	Conversion steps necessary	Sustained Release	Special Effect
Cyanocobalamin 'the synthetic B12'	no	no	4	average to poor	No particular effect
Hydroxocobalamin 'the long lasting B12'	yes	no	3	very good	Detoxification of cyanide & NO
Methylcobalamin 'the DNA & nerves B12'	yes	yes	0	average	DNA, brain, nerves, blood, detoxification
Adenosylcobalamin 'the energy B12'	yes	yes	0	average	Energy, muscles, brain, DNA

Natural versus Synthetic

Folate

Synthetic: folic acid, not found in nature, used because it is cheaper, needs to be converted by the body into 5-methyltetrahydrofolate.

Natural: 5-MTHF readily available for body to use, more expensive, excellent for people with MTHFR impairment



Natural versus Synthetic

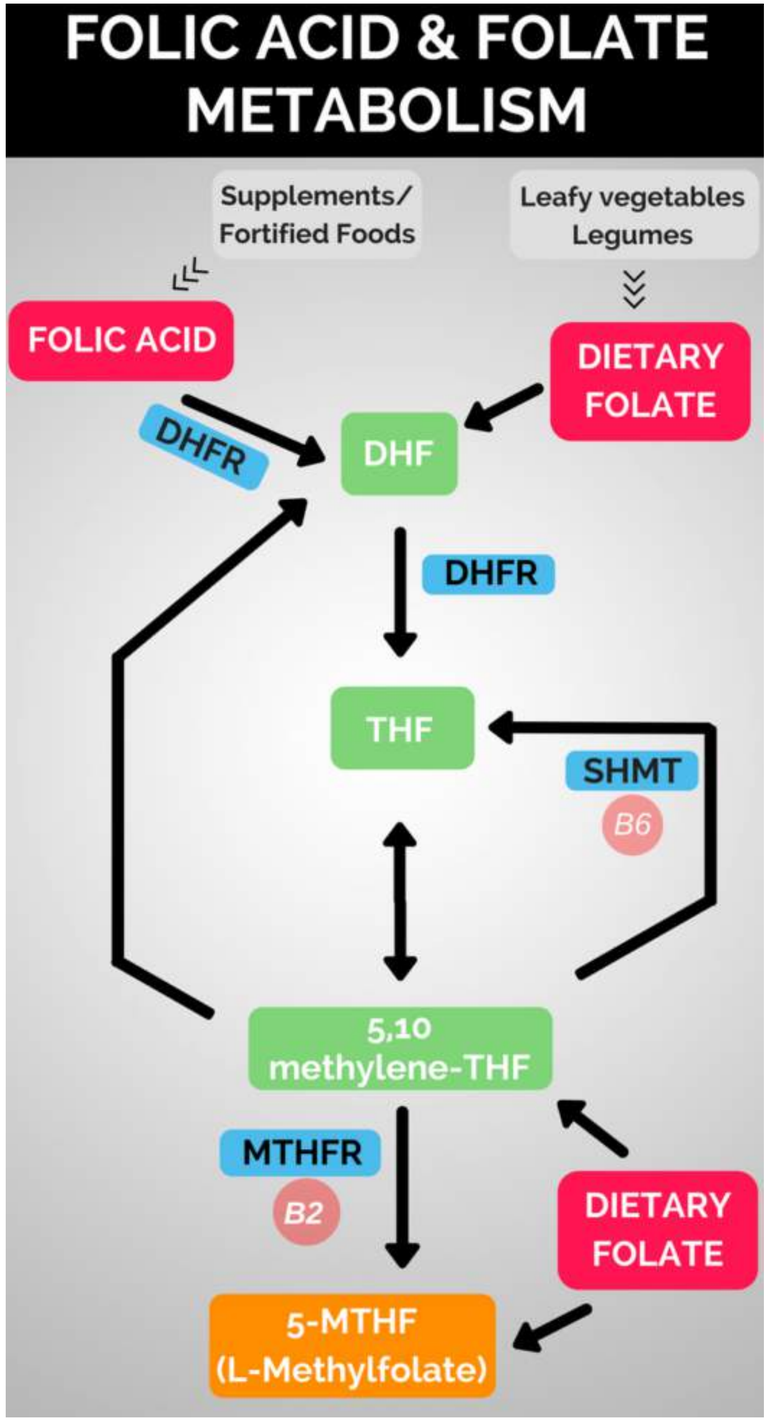
Folate: different compounds that occur naturally in foods like leafy greens and legumes.

- Dihydrofolates
- Methylfolates
- Monoglutamyl folate
- Polyglutamyl folates.

The name folate even comes from the latin term “folium”, or what we call “foliage”.

Dietary folate can either start on the top right, corner or bypass the entire sequence completely…

This is because much of our dietary folate is already in the active form of L-methylfolate.



Natural versus Synthetic

Vitamin E

Synthetic: synthetic forms of vitamin E are labeled with a dl- prefix. Synthetic Vitamin E is a mixture of 8 stereoisomers, only one of which is equivalent to d-alpha-tocopherol.

Natural: d-alpha tocopherol, d-alpha tocopheryl acetate, or d-alpha tocopheryl succinate. Alpha-tocopherol is the most biologically active form of vitamin E, at least twice as effective physiologically than the synthetic form.

Researchers at Oregon State University, Corvallis, found the human body excretes synthetic vitamin E three times faster than the natural form.

Natural versus Synthetic

Vitamin A

Synthetic: Retinyl palmitate or retinyl acetate is the synthetic form of Vit A. This synthetic is made from combining fish or palm oil with beta-ionone.

Natural: Vitamin A shows up in food as beta-carotene. The body must convert it into vitamin A to be useful. The enzyme (beta-carotene 15,15'-monoxygenase) is responsible for the conversion of beta-carotene into vitamin A.

A study revealed that 47 percent of women had a genetic variation that reduced their ability to convert beta-carotene.

Vitamin A boosts the immune system and reduces the risk of inflammation associated with chest infections.

Natural versus Synthetic

Vitamin B3

Synthetic: Nicotinic acid is created using coal tar, ammonia, acids, 3-cyanopyridine, and formaldehyde. It is less absorbable and has more risks of side effects.

Natural: Niacinamide or nicotinamide is what we find in food and commonly call niacin. Niacin can have side effects, but these are minimal when coming from plant foods. (Niacin supplements cause a flush)

Niacin	Nicotinamide
Dilatation of blood vessels	No dilatation
Lowering high blood pressure	No effect on blood pressure
Lowering Cholesterol	No effect on Cholesterol
Niacin flush	No flush
No real effect on skin health	Skin health
Non effect	Helps hyperpigmentation
No strong influence on anxiety	Mental health, anxiety
No influence on depression	Elevates depression

Natural versus Synthetic

Vitamin B5

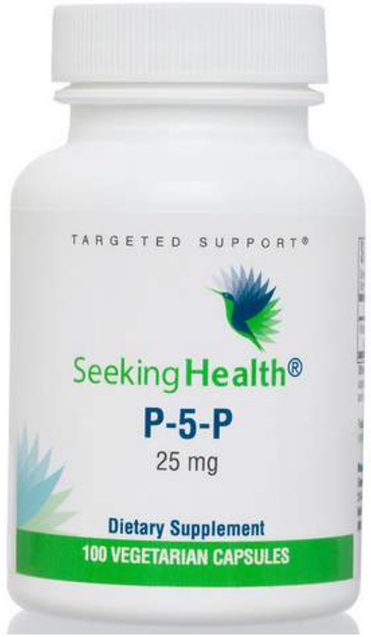
Synthetic: Pantothenic acid involves isobutyraldehyde and formaldehyde to form a calcium or sodium salt. The alcohol derivative, panthenol, is sometimes used as it is more stable and lasts longer on store shelves.

Natural: Pantothenate is the natural version of B vitamin.

Natural versus Synthetic

Vitamin B6

Synthetic: Pyridoxine hydrochloride comes from petroleum ester, hydrochloric acid, and formaldehyde. It isn't readily absorbed or converted and has been shown to actually inhibit the action of natural B6 in the body. It also has side effects not normally found with natural food sources of this vitamin.



Natural: Like B1, pyridoxine is bound with phosphate in plants to make pyridoxal-phosphate. This is the biologically active form. Any other form of B6 must be converted into this phosphate combination before our body can use it.

Natural versus Synthetic

Vitamin K

Synthetic: Vitamin K3 is a synthetic form known as menadione, comes from coal tar derivatives and genetically modified and hydrogenated soybean oil, and uses hydrochloric acid and nickel. It is considered highly toxic and damages the immune system.

Natural: Vitamin K1 is mostly found in vegetables, while vitamin K2 is found in fermented dairy products and is also produced by the bacteria in our guts. Vitamin K1 is also called phytonadione, while vitamin K2 is referred to as menaquinone.

Vitamin K_2 contributes to bone and cardiovascular health.

Vitamin K2 can be further divided into several different subtypes, the most important ones being MK-4 and MK-7. MK-7 is by far better bioavailable than MK-4

General quality of Supplements

Many supplements are marketed with a tremendous amount of hype and little scientific substance.

Supplement companies also hide behind proprietary blends, where they dont tell you how much of each ingredient is inside.

Attention should be directed towards:

- Quality control measures
- Ingredient types
- Total number of ingredients
- Ingredient forms
- Potencies
- Ingredient amounts

Vitamins are likely under-dosed

Vitamins/minerals that are very difficult to get in optimal levels from your diet.
These include:

- Vitamin D
- Vitamin K

The RDA for vitamin D is roughly 400-800 IU, and the optimal level is roughly 2000 IU minimum. The only people who do not need to concern themselves with vitamin D are those that live within the tropics and have frequent sun exposure with bare skin
The RDA for vitamin K is roughly 60-120 mcg, and the optimal level is roughly 1000 mcg. This optimal level is for both vitamin K1 and K2.

Minerals highly likely to be deficient

Minerals that are difficult to get optimal levels via diet. These include:

- Iron (mostly for people with low/no meat intake)
- Magnesium
- Zinc (people who sweat a lot)

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Omega- 3 deficiency

Omega-3 deficiency is very common. For example four out five Australian failing even to meet the moderate recommendation intake of 500mg combined EPA and DHA daily for cardiovascular health.

- Measuring RBC levels (best omega- 3 index)
- Therapeutic effect is time and dosage depending, at least 1g/day of EPA/DHA for five months is required to achieve therapeutic blood levels (2.7 g for people with RA)
- Statins inhibit omega-3 activity
- Best time for supplementation, following meal containing glycerophospholipids found in milk, eggs, meat and certain seeks and legumes (such as sunflower and soybeans)

Most clinical studies on vitamins flawed by poor methodology

Summary:
Most large, clinical trials of vitamin supplements, including some that have concluded they are of no value or even harmful, have a flawed methodology that renders them largely useless in determining the real value of these micronutrients, a new analysis suggests. These flawed findings will persist until the approach to studying micronutrients is changed.

Alexander Michels, Balz Frei. **Myths, Artifacts, and Fatal Flaws: Identifying Limitations and Opportunities in Vitamin C Research**. *Nutrients*, 2013; 5 (12): 5161 DOI: 10.3390/nu5125161

Poor Oversight of Dietary Supplements by the FDA or any regulatory body

Unlike pharmaceutical drugs, dietary supplements are not tested for safety and efficacy before they're sold; essentially deemed innocent until proven guilty. 🤪

The government strongly relies on manufacturers to self-comply with established CFR part lll supplement manufacturing regulations.

Fortunately, most dietary supplement companies do comply and reliably produce quality products. 🤩

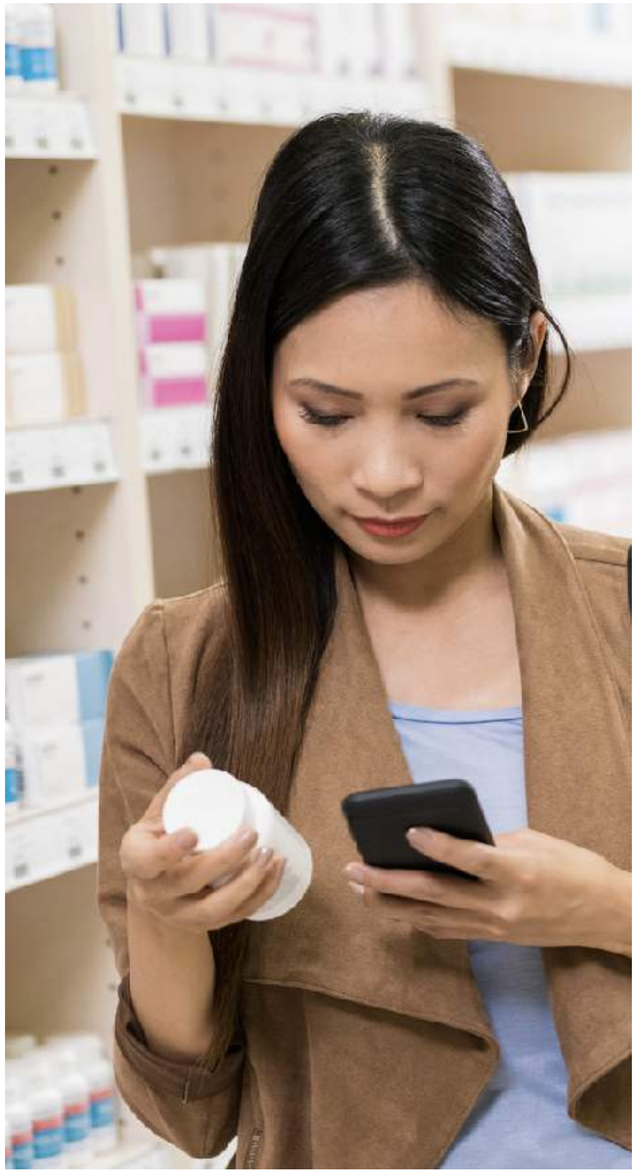
We should keep in mind that the volume of adverse effects reported for natural products is miniscule compared to pharmaceuticals, purported to take over 100,000 American lives each year.

Top Quality Manufacturers

Companies including Ayush Herbs, Bio-Tech, BioClinic Naturals, Carlson, Designs For Health, Gaia Herbs, Genestra, Heel, Innate Response, Jarrow, Douglas, Klarie Labs, Metagenics, Integrative Therapeutics, Life Extension, Nordic Naturals, Thorne Research, Perque, Seeking Health, NOW, Pure Encapsulations, Xymogen, Vital Nutrients, Quicksilver Scientific, Energetic Nutrition, Source Natural…..

Avoid Chain and Big Box Retailers

Costco, Vitacost, CVS, Aldi, Centrum, Nature’s Way…



Some Practical Tips

Clear, easy-to-read label: Supplement labels should be legible, with a clear breakdown of active and inactive ingredients.

Quality proof: The supplement company should be provide some sort of Certificate of Analysis, compliance with good Manufacturing Practices (GMP), laboratory testing of raw materials (either in house or reputable third- party)

Backed by science: The online product page should provide a clear listing of studies used to substantiate any claims made on behalf of the supplement.

Intravenous IV therapy

IV therapy allows the vitamins to go right into the bloodstream, bypassing the digestive process, to give faster, more effective results.

- Guaranteed absorption
- Faster results
- Can be customised
- Possible to give high Vitamin C dose
- Complete Rehydration

Oral supplementation

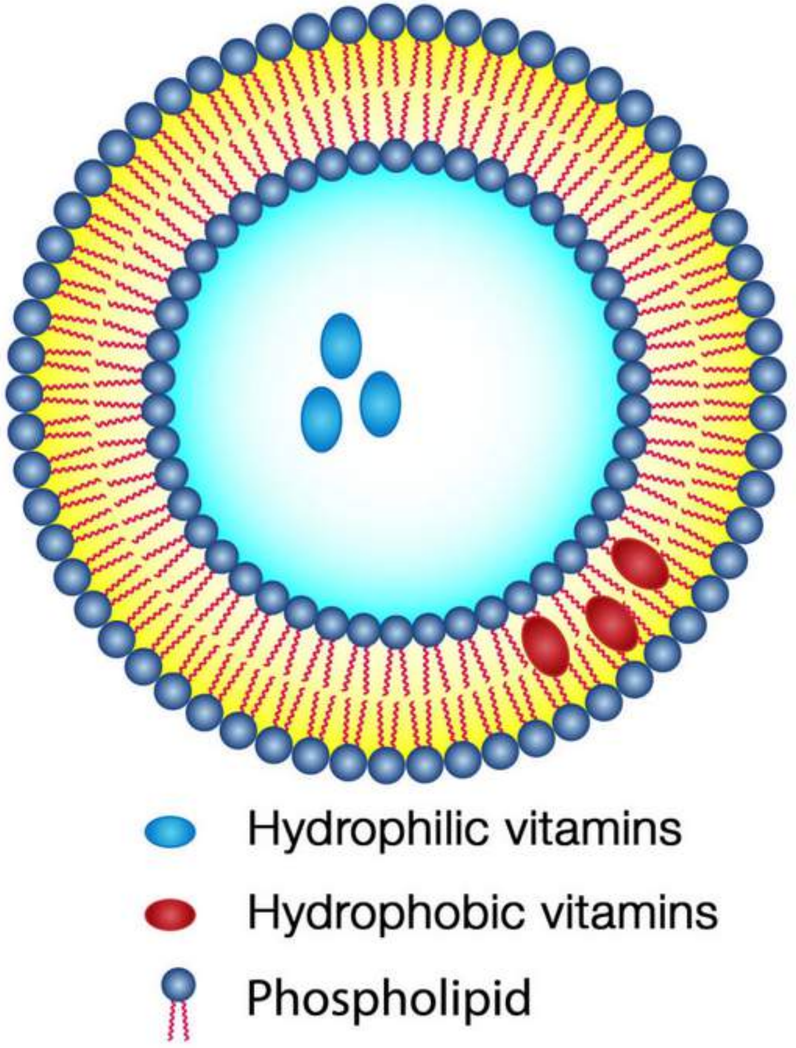
Oral supplementation of micro-nutritions in capsules, tablet or liquid form

- Needs to go through the digestive tract to get absorbed
- Easily accessible
- No doctor needed for prescription
- Can be customised and tailored to needs
- Huge variety available
- Most of the time cheaper than IV

Liposomal Supplementation

Liposomes bring the power of intravenous therapy into a convenient oral delivery.

- Best quality uses phosphatidylcholine phospholipid mixes instead of raw lecithin as it is a smaller molecule
- Easy to take
- Fast absorption mainly in the mouth
- Controlled and sustained release
- Encapsulation enhances stability
- Most of the time cheaper than IV




Q&A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