Dietary Supplements and Oral Health

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"Healthy At Home" and "Life Is Your Best Medicine"

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Per 1994
Dietary Supplement Health Education Act

• A dietary supplement is a product taken by mouth that contains a "dietary ingredient" intended to supplement the diet.
• The "dietary ingredients" in these products may include: vitamins, minerals, herbs or other botanicals, amino acids, and substances such as enzymes, organ tissues, glandulars, and metabolites.
• Dietary supplements can also be extracts or concentrates, and may be found in many forms such as tablets, capsules, softgels, gelcaps, liquids, or powders.

Do You Believe?

• Most Americans get all the micronutrients they need in their diet.
• Nutrient deficiencies are rare in the United States.
• That dental and medical communities are adequately trained to recognize nutrient deficiencies in their clinical practice.

Real State of Our Nutrition

• 90 million Americans are vitamin D deficient (using the Endocrine Society guidelines < 20ng/mL)
• 30 million are deficient in vitamin B6
• 18 million people have B12 deficiency
• ~16 million have very low serum vitamin C
• 13% of Latinas and 16% of African American women (ages 12-49) are iron deficient
• Women 25-39 overall have borderline iodine insufficiency

CDC 2nd National Report on the Biochemical Indicators of Diet and Nutrition in the U.S. population
Case 41-year old Female

• Strict vegan for 2.5 years. Disturbance of taste (unable to sense flavor of variety of fruits and vegetables), fatigue after simple daily activities, paresthesia of the anatomic structures innervated by the mandibular division of the trigeminal nerve on her left side, disturbance of memory and slowing mental faculty. No meds. No significant medical or dental history.


Laboratory Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Normal range (female)</th>
<th>Patient’s values</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC count (cells/μL)</td>
<td>3.90-5.03</td>
<td>1.63</td>
</tr>
<tr>
<td>Hemoglobin (g/dL)</td>
<td>12.0-15.5</td>
<td>7.2</td>
</tr>
<tr>
<td>MCV (fl)</td>
<td>80-100</td>
<td>144</td>
</tr>
<tr>
<td>Hematocrit (%)</td>
<td>36-45</td>
<td>23.4</td>
</tr>
<tr>
<td>RDW (%)</td>
<td>13±1.5</td>
<td>25</td>
</tr>
<tr>
<td>Serum folate (ng/mL)</td>
<td>3-16</td>
<td>7.73</td>
</tr>
<tr>
<td>Serum cobalamin (pmol/L)</td>
<td>118-716</td>
<td>71.8</td>
</tr>
</tbody>
</table>

MCV = mean corpuscular volume; RBC = red blood cell; RDW = red cell distribution width.

Patient treated with 1000 mcg B12 IM per week for 4 weeks and 1 mg folate daily. Symptoms disappeared after 14 days of treatment.
**B-Vitamins**

- The B-vitamins are important for the metabolism of carbohydrates, fats and proteins and play a vital role in the production of fuel and energy for the body.

- There are eight B-vitamins that partner together, which is why you almost always want to take them together in balanced amounts.

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**Folate**

- Women who are of reproductive age need **400 mcg/day of folate** at least 2-3 months before pregnancy to reduce the risk of neural tube defects.

- Folic acid received through food fortification in the US is less than **130 mcg/day**, making supplementation vitally important.

- Given that many women are avoiding gluten-containing foods, the contribution from fortified foods is likely even lower.

- **10-20% of individuals have abnormality in the MTHFR enzyme**, which is involved in the metabolism of folate, leading to low levels of folate in spite of intake. This is why a number of supplement companies now use **L-methylfolate** (the active form) instead of folic acid.

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**Vitamin B12**

- Found in animal and fortified foods. Key role in DNA synthesis, hematopoiesis and neurological function.

- Deficiency: megaloblastic anemia, neurological disorders (numbness/tingling feet, difficulty walking, memory loss, dementia) tongue soreness, constipation)

- American Academy of Neurology recommends elders and anyone with suspected dementia, be checked for B12 deficiency.

- Risk for deficiency: inadequate intake, impaired absorption, vegan, meds, obesity, elders, alcoholism

- **18 million Americans** deficient in vitamin B12

- Recommend > 20 mcg/d for those over age 50
Metformin With Proton Pump Inhibitors: A Polypharmacy Recipe for Neuropathy via Vitamin B12 Depletion


Meta analysis 29 studies (8,089 patients) found 245% increased risk of B12 deficiency associated with metformin use.


Metformin and Vitamin B-12

Study of 390 patients with type 2 diabetes randomized to metformin (850 mg) or placebo TID for 4.3 years.

Compared with placebo, metformin treatment was associated with a mean decrease in vitamin B-12 concentration of −19%.

De Jager et al. BMJ 2010; 340:c2181

Metabolism of B12

• Protein enters stomach, HCL and pepsin separate B12 from protein in animal food

• Free B12 joined to protein called intrinsic factor (IF) made by parietal cells in stomach.

• B12-IF travels to ileum where, if calcium is adequate, it is absorbed.

• Atrophic gastritis is thought to affect 10%-30% of people over 60 years of age.

• Frequently associated with the presence of autoantibodies directed towards stomach cells and/or H. pylori infection.

• Diminished gastric function in individuals with atrophic gastritis can result in bacterial overgrowth in the small intestine and cause food-bound vitamin B12 malabsorption.

Serotonin and Melatonin Pathways

Vitamin B3 (Niacin)

Tryptophan

5-Hydroxytryptophan (5HTP)

Serotonin

Melatonin

Folic acid, iron, folate and vitamin B12 are needed to manufacture tryptophan hydroxylase, which converts tryptophan to 5HTP.

Zinc, Vitamins B1, B3 and B6 are needed to make stomach acid

Folic acid, iron, folate and vitamin B12 are needed to manufacture tryptophan hydroxylase, which converts tryptophan to 5HTP.

Vitamin B6, vitamin C, zinc and magnesium are needed to manufacture 5HTP which converts 5HTP to serotonin.

Vitamin B5 and SAMe are needed to convert serotonin to melatonin.

Zinc, Vitamin B1, B3 and B6 are needed to make stomach acid.
**Vitamin B6**  
(*Pyridoxal-5-Phosphate*)

- Critically involved in production of serotonin, dopamine, melatonin, hemoglobin, protein metabolism, energy production, and more.
- Deficiency: depression, impaired cognition, attention, memory, and sleep. Increased risk for heart disease, stroke and colorectal cancer.
- Common OTC analgesics and oral contraceptives lower B6 levels. 30 MILLION Americans are deficient in B6.
- Serum PLP < 20 nmol/L = deficiency, PLP 20-30 nmol/L risk CVD/stroke.
- Need ~6 mg per day to maintain normal serum level.

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**To Get 1.5 mg B6 in Food**

- 2.5 bananas
- 12 Tbsp. roasted sunflower seeds
- 8 ounces chicken breast
- 8 ounces sockeye salmon
- 3.5 cups raw diced avocado
- 3 cups sweet potatoes
- 15 cups of milk OR
- 20 Tbsp. peanut butter

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65-year old man complains of persistent tingling and numbness in his legs (bilateral) during a routine oral care visit. Dentist notes he has a beefy red and deeply fissured tongue and complains of sore throat. Other than cataract in his right eye, no known medical problems. Vegetarian and lactose intolerant. Which of the following nutrient deficiencies would best explain his symptoms?

A. Vitamin B2  
B. Vitamin B6  
C. Vitamin C  
D. Vitamin B12

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Riboflavin (B2) deficiency causes ariboflavinosis, which manifests as cracked lips, inflammation of the tongue, dryness or burning of the oral cavity, and sore throat.
Riboflavin Deficiency: At Risk Groups

- Alcoholics
- Those with chronic infection or liver disease (increased demand)
- Inflammatory bowel disease (decreased absorption)
- Diabetics (increased excretion)
- Elders (decreased absorption, dietary intake)
- Vegans (insufficient dietary intake)
- Pregnant and breastfeeding women (increased demand – low riboflavin increases risk for pre-eclampsia)
- Adolescents, particularly girls (increased demand)
- Athletes (increased demand)
- Hyperthyroidism (increased demand)
- MTHFR C667TT genotype (increased demand)
- Brown-Vialetto-Van Laere syndrome genetic neurological disorder mutation in transporter: deafness, bulbar palsy, respiratory difficulties)

Which of the following micronutrients is needed to convert vitamin B6 to the active form of pyridoxal 5 phosphate in the liver?

A. Iron
B. Zinc
C. Riboflavin
D. Vitamin A

- The correct answer is C.

• Riboflavin is needed to convert all forms of vitamin B6 to the active form of PLP. Zinc is needed by cells to take up PLP.
Choline: Related to B-Vitamins

• Choline deficiency causes abnormal deposition of fat in the liver, which results in a condition called nonalcoholic fatty liver disease.
• Necessary for healthy cell membranes and cognition as we age.
• Water soluble nutrient in the B-vitamin family that is particularly crucial during pregnancy and the first three years of a child’s life.
• New daily value set in 2016: **550 mg per day**


• 57 healthy adults were fed choline-deficient diets under controlled conditions.
• Results showed that 77% of men, 80% of postmenopausal women, and 44% of premenopausal women developed fatty liver, liver damage, and/or muscle damage.
• Dysfunction corrected when choline was reintroduced into diet.


A 26-year old African American woman comes in for her routine dental exam. She mentions that she craves ice all the time, even in the winter. Dentist notes generalized oral mucosal atrophy and pallor. What nutrient deficiency is most likely?

A. Folate  
B. Iron  
C. Calcium  
D. Selenium

• Review of Systems May Yield
  • Shortness of breath
  • Fatigue
  • Sensitivity to cold
  • Muscular weakness
  • Low blood pressure
  • Restless legs
  • Pica (chew ice or non-food items)

• Physical Exam Findings
  • Angular cheilitis
  • Atrophic glossitis
  • Generalized oral mucosal atrophy
  • Candida infections
  • Mucosal pallor
  • Stomatitis
  • Nonspecific pallor of the mucous membranes

Correct answer is B: Iron

Iron

Most common nutrient deficiency in world, affecting 2 billion people.
• Iron deficiency anemia accounts for 20% of all global maternal deaths.
• Necessary for growth and development and essential component of Hg.
• Iron promotes resistance to disease; improves health of the teeth, skin, and bones; maintains energy.
• Two forms of iron: heme and non-heme. Meat contains both forms, while plants and fortified foods contain only non-heme iron. We absorb roughly 18% of iron present in meat, compared to about 10% in plants.

Figure H.3.a. Age-adjusted prevalence estimates of low body iron stores (<0 mg/kg) in U.S. children and women by race/ethnicity, National Health and Nutrition Examination Survey, 2003-2006.

Error bars represent 95% of confidence intervals. Bars not sharing a common letter differ within children and women (p < 0.05). Age adjustment was done using direct standardization.
To Get 18mg of Iron in Food

- 4 cups of raisins
- 3-5 cups instant oatmeal
- 3 cups Special K cereal**
- 3 cups cooked lentils
- 2.2 cups canned white beans
- 10 ounce beef liver
- 45 ounce chicken breasts
- 15 cups broccoli OR
- 3 cups cooked spinach

Non heme iron absorption is 2- to 3-fold higher with co-ingestion of 25 to 75 mg of vitamin C

Note: Hemochromatosis

- The gene for familial hemochromatosis (HFe gene) affects 8% of the US white population.
- Excess body iron is postulated to be important in the etiology of CAD, strokes, certain cancers, and neurodegenerative disorders because iron is important in free radical formation.
- Iron absorption is highly regulated to prevent excess, no physiologic pathway for ridding the body of iron exists.
- People NOT at risk of iron deficiency (teenage boys, adult men, women with infrequent menstrual cycles, and postmenopausal women) should NOT take multivitamins that contain iron or iron supplements unless instructed to do so by their health care provider.

Vitamin C

- Potent antioxidant, activates folate, needed to convert tryptophan to serotonin, cofactor in synthesis of carnitine, thyroxin, norepinephrine, dopamine and immune cells
- Vitamin C levels decline rapidly during periods of emotional and physical strain, and illness.
- Given the consistent effect of vitamin C on the duration and severity of colds in the regular supplementation studies, and the low cost and safety, it may be worthwhile for common cold patients to test on an individual basis whether therapeutic vitamin C is beneficial for them.

Vitamin C Deficiency

• Malaise and lethargy early symptoms.
• Then shortness of breath and muscle/bone pain.
• Skin changes, easy bruising, gum disease, loose teeth, slow healing wounds, dry mouth, dry eyes, emotionally labile.
• Weakened capillaries. Hemorrhage is hallmark of scurvy and hair follicles are common site of cutaneous bleeding.
• Inflammation of interdental and marginal gingiva followed by bleeding, ulceration, and bad breath.
• Swelling of periodontal membranes occur, followed by loss of bone and loosening of the teeth.

Sperm

• Seminal fluid rich in vitamin C, acts as a potent antioxidant and helps to maintain the quality and function of sperm.
• Fertile men have significantly higher seminal vitamin C levels compared to infertile men.
• May improve sperm concentration and mobility.

Supplement Form

• Numerous forms of supplements available: calcium and mineral ascorbates, Ester-C, ascorbic acid and natural acerola/rose hips.
• Studies have not found significant differences between the different forms.
• Oral dosing under tight control.
• 200-300 mg in more frequent dosing is superior to larger single doses.
Which of the following nutrients would be most beneficial for someone who has idiopathic taste disorders?

A. Magnesium  
B. Vitamin C  
C. Zinc  
D. Biotin

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**Zinc and Oral Health**

- A review of clinical trials found “moderate quality evidence that zinc supplements improve overall taste improvement in patients with zinc deficiency/idiopathic taste disorders.”
- Zinc deficiency detected in 28% of recurrent aphthous stomatitis patients compared to controls.

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**Zinc and the Senses**

- Zinc is necessary for sense of smell, which accounts for about 80% of your sense of taste!
- Also important for oral health; one sign of zinc deficiency is red, swollen, and tender gums that may bleed after brushing.
- Zinc helps protect cells that line the mouth in those undergoing chemotherapy or radiation.

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**Zinc and Taste**

- Study found half of women undergoing chemotherapy for gynecological cancer experienced altered taste.
- Serum zinc level consistently below lower limit of normal.
- RDBPCT of adult patients with head and neck cancers received zinc sulfate (50 mg, three times a day) or placebo at start of radiation through one month post. Zinc prevented radiation induced taste alterations.

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Zinc

- Zinc concentrations high in prostate gland, testes, and sperm. Deficiency might contribute to lower testosterone and infertility in men.
- Vegetarians need 50% more zinc due to lower absorption of zinc from plant foods. DV = 15 mg
- ACE inhibitors and thiazides deplete zinc
- Take 2 hours apart from medication, especially quinolones and tetracycline antibiotics.
- Do not take >40 mg/d for more than a couple of months without supplementing copper.

For every 2000 mg of sodium intake, it takes this much daily calcium, on average, to maintain calcium balance.

A. 200 mg
B. 500 mg
C. 1000 m
D. 1500 mg

Contributors to Lower Calcium

- One of the first signs of calcium deficiency is muscle cramping. Muscle aches of thighs and arms, with minimal exertion, could indicate a deficiency of calcium, vitamin D, and/or magnesium.
- Long term deficiency leads to poor bone development/loss of bone mineral density, numbness and tingling in the fingers, convulsions, lethargy, poor appetite, and abnormal heart rhythms.
- Sodium: high sodium intake increases urinary calcium excretion. 1,000 mg/d of calcium per 2,000 mg/d sodium to maintain balance.
- High protein intake increases calcium excretion BUT it also increases absorption, overall, a neutral effect.
- Caffeine very modestly increases urinary excretion (1 cup brewed coffee ~3 mg loss)
- Alcohol can reduce calcium absorption and also reduce hepatic activation of vitamin D, by how much is unknown.

Table 2. Some Food Sources of Zinc

<table>
<thead>
<tr>
<th>Food</th>
<th>Serving</th>
<th>Zinc (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oysters</td>
<td>6 medium</td>
<td>27.50</td>
</tr>
<tr>
<td>Beef</td>
<td>3 ounces*</td>
<td>3.7-5.8</td>
</tr>
<tr>
<td>Crab, Dungeness</td>
<td>3 ounces*</td>
<td>4.7</td>
</tr>
<tr>
<td>Pork</td>
<td>3 ounces*</td>
<td>1.9-3.5</td>
</tr>
<tr>
<td>Turkey (dark meat)</td>
<td>3 ounces*</td>
<td>3.0</td>
</tr>
<tr>
<td>Beans, baked</td>
<td>½ cup</td>
<td>0.9-2.0</td>
</tr>
<tr>
<td>Chicken (dark meat)</td>
<td>3 ounces*</td>
<td>1.6-1.7</td>
</tr>
<tr>
<td>Yogurt, fruit, nonfat</td>
<td>1 cup (8 fl oz)</td>
<td>1.8</td>
</tr>
<tr>
<td>Cereals</td>
<td>1 ounce</td>
<td>1.6</td>
</tr>
<tr>
<td>Chanapeas (garbanzo beans)</td>
<td>½ cup</td>
<td>0.5-1.3</td>
</tr>
<tr>
<td>Milk</td>
<td>1 cup (8 fl oz)</td>
<td>1.0</td>
</tr>
<tr>
<td>Almonds</td>
<td>1 ounce</td>
<td>0.9</td>
</tr>
<tr>
<td>Peanuts</td>
<td>1 ounce</td>
<td>0.9</td>
</tr>
<tr>
<td>Cheese, cheddar</td>
<td>1 ounce</td>
<td>0.9</td>
</tr>
</tbody>
</table>

*A three-ounce serving of meat is about the size of a deck of cards.
Calcium Requirements

- The RDA is 1,000 mg/day for children ages 4 to 8 years and 1,300 mg/day for boys and girls ages 9 to 13 years.
- Calcium intake recommendations are higher in children ages 9 to 13 to account for increased needs during puberty.
- Adults RDA is 1000 mg per day 1200 mg for women over 50 and 1200 mg for men over 70 years.

Calcium and Vitamin D: Fracture

- Meta-analysis by National Osteoporosis Foundation: eight studies (n= 30,970 participants) found that all studies showed calcium plus vitamin D supplementation produced a statistically significant 15% reduced risk of total fractures and 30% reduced risk of hip fractures.
- Dose of calcium ~1000 mg/d and vitamin D3 800 IU per day used in majority of studies.

Vitamin D

- Vitamin D interacts with more than 1000 genes
- Vitally important for calcium regulation (bones, heart, etc.)
- Higher blood levels improve breast cancer survival and reduce risk of colorectal cancer.
- Low vitamin D in adults causes muscle weakness and lower back and hip pain.
- Children with insufficient vitamin D at risk of developing hypomineralized dental enamel, increasing susceptibility to caries.
- Obesity increases the risk of deficiency.
Endocrine Society Clinical Practice Guidelines for Vitamin D

• Serum 25(OH)D level used to evaluate high-risk folks
  • Insufficiency defined as 21-29 ng/mL
  • Deficiency defined as <20 ng/mL
• Maximum tolerable limits for vitamin D (without supervision):
  • 1,000 IU/day for infants to age 6 months
  • 1,500 IU/day for ages 6 months to 1 year
  • 2,500 IU/day ages 1 to 3 years
  • 3,000 IU/day for ages 4 to 8 years
  • 4,000 IU/day anyone older than 8 years


Endocrine Society Guidelines

• Serum 25(OH)D level used to evaluate high-risk folks
  • Insufficiency defined as 21-29 ng/mL.
  • Deficiency defined as <20 ng/mL.

• 66.8 million Americans 1 year and older had vitamin D levels between 12-20 ng/ml
• 23 million Americans 1 year and older had serum levels less than 12 ng/ml
• Most at risk were women and non-Hispanic blacks.

CDC 2nd National Report on Biochemical Indicators of Diet and Nutrition in the U.S. Population

Endocrine Society Guidelines for Treating Deficiency

All adults who are vitamin D deficient should be treated with 50,000 IU of vitamin D2/D3 once per week for 8 weeks or 6000 IU of vitamin D2/D3 daily to achieve a blood level of 25(OH)D above 30 ng/ml, followed by maintenance therapy of 1500–2000 IU/d.

Vitamin D

To get 600 IU/d Vitamin D3:

- 3-4 ounces sockeye salmon, cooked
- 11.4 ounces water-packed tuna
- 26 oil-packed sardines
- 15 large eggs
- 6 cups fortified milk OR
- 30-45 ounces yogurt

Vitamin K

- There are two main forms of vitamin K.
  - Phylloquinone, or vitamin K1, is synthesized by plants and makes up 90% of the vitamin K obtained in the diet. Best sources are green leafy vegetables. Fat-soluble so should be eaten with some healthy fat.
  - Menaquinone, vitamin K2, is result of bacterial action in GI tract converting K1 to K2 or obtained directly from food sources such as meat, egg yolks, fermented dairy and soy (e.g., miso, natto).
Vitamin K and Fracture

- Epidemiological studies consistently show link between higher vitamin K status and reduction of fracture risk.
- Elder men and women in highest quartile of dietary vitamin K had a relative risk for hip fracture of 0.35.
- Systematic review found that majority of vitamin K intervention studies showed a reduction in BMD loss and improved bone biomarkers.
- 3 year trial of K2 (180 mcg/d) in postmenopausal women showed preservation of BMD in the lumbar spine and slowing of the rate of bone loss in the femoral neck.


Magnesium

- Low magnesium intakes and low blood levels have been associated with type 2 diabetes, metabolic syndrome, elevated CRP, hypertension, atherosclerotic vascular disease, sudden cardiac death, osteoporosis, migraine headache, asthma, and colon cancer.
- 48% of US population consumes less than the required amount of daily magnesium.

Magnesium and the Heart

- Low serum magnesium levels associated with higher all-cause and cardiovascular mortality.
- Review of 44 studies shows Mg supplements enhance blood-pressure lowering effect of BP medications in stage 1 hypertension when given 230-460 mg/d.
- Nurses Health Study (88,375 women) found that for every 0.25–mg/dL increment in plasma magnesium –41% lower risk of sudden cardiac death. Women with lowest levels of magnesium also had significantly increased risk of stroke.


Ulcer/GERD Medications

<table>
<thead>
<tr>
<th>Drug Classification</th>
<th>Nutrient Depletion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proton pump inhibitors</td>
<td>Magnesium, iron, calcium, vitamin B12, folic acid, zinc, vitamin C, vitamin D (?)</td>
</tr>
<tr>
<td>H2 antagonists</td>
<td>folic acid</td>
</tr>
</tbody>
</table>

- There were 118.5 million prescriptions for PPIs in 2010 with roughly $11.4 billion in sales. These numbers do not include over-the-counter sales for PPIs.

- esomeprazole magnesium (Nexium)
- pantoprazole sodium (Protonix)
- lansoprazole (Prevacid)
- omeprazole and sodium bicarbonate (Zegerid)

FDA Safety Advisory

- FDA issued MedWatch warning and label change for PPIs due to low magnesium levels associated with long-term use.
- “Those taking medications, generally more than one year, may end up with low magnesium, which can put them at risk for seizures, irregular heartbeats, and muscle spasms.”
- Review of nine studies (n=115,455) found that the odds of developing hypomagnesia increased by 75% if taking PPIs.
- FDA advises magnesium levels be checked before and periodically during treatment.


Magnesium for Migraines

- Studies show that migraineurs have low brain Mg during migraine attacks and may have systemic Mg deficiency.
- Mg reduces recurrent pediatric migraine and tension headaches.
- Canadian Headache Society gave magnesium citrate a strong recommendation for prophylaxis of migraine.
- Dose generally 300-600 mg/d. Diarrhea most common side effect (glycinate and citrate forms less GI complaints than oxide).


Iodine in Pregnancy

- Many reproductive aged women in US have marginal iodine status; salt in processed foods is not iodized.
- Deficiency associated with pregnancy loss and prematurity, and neurocognitive defects in the baby.
- Iodine deficiency now accepted as the most common cause of preventable brain damage in the world.
- Mild to moderate iodine deficiency associated with higher incidence of ADHD and lower IQ in the baby.
- American Thyroid Association recommends pregnant/lactating women supplement: 150 mcg/d potassium iodide.

CDC 2nd National Report on Biochemical Indicators of Diet and Nutrition. The WHO recommends that the median UI in pregnancy be 150-249 mcg/L.

Omega 3 and Prostate Cancer?

• SELECT trial raised concerns about potential link between omega 3s and increased prostate cancer/aggressive cancer.
• European Food Safety (EFSA) concluded, “there is no evidence for a role of EPA and/or DHA intake in the development of prostate cancer.”
• Also, “supplemental intake of EPA and DHA combined at doses up to 5 g/d does not give rise to safety concerns for adults.”


No Fish Story: The Omega 3 Index

• Omega-3 Index test is now the gold standard for omega-3 biostatus testing. It is used as a compliance marker for randomized controlled trials with fish oil supplements, and in epidemiological research.
• In 2008 Dr. Bernadine Healy, cardiologist and past President of the AHA and first woman Director of the NIH said, “Before long, your personal Omega-3 Index just could be the new cholesterol—the number you want to brag about.”

American Heart Association

• “Omega-3 fish oil supplements prescribed by a healthcare provider may help prevent death from heart disease in patients who recently had a heart attack and may prevent death and hospitalizations in patients with heart failure.”
• There was insufficient evidence to evaluate the role of fish oil supplements in primary prevention of CVD.

Omega 3 and Asthma

- Reduced intake of omega-3 fatty acids may be a contributing factor to the increasing prevalence of wheezing disorders.
- Reviewers found that supplementation with omega-3 fatty acids in the third trimester of pregnancy reduced the absolute risk of persistent wheeze or asthma and infections of the lower respiratory tract in offspring by approximately 33%.


Different Types of Fish Oil

- Supplementation is an alternative to eating fish; however, not all supplements are equal.
- Randomized, crossover study of 35 healthy individuals compared four popular brands/types of omega 3 fatty acids:
  - Concentrated triglyceride (rTG)
  - Ethyl ester (EE)
  - Phospholipid krill oil (PL)
  - Triglyceride salmon oil (TG)


Dosing According to Manufacturer's Recommendations

<table>
<thead>
<tr>
<th>TRF</th>
<th>Product</th>
<th>EPA &amp; DHA per capsule*</th>
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<td>rTG</td>
<td>Nordic Naturals ProOmega®</td>
<td>325 mg EPA</td>
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<td></td>
<td>Triglyceride</td>
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<td>226.0 mg DHA</td>
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<td></td>
<td>Minami Meriva®</td>
<td>796 mg EPA</td>
<td>770.2 mg EPA</td>
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<tr>
<td></td>
<td>Platinum Ester</td>
<td>228 mg DHA</td>
<td>233.7 mg DHA</td>
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<tr>
<td>EE</td>
<td>Source Naturals ArcticPure®</td>
<td>75 mg EPA</td>
<td>78.6 mg EPA</td>
<td>2</td>
<td>EPA: 150 mg</td>
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<tr>
<td>PL</td>
<td>Krill Oil Phospholipid</td>
<td>45 mg DHA</td>
<td>46.7 mg DHA</td>
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<td>DHA: 90 mg</td>
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<tr>
<td>TG</td>
<td>New Chapter</td>
<td>90 mg EPA</td>
<td>96.4 mg EPA</td>
<td>2</td>
<td>EPA: 180 mg</td>
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<tr>
<td></td>
<td>Salmon Oil Triglyceride</td>
<td>110 mg DHA</td>
<td>109.5 mg DHA</td>
<td></td>
<td>DHA: 220 mg</td>
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</table>
Canadians and Omega 3

- The Omega-3 Index indicates the percentage of EPA+DHA in red blood cell fatty acids.
- Canadian government found that the mean Omega-3 Index level of Canadians aged 20-79 was 4.5%.
  - Levels higher for women, older adults, Asians and other non-white Canadians, omega-3 supplement users, and fish consumers; levels lower for smokers and people who were obese.
  - Fewer than 3% of adults had levels associated with low CHD risk; 43% had levels associated with high risk.


Probiotics and Oral Health

- A systematic review of probiotic strains for caries prevention showed promising results but only a few studies have demonstrated clear clinical outcomes.
- More than 14 strains have been researched.
- A continuous regular almost daily intake is probably required.


Evidence Based Products for Oral Health

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Strain(s)</th>
<th>Usage Form</th>
<th>Doses</th>
<th>Doses/Day</th>
<th>ID</th>
<th>AAD</th>
<th>OAD</th>
<th>ID</th>
<th>C</th>
<th>P</th>
<th>R</th>
<th>F</th>
<th>ROR</th>
<th>BLP</th>
<th>BLP</th>
<th>HP</th>
<th>OR</th>
<th>LCE</th>
<th>CLE</th>
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<tbody>
<tr>
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<td>L. acidophilus 434</td>
<td>Powder</td>
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</table>

- Product requires refrigeration

usprobioticguide.com
### Evidence Based Products for Oral Health

<table>
<thead>
<tr>
<th>Brand Name</th>
<th>Product</th>
<th>Dosage Form</th>
<th>CFU/Dose</th>
<th>No of Doses/Day</th>
<th>Rating</th>
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<th>CDC</th>
<th>DO</th>
<th>IH</th>
<th>FO</th>
<th>BO</th>
<th>JO</th>
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</thead>
<tbody>
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<td>Oral</td>
<td>30 Billion CFU</td>
<td>3/Day</td>
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<td>yes</td>
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<td>Driselastin [SUBK12]</td>
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<td>3/Day</td>
<td>1-6 lozenges</td>
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</tr>
</tbody>
</table>

*Product requires refrigeration*

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### Resources

- *Fortify Your Life*, Tieraona Low Dog, MD with National Geographic
- Dietary Supplement Label Database: dsld.nlm.nih.gov
- NIH National Center for Complementary and Integrative Health (NCCIH): nccih.nih.gov
- Office of Dietary Supplements: ods.od.nih.gov
- Linus Pauling Institute: lpi.oregonstate.edu
- Consumer Labs: www.ConsumerLabs.com
- Natural Medicines Comprehensive Database: NaturalDataBase.com