

“Nutrition, Dietary Supplements and Oral Health”



Tieraona Low Dog, MD

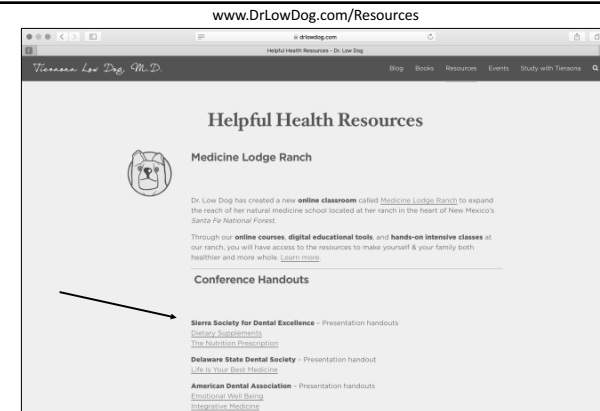
Chair: US Pharmacopeia
Dietary Supplements Admissions
Joint Standard Setting Sub-
Committee

Author of National Geographic's
“Fortify Your Life?” “Healthy At Home”
and “Life Is Your Best Medicine”

www.DrLowDog.com

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"THE FOOD YOU EAT
CAN BE EITHER
THE SAFEST
&
MOST POWERFUL
FORM OF MEDICINE
or
THE SLOWEST
FORM OF POISON."

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Nutrition in the 21st Century



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NEW YORK TIMES BESTSELLER

THE BIG FAT SURPRISE
Why Butter, Meat & Cheese
Belong in a Healthy Diet
NINA TEICHOLZ

NEW YORK TIMES BESTSELLER

EAT FAT, GET THIN
Why the Fat We Eat Is the Key
to Sustained Weight Loss
and Vibrant Health
Mark Hyman, MD
#1 BESTSELLING AUTHOR OF
The Blood Sugar Solution

Blue Zones Solution
Eating and Living Like
the World's Healthiest People
Dan Buettner
New York Times Bestseller

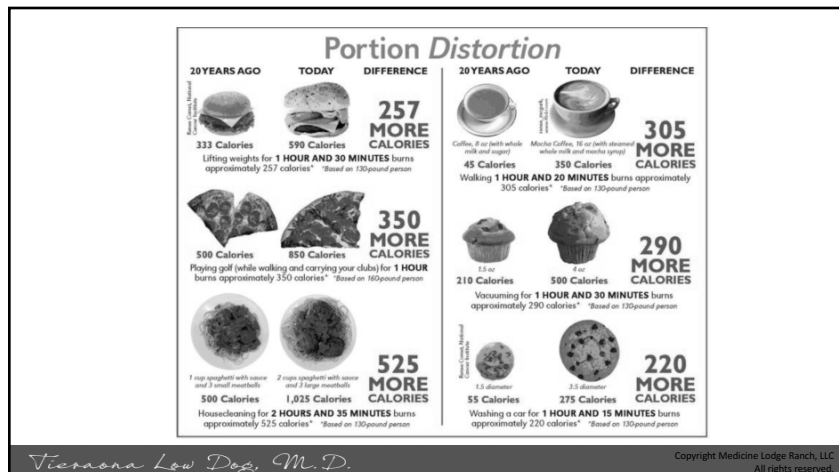
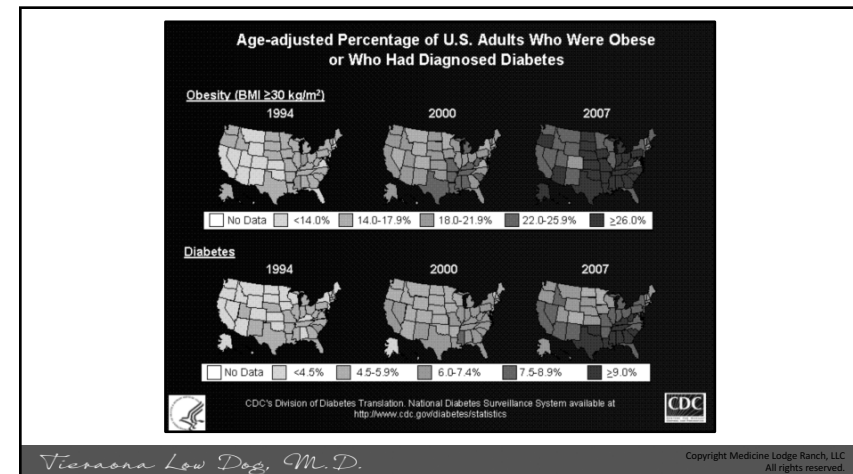
NEW YORK TIMES BESTSELLER

THE FORKS OVER KNIVES PLAN
A 4-WEEK MEAL-BY-MEAL MAKEOVER
How to Transition to the Life-Saving,
Whole-Food, Plant-Based Diet
Alona Patai, MD, and Matthew Lederman, MD
FOREWORD BY DEAN ORSHAN, MD

Is it any wonder that people are confused?

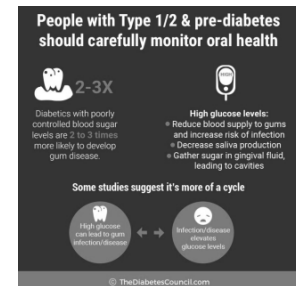
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Diabetes Matters to Us All

- “There is strong evidence that *people with periodontitis have elevated risk for dysglycemia and insulin resistance.*”
- Periodontitis* is also associated with an *increased risk* of type 2 diabetes.”
- “The European Federation of Periodontology and the International Diabetes Federation report consensus guidelines for **physicians, oral healthcare professionals and patients to improve early diagnosis, prevention and co-management of diabetes and periodontitis.**”



Sanz M, et al. Scientific evidence on the links between periodontal diseases and diabetes: Consensus report and guidelines of the joint workshop on periodontal diseases and diabetes by the International Diabetes Federation and the European Federation of Periodontology. *J Clin Periodontol* 2017 Aug 24. doi:10.1111/jcpe.12808.

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Periodontal Disease and Dental Caries

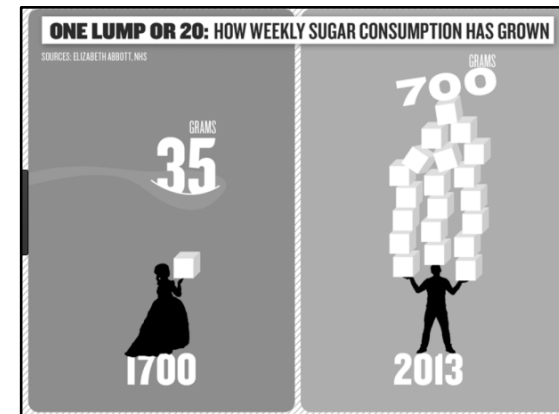


Chapple IL, et al. Interaction of lifestyle, behaviour or systemic diseases with dental caries and periodontal diseases: consensus report of group 2 of the joint EFP/ORCA workshop on the boundaries between caries and periodontal diseases. *J Clin Periodontol* 2017 Mar;44 Suppl 18:S39-S51.

- Fermentable carbohydrates/sugars/ starches **most relevant common dietary risk factor for periodontal diseases and dental caries.**
- In caries, fermentation process leads to acid production and the generation of biofilm components (e.g., glucans).
- In periodontitis, glycemia drives oxidative stress and advanced glycation end-products trigger hyper inflammatory state.
- Micronutrient deficiencies, such as vitamins C, D and B12, may be related to the onset and progression of both periodontal diseases and caries.

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November 2016

Sugar Industry and Coronary Heart Disease Research

A Historical Analysis of Internal Industry Documents

Cristin E. Kearns, DDS, MBA^{1,2}; Laura A. Schmidt, PhD, MSW, MPH^{1,3,4}; Stanton A. Glantz, PhD^{1,5,6,7,8}

> Author Affiliations

JAMA Intern Med. 2016;176(11):1680-1685. doi:10.1001/jamainternmed.2016.5394

Editorial Comment

Related Articles

Author Interview

Abstract

Early warning signals of the coronary heart disease (CHD) risk of sugar (sucrose) emerged in the 1950s. We examined Sugar Research Foundation (SRF) internal documents, historical reports, and statements relevant to early debates about the dietary causes of CHD and assembled findings chronologically into a narrative case study. The SRF sponsored its first CHD research project in 1965, a literature review published in the *New England Journal of Medicine*, which singled out fat and cholesterol as the dietary causes of CHD and downplayed evidence that sucrose consumption was also a risk factor. The SRF set the review's objective, contributed articles for inclusion, and received drafts. The SRF's funding and role was not disclosed. Together with other recent analyses of sugar industry documents, our findings suggest the industry sponsored a research program in the 1960s and 1970s that successfully cast doubt about the hazards of sucrose while promoting fat as the dietary culprit in CHD. Policy-

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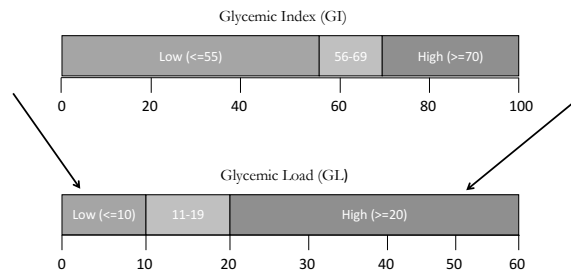
- One of the most popular dietary trends in US is the “low carb” diet.
- Perhaps instead of focusing on LOW CARB, we could emphasize **LOW GLYCEMIC LOAD CARBS.**



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Glycemic Index & Glycemic Load Rating Chart



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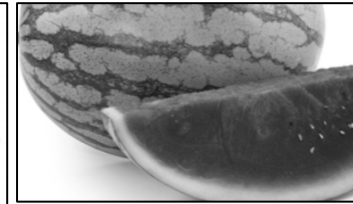
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Which One Would You Choose?

Banana
Glycemic Index = 52
Available Carbs = 24 grams
Glycemic Load = 14



Watermelon
Glycemic Index = 72
Available Carbs = 10 grams
Glycemic Load = 8

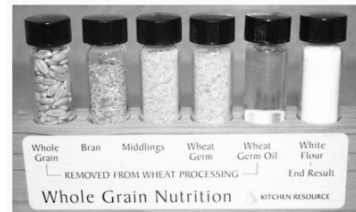


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What Impacts Glycemic Load of Foods

- Amount of **processing** (increases surface area, increases GL)
- Fiber** content (decreases GL)
- Fat** content and **protein** slow stomach emptying (decreases GL)
- Many “fat-free” foods are **high GL** and contribute to obesity



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Tips on Whole Grains

- **100% Whole Wheat** (first ingredient!)
- **Oats** (skip the instant)
- **Brown Rice** (white has bran/germ removed, LOW in nutrients)
- **Whole Rye** (four times the fiber of whole wheat, most nutritious)
- **Whole Grain Barley** (not pearled: bran and germ have been removed)
- **Buckwheat** (loaded in magnesium, gluten-free)
- **Quinoa** (not a grain, it's a seed loaded in protein and omega 3)
- **Whole Wheat Couscous** (delicious and high in fiber)
- **Corn** (organic, non-GMO – increases healthy gut flora)

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Health Benefits of Low Glycemic Load Diet

- Numerous studies in both adults and teens have found that low glycemic load diets are associated with:
 - Better **weight control**
 - **Improvement in blood sugar**
 - **Reduction in triglycerides**
 - Improved ovulation in **obese women with infertility**
 - **Lower risk of heart disease**, particularly in women

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Glycemic Load and Mood

- 82 healthy weight and healthy overweight or obese, adults enrolled in randomized, crossover controlled feeding study.
- Compared to a low GL diet, consumption of **high GL diet** resulted in:
 - 38% higher score for **depressive symptoms** ($P = 0.002$)
 - 55% higher score for **total mood disorder** ($P = 0.05$)
 - 26% higher score for **fatigue/inertia** ($P = 0.04$), compared to low GL diet.



Breymeyer KL, et al. *Appetite* 2016; Dec 1;107:253-259.

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Food	Serving Size	Glycemic Load	Food	Serving Size	Glycemic Load
Grapefruit	½ large	3	Asparagus	½ cup	2
Apple	1 medium	6	Broccoli	1 cup	4
Banana	1 large	14	Green beans	1 cup	3
Raisins	1 small box	20	Tomato	1 medium	2
Watermelon	1 cup	8	Subway sandwich Turkey breast	6 inch	17
Carrots	1 large	5	Butter pecan ice cream	5.5 ounces (small)	22
Orange	1 medium	6	Vanilla ice cream cone	4.5 ounces (small)	19
Sweet potato	1 cup	17	Potato chips, fat free	1 bag (8 ounces)	49
Baked potato	1 medium	28	Tortilla chips, white corn	3.5 ounces	38
French fries	1 medium serving	26	Eggo oat waffles	1 serving	13
Snickers	1 bar	35	Maple syrup	4 Tbsp	39
Reese's cup	1 miniature	2	Egg, hard boiled	1	2
White table wine	5 ounces	1	Apple juice	8 ounce	6
Red table wine	5 ounces	1			
Grape juice	6 ounces	12			

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Food	Serving Size	Glycemic Load
Spaghetti	1 cup	38
Brown rice	1 cup	23
White rice	1 cup	33
White bread	1 slice	10
Whole grain bread	1 slice	5
Bagel, cinnamon raisin	1 3.5 inch	24
Pumpernickel bread	1 slice	6
Macaroni and cheese	1 cup prepared	31
Chocolate doughnut	1 doughnut (80 g)	25
Glazed doughnut	1 doughnut (80 g)	12
Kellogg's Frosted Flakes	¾ cup	20
Kellogg's Special K	1 cup	14
Post Bran Flakes	¾ cup	12
Post Raisin Bran	1 cup	25

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Low/High GI Meals



GI = 80 GL = 32

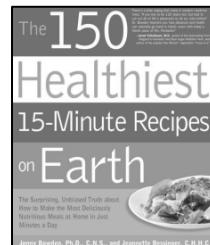
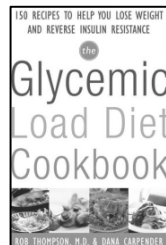


GI = 61 GL = 12

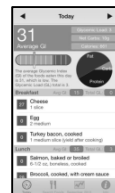
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Some Resources



App \$3.99
↓
Low GI Diet Tracker



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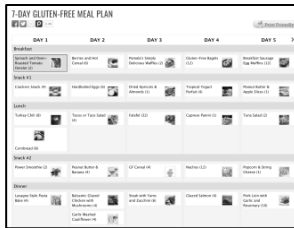
Gluten

- Autoimmune condition **celiac disease**, where immune system interacts negatively with **gluten**, a storage protein in cereal grains. **ONLY** treatment is complete avoidance of gluten. Note: *In children, celiac disease is associated with both enamel defects and aphthous stomatitis.**
 - Celiac symptom checklist: (celiac.org/celiac-disease/resources/checklist/)
- Other individuals may be **allergic to wheat**, not all grains. Symptoms can include GI (indigestion, cramps, diarrhea, nausea), respiratory (stuffy/runny nose) and/or skin (hives or rash). Necessary to **AVOID** wheat.
- And still others appear to have a **gluten sensitivity**, where “symptoms” improve when they eliminate gluten from their diet. This is less clear....

*Nieri M, et al. Enamel defects and aphthous stomatitis in celiac and healthy subjects: Systematic review and meta-analysis of controlled studies. *J Dent* 2017; Oct;65:1-10.

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www.celiac.org

Lots of info. Recipes provided for 7 day meal plan.

Get an app!

The Gluten-Free Scanner (free, more than 500,000 products)



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FAT



- Most concentrated source of energy, more than twice carbohydrates or proteins.
- Acts as messengers in reactions that help control growth, immune function, reproduction and basic metabolism. Helps absorb vitamins A, D, E, K.
- Certain fats, like *linoleic acid* and *alpha linolenic acid* (ALA), are “essential” because our bodies cannot produce them, we must get in diet.
- Makes foods taste flavorful and help us feel full.
- Look for cold-processed, organic, extra virgin when possible. Avoid partially hydrogenated/trans.

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SATURATED FAT

- Meat, dairy products, eggs
- Coconut and palm oil
- Solid at room temperature
- Increases LDL and HDL.

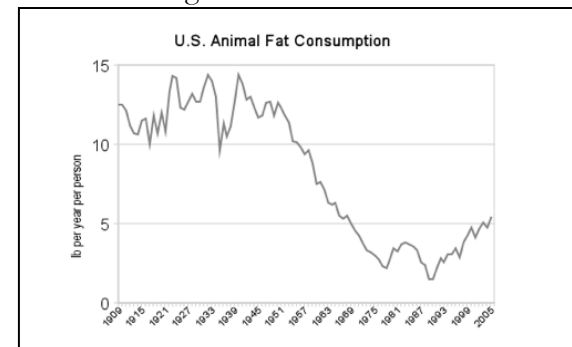
UNSATURATED FAT

- Vegetable oils
- Liquid at room temperature
- Increases HDL, lowers LDL
- Includes monounsaturated
 - Olive oil, avocados, peanuts, almonds
- Polyunsaturated
 - Omega 3
 - EPA/DHA: fish/shellfish
 - ALA: flax, walnut, soy, canola
 - Omega 6
 - Corn oil, safflower oil, sunflower oil

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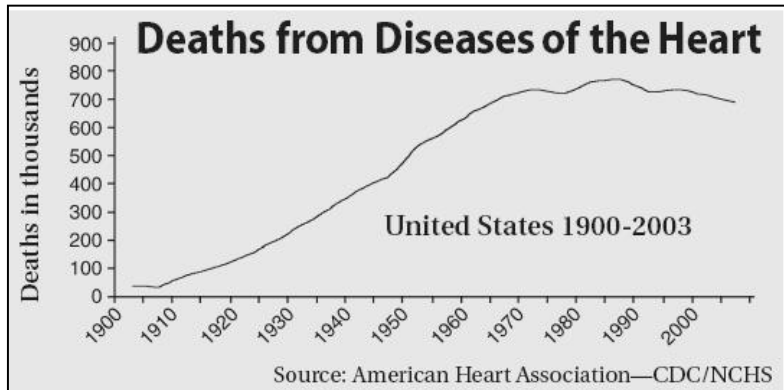
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Does Eating Fat Give You Heart Disease?



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Saturated Fat Debate

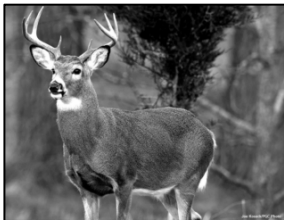
- Three large meta analyses (21 studies, 12 studies, and 76 studies) have all failed to show any significant evidence that saturated fat increases the risk for heart disease.
- It also has failed to find any significant evidence that increasing polyunsaturated fats and decreasing saturated fats lowers your heart risk.
- Include a variety of fats in your diet!



Siri-Tarino, *Amer J Clin Nutr* 2010; 91 (3): 535–46.
Schwingshackl L, et al. *BMJ Open* 2014; 4(4):e004487.
Chowdhury R, et al. *Ann Intern Med* 2014; 160(6):398–406.

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- Ethical and humane treatment of farm animals is an important consideration. Many reasons to support organic and grass fed/finished animals.
- Grass fed higher in conjugated linoleic acid, stearic acid, vitamins A and E.
- *Organic* pastured dairy and meats are up to ~50% higher in omega 3 fatty acids and were only given organic feed and no growth hormones or antibiotics.

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Red Meat and Cancer

- Poultry/turkey and fish neutral or beneficial effects regarding cancer/health.
- The American Institute for **Cancer** Research has made the following recommendations regarding red meats (**beef, lamb, pork**) based upon the data that links them to an increased risk of colon cancer:
 - **Limit red meats to < 18 ounces per week.**
 - **Avoid processed** red meats (e.g., bologna, salami, hot dogs, corned beef)

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Fish and Seafood

- Fish and seafood are excellent sources of omega 3's
 - Beneficial for helping to prevent atherosclerosis and maintaining healthy blood pressure and blood flow.
 - Promote brain health and may help reduce the risk of depression.
 - Necessary for the health of the eyes. Can help reduce dry eye syndrome.
 - Crucial for health pregnancy and childhood development.
 - Help quell inflammation, which has been linked to many chronic disorders.



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Choose Your Seafood Wisely



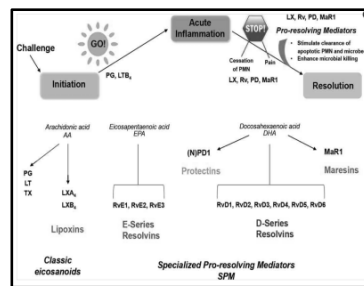
<https://www.seafoodwatch.org/seafood-recommendations/our-app>

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Resolution Biology

- Research shows that resolution of self-limited acute inflammation is an active, programmed response.
- Omega 3 fatty acids** produce specialized **pro-resolving mediators** (SPM) – resolvins, protectins and maresins.
- These active resolvers of inflammation, show great promise as therapeutics for the treatment of periodontitis and other inflammatory diseases.

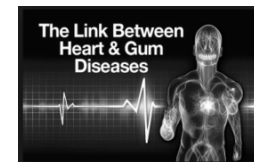


VanDyke TE. Pro-resolving mediators in the regulation of periodontal disease. *Mol Aspects Med* 2017 Dec;58:21-36.

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Speaking of Heart Disease



- Periodontitis is an inflammatory disease of the supporting structures of the dentition that is initiated by bacteria that form a biofilm on the surface of the teeth.
- Numerous studies have found an association between periodontitis and heart disease. The plausibility of periodontal bacteria influencing vascular inflammation strengthened when *Porphyromonas gingivalis* isolated from human atheromatous plaques.
- Periodontitis is a contributory factor for atherosclerotic vascular disease.

Friedewald VE, et al. *J Periodontol* 2009; 80:1021-1032

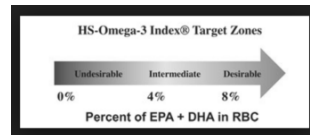
Ahn YB, et al. *Atherosclerosis* 2016 Aug;251:311-318.

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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.”



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Canadians and Omega 3: Not So Good

- 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.

Langlois K, et al. *Health Rep* 2015; Nov 18;26(11):3-11

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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.”



Siscovick DS, et al. *Circulation* 2017; Mar 13.

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Omega 3 and Asthma: Impressive

- 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%.**



Bisgaard H, et al. *N Engl J Med* 2016; Dec 29;375(26):2530-9

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Fish Oil: What Type is Best?

- 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)

Laidlaw M, et al. *Lipids Health Dis* 2014; 13:99

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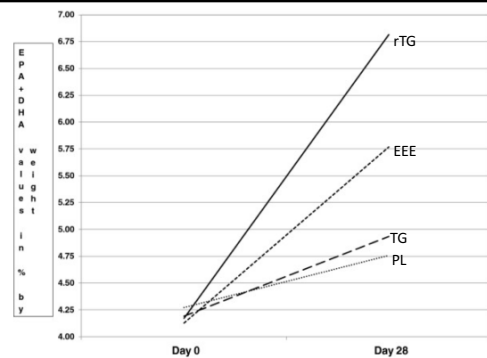
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Dosing According to Manufacturer's Recommendations

TRT	Product	EPA & DHA per capsule*	Tested values	Label use: caps/day	Daily dosage of EPA + DHA
rTG	Nordic Naturals ProOmega®	325 mg EPA	329.6 mg EPA	2	EPA: 650 mg
	Triglyceride	225 mg DHA	226.0 mg DHA		DHA: 450 mg
EE	Minami MorEPA®	756 mg EPA	774.2 mg EPA	1	EPA: 756 mg
	Platinum Ethyl Ester	228 mg DHA	233.7 mg DHA		DHA: 228 mg
PL	Source Naturals ArcticPure®	75 mg EPA	78.0 mg EPA	2	EPA: 150 mg
	Krill Oil Phospholipid	45 mg DHA	46.7 mg DHA		DHA: 90 mg
TG	New Chapter				
	Wholemega® Salmon	90 mg EPA	96.4 mg EPA	2	EPA: 180 mg
	Oil Triglyceride	110 mg DHA	109.5 mg DHA		DHA: 220 mg

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Mean levels of EPA + DHA for four supplement groups at Day 0 and Day 28.

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Coconut Oil (*Cocos nucifera*)

- Extensively used in tropics/subtropics. Rich in medium chain saturated fatty acids (e.g., lauric acid), MAY be less likely stored as adipose tissue and less likely to promote insulin resistance and inflammation.
- Possesses antibacterial and antifungal activity (great for topical use). Study of 60 patients found oil-pulling (10 minutes, 2 tsp) equivalent to chlorhexidine in reducing *S. mutans*.
- **If using refined coconut oil use ORGANIC only:** no chemical solvents. Smoke point: 450 F.
- **"Virgin" coconut oil** obtained from fresh mature kernel of coconut by mechanical or natural means with or without the application of heat.



McCarthy MJ, et al. *Open Heart* 2016; 3(2):e000467.
Eyles L, et al. *Nut Rev* 2016; 74(4):267-80
Kaushek M, et al. *J Contemp Dent Pract* 2016;17(1):38-41.

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Olive Oil

- Cornerstone of Mediterranean diet.
- Rich in **monounsaturated fat oleic acid (73%)**, antioxidants, and modest levels of vitamin E and K.
- **Oleocanthal mimics ibuprofen** in reducing inflammation.
- Protects against **heart disease and stroke**; lowers **total cholesterol, LDL-C, triglycerides**; improves **HDL**, has a **mild blood pressure lowering effect**.
- May offer protection against **Alzheimer's disease, diabetes and cancer** as part of a healthy diet.
- Keep **refrigerated** for optimal shelf life.
- To find top olive oils that meet rigorous quality and taste standards: www.bestoliveoils.com



Hernandez A, et al. *Arterioscler Thromb Vasc Biol* 2014; 34(9):2115-9.
Crous-Bou M, et al. *BMJ* 2014;349:g6674

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Full or Low Fat Dairy?

- Full fat dairy products may help protect against type 2 diabetes. Fat slows absorption of milk sugar, causing slower rise in blood sugar, and lower/slower release of insulin. No evidence full fat dairy increases risk of heart disease.
- Full fat dairy **recommended** for **women trying to get pregnant** as it reduces anovulatory infertility.
- Full fat dairy improves **acne**, low fat dairy aggravates it.
- Full fat dairy **lower in lactose**, better tolerated by lactose intolerant individuals.



Chavarro JE, et al. *Hum Reprod* 2007; 22(5):1340-7.
Alexander DD, et al. *Br J Nutr* 2016; 115(4):737-50

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Dairy Products

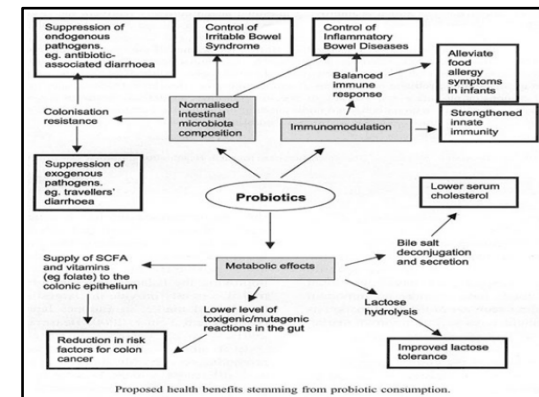


- Lactase produced by intestinal cells allows lactose to be digested/absorbed. Enzyme activity is highest after birth.
- 30% of global population produces enough lactase to digest/absorb lactose in adulthood; in majority declines to 5-10% of what was produced in childhood.
- When more lactose is consumed than can be digested, bloating, gas and diarrhea occur.
- Consumption of dairy products may protect against periodontal disease in both children and adults.
- Very good source of protein (~8 grams per cup of milk, 6 ounces of yogurt, 1.5 ounces cheese)

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- Fermented foods (kimchi, pickles, sauerkraut, kombucha, miso, tempeh, yogurt, kefir) are all rich in probiotics.
- Supplementation may be useful in certain health conditions: increase response to vaccinations in elders, when taking antibiotics, during pregnancy, as an adjunctive treatment in clinical management of dental caries and periodontal diseases.
- Strain specificity is vitally important.



Allaker RP, et al. Use of Probiotics and Oral Health. *Curr Oral Health Rep* 2017; 4(4): 309–318.

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Evidence Based Products for Oral Health

INDICATION FOR ADULT HEALTH													
Brand Name	Probiotic Strain	Dosage Form	CFU/Dose	No of Doses/Day	ID	AAD	CDAD	TD	C	FAP	IBS	IBD-UC	IBD-P
Dentax™ Oral Health Probiotic Complex	<i>S. salivarius</i> BAA-1024 <i>L. plantarum</i> SO-5870 <i>L. reuteri</i> SD-5865 <i>L. acidophilus</i> SD-5212 <i>L. salivarius</i> SO-5209 <i>L. paracasei</i> SO-5273	Lozenge	1B/lozenge	2 lozenges									
GumB PerioBalance®	<i>L. reuteri</i> ATCC 55730 100M <i>L. reuteri</i> ATCC PTA 5289 100M	Lozenge	200M/lozenge	2 lozenges									
OralBiotics™ [BLIS K12]	<i>Streptococcus salivarius</i> K12	Lozenge	1B/lozenge	1-5 lozenges									

® - Product requires refrigeration

usprobioticguide.com

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What About Eggs?

- Provide essential fatty acids, proteins, *choline*, vitamins A and B12; selenium, and other critical nutrients.
- Egg consumption (dietary cholesterol) not associated with an increased risk of heart disease in the general population.
- Look for organic eggs and omega 3 enriched whenever possible.
- One egg provides ~ 6grams protein



Shin JY, et al. *Am J Clin Nutr* 2013; 98(1):146-59

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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.
- Particularly crucial during pregnancy and the first three years of a child's life, where animal models show it improves cognitive function in adulthood, prevents age-related memory decline, and protects the brain from the neuropathological changes associated with Alzheimer's disease (AD), and neurological damage associated with epilepsy, fetal alcohol syndrome, and Down's syndrome.
- New daily value set in 2016: **550 mg per day**

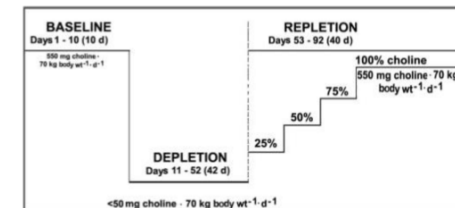
Jiang X, et al. *Trends Endocrinol Metab* 2014; 25(5):263-73.

Jiang X, et al. *FASEB J*. 2012;26(8):3563-3574.

Wozniak JR, et al. *Nutr Res* 2013; 33(11):897-904

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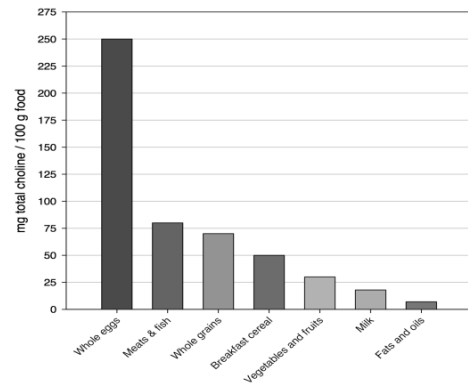


- 57 healthy adults were fed choline-deficient diets under controlled conditions.
- Results showed that 77% of men, 80% of postmenopausal women, and 44% of premenopausal women developed fatty liver, liver damage, and/or muscle damage.
- Dysfunction corrected when choline was reintroduced into diet.

Fischer LM, et al. *Am J Clin Nutr*. 2007;85(5):1275-1285.

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Choline in Foods: <http://naldc.nal.usda.gov/download/47335/PDF>

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Protein



- From Greek *protos*, “first.” Build new cells, maintain tissues (e.g., muscles, inner bone, hair, nails), create enzymes, make hemoglobin, lipoproteins to transport cholesterol; present in membrane of every living cell.
- Sources include meat, poultry, seafood, eggs, soy products, nuts, nut butters, beans, peas, and seeds. You need ~8 grams protein per 20 pounds body weight for adults.
 - Choose seafood 2 x weekly (low in mercury, high in omega 3s, sustainable)
 - Include beans and peas often in your diet, as a side or main dish
 - Avoid processed red meats, include modest amounts of other meats

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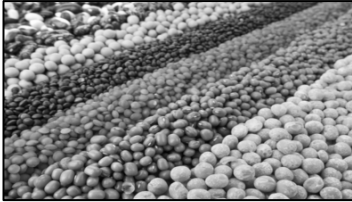
Protein Rich Foods

Food	Portion Size	Protein (g) (approximate)
Meat, fish, or poultry	75g (2 ½ oz) / 125 mL (½ cup)	21
Firm tofu	150g / 175 mL (¾ cup)	21
Egg, chicken	2 large	13
Cheese	50 g (1 ½ oz)	12
Fortified soy beverage	250 mL (1 cup)	6-8.5
Cooked dried beans, peas, or lentils	175 mL (¾ cup)	12
Cow's milk	250 mL (1 cup)	9
Yogurt	175 mL (¾ cup)	8
Peanut butter or other nut spread	30 mL (2 Tbsp)	8
Nuts or seeds	60 mL (¼ cup)	7
Bread	1 slice (35g)	3
Cereals, cold	30 g	3
Cereals, hot	175 mL (¾ cup)	3
Pasta or rice	125 mL (½ cup)	3
Vegetables	125 mL (½ cup) or 250 mL (1 cup)	2
Fruit	1 fruit or 125 mL (½ cup)	1

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Legumes: The “Pulse of Health”



- Soak larger dried legumes (kidney, chickpeas, black & red beans) for 4-24 hours in cold water before cooking. Change water 1-2 times to reduce gas.
- Use 3 cups water per cup of legumes in cooking.
- Use ladle to occasionally remove foam on top when cooking legumes
- Rinse canned beans before use to remove sodium
- Lentils are quick and easy to prepare - rinse till clear and remove any small stones/grit.
- Prepare large bag of lentils and then freeze half for future use.
- Add vinegar, salt, etc. at end of cooking time.

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Soy Milk

- Highest in protein of dairy alternatives (almond milk has 1 gram protein per cup)
- Good source of B-vitamins and is least processed of most commercially available dairy alternatives.
- High in phytic acid, however, which can impair absorption of nutrients such as calcium, iron and zinc. (Fermented soy: no phytic acid: miso, tempeh)
- Very high soy intake in the presence of low iodine can impact thyroid.
- Purchase organic, non-GMO soy and look for unsweetened products to avoid high sugar.
- 1 cup soy milk ~ 8 grams protein



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Protein and Fracture Risk



- Framingham Osteoporosis Study found **higher protein intakes** (60-83g/d versus 46g/d) in elder men and women (mean 75 years) were associated with a **37% decreased risk of hip fracture**.
- Women's Health Initiative found 20% increase in protein intake (15-18% of energy intake) improved bone mineral density maintenance and marginally lowered forearm fracture risk.
- Systematic review of **29 studies found that protein intakes above the current RDA have a beneficial role in preventing hip fractures and BMD loss**. No differences between animal or plant proteins, although data in this area were scarce.

Misra D, et al. *Osteoporosis Int* 2011; 22(1):345-349.

Beasley JM, et al. *Am J Clin Nutr* 2014; 99(4):934-940.

Calvez J, et al. *Eur J Clin Nutr*. 2012;66(3):281-295.

Wallace TC, et al. *J Am Coll Nutr* 2017; 36(6):481-496

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Bisphosphonates for Fracture Prevention in Post-Menopausal Women With Prior Fractures or With Very Low Bone Density (NNT = 100)

In Summary, for those who took the bisphosphonates:

Benefits in NNT

- 1 in 20 were helped (vertebral fracture prevented)
- 1 in 100 were helped (hip fracture prevented)

Harms in NNT

- A small number were harmed

Benefits in Percentage

- 94% saw no benefit after 3 years of treatment
- 5% avoided a vertebral fracture
- 1% avoided a hip fracture

Harms in Percentage

- A small percentage were harmed

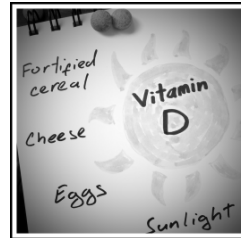
www.thent.com/nnt/bisphosphonates-for-fracture-prevention-in-post-menopausal-women-with-prior-fractures-or-very-low-bone-density/

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Calcium and Vitamin D

- 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**.
- Higher blood levels of vitamin D improve **breast cancer survival and reduce risk of colorectal cancer**.
- Low vitamin D in adults causes **muscle weakness and lower back and hip pain**.
- **Obesity increases the risk of vitamin D deficiency**.



Kim Y, et al. *Br J Cancer* 2014; 110(11):2772-84.
Ma Y, et al. *J Clin Oncol* 2011; 29(26):3775-82
Weaver CM, et al. *Osteoporosis Int* 2016; 27: 367-376

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Endocrine Society Guidelines

- Serum 25(OH)D level is used to determine vitamin D status
 - **Sufficiency** is 30 ng/mL (75 nmol/L) and above
 - **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
Holick MF, et al. *J Clin Endocrinol Metab* 2011; 96(7):1911-30

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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.*



Holick MF, et al. *J Clin Endocrinol Metab* 2011; 96(7):1911-30

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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

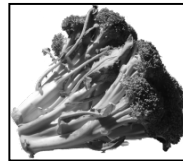


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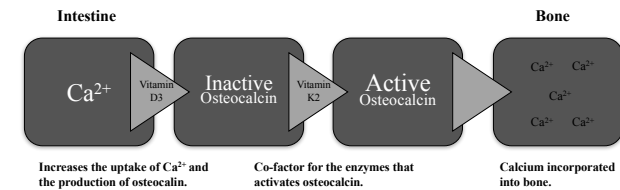
Vitamin K

- 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).



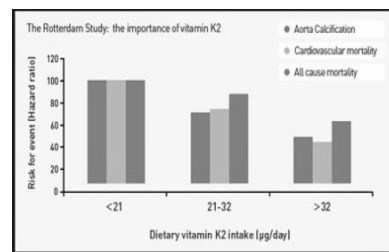
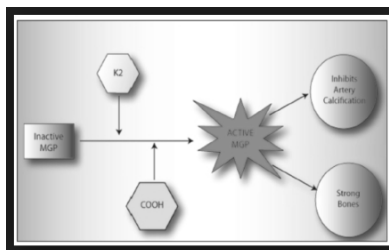
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Geleijnse JM, et al. *J Nutr*. 2004;134(11):3100-5

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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.

Cockayne S, et al. *Arch Intern Med*. 2006;166(12):1256-1261.
Knapen MHJ, et al. *Osteoporosis Int*. 2013;24(9):2499-2507.

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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

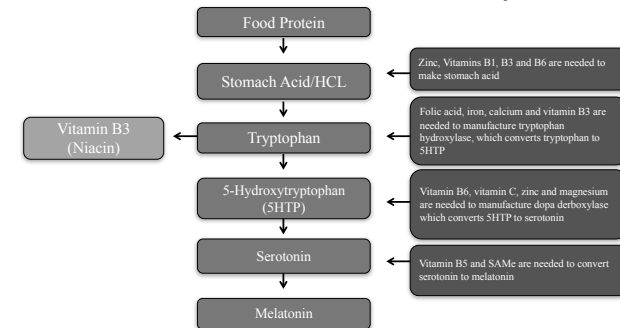


CDC: 2nd National Report on the Biochemical Indicators of Diet and Nutrition in the U.S. population

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Serotonin and Melatonin Pathways

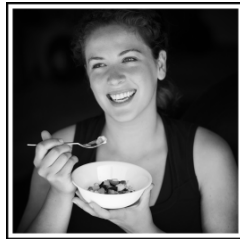


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Vitamin B6 (Pyroxidal-5-Phosphate)

- 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.
- Data from the Normative Aging Study show individuals in lowest tertile of vitamin B₆ concentration have significant loss in cognitive ability over five years.
- 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.



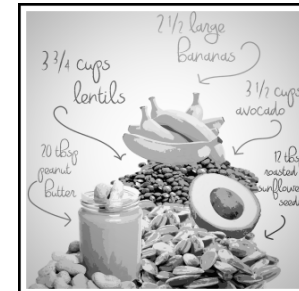
Larsson SC, et al. *J Am J* 2010; 303(11):1077-83
Morris MS, et al. *Am J Clin Nutr* 2008; 87(5):1446-54
Ulvik A, et al. *Am J Clin Nutr* 2014; 100(1):250-5

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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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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.

Pontes HA, et al. *J Can Dent Assoc* 2009; 75(7):533-7.

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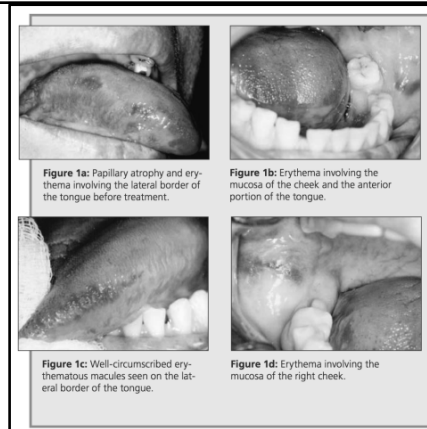


Figure 1a: Papillary atrophy and erythema involving the lateral border of the tongue before treatment.

Figure 1b: Erythema involving the mucosa of the cheek and the anterior portion of the tongue.

Figure 1c: Well-circumscribed erythematous macules seen on the lateral border of the tongue.

Figure 1d: Erythema involving the mucosa of the right cheek.

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Laboratory Tests

Test	Normal range (female)	Patient's values
RBC count (cells/ μ L)	3.90–5.03	1.63
Hemoglobin (g/dL)	12.0–15.5	7.2
MCV (fL)	80–100	144
Hematocrit (%)	36–45	23.4
RDW (%)	13 \pm 1.5	25
Serum folate (ng/mL)	3–16	7.73
Serum cobalamin (pmol/L)	118–716	71.8

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

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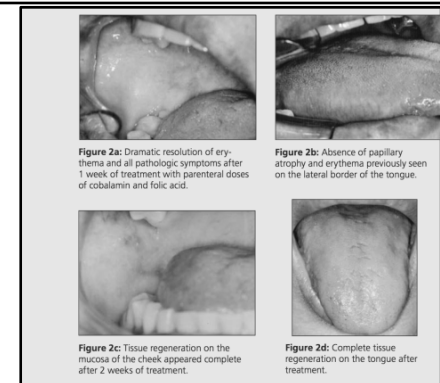


Figure 2a: Dramatic resolution of erythema and all pathologic symptoms after 1 week of treatment with parenteral doses of cobalamin and folic acid.

Figure 2b: Absence of papillary atrophy and erythema previously seen on the lateral border of the tongue.

Figure 2c: Tissue regeneration on the mucosa of the cheek appeared complete after 2 weeks of treatment.

Figure 2d: Complete tissue regeneration on the tongue after treatment.

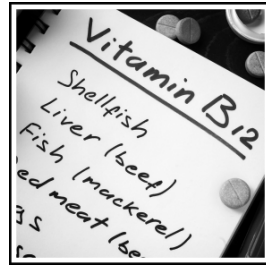
Patient treated with 1000 mcg B12 IM per week for 4 weeks and 1 mg folate daily. Symptoms disappeared after 14 days of treatment.

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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 (metformin, PPIs), obesity, elders, alcoholism
- 18 million Americans** deficient in vitamin B12
- Recommend > 20-100 mcg/d for those over age 50



Niafar M, et al. *Intern Emerg Med* 2015; 10(1):93-102.

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Metformin With Proton Pump Inhibitors: A Polypharmacy Recipe for Neuropathy via Vitamin B12 Depletion

Zabala MJ. *Clin Diabetes* 2015; 33(2):90-5.



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

Niafar M, et al. *Intern Emerg Med* 2015; 10(1):93-1026

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Vitamin C

- Potent antioxidant, activates folate, needed to convert tryptophan to serotonin, cofactor in synthesis of carnitine, thyroxine, norepinephrine, dopamine and immune cells
- Vitamin C levels decline rapidly during periods of emotional and physical strain, and illness.
- Malaise and lethargy early symptoms.
- Skin changes, easy bruising, gum disease, loose teeth, slow healing wounds, dry mouth, dry eyes. emotionally labile.
- 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.



Hemila H, et al. *Cochrane Database Syst Rev* 2013; Jan 31;1:CD 000980

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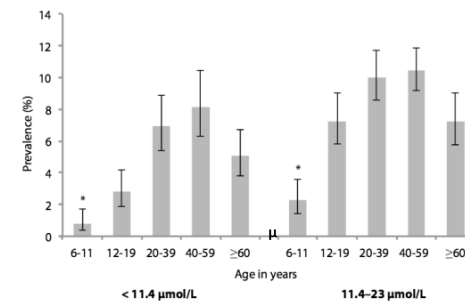


Figure H.1.f. Prevalence estimates of vitamin C deficiency (serum concentrations less than 11.4 μmol/L) and low vitamin C concentrations (11.4-23 μmol/L) in the U.S. population aged 6 years and older by age group, National Health & Nutrition Examination Survey, 2003-2006.

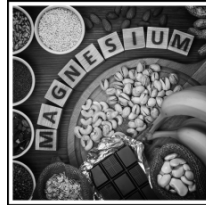
Error bars represent 95% of confidence intervals. *Prevalence in children is significantly lower than prevalence in persons 20 years and older ($p < 0.05$).

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Magnesium

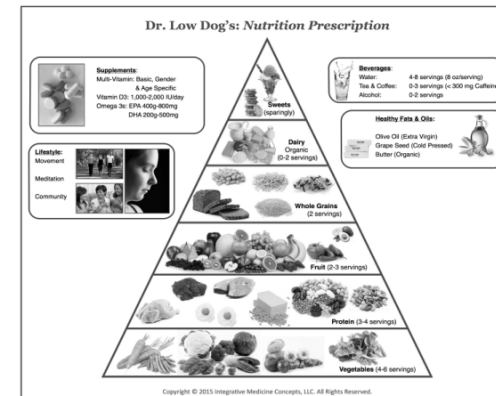
- Low magnesium associated with type 2 diabetes, metabolic syndrome, inflammation, high blood pressure, atherosclerotic vascular disease, sudden cardiac death, osteoporosis, migraine headache, asthma, and colon cancer.
- 50% of U.S. population consumes less than the required amount of daily magnesium.
- Deficiency associated with negative effects on calcium and vitamin D homeostasis. Magnesium required for the conversion of vitamin D to 1,25-dihydroxycholecalciferol.
- 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).



Rosanoff A, et al. Nutr Rev 2010;70(3):153-64
Castiglioni S, et al. . *Nutrients*. 2013;5(8):3022-3033

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