

## "The Nutrition Prescription"



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**"The Food You Eat Can Be  
Either:**

**The Safest  
&  
Most Powerful Form Of  
Medicine**

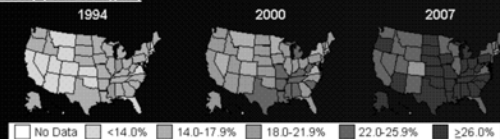
**-or-**

**The Slowest Form Of *Poison.*"**

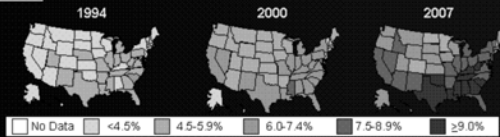
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## Age-adjusted Percentage of U.S. Adults Who Were Obese or Who Had Diagnosed Diabetes

### Obesity (BMI $\geq 30$ kg/m<sup>2</sup>)



### Diabetes

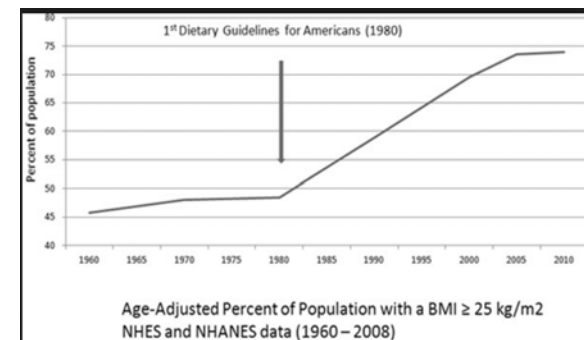


CDC's Division of Diabetes Translation, National Diabetes Surveillance System available at  
<http://www.cdc.gov/diabetes/statistics>



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## Diet and Obesity in US



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## Nutrition in the 21<sup>st</sup> Century



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*“Let your food be your medicine and your  
medicine be your food.”*

—Hippocrates



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**Refined Sugar  
The Other  
White Drug**

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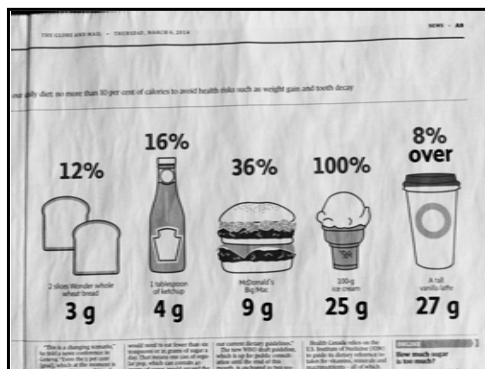
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### WHO Recommends Limiting Sugar Consumption To 25g/d



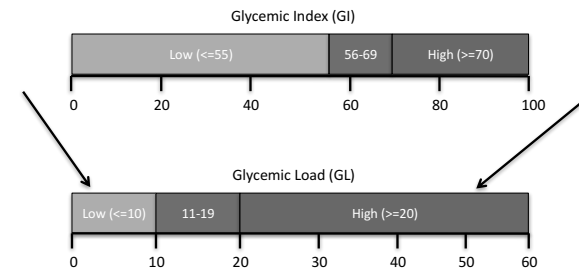
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Sugars added to foods, as well as those found naturally in honey, syrups, fruit juices and fruit concentrates. Not in fresh produce.



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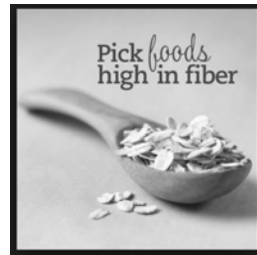
### Glycemic Index & Glycemic Load Rating Chart



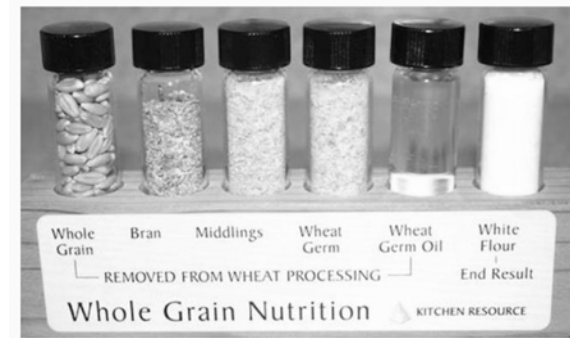
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## Influences on Glycemic Load of Foods

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



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## Glycemic Load

### Individual Food Portion

Low	0-10
Moderate	11-19
High	20+

### Whole Day

Low	< 80
Moderate	80-120
High	>120

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## Glycemic Load

Food	Serving Size	Glycemic Load
Grapefruit	½ large	3
Apple	1 medium	6
Banana	1 large	14
Raisins	1 small box	20
Watermelon	1 cup	8
Carrots	1 large	5
Orange	1 medium	6
Sweet potato	1 cup	17
Baked potato	1 medium	28
French fries	1 medium serving	26
Snickers	1 bar	35
Reese's cup	1 miniature	2
White table wine	5 ounces	1
Red table wine	5 ounces	1
Grape juice	6 ounces	12

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## Glycemic Load

Food	Serving Size	Glycemic Load
Asparagus	½ cup	2
Broccoli	1 cup	4
Green beans	1 cup	3
Tomato	1 medium	2
Subway sandwich Turkey breast	6 inch	17
Butter pecan ice cream	5.5 ounces (small)	22
Vanilla ice cream cone	4.5 ounces (small)	19
Potato chips, fat free	1 bag (8 ounces)	49
Tortilla chips, white corn	3.5 ounces	38
Eggo oat waffles	1 serving	13
Maple syrup	4 Tbsp	39
Egg, hard boiled	1	2
Apple juice	8 ounce	6

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## Glycemic Load

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	½ cup	20
Kellogg's Special K	1 cup	14
Post Bran Flakes	½ cup	12
Post Raisin Bran	1 cup	25

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## Pictures of Low/High GI Meals &amp; Snacks



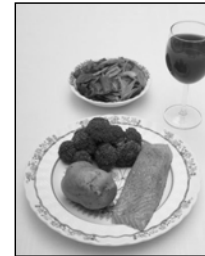
GI = 60    GL = 48



GI = 42    GL = 31

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## Pictures of Low/High GI Meals &amp; Snacks



GI = 80    GL = 32



GI = 61    GL = 12

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## Reality Check



- It *is not practical to try to “count” glycemic load*, in part because it will vary based upon portion size and other components in the meal.
- *The take home message: cut back on processed, refined , sugary foods and drinks.*

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## Resources

- The New Glucose Revolution by Jennie Brand-Miller, PhD
- The Glycemic Load Diet by Rob Thompson MD
- The Glycemic Load Diet Cookbook by R. Thompson
- The Easy GL Diet Handbook by Fedon Lindberg MD
- The 150 Healthiest 15-Minutes Recipes on Earth by Jonny Bowden, PhD

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## Sugar Substitutes/ Non-Caloric Sweeteners

- Aspartame (Equal & Nutrasweet)
- Sucralose (Splenda)
- Saccharin (Sweet 'N Low, Sweet Twin)
- Acesulfame K (Sunett, Sweet One)
- Stevia (Truvia, Pure Via, Sun Crystals)
  - From *Stevia rebaudiana* leaves
- Monk Fruit (Nectresse)

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## Sugar Alcohols

- Erythritol
- Hydrogenated starch hydrolysate
- Isomalt
- Lactitol
- Maltitol
- Mannitol
- Sorbitol

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## Natural Sweeteners

- Agave nectar
- Date sugar
- Fruit juice concentrates
- Honey
- Maple syrup
- Molasses
- Cane sugar

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## Gluten and Celiac

- Gluten is the name for the storage proteins found in wheat, barley, rye and related cereal grains – triticale, spelt and kamut.
- In patients with celiac disease, a strict gluten-free diet is the only treatment.
- Experts estimate that about 1% of Americans have celiac disease.
- The condition, caused by an abnormal immune response to gluten, can damage the lining of the small intestine.

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## Symptoms of Celiac

- Recurring bloating, gas, or abdominal pain
- Chronic diarrhea or constipation or both (can present like IBS)
- Pale, foul-smelling stool
- Unexplained anemia
- Bone or joint pain
- Behavior changes/depression/irritability
- Vitamin K Deficiency
- Fatigue, weakness or lack of energy
- Delayed growth or onset of puberty
- Failure to thrive (in infants)
- Missed menstrual periods, infertility male & female, miscarriage
- Canker sores inside the mouth
- Tooth discoloration or loss of enamel

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## Gluten Sensitivity

- Not much is known about this condition except:
  - People do not test positive for celiac disease.
  - Are not allergic to gluten.
  - They report feeling sick after eating or drinking products that contain gluten.
- Many gluten-free foods contain rice starch, cornstarch, tapioca starch, potato starch and guar gum as a substitute for flour. In other words, a lot of these foods are not particularly “wholesome.”

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## Pesticide Exposure and ADHD

- Using data from NHANES – children with typical levels of pesticide exposure from eating pesticide-treated fruits/vegetables have higher risk of developing ADHD.
- Children ages 8-15 with higher urinary levels of dimethyl alkylphosphate (DMAP) had twice the odds of ADHD when compared with children with low or undetectable levels.

Kuehn BM. JAMA. 2010 Jul 7;304(1):27-8.

Bouchard, et al. Pediatrics. 2010 Jun;125(6):e1270-7.

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## Pesticide and ADHD

- Pyrethroid pesticides cause abnormalities in dopamine system and produce ADHD phenotype in animal models.
- 687 children (8-15 years of age) evaluated. Those with urinary 3-PBA above limit of detection were 2 x more likely to have ADHD compared with those below LOD.
- Hyperactive-impulsive symptoms increased by 50 % for every 10-fold increase in 3-PBA levels; change in inattention was not significant.

Wagner-Schuman M, et al. Environ Health 2015; May 28;14:44.

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Eating an organic diet for one week significantly reduced pesticide exposure in adults. Mean total organophosphate metabolites were 89% lower than when participants were eating conventional foods. Similar results have been shown in children.



Oates L, et al. Environ Res 2014; 132:105-11  
Bradman A, et al. Environ Health Perspect 2015; 123(10):1086-93

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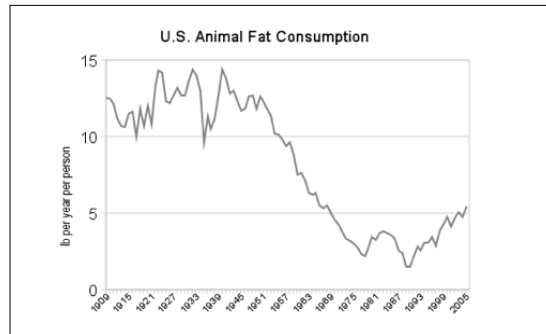
<http://www.ewg.org/foodnews/>



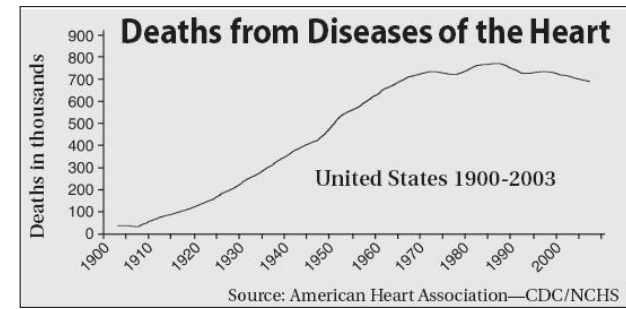
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## Does Eating Fat Give You Heart Disease?

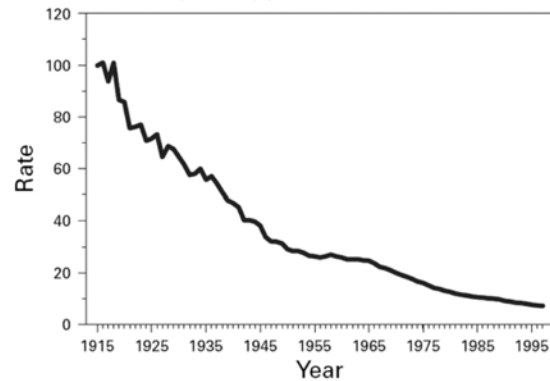


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**FIGURE 1. Infant mortality rate,\* by year — United States, 1915–1997**



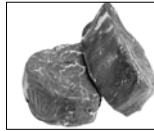
\*Per 1000 live births.

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[www.cdc.gov](http://www.cdc.gov)



## 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 heart risk.
- Advice for very low fat diets not supported by evidence.

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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## Eggs

- Provide essential fatty acids, proteins, choline, vitamins A and B12, selenium, and other critical nutrients at levels above or comparable to those found in other animal-source foods.
- Meta-analysis suggests that egg consumption is not associated with the risk of CVD and cardiac mortality in the general population.
- New dietary guidelines **do not** limit dietary cholesterol.

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

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## Choline



- Related to B-vitamins. Necessary for synthesis of cell membranes, production of VLDL, precursor ACh
- Suboptimal intake of choline in 95% pregnant women in Boston. Low intake ↑ risk of NTD
- Higher maternal choline intake alters gene methylation and expression of placental CRH, key regulator in stress response. Baby's intelligence, memory, and possibly mood regulation may be damaged permanently if mother is choline deficient
- RDA: 450 mg/d Breastfeeding: 550 mg/d

Jiang X, et al. *FASEB J*. 2012;26(8):3563–3574.  
Brunst KJ, et al. *Public Health Nutr* 2014; 17(9):1960-70.

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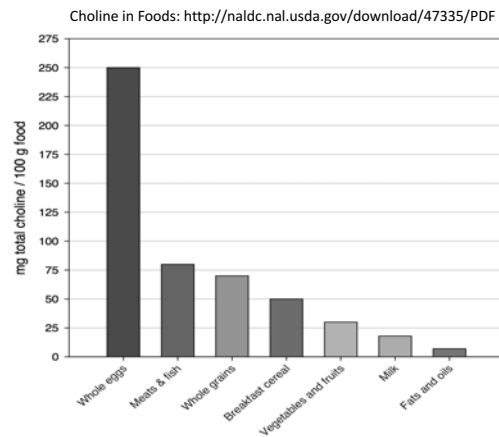
## Choline and Cognition



- Prospective study involving 154 healthy mother-infant pairs conducted in Vancouver, Canada (72% white, 15% Asian). All women were taking PNV.
- Maternal blood collected at 16 and 36 weeks gestation and infant neurodevelopment assessed at 18 months age for 154 mother-infant pairs. Babies were all singletons and full-term.
- Significant *positive* associations found between infant cognitive test scores and maternal plasma free choline ( $p=0.009$ ) and a strong trend towards gross motor development.

Wu BT, et al. *PLoS One* 2012; 7(8):e43448.

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- Studies show dairy products are beneficial in muscle building, lowering blood pressure, preventing tooth decay, diabetes, colorectal cancer, and obesity.

Tunick MH, et al. J Agric Food Chem 2014; Nov 19

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## Milk and Butter



- For moderate milk users, normal milk at 4% fat is no big deal and contains fat soluble vitamins removed in making low fat milk. The saturated fatty acids in milk are mostly the shorter chain forms that do not effect cholesterol metabolism.
- Systematic review and meta-analysis suggest relatively small or neutral overall associations of butter with mortality, CVD, and diabetes. These findings do not support a need for major emphasis in dietary guidelines on either increasing or decreasing butter consumption.

Pimpin L, et al. PLoS One 2016; 11(6):30158118

Liang J, et al. Crit Rev Food Sci Nutr 2016; Dec 21

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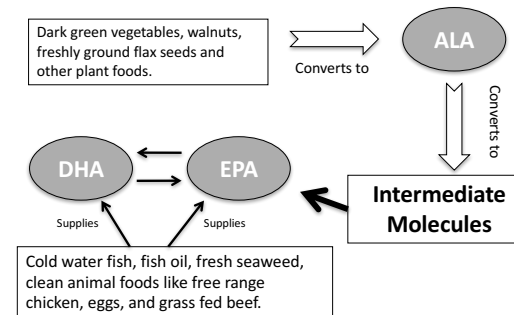
## Dietary Fat and Cancer Systematic Review

- No associations were found for prostate, esophageal, gastric, renal cell, bladder, lung, skin, or postmenopausal breast cancer by the total intake or types of dietary fat.
- There *may* be an association between total dietary fat and premenopausal breast cancer.
- Ovarian cancer there was limited-suggestive evidence for a positive association with intake of saturated fats.

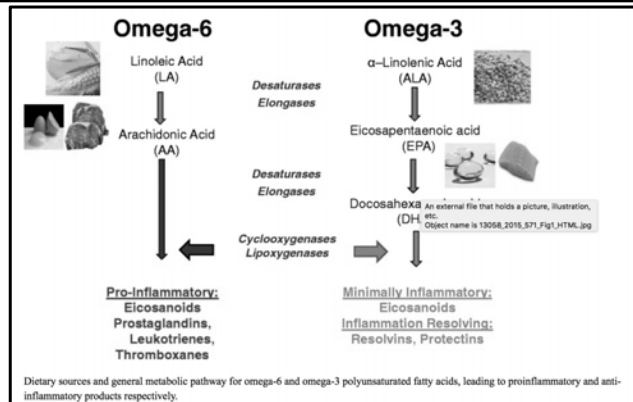
Schwab U, et al. Food Nutr Res 2014; 10;58. doi: 10.3402/fnr.v58.25145.

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## Omega 3 Fatty Acids from Plants and Animals



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Dietary sources and general metabolic pathway for omega-6 and omega-3 polyunsaturated fatty acids, leading to proinflammatory and anti-inflammatory products respectively.

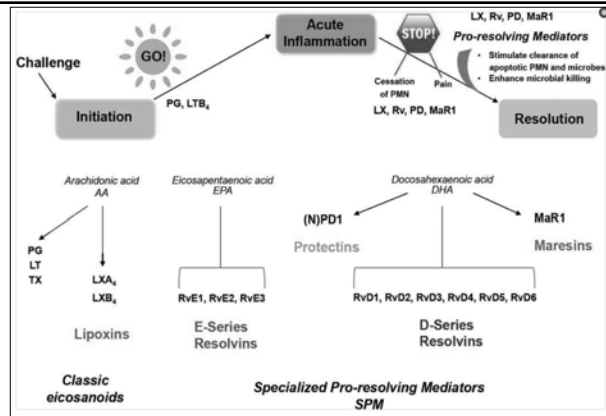
Image From: Fabian CJ, et al. Breast Cancer Res 2015; 2015; 17(1): 6

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## Resolution Biology

- Inflammation always considered a passive process.
- Newer 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.

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Serhan CN, Chiang N. Curr Opin Pharmacol 2013; 13(4):632-40.

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## Cardiovascular Health

On the basis of 19 cohort studies of free-living populations globally, biomarker concentrations of seafood and plant-derived ω-3 fatty acids are associated with a modestly lower incidence of fatal CHD.

PrediMed study found that dietary ALA, supplied mainly by walnuts and olive oil, relates inversely to all-cause mortality, whereas protection from cardiac mortality was limited to fish-derived long-chain n-3 polyunsaturated fatty acids.

Del Gobbo LC, et al. JAMA Intern Med 2016; 176(8): 1155-66.

Sala-Vila A, et al. J Am Heart Assoc 2016; Jan 26;5(1). pii: e002543.

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## Know Your “O”

- 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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## Omega 3 and HTN



- Omega-3 fatty acids decrease the production of vasoconstrictor eicosanoids, reduce ACE activity and angiotensin II formation, and enhance endothelial nitric oxide production and activate the parasympathetic nervous system.
- Meta analysis found that marine omega 3s leads to small but significant reduction in SBP and ≥2 grams/d reduces DBP.
- DHA > EPA for blood pressure lowering effects.

Miller PE, et al. Am J Hypertens 2014; 27(7):885-96.

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## Omega 3 Fatty Acids – Bone/Muscle



- In animal studies, marine omega 3 attenuates bone loss associated with estrogen loss; EPA enhances calcium absorption, reduces calcium excretion and increases calcium deposition in bone.
- Marine omega 3 acids tend to have positive effects on bone if ingested for  $\geq 18$  months and given along with calcium.
- Omega-3 fatty acids stimulate muscle protein synthesis in older adults and may be useful for the prevention and treatment of sarcopenia.

Fernandes G, et al. *Prostaglandins Leukot Essent Fatty Acids*. 2003;68(6):361-372  
Orchard TS, et al. *Br J Nutr*. 2012;107:S253-S260  
Smith GI, et al. *Am J Clin Nutr* 2011; 93(2): 402-412

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## Pregnancy



- Maternal DHA intake during pregnancy and lactation can prolong high risk pregnancies, increase birth weight, head circumference; enhance visual acuity, hand and eye co-ordination, attention, and information processing.
- Systematic review found risk of early preterm delivery reduced by 58% and any preterm delivery by 17% with the EPA/DHA supplementation.

Morse NL. *Nutrients* 2012; 4(7): 799-840  
Kar S, et al. *Eur J Obstet Gynecol Reprod Biol* 2016; 198:40-6

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## 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.”

EFSA Journal 10(7): doi:10.2903/j.efsa.2012.2815

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## Seafood Calculator

[www.ewg.org/research/ewg-s-consumer-guide-seafood/seafood-calculator](http://www.ewg.org/research/ewg-s-consumer-guide-seafood/seafood-calculator)

Calculations are based on 4 oz. serving size

CATEGORY	SPECIES	WEEKLY MERCURY	SUSTAINABILITY	CONCLUSION
 <b>EWG'S BEST BETS!</b> Very High Omega-3s, Low Mercury, Sustainable	SALMON	NuNu	Best Choice: Wild Alaska	⚠️⊗⚠️
	SARDINES	NuNu	Best Choice: Pacific	⚠️⊗⚠️
	MUSSELS	NuNu	Best Choice: Farmed	⚠️⊗⚠️
	RAINBOW TROUT	NuNu	Best Choice: Farmed	⚠️⊗⚠️
	ATLANTIC MACKEREL	NuNu	Best Choice: Not Trawled	⚠️⊗⚠️

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## Olive Oil

- Cornerstone of Mediterranean diet. Rich in antioxidants, particularly vitamin E.
- Oleocanthal mimics effect of ibuprofen in reducing inflammation.
- Protects against heart disease; lowers total blood cholesterol, LDL-C, triglycerides; improves HDL.
- Nurses Health Study found that greater adherence to Mediterranean diet was associated with longer telomeres (health and longevity).



Hemaez 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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## Avocado

- Avocados second only to olives for level of monounsaturated fat.
- Randomized, crossover trial of 45 overweight/obese participants found inclusion of one avocado per day was superior to low-fat or moderate fat diet high in oleic acid for lowering cholesterol.
- Only avocado group had significantly decreased LDL particle number, small dense LDL-C and ratio of LDL/HDL.

Wang L, et al. *J Am Heart Assoc* 2015; 4(1). pii: e001355.

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## Protein



- From the Greek word *protos*, "first."
- Used to build new cells, maintain tissues (e.g., muscles, inner bone, hair, nails), create enzymes, make hemoglobin to carry oxygen, lipoproteins to transport cholesterol; present in inner and outer membrane of every living cell.
- Sources include meat, poultry, seafood, beans and peas, eggs, soy products, nuts, nut butters, and seeds.

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## WCRF/AICR Recommendations to **Reduce Cancer Risk**

- Limit consumption of red meats (beef, pork, lamb) and avoid processed meats.
- There is NO question that regular consumption of processed red meats increases risk of colorectal cancer.

Kmietowicz Z. *BMJ* 2015; 351:h5729



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### We Aren't Eating What We Ate In The Stone Age



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### HEALTHY PROTEIN SOURCES

- Soy and other legumes (lentils, beans, etc.)
- Quinoa
- Nuts and seeds
- Low mercury cold water fish
- Organic poultry
- Grass fed beef, pork, lamb
- Wild game
- Milk and dairy without hormones
- Omega 3 enriched eggs

*Roughly 8 grams of protein per 20 pounds of body weight is generally recommended*

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### Sodium Recommendations?

- In May 2013, Institute of Medicine found limited evidence linking association between low sodium intake (1500-2300 mg/d) and improved health outcomes in those with diabetes, kidney disease, heart disease, hypertension or borderline hypertension; those 51 years of age and older; or African Americans (National Research Council).
- However, average American consumes 3400 mg/d sodium. Too much! Use iodized salt.

*Sodium Intake in Populations: Assessment of Evidence.* Washington, DC: The National Academies Press, 2013.

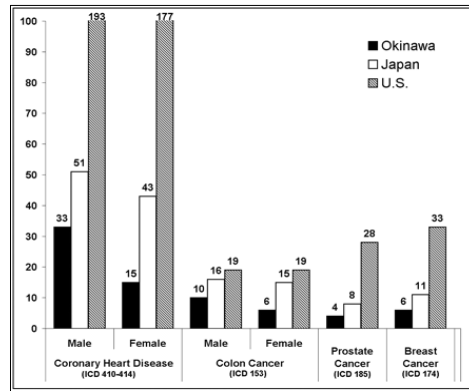
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### Traditional Asian Diet

- Little question many people in Asian countries have low rates of diabetes, heart disease and cancer.
- There is no one "Asian" diet but some generalizations that can be made.
- Traditional Chinese diets have been explored through the China-Cornell-Oxford project. This long-term study is discussed at length in the recent film Forks over Knives, which promotes better health through a plant-based diet.

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Willcox DC, et al. J Am Coll Nutr 2009; 28(S):500-516

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## Okinawan Dietary Pattern

- High consumption of vegetables
- High consumption of legumes (mostly soy)
- Moderate consumption fish products
- Low consumption meat and meat products
- Low consumption of dairy products
- Moderate alcohol consumption
- Low caloric intake
- Emphasis on low GL carbohydrates

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## Flexitarian or Vegetarian Diets

- Review of 25 studies of flexitarian diets found emerging evidence suggestive of benefits for body weight, improved markers of metabolic health, blood pressure, and reduced risk of type 2 diabetes.
- Vegetarian diets have very beneficial effects on lipids.

Derbyshire EJ. Front Nutr 2017; Jan 6;3:55

Wang F, et al. J Am Heart Assoc 2015; 4(10):e002408

