

## Optimizing Nutrition for Oral Health and Beyond



**Tieraona Low Dog, MD**

Founder: Medicine Lodge Ranch

National Geographic's: *"Life Is Your Best Medicine," "Healthy At Home,"*  
and *"Fortify Your Life"*

[www.DrLowDog.com](http://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 Matters

- Oral cavity is **intersection of medicine and dentistry** and window into the general health of an individual..
- **>100 systemic diseases and upward of 500 medications have oral manifestations**, typically more prevalent in elders.
- **Diabetes bidirectional relationship** with periodontal disease; **inflammation** impairs body's ability to use **insulin** and high blood sugar provides **ideal environment for infection**, including gum infections. Strong evidence that **treating one condition positively impacts the other**.

Carton BJ. Root caries and diabetes: risk assessing to improve oral and systemic health outcomes. *Am J Dent* 2012;25(2):114-122.

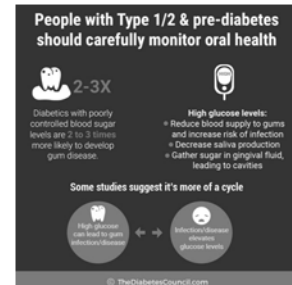
Alpert PT. Oral health: the oral-systemic health connection. *Home Health Care Manag Pract*. 2017;29(1):56-59.

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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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## Obesity and Periodontal Disease

- **Strong link between obesity and periodontal disease** in adults, children and various global geographic locations.
- NHANES: **overweight with central obesity**, prevalence of **tooth loss increased 31%**, compared to individual with similar BMI but no central obesity, and increased by **40%**, compared **normal-weight person**.
- **Oral microbiota** significantly altered and **less diverse** in obese individuals compared to non-obese controls.

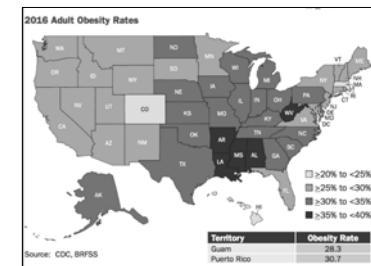
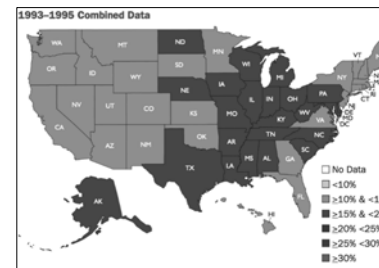
Kang J, et al. Association between central obesity and tooth loss in the non-obese people: Results from the continuous National Health and Nutrition Examination Survey (NHANES) 1999-2012. *J Clin Periodontol* 2019 Feb 21. doi: 10.1111/jcpe.13091.

Tam J, et al. Obesity alters composition and diversity of the oral microbiota in patients with type 2 diabetes mellitus independently of glycemic control. *PLoS One*. 2018 Oct 1;13(10):e0204724.

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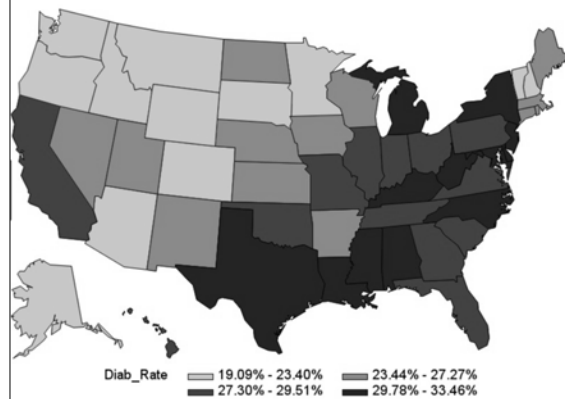
## The Changing Landscape of Adult Weight



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Diabetes Period Prevalence, 2015



<https://www.cdwdata.org/web/guest/medicare-chronic-condition-charts>

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SCIENTIFIC  
AMERICAN

PUBLIC HEALTH

## The Hunger Gains: Extreme Calorie-Restriction Diet Shows Anti-Aging Results

A new study shows five days of hunger a month may reduce risk factors for aging and age-related diseases

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## Caloric Restriction?



Canto is 27 year old monkey on CR diet, Owen is 29 year old on unrestricted diet.

[news.wisc.edu/monkey-caloric-restriction-study-shows-big-benefit-contradicts-earlier-study/](http://news.wisc.edu/monkey-caloric-restriction-study-shows-big-benefit-contradicts-earlier-study/)  
Ravussin E, et al. *J Gerontol. A Biol Sci Med Sci.* 2015;70(9):1097-104

- 25 year study University of Wisconsin: **76 rhesus monkeys aged 7-14 years**, fed a diet **30% less calories**.
- **Disease 3 fold greater in control group. No diabetes** in caloric-restricted animals.
- **2-year** study randomized 218 non-obese people to current diet or 25% caloric restriction (**11.7% on average**).
  - **Statistically significant reduction in inflammatory markers, weight loss, improved mood, sleep duration, etc.**

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## Fasting-Mimicking Diets (FMD)



Wei M, et al. Fasting-mimicking diet and markers/risk factors for aging, diabetes, cancer, and cardiovascular disease. *Sci Transl Med* 2017; 9(377).

- **100 healthy participants** 2 study arms tested FMD 5 consecutive days/mo. for 3 months.
  - **1100 calorie first day, 700 calories for 4 days (plant based, multivitamin)**. Ate whatever they wanted rest of the month.
- **Reduced body weight, total body fat; lowered blood pressure, cholesterol, triglycerides and IGF-1.**
- **Effects noted 3 months AFTER study ended.**
- **Note: 25% drop-out rate**

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## INFLAMMATION.....



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## Diabetes, Inflammation, Cancer

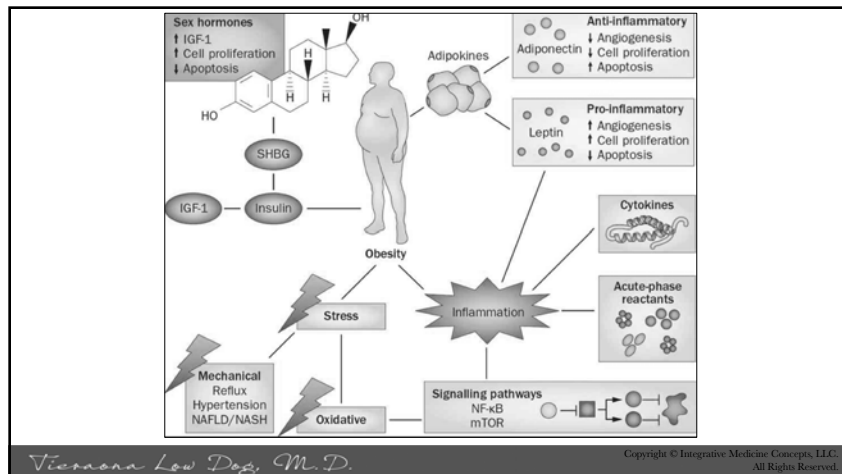
- **Poorly regulated blood sugar** often accompanied by increased **inflammatory markers** (e.g., interleukin (IL)-1 $\beta$ , IL-6, TNF- $\alpha$ )
- **Uncontrolled pro-inflammatory responses** creates **chronic inflammatory state**, promoting **tumor-favorable microenvironment**.



Chang SC, Yang WV. *Crit Rev Oncol Hematol* 2016; 108:146-153

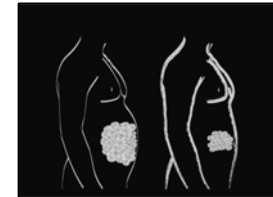
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## Obesity and Cancer: What is The Connection?

- Fat cells, particularly in belly, produce/react to hormones/proteins that drive **inflammation and insulin resistance**, promoting cell growth. More cells divide, more opportunity for cancer to develop.
- Waist measurements indicating increased risk:
  - 31.5 inches or more for women
  - 37 inches or more for men
- High risk
  - 35 inches or more for women
  - 40 inches or more for men



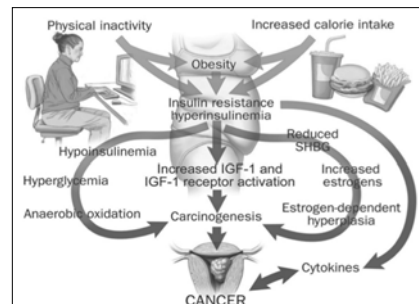
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## Obesity and Insulin Growth Factors

- Obesity can **increase cancer risk** and cancer-related **mortality** via **insulin resistance, high blood sugar and insulin-growth factors (IGF)**.
- **Elevated insulin increases tumor growth and aggressiveness.**
- **IGF-1, IGF-2** identified as tumor promoters in multiple studies.

Belardi V, et al. *J Mammary Gland Biol Neoplasia* 2013; 18(3-4):277-89



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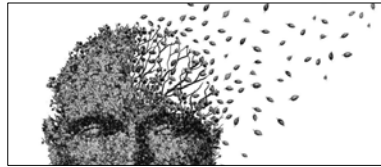
## Dietary Inflammatory Index (DII)

- Anti-inflammatory diet may reduce **sub-chronic inflammation** and improve **cardiovascular, metabolic, and neurologic parameters**.
- **Dietary Inflammatory Index** based on measuring inflammation in the body in response to specific foods (1900 studies)
- Tobacco/alcohol major risk factors for oral/pharyngeal cancers, but in large cohort, **higher DII scores increased risk of oral/pharyngeal CA**.
- NHANES – those with highest DII score had **16% more teeth lost compared to those with lowest scores**.
- Shivappa N, et al. Inflammatory potential of diet and risk of oral and pharyngeal cancer in a large case-control study from Italy. *Int J Cancer* 2017; 141(3):471-479; Kotsakis GA, et al. Diet-borne systemic inflammation is associated with prevalent tooth loss. *Clin Nutr* 2018 Aug;37(4):1306-1312.

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## Mediterranean Dietary Pattern Inflammation & Memory



- Mediterranean diet associated with lower dementia risk.
- Researchers evaluated inflammatory potential of diet in relation to mild cognitive impairment/dementia risk using the **DII** during an average follow up of 9.7 years during Women's Health Initiative Memory Study.
- Higher inflammatory scores were significantly associated with *greater cognitive decline and earlier onset of cognitive impairment*.

Hayden KM, et al. The association between an inflammatory diet and global cognitive function and incident dementia in older women: The Women's Health Initiative Memory Study. *Alzheimers Dement* 2017 May 19; pii: S1552-5260(17)30185-1.

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## Mediterranean Dietary Pattern

- 13 meta-analyses observational studies + 16 meta-analyses of randomized controlled trials investigated association between Mediterranean diet and 37 different health outcomes **>12,800,000 subjects**.
- Robust evidence (P-value<0.001) show greater adherence to Mediterranean diet associated with *reduced risk* of **overall mortality, cardiovascular disease, heart attack, overall cancer incidence, diabetes, neuro-degenerative diseases and lower inflammatory markers**.

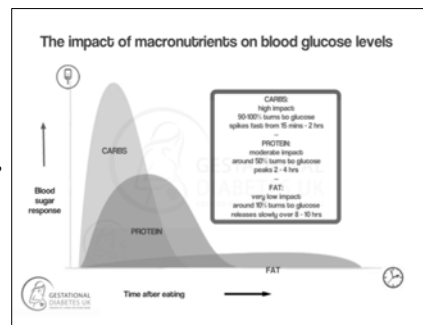
Dinu M, et al. Mediterranean diet and multiple health outcomes: an umbrella review of meta-analyses of observational studies and randomized trials. *Eur J Clin Nutr* 2017; May 10. doi: 10.1038/ejcn.2017.58.

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## Carbohydrates

- Provide majority calories most diets
- Body's preferred fuel source
- Largest contributor to the control of **blood sugar**
- **Half** of carbohydrates in North American diet come from: bread, soft drinks, cakes, cookies, donuts, quick breads, sugars, syrups, jams, white potatoes (including chips) and breakfast cereal.



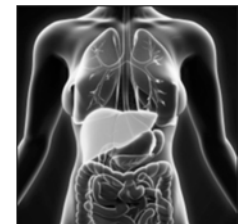
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## Sugars



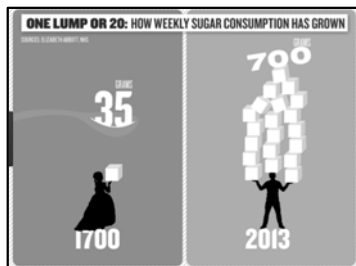
- Table sugar (sucrose): **one glucose + one fructose** molecule
- **High fructose corn syrup**: 55% fructose, 42% glucose and 3% other sugars.
- Every cell in body readily converts glucose into energy. But *liver cells are one of few types of cells that can convert fructose to energy*.
- Large amounts of "free" fructose *taxes the liver and increases risk of non-alcoholic fatty liver disease*.



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## Too Little Fiber, Too Much Sugar



Canadians average daily sugar intake:

- 101 grams (24 tsp) children 1-8 years
- 115 grams (27 tsp) children 9-18 years
- 85 grams (20 tsp) for adults - lower due to increase intake "diet" sodas.

Langlois K, et al. Change in total sugars consumption among Canadian children and adults. *Health Rep* 2019 Jan 16;30(1):10-19.

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## Glycemic Index/Load

Low Glycol Diet  
Calculator

- **Glycemic load** is measurement of impact of carbohydrates on **blood sugar/insulin**.
- International **consensus** conference concluded that given **consistency of scientific evidence**, diets **low in glycemic index/load** should be promoted in the **prevention and management of diabetes** and **coronary heart disease**, and are **particularly important in individuals with insulin resistance**.

Augustin LS, et al. Glycemic index, glycemic load and glycemic response: An International Scientific Consensus Summit from the International Carbohydrate Quality Consortium (ICQC). *Nutr Metab Cardiovasc Dis* 2015 Sep;25(9):795-815.



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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.



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

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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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Food	Serving Size	Glycemic Load	Food	Serving Size	Glycemic Load
Grapefruit	½ large	3	Spaghetti	1 cup	38
Apple	1 medium	6	Brown rice	1 cup	23
Banana	1 large	14	White rice	1 cup	33
Raisins	1 small box	20	White bread	1 slice	10
Watermelon	1 cup	8	Whole grain bread	1 slice	5
Carrots	1 large	5	Bagel, cinnamon raisin	1 3.5 inch	24
Orange	1 medium	6	Pumpernickel bread	1 slice	6
Sweet potato	1 cup	17	Macaroni and cheese	1 cup prepared	31
Baked potato	1 medium	28	Chocolate doughnut	1 doughnut (80 g)	25
French fries	1 medium serving	26	Glazed doughnut	1 doughnut (80 g)	12
Snickers	1 bar	35	Kellogg's Frosted Flakes	¾ cup	20
Reese's cup	1 miniature	2	Kellogg's Special K	1 cup	14
White table wine	5 ounces	1	Post Bran Flakes	¾ cup	12
Red table wine	5 ounces	1	Post Raisin Bran	1 cup	25
Grape juice	6 ounces	12			

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## Low/High GI Meals

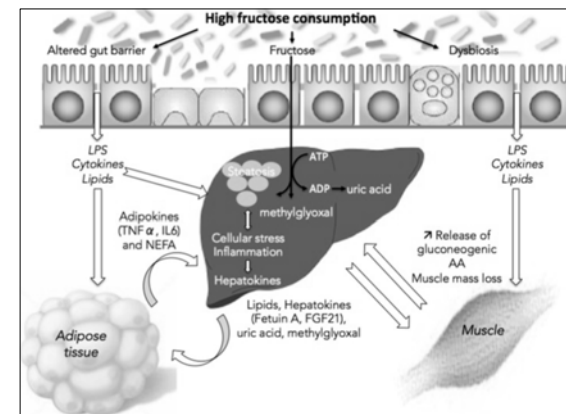


GI = 80 GL = 32



GI = 61 GL = 12

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Jegatheesan P, et al. Fructose and NAFLD: The multifaceted aspects of fructose metabolism. *Nutrients* 2017; Mar 3;9(3)

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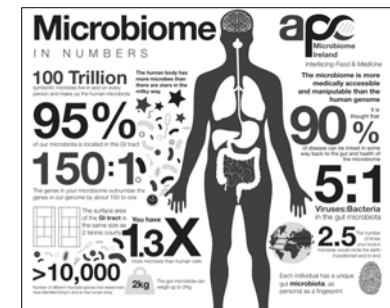
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## Definitions

- **Microbiome**—collective genomes of microorganisms in particular environment
- **Microbiota**—community of microorganisms themselves.
- Lower diversity is marker of *dysbiosis* (microbial imbalance) in gut and is associated with autoimmune disease, obesity, metabolic conditions, and is common in elders.

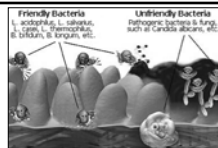


Valdes AM, et al. *BMJ* 2018;361:k2179

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## Microbiota.....

- Train and modulate immune system (e.g., skin, gut)
- Convert skin oils to compounds that keep skin supple and lower pH
- Block adhesion and suppress growth of pathogenic bacteria
- Break down carbs and make **n-butyrate**, energy for intestinal cells but also crucial for maintaining **tight junctions** to **reduce permeability**.
- Make **ARA and DHA**, signal brain cells to divide (infants). Gut and brain neurons communicate. Gut microbes make serotonin, melatonin, GABA, and others.
- Produce **vitamins** and assist in building **amino acids**.
- Help maintain **blood pressure** (complex carbs → formate → impact salt processing)



Wilkins T, et al. Probiotics for Gastrointestinal Conditions: A Summary of the Evidence. *Am Fam Physician*. 2017 Aug 1;96(3):170-178.

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## It's the Fiber Folks!



- Diets **high in fiber** and **low in sugar** increase ***Bifidobacteria***, preventing toxins from passing through **intestinal wall** into **bloodstream**.
- Prebiotics: **un-digestible plant fiber** acts as food for microbiota.
- Bananas, onions, garlic, leeks, Jerusalem artichoke, apple skin, chicory root, dandelion greens, beans, wheat flour just a few examples of prebiotic foods.

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## Obesity and Microbiota?

- **Early disruption** of gut microbiota (C-section, antibiotics) = **too few *Bifidobacteria*** can contribute to obesity.
- **Diet high in sugar, simple carbs, and fat** encourages growth of microbes better at **extracting** energy from food, signaling body to store energy as fat.
- Bacteria transplanted from overweight mice to thin mice make the thin mice gain weight.



Federico A, et al. Gut microbiota, obesity and metabolic disorders. *Minerva Gastroenterol Dietol* 2017;63(4):337-344.

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## Sugar Substitutes – Better?

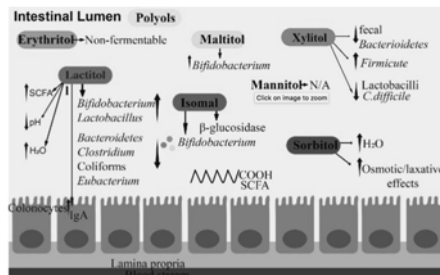


Nettleton JE, et al. Reshaping the gut microbiota: Impact of low caloric sweeteners and the link to insulin resistance? *Physiol Behav* 2016;164(Pt B):488-93.

- Sugar substitutes frequently **1000 times sweeter** than sucrose.
- Despite GRAS status by regulatory agencies, sugar substitutes **can have negative effects** on gut microbiota.
- **Sucralose and saccharin** disrupt balance and **diversity** of gut microbiota. **Sucralose increases bacterial pro-inflammatory genes.**

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## Stevia and the Polyols



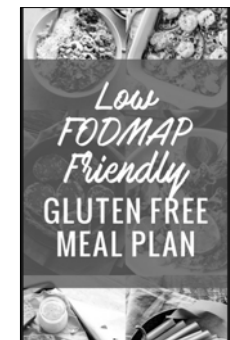
Ruiz-Ojeda F, et al. Effects of sweeteners on the gut microbiota: a review of experimental studies and clinical trials. *Adv Nutr* 2019; 10(S1): PMC6363527

- Erythritol, mannitol and sorbitol have **no effect** on gut microbiota.
- Isomaltose and maltitol, increase *bifidobacteria* and may have **prebiotic actions**.
- Stevia extracts may **negatively impact** gut microbiota composition.

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## Impact of Certain Diets

- 21 healthy people had substantially **different gut microbiota** profiles after four weeks on **gluten-free** diet; **significant reduction** in key beneficial microbe species.
- Low FODMAP diets lead to **significant reduction in *Bifidobacterium*** and **profound changes in the microbiota and metabolome**; duration and clinical relevance are not known.



Bonder MJ, et al. The influence of a short-term gluten-free diet on the human gut microbiome. *Genome Med* 2016;8:45  
McIntosh K, et al. FODMAPs alter symptoms and the metabolome of patients with IBS: a randomised controlled trial. *Gut* 2017;66:1241-51.

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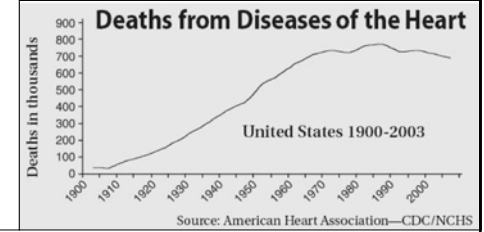
**Table 1 | Examples of foods, nutrients, and dietary patterns that influence human health linked to their effects**

Dietary element	Effect on gut microbiome	Effect on health outcomes mediated by gut microbiome
Low FODMAP diet	Low FODMAP diet increased Actinobacteria; high FODMAP diet decreased abundance of bacteria involved in gas consumption <sup>58</sup>	Reduced symptoms of irritable bowel syndrome <sup>56</sup>
Cheese	Increased <i>Bifidobacteria</i> , <sup>97,98</sup> which are known for their positive health benefits to their host through their metabolic activities. <sup>99</sup> Decrease in <i>Bacteroides</i> and <i>Clostridia</i> , some strains of which are associated with intestinal infections <sup>98</sup>	Potential protection against pathogens. <sup>100</sup> Increased production of SCFA and reduced production of TMAO <sup>99</sup>
Fibre and prebiotics	Increased microbiota diversity and SCFA production <sup>101,102</sup>	Reduced type 2 diabetes <sup>103</sup> and cardiovascular disease <sup>103</sup>
Artificial sweeteners	Overgrowth of Proteobacteria and <i>Escherichia coli</i> . <sup>104</sup> <i>Bacteroides</i> , <i>Clostridia</i> , and total aerobic bacteria were significantly lower, and faecal pH was significantly higher <sup>104</sup>	Induced glucose intolerance <sup>105</sup>
Polyphenols (eg, from tea, coffee, berries, and vegetables such as artichokes, olives, and asparagus)	Increased intestinal barrier protectors ( <i>Bifidobacteria</i> and <i>Lactobacillus</i> ), butyrate producing bacteria ( <i>Faecalibacterium prausnitzii</i> and <i>Roseburia</i> ) and <i>Bacteroides vulgatus</i> and <i>Akkermansia muciniphila</i> . <sup>107</sup> Decreased lipopolysaccharide producers ( <i>E coli</i> and <i>Enterobacter cloacae</i> ) <sup>106</sup>	Gut micro-organisms alter polyphenol bioavailability resulting in reduction of metabolic syndrome markers and cardiovascular risk markers <sup>108</sup>
Vegan	Very modest differences in composition and diversity in humans and strong differences in metabolomic profile compared with omnivore diet in humans <sup>10</sup>	Some studies show benefit of vegetarian over omnivore diet, <sup>109</sup> others fail to find a difference <sup>110</sup>

Valdes AM, et al. Role of gut microbiota in nutrition and health. *British Medical Journal* 2018;361:j2179

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## Animal/Saturated Fat and Heart Disease



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## COMPARISON OF DIETARY FATS AND OILS

Source: Composition of Foods: Fats and Oils, Agriculture Handbook No. 8-4, United States Department of Agriculture, 1979.

Type of Fat/Oil	Cholesterol (mg)	Fat Content (% of total)				
Coconut Oil	0		87		6	2
Butter	33			29	4	5
Cocoa Butter	0	62		33	3	4
Beef Tallow	14	50		42	4	4
Palm Oil	0	49		37	9	5
Lard	12	39	45		11	5
Chicken Fat	11	30	45		21	4
Cottonseed Oil	0		18		52	
Rice Bran Oil	0	20	39		35	6
Peanut Oil	0	17	46		32	5
Margarine, stick	0	15	37		25	23
Soybean Oil	0	14	23		58	5
Sesame Oil	0	14	40		42	6
Olive Oil	0	14		74		8
Corn Oil	0	13	24		59	4
Sunflower Oil	0	10	20		66	4
Safflower Oil	0	9	12		75	4
Canola Oil (rapeseed)	0	5	66		24	5

KEY:
<span style="display:inline-block; width:10px; height:10px; background-color:gray; border:1px solid black;"></span> Saturated Fat
<span style="display:inline-block; width:10px; height:10px; background-color:lightgray; border:1px solid black;"></span> Monounsaturated Fat
<span style="display:inline-block; width:10px; height:10px; background-color:lightgray; border:1px solid black;"></span> Polyunsaturated Fat
<span style="display:inline-block; width:10px; height:10px; background-color:white; border:1px solid black;"></span> Other Components



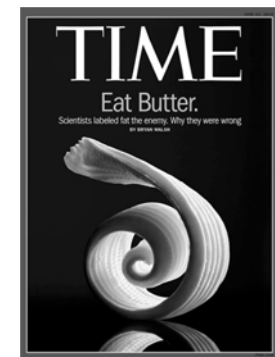
University of Nevada  
Cooperative Extension

Sections CAN Curriculum, N-1 Handbook

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## Saturated Fat Debate

- Three large meta analyses (21 studies, 12 studies, and 76 studies) **failed to show significant evidence that saturated fat increases risk for heart disease.**
- Failed to find significant evidence that **increasing polyunsaturated fats and decreasing saturated fats lowers heart risk.**
- ***This does not mean gorging on saturated fats....***



Siri-Tarino, *Am 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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## Dietary Fat and Cancer: Systematic Review

- **No associations** found for prostate, esophageal, gastric, renal, bladder, lung, skin, or postmenopausal breast cancer by **total intake or types of dietary fat**.
- **May be an association between total dietary fat and premenopausal breast cancer.**
- Limited-suggestive evidence positive association for **ovarian CA** 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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## Keto Diet: Clinical Trial

- **RCT women with ovarian or endometrial cancer** randomly assigned to ketogenic diet (**70:25:5** energy from fat, protein, and carbohydrate) or American Cancer Society diet (high-fiber, low-fat).
- **Body composition, fasting serum insulin and IGF-I** obtained at baseline and at end of 12 weeks.
- Those on keto diet **had statistically significant reduction in fasting insulin and IGF-1 levels, and greater reduction in visceral fat.**

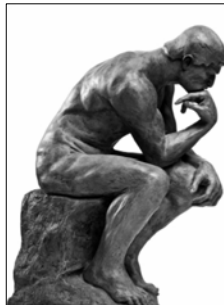
Cohen CW, et al. A Ketogenic Diet Reduces Central Obesity and Serum Insulin in Women with Ovarian or Endometrial Cancer. *J Nutr* 2018; 148(8):1253-1260.

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## Personalized Diets

- Personalized diets based on individual's genome to reduce disease risk is one of the biggest opportunities and challenges being discussed in scientific/nutrition community.
- *And it is the future.....*

Corella D, et al. Utilizing nutritional genomics to tailor diets for the prevention of cardiovascular disease: a guide for upcoming studies and implementations. *Expert Rev Mol Diagn* 2017 May;17(5):495-513.



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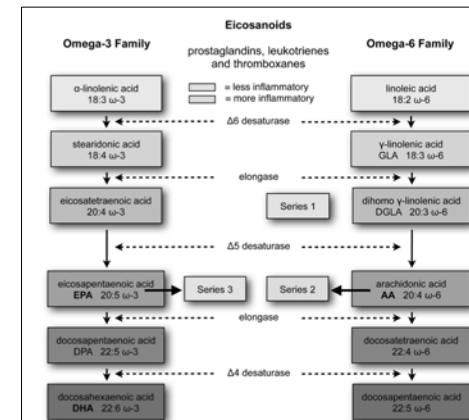
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Name of Oil	Smoke Point	Other
Avocado	520/420 F	Refined/unrefined. Good for deep frying, mild flavor
Rice bran oil	490 F	Good for stir-fries, light taste
Ghee	480 F	Nutty flavor,
Canola oil, high oleic	475 F	Light taste, high in omega 3 fatty acids
Olive oil	468/375 F	Regular/Extra Virgin
Coconut oil	450/350 F	Refined/Virgin
Sunflower oil	440/225 F	Refined/unrefined: Sauté, baking, light flavor, versatile
Peanut oil	440/320 F	Refined/unrefined. Neutral taste.
Grapeseed oil	420 F	Light, good for frying and baking
Almond oil	420 F	Clean flavor, stir fries/sauteeing.
Hazelnut/Macadamia oil	430/413 F	Baking, nutty flavor
Sesame oil	410/350 F	Refined /unrefined. Stir frying, salads
Butter	350 F	Highly versatile, watch smoke point.

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Fatty Acid Family	Name	Structure	Food Source
Omega 3	Alpha-linolenic acid	ALA; 18:3 (n=3)	Walnut, soybeans, flaxseed, canola oil
	Eicosapentaenoic acid	EPA; 20:5 (n=3)	Fatty fish and fish oil
	Docosahexaenoic acid	DHA; 22:6 (n=3)	Fatty fish, fish oils, algal oils, omega 3 eggs
Omega 6	Linolenic acid	LA; 18:2 (n=6)	Corn, safflower, cottonseed, soybean, sunflower oils
	Gamma-linolenic acid	GLA; 18:3 (n=6)	Black currant seed oil, borage seed oil, evening primrose oil
	Arachidonic acid	AA; 20:4 (n=6)	Meat, poultry, eggs
Omega 9	Oleic acid	18:1 (n=9)	Olive oil, grapeseed oil, avocado oil

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## Fish and Seafood



- Excellent source of protein high in **omega 3 fatty acids**. Provide **vitamin D** and **contribute valuable nutrients: selenium, iodine, magnesium, iron and copper**.
  - Fish/seafood have **positive effect on oral health**
  - **Help reduce atherosclerosis and maintain healthy blood pressure**
  - **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**.
  - **Quells inflammation**

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## What About Eggs, Shrimp and Dietary Cholesterol?

- 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-sourced foods.
- No limits put on dietary cholesterol in newest guidelines.
- Egg consumption not associated with an increased risk of heart disease in the *general population*.



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

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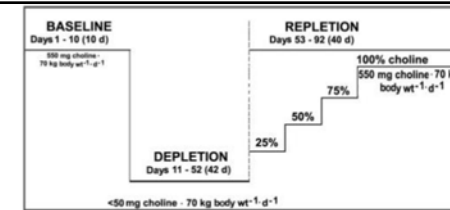
## Eggs Primary Source of Choline

- Choline is a water soluble nutrient in the B-vitamin family that is necessary for preventing non-alcoholic fatty liver disease and crucial during pregnancy and early childhood.
- Deficiency in pregnancy may be associated with permanent changes in brain function that negatively impact intelligence, memory, mood regulation, and stress response in baby.
- New DV set by FDA in 2016: 550 mg per day



Jiang X, et al. *Trends Endocrinol Metab* 2014; 25(5):263-73.  
Wozniak JR, et al. *Nutr Rev* 2013; 33(11):897-904

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- 57 healthy adults 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.
- Liver 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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## Protein Is Important

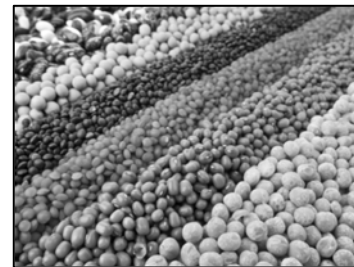
- A recent study conducted in Denmark suggested an inverse relationship between high protein intake and periodontitis.
- Adegboye AR, et al. Calcium, vitamin D, casein and whey protein intakes and periodontitis among Danish adults. *Public Health Nutr*. 2016;19:503-510. doi: 10.1017/S1368890015001202.

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



- Soak larger dried legumes (kidney beans, chickpeas, black beans, red beans) for 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
- 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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## Protein Maintains Healthy Bones

- Framingham Osteoporosis Study found **higher protein intakes** (60-83g/d versus 46g/d) in older men/women (mean 75 years) associated with **37% decreased risk of hip fracture**.
- Systematic review: **29 studies found protein intakes above the current RDA have a beneficial role in preventing hip fractures and BMD loss**.



Misra D, et al. *Osteoporosis Int* 2011; 22(1):345-349.  
 Reinken 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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## Protein Intake and Fracture in Men

- **Osteoporotic Fractures in Men Research** (5,875 men; mean age 73.6 years), **higher protein intake associated with 8% decreased risk of major osteoporotic fracture**.
- Increased dairy protein and non-dairy animal protein associated with **20% and 16% decreased risk of hip fracture**.
- **Plant protein was not associated** with decreased risk of hip fracture in men.



Langsetmo L, et al. The Association Between Protein Intake by Source and Osteoporotic Fracture in Older Men: A Prospective Cohort Study. *J Bone Miner Res* 2017; Mar;32(3):592-600

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## Meat, Poultry, Fish

- Meat, fish and poultry are excellent sources of protein.
- One serving size is roughly the size of a deck of cards and provides 18-27 grams/protein.
- Excellent source of B12 (and other B-vitamins), zinc, iron, and other minerals.
- Ethical issues to consider



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## The Uncertainty of Science

- Recent review: 61 articles; 55 cohorts, 4.2 million participants.
  - Low-certainty evidence: reduction in unprocessed red meat intake of 3 servings/week associated with very small reduction in risk for cardiovascular mortality, stroke, heart attack and type 2 diabetes.
- Review: 118 articles, 56 cohorts, >6 million participants
  - Possible absolute effects of red and processed meat consumption on cancer mortality and incidence are very small; certainty of evidence is low to very low.

Zeraatkar D, et al. Red and Processed Meat Consumption and Risk for All-Cause Mortality and Cardiometabolic Outcomes: A Systematic Review and Meta-analysis of Cohort Studies. *Ann Intern Med*. 2019. DOI: 10.7326/M19-0655

Han MA, et al. Reduction of Red and Processed Meat Intake and Cancer Mortality and Incidence: A Systematic Review and Meta-analysis of Cohort Studies. *Ann Intern Med*. 2019. DOI: 10.7326/M19-0699

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