

## 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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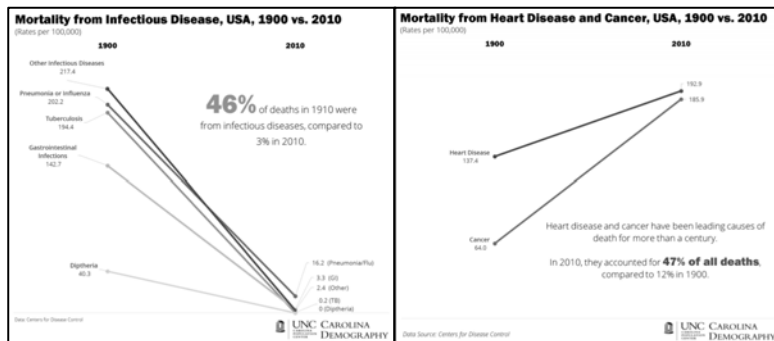
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## The Times They Are A-Changing



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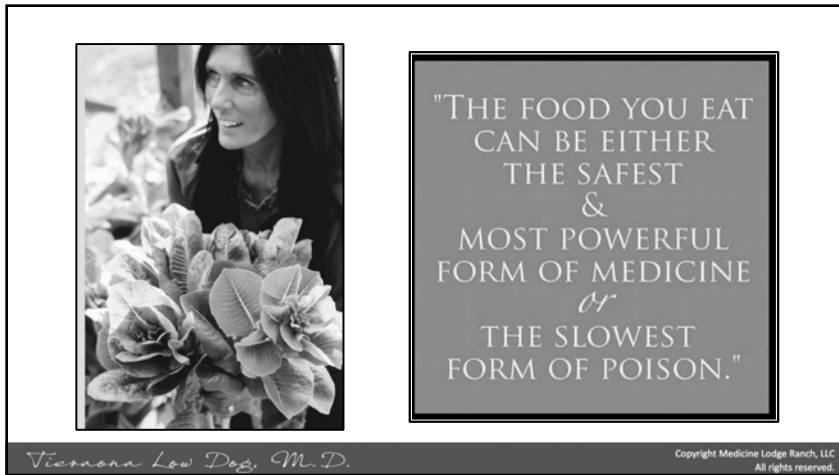
## Epigenetics



- The mapping of **human genome** one of the greatest scientific undertakings of past century, **detailing with incredible accuracy the blueprint of our species.**
- It paved the way for field of **epigenetics**, showing that when it comes to our genes, **nurture** is inextricably linked with **nature**.
- That it is the **way we live our lives - from the moment of conception to our last breath - that influences the expression of our genes.**

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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** 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**.

Garton BJ. Root caries and diabetes: risk assessing to improve oral and systemic health outcomes. *Aust Dent J*. 2012;57(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** associated with an **increased risk of type 2 diabetes.**”
- **Strong link between obesity and periodontal disease.**
- **Oral microbiota significantly altered and less diverse** in obese individuals compared to non-obese controls.

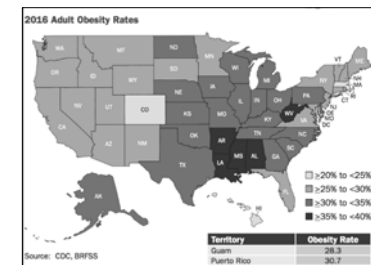
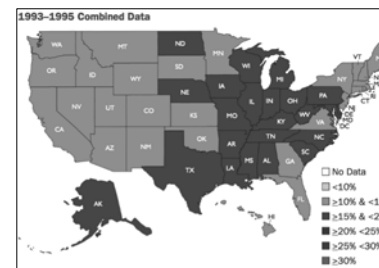


Sanz M, et al. Scientific evidence on the links between periodontal diseases and diabetes: Consensus report and guidelines of the joint workshop on periodontal diseases and diabetes by the International Diabetes Federation and the European Federation of Periodontology. *J Clin Periodontol* 2017 Aug 24.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

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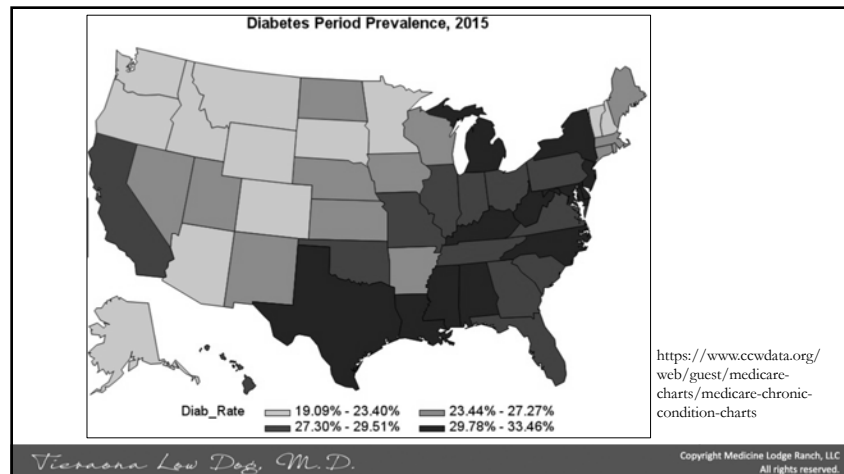
## The Changing Landscape of Adult Weight



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SCIENTIFIC  
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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/](https://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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## Inflammation and Cancer

- **Poorly regulated blood sugar** often accompanied by increased **inflammatory markers** (e.g., interleukin (IL)-1 $\beta$ , IL-6, TNF- $\alpha$ )
- Inflammation is strongly linked with cancer.
- Nuclear factor- $\kappa$ B (**NF- $\kappa$ B**) is one of the most important molecules **linking chronic inflammation to cancer**
- Activation of NF- $\kappa$ B primarily initiated by bacterial endotoxins such as **lipopolysaccharide (LPS)** and **pro-inflammatory cytokines**.
- NF- $\kappa$ B activation occurs in **cancer cells and tumor microenvironments**.

Taniguchi K, et al. NF- $\kappa$ B, inflammation, immunity and cancer: coming of age. *Nature Reviews Immunology* 2018; 18: 309–324

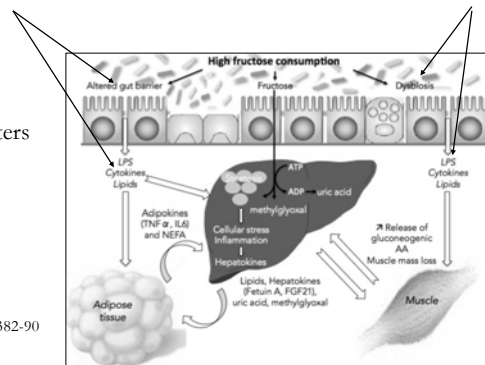
Chang SC, Yang WV. *Crit Rev Oncol Hematol* 2016; 108:146-153

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- **High fructose diet increases intestinal permeability.**
- **Bacterial endotoxin (LPS)** enters bloodstream, **inflammation is activated** by changing **insulin signaling** and triggering **inflammatory mediators**.

Jin R, et al. *Nutrients* 2014; 6:3187–3201  
 Boroni Moreira AP, et al. *Nutr Hosp* 2012; 27(2):382-90  
 Jegatheesan P, et al. *Nutrients* 2017; Mar 3;9(3)



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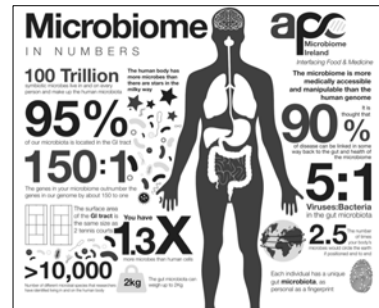


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## Definitions

- **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.

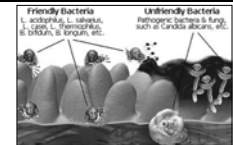


Valdes AM, et al. *BMJ* 2018;361:k2179

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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)

Willis 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?



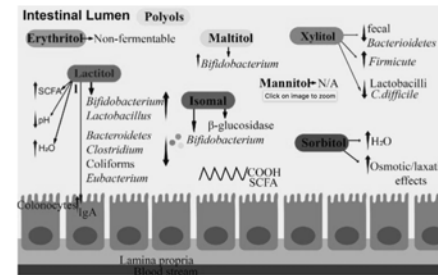
Nettleton JE, et al. Reshaping the gut microbiota: Impact of low calorie sweeteners and the link to insulin resistance? *Physiol Behav* 2016;164(Pt B):488-93.

- 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

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## Gluten Free?

- 21 healthy people had substantially **different gut microbiota** profiles after four weeks on **gluten-free** diet; **significant reduction** in key beneficial microbe species.



Bonder MJ, et al. The influence of a short-term gluten-free diet on the human gut microbiome. *Genome Med* 2016;8:45

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

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>59</sup>
Cheese	Increased <i>Bifidobacteria</i> <sup>57, 58</sup> which are known for their positive health benefits to their host through their metabolic activities. <sup>59</sup> Decrease in <i>Bacteroides</i> and <i>Clostridia</i> , some strains of which are associated with intestinal infections <sup>60</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>22, 101, 102</sup>	Reduced type 2 diabetes <sup>22</sup> and cardiovascular disease <sup>103</sup>
Artificial sweeteners	Overgrowth of <i>Proteobacteria</i> 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>27</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>50</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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Clinical Resource Tool: [www.usprobioticguide.com](http://www.usprobioticguide.com)

[illegible]

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Click next to brand name to see evidence.....

Colic - Colic	I	<p>82. Savino, F., E. Palle, E. Palumeri, R. Oggero, and R. Miniero. "Lactobacillus reuteri (American Type Culture Collection Strain 55730) versus simethicone in the treatment of infantile colic: a prospective randomized study." <i>Pediatrics</i> 119:1 (2007): e124-e130.</p> <p>83. Chau, K., E. Lau, S. Greenberg, S. Jacobson, P. Yazdani-Singeri, N. Verma, and G. Koren. "Probiotics for infantile colic: a randomized, double-blind, placebo-controlled trial investigating <i>Lactobacillus reuteri</i> DSM 17938." <i>The Journal of Pediatrics</i> 166:1 (2015): 74-78.</p> <p>84. Sung, V., H. Miscock, M.L.M. Tang, F.J. Mennan, M.L. Nordin, C. Szatke, R.G. Heine, A. Stock, R.G. Bart, and M. Wake. "Treating infant colic with the probiotic <i>Lactobacillus reuteri</i>: double-blind, placebo-controlled trial." <i>BMJ</i> 348 (2014): g1917.</p> <p>85. Savino, F., L. Cordoso, V. Tarasco, E. Palumeri, R. Calabrese, R. Oggero, S. Roca, and D. Maltucci. "Lactobacillus reuteri DSM 17938 in infantile colic: a randomized, double-blind, placebo-controlled trial." <i>Pediatrics</i> 126:3 (2010): e626-e630.</p>
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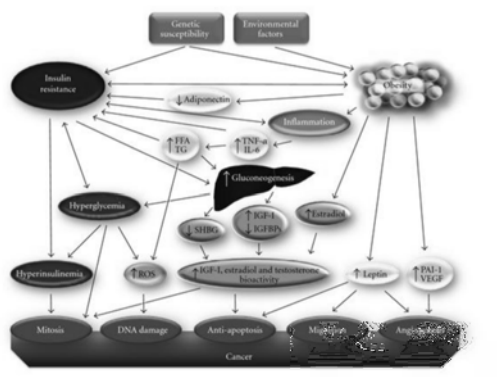
Evidence is ranked using grading system of I, II, III. You can then see the references for your review.

[http://www.usprobioticguide.com/PBCPediatricHealth.html?utm\\_source=pediatric\\_ind&utm\\_medium=civ&utm\\_campaign=USA\\_CHART](http://www.usprobioticguide.com/PBCPediatricHealth.html?utm_source=pediatric_ind&utm_medium=civ&utm_campaign=USA_CHART) Accessed January 17, 2019

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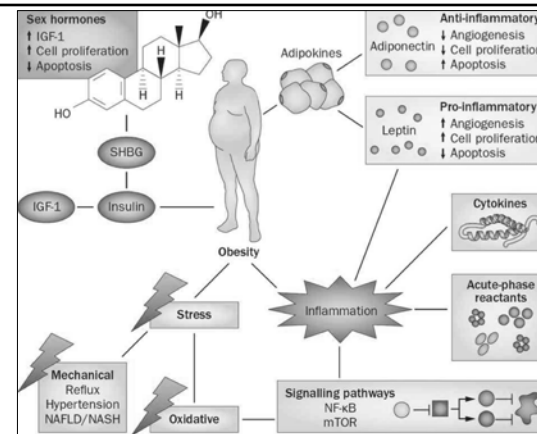
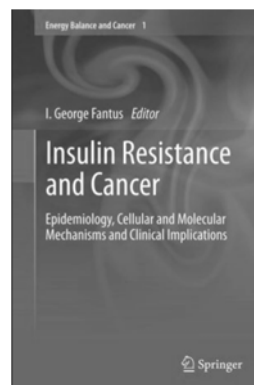
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## Insulin Resistance and Cancer

- Strong association: **higher BMI in adolescence and increased cancer risk in adulthood**
- Obesity and metabolic syndrome **associated with prostate cancer development and poorer outcomes for cancer survivors.**
- **Hyperinsulinemia:** increased risk for **breast cancer, double the risk for endometrial cancer; and increased risk for prostate cancer development, progression and aggressiveness.**

Di Sebastiano, KM, et al. Glucose impairments and insulin resistance in prostate cancer: the role of obesity, nutrition and exercise. *Obesity Reviews* 2018; 19: 1008–1016.  
 Kabat, GC, et al. Serum glucose and insulin and risk of cancers of the breast, endometrium, and ovary in postmenopausal women. *Eur J Cancer Prev* 2018; 27(3): 261-268  
 Weirauch-Blüher, et al. Childhood obesity: increased risk for cardiometabolic disease and cancer in adulthood. *Metabolism* 2019; 92: 147-52

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## Factors That Drive Inflammation and Insulin Resistance

- **Sedentary lifestyle**, lack of exercise
- Pattern of **central obesity**
- **Western-dietary pattern, high fructose**
- Prolonged psychosocial **stress**
- **Environmental exposures** (smoke, toxins, chemicals)
- Alterations in **oral and gut flora and intestinal permeability**

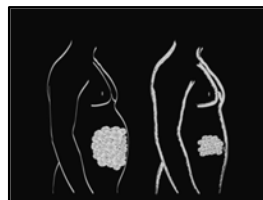
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## Obesity and Cancer: What is The Connection?

- 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**



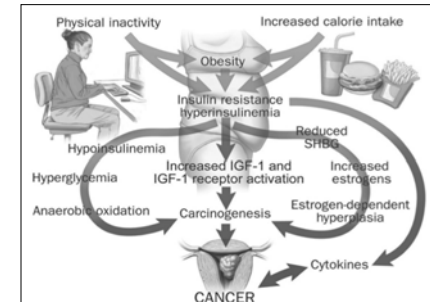
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## Obesity and Insulin Growth Factors

- 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)

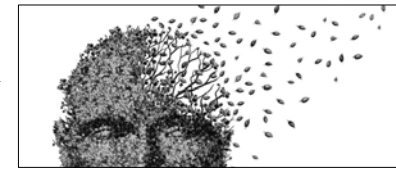
- Anti-inflammatory diet may reduce **sub-chronic inflammation** and improve **cardiovascular, metabolic, and neurologic parameters**.
- **Dietary Inflammatory Index** based on measuring inflammation in the body in response to specific foods (1900 studies)
- **Higher DII scores increased risk of oral/pharyngeal 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(5):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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## Inflammation & Memory



- Researchers evaluated inflammatory potential of diet in relation to mild cognitive impairment/dementia risk using **DII during 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.**

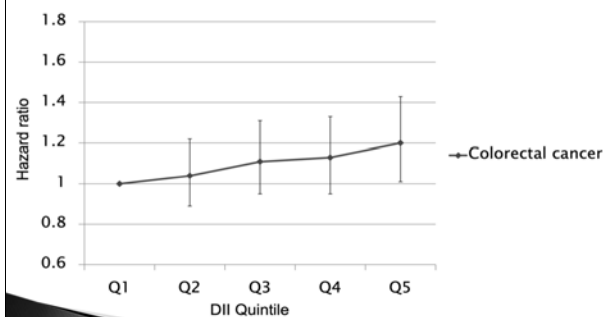
Hayden KM, et al. The association between an inflammatory diet and global cognitive function and incident dementia in older women: The Women's Health Initiative Memory Study. *Alzheimers Dement* 2017 May 19. pii: S1552-5260(17)30185-1.

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## Risk of colorectal cancer across quintiles of the DII: Iowa Women's Health Study



CE  
CANCER PREVENTION  
& CONTROL PROGRAM

Shivappa et al. 2014 CEBP

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Users receive a personalized report that includes their DII® score, dietary recommendations and next steps for reducing the inflammatory potential of one's diet.

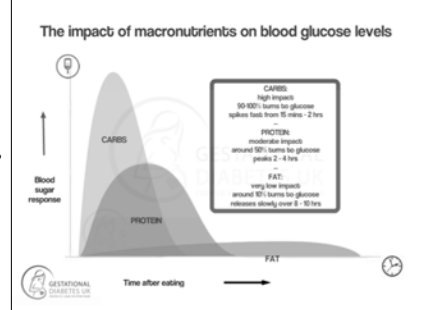
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## Carbohydrates

- 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.*

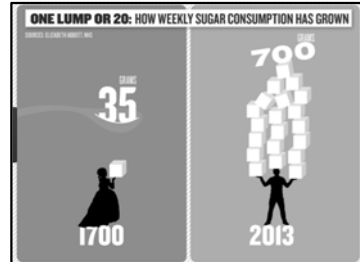


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## Too Little Fiber, Too Much Sugar



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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Food	Serving Size	Glycemic Load	Food	Serving Size	Glycemic Load
Grapefruit	¼ 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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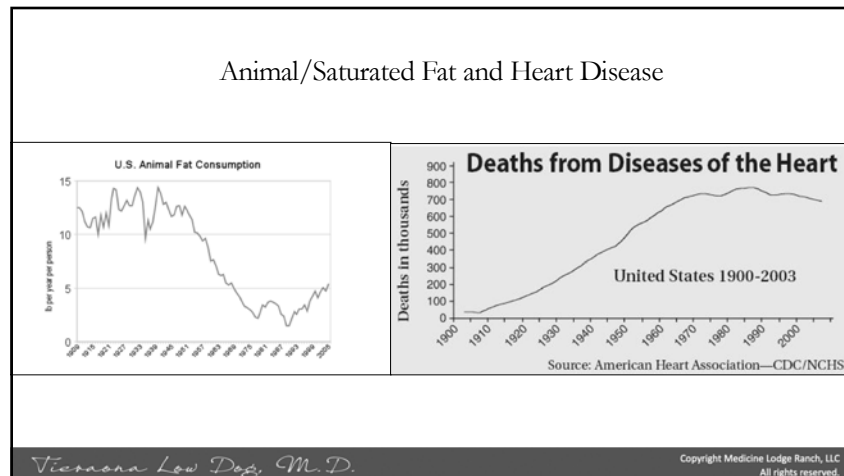
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### Low/High GI Meals

GI = 80 GL = 32

GI = 61 GL = 12

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Source: American Heart Association—CDC/NCHS

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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
Butter	33	62
Cocoa Butter	0	60
Beef Tallow	14	50
Palm Oil	0	49
Lard	12	39
Chicken Fat	11	30
Cottonseed Oil	0	30
Rice Bran Oil	0	29
Peanut Oil	0	17
Margarine, stick	0	15
Soybean Oil	0	14
Sesame Oil	0	14
Olive Oil	0	14
Corn Oil	0	13
Sunflower Oil	0	10
Safflower Oil	0	9
Canola Oil (rapeseed)	0	5

KEY:

- Saturated Fat
- Monounsaturated Fat
- Polyunsaturated Fat
- Other Components

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Series CAN Curriculum, N-1 Handout

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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: Saut�, 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.

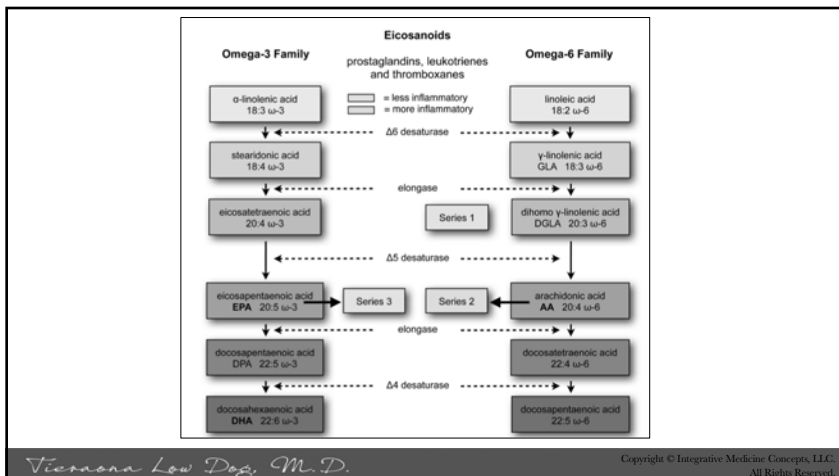
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Fatty Acid Family	Name	Structure	Food Source
Omega 3	Alpha-linolenic acid	ALA; 18:3 (n=3)	Walnut, soybeans, flaxseed, canola oil
	Eicosapentaenoic acid	EPA; 20:5 (n=3)	Fatty fish and fish oil
	Docosahexaenoic acid	DHA; 22:6 (n=3)	Fatty fish, fish oils, 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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## 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, *Amer J Clin Nutr* 2010; 91 (3): 535-46.  
Schwingshacke 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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## 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

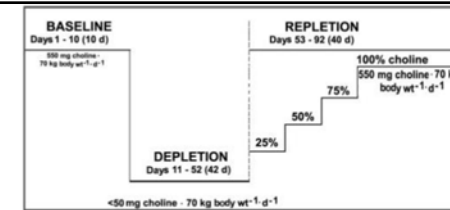
- Choline water soluble nutrient in B-vitamin family necessary for preventing non-alcoholic fatty liver disease and crucial during pregnancy and early childhood.
- Deficiency in pregnancy may be associated with permanent changes in brain function that negatively impact intelligence, memory, mood regulation, 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

- 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.

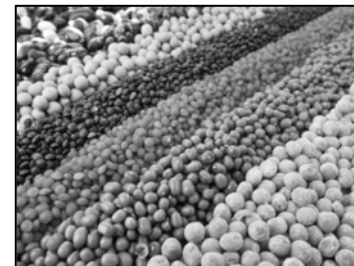
Food	Portion Size	Protein (g) (approximate)
Meat, fish, or poultry	75g (2 ½ oz) / 125 mL (½ cup)	21
Firm tofu	150g / 175 mL (¾ cup)	21
Egg, chicken	2 large	13
Cheese	50 g (1 ½ oz)	12
Fortified soy beverage	250 mL (1 cup)	6-8.5
Cooked dried beans, peas, or lentils	175 mL (¾ cup)	12
Cow's milk	250 mL (1 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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