Nutrition, Dietary Supplements and Their Relationship to Oral Health

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

Helpful Health Resources

Medicine Lodge Ranch

Dr. Low Dog has created a new online classroom called Medicine Lodge Ranch to expand the reach of her natural medicine school located at her ranch in the heart of New Mexico’s Santa Fe National Forest.

Through our online courses, digital educational tools, and hands-on intensive classes at our ranch, you will have access to the resources to make yourself & your family both healthier and more whole. Learn more.

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Nutrition for the Dental Team

The Rendezvous Conference – handouts: Nutrition and Dietary Supplements
Women’s Health

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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.


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.

Obesity and Periodontal Disease

• There is strong link between obesity and periodontal disease in adults, children and various global geographic locations.
• NHANES: overweight person with central obesity, prevalence of tooth loss increased 31%, compared to person with similar BMI but no central obesity, and increased by 40%, compared with normal-weight person without central obesity.
• Oral microbiota significantly altered and less diverse in obese individuals compared to non-obese controls.


The Changing Landscape of Adult Weight

https://www.ccwdata.org/web/guest/medicare-charts/medicare-chronic-condition-charts
Intermittent Fasting

- In our development as a species, food sources were sometimes abundant and sometimes scarce.
- Periods of eating and periods of fasting probably the norm. Theory of thrifty genes states these fluctuations are required for optimal metabolic function.
- Intermittent fasting is one way to replicate this evolutionary pattern.
- Scientific evidence suggests our bodies respond to intermittent fasting in ways that may ultimately protect us from diseases of aging by improving cardiovascular and cognitive function, as well as risk factors for developing metabolic diseases.


- There are many variations. Two of the most popular are:
  - 16/8 method – restrict the time you eat to 8 hours/day and fast for 16 hours in between
  - 5:2 diet – eat only 500-600 calories on two non-consecutive days, and eat normally the other five days
Pilot Study: Intermittent Fasting 16:8

- 23 obese people 16:8 IF for 12 weeks, 23 matched controls.
- Two week baseline run-in.
- IF group had increased weight loss (p<0.001), decreased total calories and lower systolic blood pressure, compared to controls.


IF Impact on Metabolism

- IF lowers inflammatory mediators in healthy adults during Ramadan.
- Some studies show alternate day fasting improves insulin sensitivity, reduces triglycerides and increases HDL-C.
- More research needed.

Fasting-Mimicking Diets (FMD)

- 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.

Inflammation and the Oral Cavity

- Inflammation and periodontal disease well established.
- **Dietary Inflammatory Index** based on measuring inflammation in the body in response to specific foods (1900 studies)
- Tobacco and alcohol major risk factors for oral and pharyngeal cancers, but in large cohort, *higher DII scores increased risk of oral/pharyngeal cancer.*
- NHANES – those with highest DII score had **16% more teeth lost compared to those with lowest scores.**


### Inflammatory Food Ratings

<table>
<thead>
<tr>
<th>FOOD</th>
<th>SERVING SIZE</th>
<th>SERVING SIZE (GRAMS)</th>
<th>IF RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGAVE NECTAR</td>
<td>1 TBSP</td>
<td>21</td>
<td>-74</td>
</tr>
<tr>
<td>ALMOND BUTTER</td>
<td>¼ CUP</td>
<td>64</td>
<td>100</td>
</tr>
<tr>
<td>CHEESE, CHEDDAR</td>
<td>1 OUNCE</td>
<td>28.35</td>
<td>-20</td>
</tr>
<tr>
<td>CHICKEN BREAST, RSTD</td>
<td>3 OUNCES</td>
<td>85</td>
<td>-19</td>
</tr>
<tr>
<td>MILK, WHOLE</td>
<td>1 CUP</td>
<td>246</td>
<td>-46</td>
</tr>
<tr>
<td>OLIVE OIL</td>
<td>1 TBSP</td>
<td>14</td>
<td>74</td>
</tr>
<tr>
<td>ONIONS, COOKED</td>
<td>½ CUP</td>
<td>105</td>
<td>240</td>
</tr>
<tr>
<td>RICE, WHITE</td>
<td>1 CUP</td>
<td>158</td>
<td>-153</td>
</tr>
<tr>
<td>SPINACH</td>
<td>1 CUP</td>
<td>30</td>
<td>75</td>
</tr>
<tr>
<td>SALMON, SOHO BAKED</td>
<td>3 OUNCES</td>
<td>85</td>
<td>450</td>
</tr>
<tr>
<td>TURMERIC</td>
<td>½ TSP</td>
<td>1.5</td>
<td>338</td>
</tr>
</tbody>
</table>

200 or higher | Strongly anti-inflammatory
101 to 200 | Moderately anti-inflammatory
0 to 100 | Mildly anti-inflammatory
-1 to -100 | Mildly inflammatory
-101 to 200 | Moderately inflammatory
-201 or lower | Strongly inflammatory
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.
Too Little Fiber, Too Much Sugar

Sugars contribute to dental caries and periodontal disease: bacteria ferment them and produce acid, demineralizing tooth structure. 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.


Glycemic Index/Load

- **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.

## Glycemic Load

### Individual Food Portion

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>0-10</th>
<th>Moderate</th>
<th>11-19</th>
<th>High</th>
<th>20+</th>
</tr>
</thead>
</table>

### Whole Day

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>&lt; 80</th>
<th>Moderate</th>
<th>80-120</th>
<th>High</th>
<th>&gt;120</th>
</tr>
</thead>
</table>

### Food Serving Size Glycemic Load

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

• Some people have an autoimmune condition known as celiac disease, where their immune system interacts negatively with gluten, a storage protein in cereal grains. The ONLY treatment is complete avoidance of gluten.
  • Celiac symptom checklist: [celiac.org/celiac-disease/resources/checklist/]
• Other individuals may be allergic to wheat, not all grains, just wheat. Symptoms can include GI (indigestion, cramps, diarrhea, nausea), respiratory (stuffy/runny nose) and/or skin (hives or rash). Necessary to AVOID wheat.
• And still others appear to have a gluten sensitivity, where “symptoms” improve when they eliminate gluten from their diet. This is less clear…..

Foods to Avoid with Celiac

- Atta (chapatti flour)
- Barley (flakes, flour, pearl)
- Beer, ale, lager
- Breading and bread stuffing
- Brewers yeast
- Bulgur
- Communion wafers
- Couscous
- Croutons
- Dinkel (also known as spelt) *
- Durum *
- Einkorn *
- Emmer *
- Farina
- Farro (also known as spelt) *
- Fu **
- Graham flour
- Hydrolyzed wheat protein
- Kamut *
- Malt, malt extract, malt syrup and malt flavoring, malt vinegar
- Malted milk
- Matzoh, matzoh meal
- Modified wheat starch
- Oatmeal, oat bran, oat flour and whole oats ***
- Pastas
- Rye bread and flour
- Seitan ****
- Semolina
- Spelt (also known as farro or faro, dinkel) *
- Triticale
- Wheat bran
- Wheat flour
- Wheat germ
- Wheat starch
- *All types of wheat
- **Dried gluten product
- ***Often contaminated with wheat and barley
- ****Meat like dish made with gluten

From [www.celiac.ca](http://www.celiac.ca)
Gluten Free

Some of My Favorite Gluten Free Cookbooks

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Carbs to Fiber Ratio

- Total carbs to dietary fiber
- Divide the grams of carbohydrates by 10.
- Corn flakes far left, Kashi GoRise cereal right.
  - >10:1 is poor
  - <10:1 is good
  - <6:1 is great
Consider Ancient Grains

- Teff, einkorn, emmer, amaranth, millet, quinoa, black rice, black barley, and spelt.
- Generally, they have more protein, fiber, and vitamins than modern grains.
- People who do not have celiac but have wheat intolerance often can consume ancient grains.

What is the Low FODMAP Diet?

- FODMAP are highly fermentable but poorly absorbed short-chain carbohydrates and polyols. Studies have shown that in some people, they can be a big cause of irritable bowel syndrome (IBS).
  - Gas, cramping, diarrhea
- Studies show that by eliminating wheat derivatives, lactose-containing dairy products, many vegetables and beans, and several types of fruits can improve IBS.

**FODMAP**

**Fermentable:** Fermentable carbohydrates are sugars that are broken down and digested by bacteria in our intestines, producing gas and other by-products.

**Oligosaccharides:** Oligosaccharides are short chains of carbohydrate molecules linked together.
- Fructans (a chain of fructose molecules) and galacto-oligosaccharides (a chain of galactose molecules) are oligosaccharides that humans cannot break down and properly absorb in the small intestine.

**Disaccharides:** Disaccharides are two carbohydrate molecules linked together.
- Lactose, the sugar found in milk and dairy products, is a disaccharide composed of glucose and galactose.
  
  Lactose must be broken down by the digestive enzyme lactase before it can be absorbed in the small intestine. In people with lactose intolerance, the level of lactase enzyme is insufficient to properly digest lactose and lactose travels to the colon where fermentation occurs.

**Monosaccharides:** Monosaccharides are single carbohydrate molecules.
- Fructose, the sugar found in many fruits and some vegetables, is a monosaccharide and does not require any digestion before it is absorbed. When foods containing equal amounts of fructose and glucose are eaten, glucose helps fructose to be completely absorbed.

However, when fructose is present in greater quantities than glucose, fructose absorption depends upon the activity of sugar transporters located in the intestinal wall. The ability to absorb excess fructose varies from person to person. In people with fructose malabsorption, the capacity of sugar transporters is limited and excess fructose travels to the colon where fermentation occurs.

**Polyols:** Polyols, or sugar alcohols, are a type of carbohydrate that humans can only partially digest and absorb in the small intestine.
- Polyols, such as sorbitol, mannitol, xylitol, maltitol and isomalt, mimic the sweetness of sucrose (table sugar), however, because their absorption is much slower, only a small amount of what is eaten is actually absorbed.

Polyols are often used as low-calorie sweeteners in sugar-free and diet products.

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**LOW FODMAP GROCERY LIST**

<table>
<thead>
<tr>
<th>GRAINS</th>
<th>NUT BUTTER</th>
<th>NUTS/SEEDS</th>
<th>PRODUCE</th>
<th>VEGETABLES</th>
<th>DAIRY</th>
<th>OILS/CONDIMENTS</th>
<th>SNACKS+SWEETS</th>
<th>BEVERAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glutens Free Brown Rice</td>
<td>Almond Butter</td>
<td>Almond Butter (plain)</td>
<td>Apples</td>
<td>Beets</td>
<td>Milk</td>
<td>Sunflower Oil</td>
<td>Popcorn</td>
<td>Cranberry Juice</td>
</tr>
<tr>
<td>Glutens Free White Rice</td>
<td>Almond Butter</td>
<td>Almond Butter (plain)</td>
<td>Beets</td>
<td>Broccoli</td>
<td>Milk</td>
<td>Olive Oil</td>
<td>Walnuts</td>
<td>Grapefruit Juice</td>
</tr>
<tr>
<td>Glutens Free Oatmeal</td>
<td>Almond Butter</td>
<td>Almond Butter (plain)</td>
<td>Broccoli</td>
<td>Carrots</td>
<td>Milk</td>
<td>Canola Oil</td>
<td>Pecans</td>
<td>Orange Juice</td>
</tr>
<tr>
<td>Gluten Free Corn Flour</td>
<td>Almond Butter</td>
<td>Almond Butter (plain)</td>
<td>Carrots</td>
<td>Cucumbers</td>
<td>Milk</td>
<td>Sesame Oil</td>
<td>Cashews</td>
<td>Apple Juice</td>
</tr>
<tr>
<td>Gluten Free Quinoa</td>
<td>Almond Butter</td>
<td>Almond Butter (plain)</td>
<td>Cucumbers</td>
<td>Eggplant</td>
<td>Milk</td>
<td>Coconut Oil</td>
<td>Almonds</td>
<td>Orange Juice</td>
</tr>
<tr>
<td>Gluten Free Buckwheat</td>
<td>Almond Butter</td>
<td>Almond Butter (plain)</td>
<td>Endive</td>
<td>Garlic</td>
<td>Milk</td>
<td>Grapeseed Oil</td>
<td>Almonds</td>
<td>Apple Juice</td>
</tr>
<tr>
<td>Gluten Free Teff</td>
<td>Almond Butter</td>
<td>Almond Butter (plain)</td>
<td>Ginger</td>
<td>Green Beans</td>
<td>Milk</td>
<td>Olive Oil</td>
<td>Almonds</td>
<td>Orange Juice</td>
</tr>
<tr>
<td>Gluten Free Amaranth</td>
<td>Almond Butter</td>
<td>Almond Butter (plain)</td>
<td>Green Beans</td>
<td>Green Peppers</td>
<td>Milk</td>
<td>Olive Oil</td>
<td>Almonds</td>
<td>Orange Juice</td>
</tr>
<tr>
<td>Gluten Free Kamut</td>
<td>Almond Butter</td>
<td>Almond Butter (plain)</td>
<td>Green Peppers</td>
<td>Green Beans</td>
<td>Milk</td>
<td>Olive Oil</td>
<td>Almonds</td>
<td>Orange Juice</td>
</tr>
<tr>
<td>Gluten Free Kasha</td>
<td>Almond Butter</td>
<td>Almond Butter (plain)</td>
<td>Green Beans</td>
<td>Green Beans</td>
<td>Milk</td>
<td>Olive Oil</td>
<td>Almonds</td>
<td>Orange Juice</td>
</tr>
</tbody>
</table>

**Spices**

- Cumin
- Coriander
- Turmeric
- Ginger
- Black Pepper
- Oregano
- Cayenne Pepper
- Jalapeno Pepper

**Oils/Condiments**

- Olive oil
- Canola oil
- Sesame oil
- Grapeseed oil
- Olive oil

**Snacks+Sweets**

- Almonds
- Cashews
- Pecans
- Walnuts
- Popcorn
- Granola bars
- Trail mix

**Beverages**

- Cranberry juice
- Orange juice
- Apple juice
- Grapefruit juice

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*[www.CDHF.ca](http://www.CDHF.ca)*
Great Resources

Use an App

Viennona Low Dog, M.D.

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Science

GUT MICROBES AND CANCER

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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

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.
- **Produce vitamins** and assist in building **amino acids**.
- Help maintain **blood pressure** (complex carbs→formate→impact salt processing)

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.

Sugar Substitutes – Better?

- 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.


Stevia and the Polyols

- 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.

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.


https://irishhealthstores.com/news-events/fermented-foods/
**Table 1 | Examples of foods, nutrients, and dietary patterns that influence human health linked to their effect on gut microbiome**

<table>
<thead>
<tr>
<th>Dietary element</th>
<th>Effect on gut microbiome</th>
<th>Effect on health outcomes mediated by gut microbiome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low FODMAP diet</td>
<td>Low FODMAP diet increased Actinobacteria, high FODMAP diet decreased abundance of bacteria involved in gas consumption(^{18})</td>
<td>Reduced symptoms of irritable bowel syndrome(^{14})</td>
</tr>
<tr>
<td>Cheese</td>
<td>Increased <em>Bifidobacteriaceae</em>,(^{49})(^{50}), which are known for their positive health benefits to their host through their metabolic activities.(^{59}) Decrease in <em>Bacteroides</em> and <em>Clostridia</em>, some strains of which are associated with intestinal infections(^{48})</td>
<td>Potential protection against pathogens.(^{100}) Increased production of SCFA and reduced production of TMAO(^{99})</td>
</tr>
<tr>
<td>Fibre and prebiotics</td>
<td>Increased microbiota diversity and SCFA production(^{43})(^{101})(^{102})</td>
<td>Reduced type 2 diabetes(^{57}) and cardiovascular disease(^{103})</td>
</tr>
<tr>
<td>Artificial sweeteners</td>
<td>Overgrowth of Proteobacteria and <em>Escherichia coli</em>.(^{100}) <em>Bacteroides</em>, <em>Clostridia</em>, and total aerobes bacteria were significantly lower, and faecal pH was significantly higher(^{12})</td>
<td>Induced glucose intolerance(^{105})</td>
</tr>
<tr>
<td>Polyphenols (eg, from tea, coffee, berries, and vegetables such as artichokes, olives, and asparagus)</td>
<td>Increased intestinal barrier protectors (<em>Bifidobacteria</em> and <em>Lactobacillus</em>), butyrate producing bacteria (<em>Faecalibacterium prausnitzii</em> and <em>Roseburia</em>), and <em>Bacteroides vulgatus</em> and <em>Akromonas muciphila</em>.(^{100}) Decreased lipopolysaccharide producers (<em>E. coli</em> and <em>Enterobacter cloacae</em>).(^{106})</td>
<td>Gut micro-organisms alter polyphenol bioavailability resulting in reduction of metabolic syndrome markers and cardiovascular risk markers(^{108})</td>
</tr>
<tr>
<td>Vegan</td>
<td>Very modest differences in composition and diversity in humans and strong differences in metabolomic profile compared with omnivore diet in humans(^{50})</td>
<td>Some studies show benefit of vegetarian over omnivore diet,(^{109}) others fail to find a difference(^{110})</td>
</tr>
</tbody>
</table>

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
Protein

• Study conducted in Denmark suggested an inverse relationship between high protein intake and periodontitis.


### Protein Maintains Healthy Bones

• Framingham Osteoporosis Study: higher protein intakes (60-83g/d versus 46g/d) in men/women (mean 75 years) associated with 37% decreased risk of hip fracture.

• Systematic review 29 studies: protein intakes above current RDA have beneficial role in preventing hip fractures and BMD loss.

<table>
<thead>
<tr>
<th>Food</th>
<th>Portion Size</th>
<th>Protein (g) (approximate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meat, fish, or poultry</td>
<td>75g (2 3/4 oz) / 125 mL (1/2 cup)</td>
<td>21</td>
</tr>
<tr>
<td>Firm tofu</td>
<td>150g / 175 mL (4/1 cup)</td>
<td>21</td>
</tr>
<tr>
<td>Egg, chicken</td>
<td>2 large</td>
<td>13</td>
</tr>
<tr>
<td>Cheese</td>
<td>50 g (1 3/4 oz)</td>
<td>12</td>
</tr>
<tr>
<td>Fortified soy beverage</td>
<td>250 mL (1 cup)</td>
<td>6-8.5</td>
</tr>
<tr>
<td>Cooked dried beans, peas, or lentils</td>
<td>175 mL (4/1 cup)</td>
<td>12</td>
</tr>
<tr>
<td>Cow’s milk</td>
<td>250 mL (1 cup)</td>
<td>9</td>
</tr>
<tr>
<td>Yogurt</td>
<td>175 mL (4/1 cup)</td>
<td>8</td>
</tr>
<tr>
<td>Peanut butter or other nut spread</td>
<td>30 mL (2 Tbsp)</td>
<td>8</td>
</tr>
<tr>
<td>Nuts or seeds</td>
<td>60 mL (4/1 cup)</td>
<td>7</td>
</tr>
<tr>
<td>Bread</td>
<td>1 slice (35g)</td>
<td>3</td>
</tr>
<tr>
<td>Cereals, cold</td>
<td>30 g</td>
<td>3</td>
</tr>
<tr>
<td>Cereals, hot</td>
<td>175 mL (4/1 cup)</td>
<td>3</td>
</tr>
<tr>
<td>Pasta or rice</td>
<td>125 mL (4/1 cup)</td>
<td>3</td>
</tr>
<tr>
<td>Vegetables</td>
<td>125 mL (4/1 cup) or 250 mL (1 cup) lettuce</td>
<td>2</td>
</tr>
<tr>
<td>Fruit</td>
<td>1 fruit or 125 mL (4/1 cup)</td>
<td>1</td>
</tr>
</tbody>
</table>

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 associated with **20% decreased risk**, and non-dairy animal protein with a **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

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

• 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.


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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....*
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.


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.**

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.


Real State of Our Nutrition

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

Vienna Low Dog, M.D.
Case: 41-year old Female

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


Laboratory Tests & After Treatment

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

MCV = mean corpuscular volume; RBC = red blood cell; RDW = red cell distribution width.
Vitamin B12 Deficiency

- Institute of Medicine recommends adults > 50 yrs get B12 from fortified foods/supplements
- Deficiency: tingling/numbness in hands and feet, fatigue, shortness of breath, loss of appetite, joint pain, depression, loss of taste and smell, cognitive impairment, and dementia.
- 2015 meta-analysis: 80% increased risk B12 deficiency after 10 months of regular PPI use.
- Meta analysis 29 studies: 245% increased risk B12 deficiency metformin use. Low B12 shown to increase progression of diabetic neuropathy.


Proton Pump Inhibitors and Fracture

- FDA concluded patients taking high doses of PPIs and/or taking one year or more are at highest risk. Warning label mandated.
- Recent study of adverse event reporting at FDA showed that PPI also increases fracture of ribs and other sites.
- American Geriatrics Society recommends against use of PPIs for longer than eight weeks in older adults, except in high-risk patients, due to the potential risk of bone loss, fractures and *C. difficile* infection

Vitamin B6
(Pyroxidal-5-Phosphate)

• Involved in production of serotonin, dopamine, melatonin, hemoglobin, protein metabolism, energy production, and more.

• Deficiency: depression; impaired cognition, attention, memory, and sleep.

• OTC analgesics and OCPs lower B6 levels.

• 30 million Americans deficient in B6.

• Vancouver BC; 12.4% prevalence of B6 deficiency and suboptimal status in women 19-32 years of age.

• Need ~6 mg per day to maintain normal serum level.

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

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

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

- Marked differences between women in menstrual blood loss (10-250 mL per menses).
- Low iron levels are the most common cause of anemia in adolescent girls and can be very detrimental to mood and cognition, as well as physical well-being.
- Heavy menstrual bleeding is a significant risk for iron deficiency and is often overlooked.
- Data from cycle 2 (2009 to 2011) of Canadian Health Measures Survey, depleted iron stores were found in 13% of females aged 12-19 and 9% of females aged 20-49.

Iron

To Get 18mg of Iron in Food

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

Vitamin C

- Potent antioxidant, activates folate, cofactor in synthesis of carnitine, thyroxin, serotonin, norepinephrine, dopamine and immune cells
- Levels decline rapidly during periods of emotional/physical strain, and illness.
- Deficiency: skin changes, easy bruising, gum disease, loose teeth, slow healing wounds, dry mouth, dry eyes. emotionally labile.
- Inflammation of interdental and marginal gingiva followed by bleeding, ulceration, and bad breath.
Calcium and Vitamin D: Fracture

- Meta-analysis National Osteoporosis Foundation: eight studies (n= 30,970 participants): *all studies showed calcium plus vitamin D supplementation produced statistically significant 15% reduced risk of total fractures and 30% reduced risk of hip fractures.*
- Calcium, vitamins D, K2 and magnesium contribute independently and collectively to bone health.

Many of Us Are Deficient

• Serum 25(OH)D level used to evaluate high-risk folks
  • Insufficiency defined as 21-29 ng/mL
  • Deficiency defined as <20 ng/mL
• **66.8 million Americans** 1 year and older vit D levels between 12-20 ng/ml
• **23 million Americans** 1 year and older vit D levels less than 12 ng/ml

CDC 2nd National Report on Biochemical Indicators of Diet and Nutrition in the U.S. Population
*J Clin Endocrinol Metab* 2011; 96(7):1911-30

Viviana Low Dog, M.D.

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Vitamin D and Respiratory Infection

• Acute respiratory infection kills ~2.65 million people/year.
• 25 eligible randomized controlled trials (n=10,933, aged 0-95 years).
• Vitamin D supplementation reduced risk of acute respiratory infection among all participants (NNT=33) and those who were vitamin D deficient experienced the most benefit (NNT=4).


Viviana Low Dog, M.D.
Magnesium

- Low magnesium associated with type 2 diabetes, metabolic syndrome, inflammation, high blood pressure, atherosclerotic vascular disease, sudden cardiac death, osteoporosis, migraine headache, asthma, and colon cancer.

- **Insulin resistance decreases magnesium** levels and **diabetics** with low magnesium show **more rapid disease progression** and increased risk for diabetes-related complications

- Many benefit from 200-300 mg/d

Zinc and Oral Health

- Zinc necessary for **sense of smell**, which accounts 80% of sense of taste.
- Zinc can help protect taste changes in those undergoing chemotherapy or radiation.
- “moderate quality evidence zinc supplements improve overall taste improvement in patients with zinc deficiency/idiopathic taste disorders.”
- Zinc deficiency detected in 28% of recurrent aphthous stomatitis patients compared to controls.
Resources

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