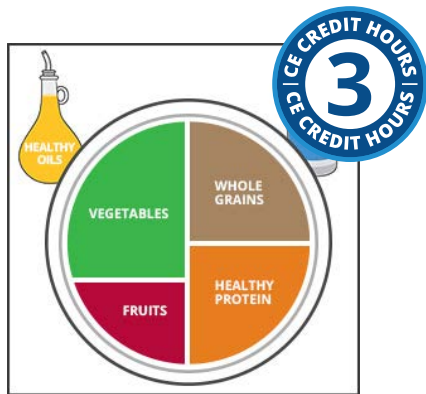


# Food for Thought: The Relationship Between Oral Health and Nutrition



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**Disclaimer:** Participants must always be aware of the hazards of using limited knowledge in integrating new techniques or procedures into their practice. Only sound evidence-based dentistry should be used in patient therapy.

## Conflict of Interest Disclosure Statement

- The author reports no conflicts of interest associated with this course.

## Introduction – Nutrition

This course is intended to provide awareness and a deeper understanding of the connection between optimal nutrition and its impact on oral health.

## Course Contents

- Overview
- Learning Objectives
- Glossary
- Introduction
- Nutrition 101
- Healthy Eating Plates
  - Create Your Plate
  - My Vegan Plate
- Dietary Guidelines for Americans
- Dietary Trends
- Major Nutrients
  - Carbohydrates: Quality Matters
  - Protein: Lean is Best
  - Lipids: Choose Wisely
  - What is Cholesterol?
  - Vitamins
  - Minerals
  - Electrolytes
  - Phytochemicals
- Factors in the Dental Caries Process
- Dietary Implications in Periodontal Disease
- The Life Cycle: Dietary Considerations for the Dental Patient
  - Prenatal
  - Infants and Toddlers
  - Teenagers
  - Young Adults
  - Older Adults
- Nutritional Counseling in the Dental Practice
  - Assessment
  - Counseling Tips
- Conclusion
- References / Additional Resources
- Test Preview
- About the Author

## Overview

If the oral cavity is the window for viewing internal health, as dental professionals, we are the first line of defense. Our frequent patient contact places us in an ideal position to provide nutritional information to our patients so they may better assess their dietary habits for optimal health.

## Learning Objectives

**Upon completion of this course, the dental professional should be able to:**

- Classify carbohydrates, proteins, fats, and the role they play in the oral cavity.

- Identify the function of vitamins, minerals, and phytochemicals and symptoms of excesses or deficiencies.
- Recognize specific nutrient requirements during the human life cycle.
- Understand the Healthy Eating Plates and current dietary trends.
- Identify the Dietary Guidelines for Americans.
- Recognize the relationship between nutritional deficiencies and oral disease.
- Assess nutritional aspects of dental caries, its causes, and prevention.
- Guide the patient to clarify and understand his or her own diet-dental relationship.
- Apply basic nutritional concepts to help patients with nutritional problems.

## Glossary

**anencephaly** - Absence of bones of the cranial vault and cerebral and cerebellar hemispheres.

**anticariogenic** - A food that contributes favorably to dental health by discouraging acid production.

**antioxidant** - A substance that prevents cell damage from free radicals.

**beriberi** - A vitamin B1 (thiamine) deficiency which causes loss of appetite, muscle weakness, enlarged heart, and burning tongue.

**cariogenic** - A fermentable carbohydrate that will cause a reduction of salivary and plaque pH to less than 5.5, thus promoting tooth decalcification.

**cariostatic** - Caries-inhibiting.

**celiac disease** - An autoimmune reaction to eating gluten, causing intestinal inflammation.

**cheilitis** - Unilateral or bilateral presence of cracks in the corners of the mouth.

**cholesterol** - Waxy lipid found in all body cells; made by the liver and found only in animal products.

**collagen** - Connective tissue that helps support body structures such as skin, bones, teeth and tendons.

**complex carbohydrate** – Sugars containing more than 12 carbon atoms. Found in foods such as whole grains, vegetables, and beans.

**cruciferous vegetables** - A family of plants whose leaf structure resemble a cross. Examples include cabbage, cauliflower, Brussel sprouts, broccoli and Bok choy.

**demineralization** – The removal or loss of calcium, phosphate, and other minerals from tooth enamel.

**diet history** – A detailed dietary record which may include a 24 hour or 3, 5, and 7-day recall.

**dysphagia** – Difficulty swallowing.

**encephalocele** - Gap in the skull with herniation of the brain.

**gastroesophageal reflux disease (GERD)** - Malfunction in the sphincter allows digested food and bile to backwash into the esophagus.

**fermentable carbohydrate** – Carbohydrates that can be metabolized by bacteria in plaque to decrease the pH to a level where demineralization occurs.

**glossitis** – Inflammation of the tongue.

**glycemic index** - Rate at which ingested food causes the level of glucose in the blood to rise.

**HDL** – High-density lipoproteins, also referred to as healthy cholesterol.

**heme iron** – Iron provided from animal sources.

**homeostasis** – To maintain a relatively stable state of equilibrium maintained by physiological processes.

**hyperlipidemia** – Elevated concentrations of triglycerides and/or cholesterol.

**insulin** – A hormone needed for cell utilization of carbohydrates.

**lactose intolerance** - The enzyme, lactase, no longer is available to break down the carbohydrate, lactose, in the small intestines.

**LDL** – Low-density lipoproteins, also referred to as bad cholesterol.

**legumes** – A plant that grows from a pea or a pod.

**non-heme iron** – Iron provided from a plant source.

**nutrient-dense** – Containing a high percentage of nutrients in relation to the number of calories it provides.

**osteomalacia** - Calcium deficiency during growth years where bone mineralization is reduced.

**osteopenia** – A decrease in density, calcification, or insufficient synthesis of bone which may put an individual at risk for osteoporosis.

**Phytochemicals** - Known as antioxidants, flavonoids, and phytonutrients found in fruits and vegetables.

**refined carbohydrate** – Processed carbohydrates from which the fiber and bran have been removed, leaving only starch.

**salivary gland hypofunction** - Decreased volume of saliva leading to xerostomia.

**spina bifida** - Embryonic failure of fusion of one or more vertebral arches

**vegan** – A person who eats only a plant based diet and consumes no foods of animal origin.<sup>7</sup>

**villous** - Finger shaped mucous membrane in small intestine to assist with nutrient absorption.

**xylitol** – A sugar alcohol which has the ability to reduce *S. mutans* in the mouth.

## Introduction

Dental patients face the challenge of interpreting nutritional information and making wise dietary choices. Early childhood caries, oral lesions, and periodontal disease leave many patients with missing teeth that may further complicate the mastication process needed for proper digestion of nutrient dense foods.

## Nutrition 101

***One Should Eat to Live,  
Not Live to Eat...***

*– Benjamin Franklin*

Nutritional status is often reflected in the oral health of tissues. The conditions of health or disease often relate to food and nutrient intake and the inflammatory activity that may occur in oral pathology and other systemic diseases in the body.<sup>11</sup>

A balanced diet is essential to support nutritional status and contains all the necessary nutrients in amounts needed to meet individual needs.

## Healthy Eating Plates

The Healthy Eating Plates have been designed to replace the former Food Guide Pyramids. The Harvard School of Public Health has revised some key points to the USDA's MyPlate to offer a more comprehensive picture of basic nutritional advice.<sup>8</sup>

- Choose more healthy protein such as fish, poultry, beans and nuts, and limiting red and processed meats which can raise the risk of heart disease, diabetes, colon cancer, and weight gain.
- Consume a variety of vegetables with the exception of potatoes, which can have the same effect on blood sugar as refined grains and sweets.
- Add a colorful abundance of fruits.
- Use health oils such as olive, canola, while limiting butter and trans-fats.
- Consume naturally calorie free water or plain tea and coffee for optimal

## Dental Facts:

The tongue is the fastest healing part of the body.<sup>26</sup>

Oral cancer kills as many people as melanoma and is more common than leukemia.<sup>27</sup>

Tooth decay is the most common chronic childhood disease.<sup>28</sup>

Figure 1. Dental Facts.<sup>26,27,28</sup>

beverage choices. Limit sugary drinks, both soda and juice, and keep milk and dairy servings to two per day.

- Maintain an active lifestyle for overall health and weight management.

## Create Your Plate

Created by the American Diabetes Association, this [interactive tool](#) is a simple and effective way to manage your blood glucose levels and lose weight. This was launched to help Latinos and Hispanics balance meals while better managing their diabetes.<sup>6</sup>

## My Vegan Plate

A vegan diet approach eliminates all foods of animal origin. Vegans need a reliable source of Vitamin B12. Fortified foods include soymilk, breakfast cereal, and meat alternative. If fortified foods are not eaten daily, a vitamin B12 supplement is recommended. Other vegetarian eating practices include Pescatarian; a diet including fish, Flexitarian; a semi-vegetarian who eats meat occasionally, and a Raw Vegan; who consumes unprocessed vegetables that are not heated above 115 degrees so nutritional values is retained. Recommendations for vegetarian consumers include;

- Choose mainly whole grains.
- Eat a variety of foods from each food group.
- Adults should aim for 600-1,000 IU of vitamin D daily.
- Manage your protein requirements by consuming quinoa, legumes, nuts, seeds, vegetables and soy products.

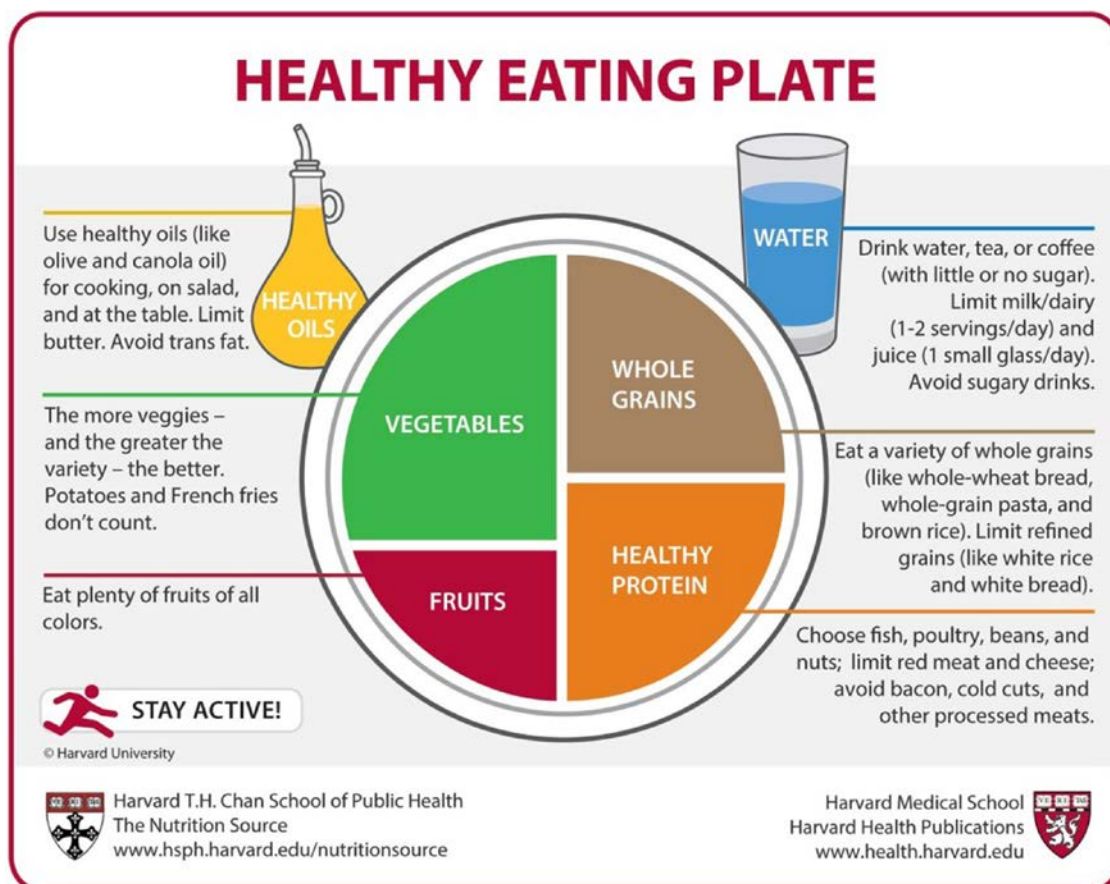


Figure 2. Healthy Eating Plate.<sup>8</sup>

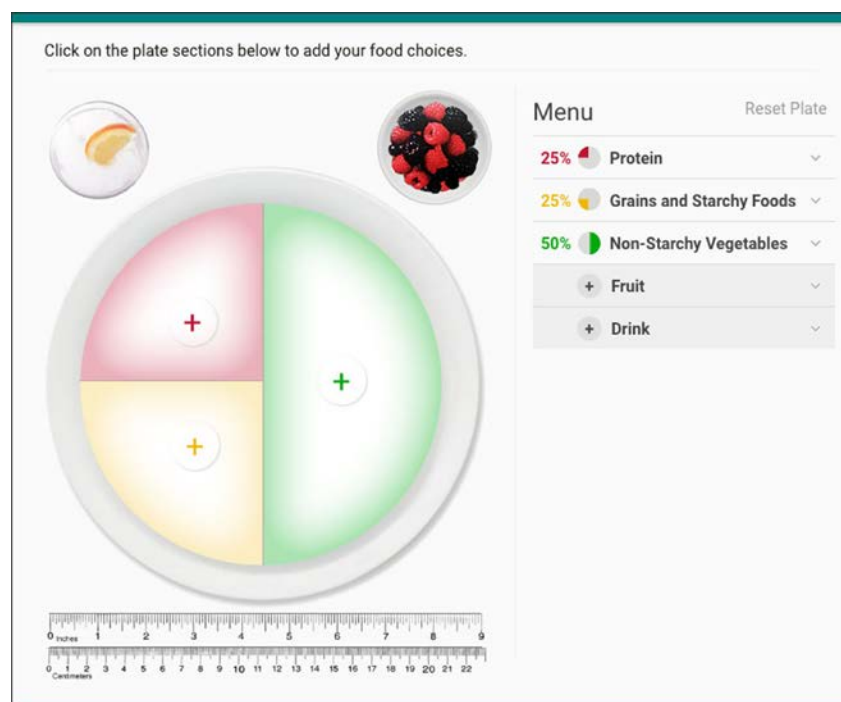


Figure 3. Creating a Healthy Plate.<sup>7</sup>

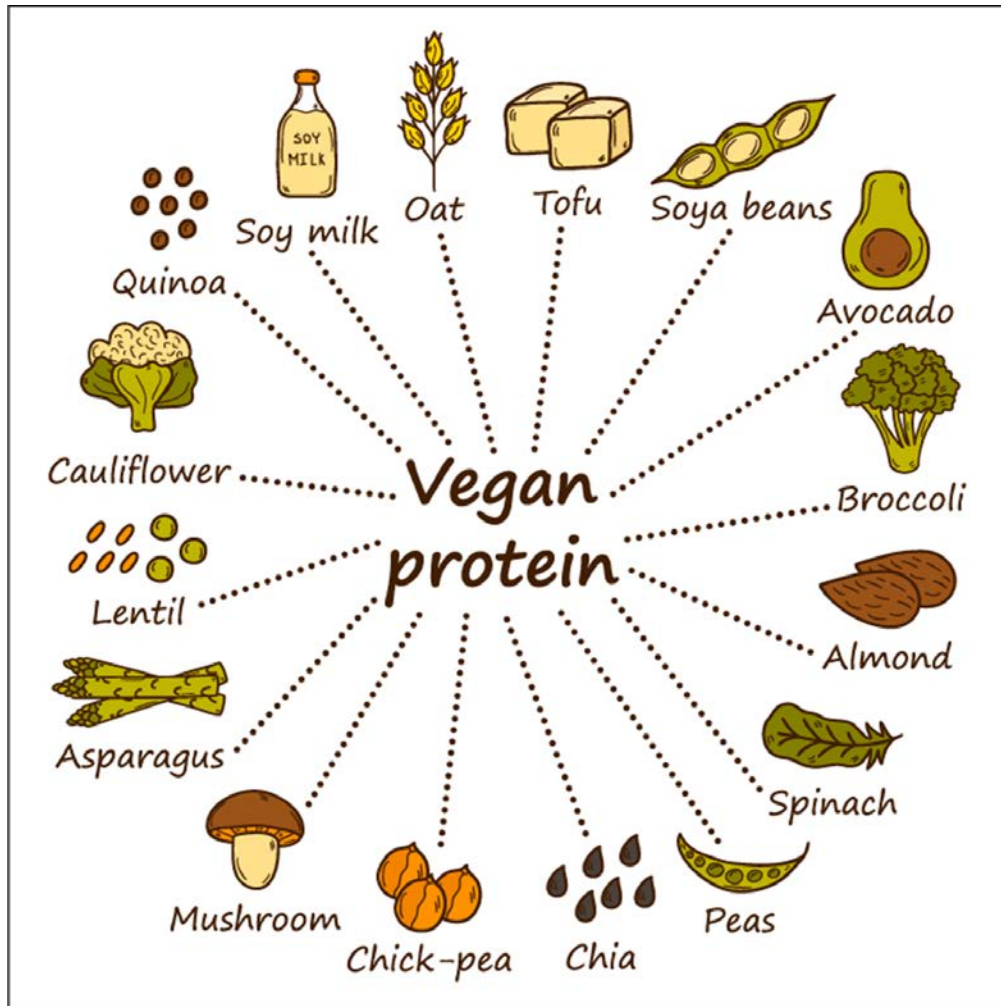


Figure 4. Vegan Protein.<sup>3</sup>



## Dietary Guidelines for Americans

The *Dietary Guidelines* focuses on the recommendations to help Americans make choices that equate to an overall healthy eating pattern. Combine healthy choices from across all food groups—while paying attention to calorie limits, too.<sup>9</sup>

### Key Elements of Healthy Eating Patterns.<sup>9</sup>

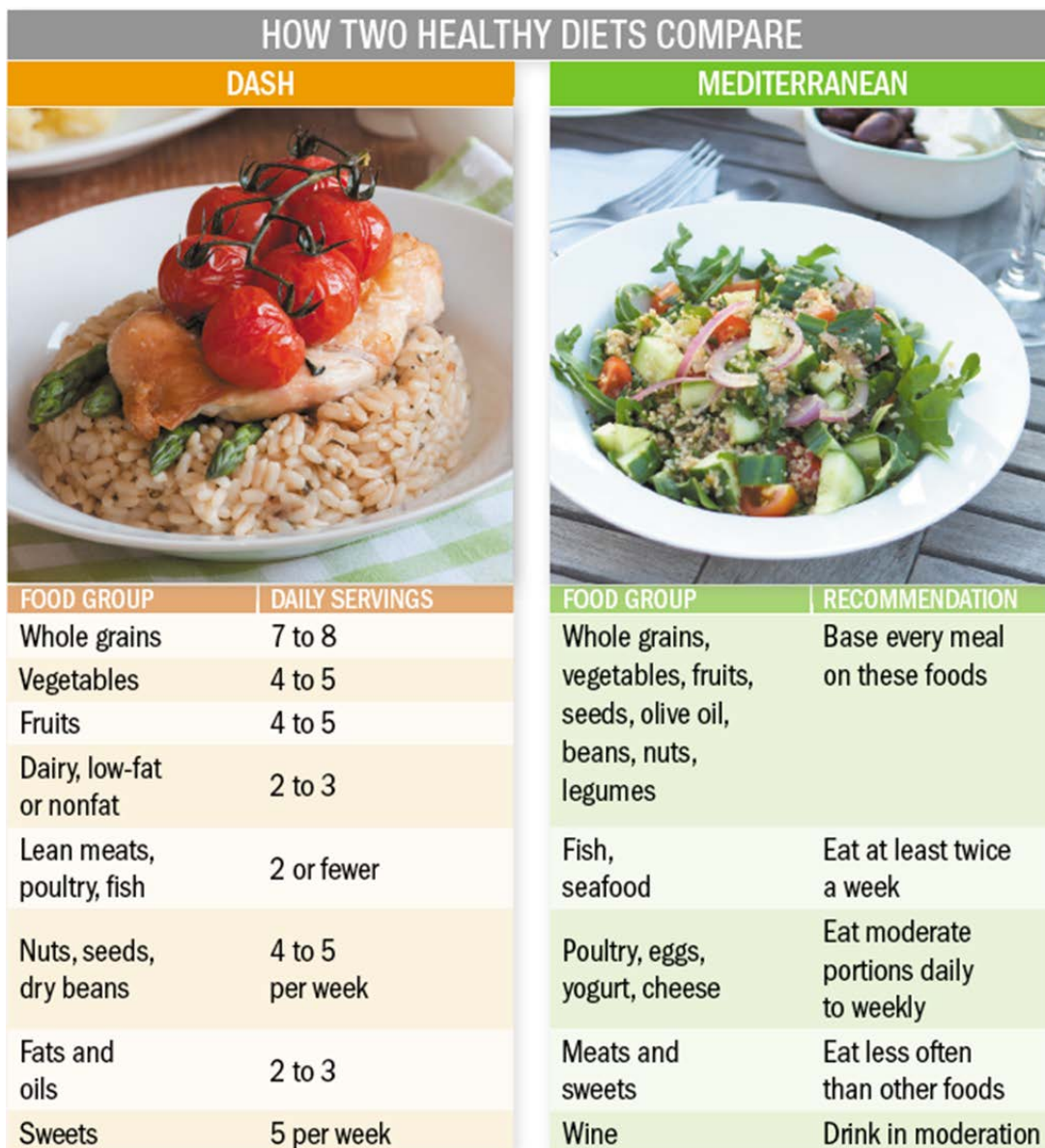
- 1. Follow a healthy eating pattern across the lifespan.** All food and beverage choices matter. Choose a healthy eating pattern at an appropriate calorie level to help achieve and maintain a healthy body weight, support nutrient adequacy, and reduce the risk of chronic disease.
- 2. Focus on variety, nutrient density, and amount.** To meet nutrient needs within calorie limits, choose a variety of nutrient-dense foods across and within all food groups in recommended amounts.
- 3. Limit calories from added sugars and saturated fats and reduce sodium intake.** Consume an eating pattern low in added sugars, saturated fats, and sodium. Cut back on foods and beverages higher in these components to amounts that fit within healthy eating patterns.
- 4. Shift to healthier food and beverage choices.** Choose nutrient-dense foods and beverages across and within all food groups in place of less healthy choices. Consider cultural and personal preferences to make these shifts easier to accomplish and maintain.
- 5. Support healthy eating patterns for all.** Everyone has a role in helping to create and support healthy eating patterns in multiple settings nationwide, from home to school to work to communities.



Figure 5. Healthy Eating Patterns.<sup>9</sup>

## Dietary Trends

Two dietary approaches that provide scientific data to back their claims are both the Mediterranean and DASH diet plans. The traditional Mediterranean diet is rich in fruits, vegetables, legumes, whole grains, olive oil, wine in moderation, fish. The Mediterranean diet is low in meat and dairy products.<sup>2</sup> The acronym DASH, stands for Dietary Approaches to Stop Hypertension. The DASH diet encourages a reduction of sodium and to consume a variety of foods rich in nutrients that help lower blood pressure, such as potassium, calcium and magnesium. Both diets emphasize vegetables, fruits and low-fat dairy foods and moderate amounts of whole grains, fish, poultry and nuts.<sup>9</sup>



**Figure 6.** How Two Healthy Diets Compare.<sup>4</sup>



## Major Nutrients

### Carbohydrates: Quality Matters

The carbohydrates you chose to consume plays an integral role in your diet. Complex carbohydrates are a better choice than highly-refined carbohydrates. The healthiest sources are whole grains, quinoa, fruits, vegetables and beans, because these deliver vitamins, minerals, fiber, phytonutrients, while maintaining blood glucose homeostasis. Unhealthy sources include; white bread, pastries, soda, or refined foods that are easily digested and can contribute to weight gain and may promote diabetes and heart disease. Here are some tips when looking for the healthiest carbohydrates.

- Look for “whole” as the first ingredient on the food label
- Choose foods with a low glycemic Index (GI) score
- Eat small amounts of carbohydrates at each meal
- Choose whole fruit instead of juice
- Pass on the potatoes, bring on the beans.

The glycemic index is a numeric ranking system for carbohydrates based on their immediate effect on blood glucose levels. Carbohydrates that breakdown quickly are on the high end of the index and those that take longer to break down and digest are at the low end, which have a lower demand for insulin and provide better glycemic control.<sup>6</sup> This is especially important for individuals with diabetes. In the table below are a list of low, medium, and high glycemic foods. Aim for lower glycemic index foods, which require less demand for insulin and promote blood glucose homeostasis.<sup>5</sup>

The gut microbiome and its connection to overall health has been studied extensively in the last 10 years. Research shows a diet high in sugars and processed foods illicit an inflammatory reaction that may alter healthy gut microbes, linked to autoimmune diseases, food intolerances, fatigue, sleep disturbances, and GI disturbances. To maintain a healthy microbiome, eat plenty of plant based proteins that include a good source of fiber for gut health.<sup>29</sup>

Glycemic Index									
Low GI (<55), Medium GI (56-69) and High GI (70>)									
Grains / Starches		Vegetables		Fruits		Dairy		Proteins	
Rice Bran	27	Asparagus	15	Grapefruit	25	Low-Fat Yogurt	14	Peanuts	21
Bran Cereal	42	Broccoli	15	Apple	38	Plain Yogurt	14	Beans, Dried	40
Spaghetti	42	Celery	15	Peach	42	Whole Milk	27	Lentils	41
Corn, sweet	54	Cucumber	15	Orange	44	Soy Milk	30	Kidney Beans	41
Wild Rice	57	Lettuce	15	Grape	46	Fat-Free Milk	32	Split Peas	45
Sweet Potatoes	61	Peppers	15	Banana	54	Skim Milk	32	Lima Beans	46
White Rice	64	Spinach	15	Mango	56	Chocolate Milk	35	Chickpeas	47
Cous Cous	65	Tomatoes	15	Pineapple	66	Fruit Yogurt	36	Pinto Beans	55
Whole Wheat Bread	71	Chickpeas	33	Watermelon	72	Ice Cream	61	Black-Eyed Beans	59
Muesli	80	Cooked Carrots	39						
Baked Potatoes	85								
Oatmeal	87								
Taco Shells	97								
White Bread	100								
Bagel, White	103								

Figure 7. Glycemic Index.<sup>5</sup>

Some individuals will have carbohydrate restrictions due to food intolerances. Celiac disease is an autoimmune reaction to gluten, which is a combination of two proteins found in grains like wheat, barley, and rye. When consumed, these carbohydrates trigger inflammation in the duodenum of the small intestine causing villous atrophy, which in turn prevents the absorption of nutrients and symptoms of abdominal bloating, cramping, diarrhea, and vomiting.<sup>11</sup>

### Protein: Lean is Best

Proteins are found in muscle, bone, skin, hair, and almost all body tissues and are responsible for growth, maintenance and repair. Protein is built from building blocks called amino acids, which is considered a complete protein. Since our bodies cannot synthesize complete proteins, they must be obtained by the foods we eat. Only two foods are considered complete proteins, containing all essential amino acids; a whole egg and quinoa, a gluten-free starchy seed. Both protein sources have an estimated biological value of 100. Other good sources of protein include low-fat dairy, beef, poultry, fish, brown rice and peanuts.<sup>11</sup>

The protein package, whether from an animal or plant source, is something to consider. Choosing the leanest animal protein source is best, consider; top round steak or flank beef, bison, buffalo, egg whites, seafood, and poultry (skinless breast). Good sources of plant protein include; peas, beans and grains, which are also a great source of fiber, needed to regulate body processes, stabilize blood glucose levels, and reduce cholesterol.<sup>11</sup>

Processed meats, such as ham, salami, bacon and sausage, provide a lower quality protein with high levels of sodium and fat. Research studies indicate eating processed meat increases the risk of heart disease by 43% and diabetes by 19%.<sup>11</sup>

Entomophagy is the practice of eating insects. Two million people worldwide eat insects as part of their daily diet.<sup>11</sup> Insects are an excellent source of protein and contain fewer calories and fat than traditional animal protein. Grasshoppers are the most consumed insect

worldwide and are equal in protein to ground beef. There are more than 1,900 edible insects globally safe for consumption.<sup>11</sup>

Eating healthy proteins is essential to overall health. The RDA (Recommended Dietary Allowance) of protein is dependent on an individual's assessment of body size and physical activity level. It is estimated to be between 40 to 65 grams per day. To calculate your protein requirement, use the formula below;

$$\text{_____ lb.} / 2.2 = \text{_____ kg}$$

$$\text{_____ kg} \times 0.8 = \text{_____ g of protein/day}$$

### Lipids: Choose Wisely

Lipids are an important major nutrient in our diet that are components of every cell, are required to absorb beneficial phytonutrients, and provide the essential nutrients linoleic (omega-3) and linolenic acids (omega-6). Obtaining healthy monounsaturated and polyunsaturated fats from salmon, tuna, avocado, nuts, flax and chia seeds, and olive oil are important for overall health. Saturated and trans fats, (look for partially hydrogenated on the food label) are associated with cardiovascular disease (CVD) risk, which is the leading cause of death in the United States, causing about 600,000 deaths annually.<sup>11</sup> A diet high in saturated and trans-fats, that illicit an inflammatory response, can negatively impact cardiovascular health as well as an increased risk of breast and colon cancer. According to the American Heart Association, adults should limit their intake of saturated fat to less than 7% of total daily calories and trans-fats to less than 1%.<sup>13</sup>

### What is Cholesterol?

Cholesterol is found in every cell in your body and is mostly manufactured by the body itself. Dietary sources, which have little effect on overall cholesterol numbers, are found in eggs, shell fish, butter, fatty meats, full fat dairy and oils. Today, the overall lipid profile is measured for risk of heart disease, stroke, and peripheral vascular disease. The ratio of HDL/ LDL and triglycerides circulating in the blood stream is important, along with factors such as

ATP III Classification of LDL, Total, and HDL Cholesterol (mg/dL)	
<b>LDL Cholesterol – Primary Target of Therapy</b>	
<100	Optimal
100-129	Near optimal/above optimal
130-159	Borderline high
160-189	High
≥190	Very high
<b>Total Cholesterol</b>	
<200	Desirable
200-239	Borderline high
≥240	High
<b>HDL Cholesterol</b>	
<40	Low
≥60	High

**Figure 8.** Recommended Cholesterol Guidelines for Adults.<sup>24</sup>

inactivity, smoking, and diabetes. Low-density lipoprotein (LDL) carries cholesterol to the heart walls and narrows or clogs the artery. High-density lipoprotein (HDL) removes cholesterol from the vessel walls and takes it back to the liver, where it is excreted. The table below are the recommended cholesterol guidelines for adults:<sup>24</sup>

### Coconut Oil; Good or Bad?

Even though coconut oil is saturated, studies show it may have a positive effect on raising HDL (good) cholesterol. Although it is a medium-chain triglyceride, which the body handles differently than a long-chain triglyceride like vegetable oil, dairy, and fatty meats, conflicting research also point to coconut oil having a neutral impact on heart health, raising both HDL and LDL levels. You should aim to receive most of your fat from unsaturated sources like olive oil, avocado and nuts and seeds.<sup>1</sup>

### Vitamins

Vitamins are calorie free, organic, and play a crucial role in overall health. They help prevent cellular breakdown in their role as antioxidants and prevent inflammatory reactions in the body. They are associated with many functions that can affect oral tissues. Vitamins belong in two groups: **water-soluble** and **fat-soluble**.

Tables 1 and 2 list the type of vitamins, their function, dietary sources, and deficiency symptoms.<sup>11</sup>

### Minerals

All food groups contain foods rich in minerals however, the content in our diet varies greatly depending on the quality of foods consumed and the soil and water conditions in which plants have grown. The most common mineral deficiencies include Calcium, Zinc, Iron, Magnesium and Iodide. Tables 3 and 4 describe how these minerals keep you healthy; their function, sources, and effects of getting too little.<sup>11</sup>

### Electrolytes

Sodium, potassium and chloride are macro minerals that also function as electrolytes. Salt is a food additive that adds flavor and is used as a preservative in many packaged foods. Our body needs very little sodium to conduct nerve impulses, contract and relax muscles, and maintain proper water and mineral balance. Too much sodium is associated with high blood pressure, heart disease, and stroke. Recommended limits are 1.2 to 1.5g/day. The American Heart Association has identified the “Salty Six” foods that add the most sodium in our diet.<sup>25</sup>

Table 1. Water-soluble Vitamins: C, B's.<sup>11</sup>

Vitamin	Source	Deficiency	Oral Deficiency
<b>C-Ascorbic acid</b> <ul style="list-style-type: none"> <li>Assists with formation of collagen fibers</li> <li>Strengthens the immune system</li> <li>Helps with protein metabolism</li> <li>Aids with calcium and iron absorption</li> <li>Antioxidant</li> </ul>	<ul style="list-style-type: none"> <li>Peppers</li> <li>Citrus fruits</li> <li>Kiwi</li> <li>Strawberries</li> <li>Cruciferous vegetables</li> <li>Tomatoes</li> <li>Leafy greens</li> </ul>	<ul style="list-style-type: none"> <li>Scurvy</li> </ul>	<ul style="list-style-type: none"> <li>Gingival Inflammation</li> <li>Petechiae</li> <li>Poor healing</li> </ul>
<b>B1-Thiamin or thiamine</b> <ul style="list-style-type: none"> <li>Coenzyme for energy production</li> </ul>	<ul style="list-style-type: none"> <li>Pork, trout, black beans</li> </ul>	<ul style="list-style-type: none"> <li>Beriberi</li> <li>Wernicke-Korsakoff Syndrome</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
<b>B2-Riboflavin</b> <ul style="list-style-type: none"> <li>Coenzyme for energy production</li> </ul>	<ul style="list-style-type: none"> <li>Milk, meat, enriched breads and cereals</li> </ul>	<ul style="list-style-type: none"> <li>Ariboflavinosis</li> </ul>	<ul style="list-style-type: none"> <li>Angular cheilitis</li> <li>Glossitis</li> </ul>
<b>B3-Niacin</b> <ul style="list-style-type: none"> <li>Coenzyme and partner with B2</li> <li>Assists with blood cell formation</li> </ul>	<ul style="list-style-type: none"> <li>Meat, fish, beans, nuts, coffee, enriched breads and cereals</li> </ul>	<ul style="list-style-type: none"> <li>Pellagra (dermatitis, diarrhea, dementia)</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
<b>B6-Pyridoxine</b> <ul style="list-style-type: none"> <li>Coenzyme</li> </ul>	<ul style="list-style-type: none"> <li>Chickpeas, beef, liver, tuna, salmon, chicken, bananas</li> </ul>	<ul style="list-style-type: none"> <li>Microcytic anemia;</li> <li>Depressed immunity, irritability, glossitis</li> </ul>	<ul style="list-style-type: none"> <li>Glossitis</li> <li>Angular cheilitis</li> </ul>

**Table 1. Water-soluble Vitamins: C, B's.<sup>11</sup> (Continued)**

<b>B12-Cobalamine</b> <ul style="list-style-type: none"> <li>Needs intrinsic factor from stomach for absorption</li> <li>Works with folate to make RBCs</li> </ul>	<ul style="list-style-type: none"> <li>Animal products exclusively. Need supplementation if you follow a vegan diet</li> </ul>	<ul style="list-style-type: none"> <li>Pernicious anemia</li> </ul>	<ul style="list-style-type: none"> <li>Glossitis</li> <li>Angular cheilitis</li> <li>Tissue inflammation</li> </ul>
<b>B9-Folate/folic acid</b> <ul style="list-style-type: none"> <li>Coenzyme in the synthesis of nucleic acid DNA, RNA</li> </ul>	<ul style="list-style-type: none"> <li>Beef, liver, green leafy vegetables, fruits</li> </ul>	<ul style="list-style-type: none"> <li>Megaloblastic anemia</li> <li>Neural tube defects</li> <li>Low birth weight</li> </ul>	<ul style="list-style-type: none"> <li>Ulcerated tongue</li> <li>Mucosal lesions</li> </ul>
<b>Biotin-H</b> <ul style="list-style-type: none"> <li>Regulates blood sugar levels</li> <li>Synthesis of RNA, DNA</li> </ul>	<ul style="list-style-type: none"> <li>Liver, cauliflower, salmon, carrots, bananas, nuts</li> </ul>	<ul style="list-style-type: none"> <li>High blood sugar</li> <li>Skin conditions</li> </ul>	<ul style="list-style-type: none"> <li>Inflammation of mucosal membranes</li> </ul>
<b>B5-Pantothenic acid</b> <ul style="list-style-type: none"> <li>Coenzyme</li> <li>Synthesis of fatty acids, cholesterol, and hormones</li> </ul>	<ul style="list-style-type: none"> <li>Yeast, chicken, beef, potatoes, oats, whole grains.</li> </ul>	<ul style="list-style-type: none"> <li>Loss of muscle coordination</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>



Table 2. Fat-Soluble Vitamins: A, D, E, K.<sup>11</sup>

Vitamin	Source	Deficiency	Oral Deficiency
<b>Vitamin A-Beta-carotene/Retinol</b> <ul style="list-style-type: none"> <li>Immune function</li> <li>Assist with formation of tissue of eye and cornea</li> <li>Important antioxidant</li> </ul>	<ul style="list-style-type: none"> <li>Sweet potatoes, pumpkin, spinach, carrots, liver</li> <li>Cantaloupe, mangos, red pepper</li> </ul>	<ul style="list-style-type: none"> <li>Macular degeneration</li> <li>Night blindness</li> <li>Exophthalmia (total blindness)</li> </ul>	<ul style="list-style-type: none"> <li>Xerostomia</li> <li>Oral leukoplakia</li> <li>Hyperkeratosis</li> </ul>
<b>Vitamin D-Calciferol</b> <ul style="list-style-type: none"> <li>Promotes calcium absorption</li> <li>Assist with bone formation, remodeling, and growth</li> <li>Aids in cell growth, nerve and muscle formation, the immune system, and reduction of inflammation</li> </ul>	<ul style="list-style-type: none"> <li>UV light</li> <li>Fatty fish; tuna, salmon</li> <li>Fortified milk products, and orange juice</li> </ul>	<ul style="list-style-type: none"> <li>Adults-osteomalacia</li> <li>Kids-rickets</li> <li>Delayed dentition, enamel hypocalcification</li> </ul>	<ul style="list-style-type: none"> <li>Failure of bone wounds to heal</li> <li>Enamel hypocalcification</li> <li>Loss of alveolar bone</li> </ul>
<b>Vitamin E-Tocopherol</b> <ul style="list-style-type: none"> <li>Antioxidant</li> <li>Immune function</li> <li>Inhibits blood clotting</li> </ul>	<ul style="list-style-type: none"> <li>Vegetable oils</li> <li>Nuts and seeds; sunflower, almonds, hazelnuts</li> </ul>	<ul style="list-style-type: none"> <li>Nerve pain, immune system disorders</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
<b>Vitamin K-Phylloquinone</b> <ul style="list-style-type: none"> <li>Cofactor for prothrombin formation necessary for clotting</li> <li>Bone metabolism</li> </ul>	<ul style="list-style-type: none"> <li>Intestinal bacteria</li> <li>Dark leafy greens; spinach, kale, collards</li> <li>Broccoli, soybeans, edamame</li> </ul>	<ul style="list-style-type: none"> <li>Hemolytic anemia</li> <li>Failure of wounds to stop bleeding</li> </ul>	<ul style="list-style-type: none"> <li>Failure of clotting</li> </ul>

**Table 3. Minerals for Bones and Teeth.**<sup>11</sup>

Mineral	Source	Deficiency
<b>Calcium: (Ca)</b> <ul style="list-style-type: none"> <li>• Most abundant mineral in the body</li> <li>• Stored in teeth and bones</li> <li>• Muscle contraction</li> <li>• Hormone production</li> </ul>	<ul style="list-style-type: none"> <li>• Dairy</li> <li>• Fortified orange juice and soy milk</li> </ul>	Hypocalcemia <ul style="list-style-type: none"> <li>• Osteomalacia</li> <li>• Osteopenia</li> <li>• Rickets</li> </ul>
<b>Phosphorus: (P)</b> <ul style="list-style-type: none"> <li>• Formation of bone and teeth</li> <li>• Protein synthesis</li> <li>• Muscle contraction</li> </ul>	<ul style="list-style-type: none"> <li>• Dairy</li> <li>• Meat</li> <li>• Fish</li> <li>• Nuts and legumes</li> </ul>	Hypophosphatemia <ul style="list-style-type: none"> <li>• Muscle weakness</li> <li>• Bone pain and fracture</li> <li>• Loss of appetite</li> </ul>
<b>Fluorine: (F)</b> <ul style="list-style-type: none"> <li>• Increase retention of calcium in teeth and bones</li> </ul>	<ul style="list-style-type: none"> <li>• Ground water</li> <li>• Tea</li> <li>• Gelatin</li> </ul>	<ul style="list-style-type: none"> <li>• Dental caries</li> <li>• Bone fractures in elderly</li> </ul>
<b>Magnesium: (Mg)</b> <ul style="list-style-type: none"> <li>• Mineralization of bone and teeth</li> <li>• Neural transmitter</li> <li>• Muscle contraction</li> </ul>	<ul style="list-style-type: none"> <li>• Green leafy vegetables</li> <li>• Nuts</li> <li>• Whole grains</li> <li>• Chocolate</li> </ul>	Hypomagnesium <ul style="list-style-type: none"> <li>• Diarrhea and vomiting</li> <li>• Muscle tremors</li> </ul>

Table 4. Trace Minerals: Needed in smaller amounts but play a powerful role in health.<sup>11</sup>

Trace Minerals	Source	Deficiency
<b>Iron:(Fe)</b> <ul style="list-style-type: none"> <li>• Component of hemoglobin</li> <li>• Transportation of oxygen</li> <li>• Absorption aided by Vitamin C and hampered by phytochemicals</li> </ul>	<ul style="list-style-type: none"> <li>• Heme iron: meat, fish, poultry</li> <li>• Non-heme iron: legumes, leafy greens and chocolate</li> </ul>	<ul style="list-style-type: none"> <li>• Food insecure households</li> <li>• Impaired immunity</li> <li>• Angular cheilitis</li> </ul>
<b>Zinc: (Zn)</b> <ul style="list-style-type: none"> <li>• Coenzyme in over 100 functions</li> <li>• Immunity</li> <li>• Wound healing</li> </ul>	<ul style="list-style-type: none"> <li>• Red meat</li> <li>• Poultry</li> <li>• Shellfish</li> </ul>	<ul style="list-style-type: none"> <li>• Loss of appetite, taste and smell</li> <li>• Slow tissue repair</li> <li>• Eye and skin lesions</li> </ul>
<b>Copper (Cu)</b> <ul style="list-style-type: none"> <li>• Aids in the absorption of iron</li> <li>• Antioxidant</li> </ul>	<ul style="list-style-type: none"> <li>• Shellfish</li> <li>• Nuts</li> <li>• Organ meats</li> <li>• Legumes</li> </ul>	<ul style="list-style-type: none"> <li>• Osteoporosis,</li> <li>• Anemia</li> <li>• Muscle weakness</li> </ul>
<b>Manganese (Mn)</b> <ul style="list-style-type: none"> <li>• Antioxidant</li> <li>• Wound healing</li> <li>• Co-enzyme</li> </ul>	<ul style="list-style-type: none"> <li>• Raisin bran cereal</li> <li>• Brown rice</li> <li>• Pineapple</li> <li>• Green tea</li> </ul>	<ul style="list-style-type: none"> <li>• Growth reduction</li> <li>• Glucose intolerance</li> </ul>
<b>Iodide (I)</b> <ul style="list-style-type: none"> <li>• Part of thyroid hormone</li> <li>• Immune system</li> </ul>	<ul style="list-style-type: none"> <li>• Iodized salt</li> <li>• Cod</li> <li>• Yogurt</li> <li>• Milk</li> </ul>	Hypothyroidism <ul style="list-style-type: none"> <li>• Goiter</li> <li>• Weight gain</li> <li>• Intolerance to cold</li> </ul>

✓ Breads and rolls
✓ Cold cuts and cured meats
✓ Pizza
✓ Poultry products
✓ Canned soups
✓ Fast food

Table 5 lists the type of electrolytes, their sources and deficiency symptoms.<sup>11</sup>

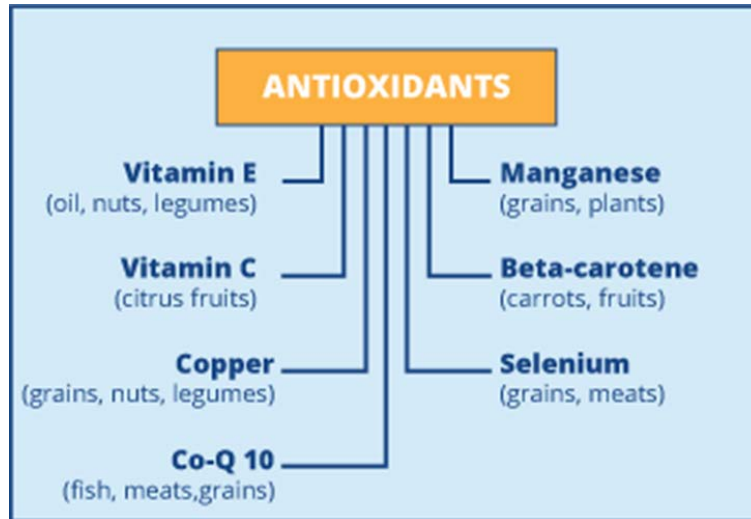
### Phytochemicals

Phytochemicals, known as antioxidants, flavonoids, and phytonutrients are chemical compounds produced by plants and are found in fruits, vegetables, grains, beans, spices, nuts and seeds. The following table provides examples of phytochemicals and the foods in which they are found. Recent studies have discovered numerous health benefits and disease prevention properties in phytochemicals.<sup>11</sup>

**Table 5. Minerals that function as Electrolytes.**

Electrolyte	Source	Deficiency
<b>Sodium: (Na)</b> <ul style="list-style-type: none"> <li>Regulates fluid balance</li> <li>Maintenance of blood volume and pressure</li> <li>Nerve and muscle impulses</li> </ul>	<ul style="list-style-type: none"> <li>Table salt, soups, cured meats, processed foods</li> </ul>	<b>Hyponatremia</b> <ul style="list-style-type: none"> <li>Consumption of too many fluids</li> <li>Heart and kidney failure</li> </ul>
<b>Chloride: (Cl)</b> <ul style="list-style-type: none"> <li>Works with sodium</li> <li>Regulates fluid balance</li> <li>Component of hydrochloric acid</li> </ul>	<ul style="list-style-type: none"> <li>Table salt, eggs, fish, meat, processed foods</li> </ul>	<ul style="list-style-type: none"> <li>Rare</li> </ul>
<b>Potassium: (K)</b> <ul style="list-style-type: none"> <li>Builds proteins and muscle tissue</li> <li>Electrical stimulation of heart muscle</li> <li>Bone health</li> </ul>	<ul style="list-style-type: none"> <li>Bananas, sweet potatoes, tomatoes, oranges, melons, dairy</li> </ul>	<b>Hypokalemia</b> <ul style="list-style-type: none"> <li>Kidney disease</li> <li>Uncontrolled diabetes</li> </ul>

Lycopene	Kale, broccoli, tomatoes, red pepper, watermelon
Lutein	Collard greens, spinach, Brussels sprouts, artichokes
Resveratrol	Red wine, peanuts, grapes
Anthocyanins	Blueberries, blackberries, plums, cranberries, raspberries
Isoflavones	Soybeans



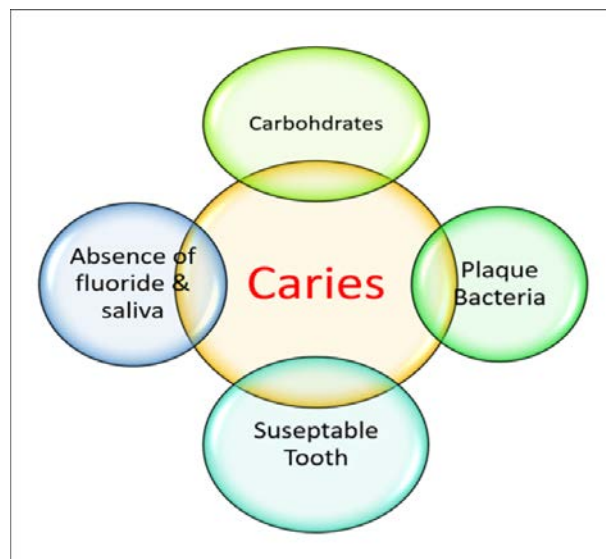
Antioxidants are also known as “free radical scavengers” as they serve as protectors from free radical cell damage. By incorporating more colorful fruits and vegetables – especially those with purple, red, orange, and yellow hues, you will be certain to include beta-carotene, vitamin C, and vitamin E, the three superstar antioxidants in your diet.<sup>11</sup> Recent studies have not yielded the same result by taking antioxidant supplements, thus eating foods rich in fruits and vegetables is still the best way to incorporate antioxidants in your diet.<sup>14</sup>

### Factors in the Dental Caries Process

The etiology of dental caries is a dynamic process that involves a susceptible tooth, cariogenic bacteria in dental biofilm (*Streptococcus mutans* and *Lactobacillus*), and the detrimental effects of cariogenic carbohydrates. Modifying factors also include the absence of fluoride, xerostomia, and inadequate oral hygiene. The demineralization process during an acid attack and subsequent remineralization by saliva and fluoride happens continuously throughout the day. Studies demonstrate it can take approximately 19 to 22 months for the cavitation process to progress to the dentin, making the caries process complex and

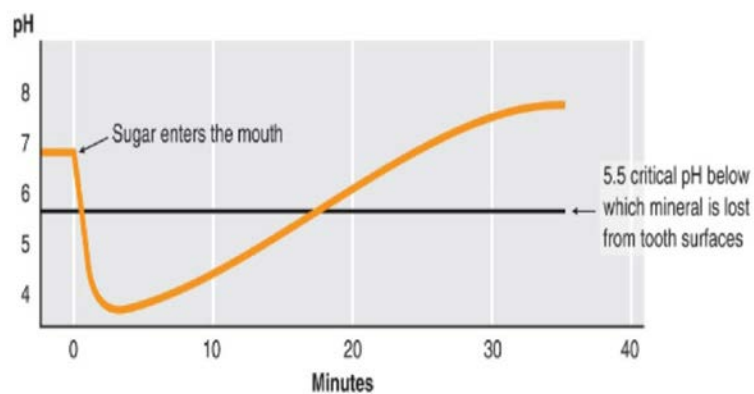
continuous.<sup>11</sup> Our role as oral health educators is to analyze dietary habits and causative factors to determine a patient’s risk for dental caries. The chart below is a guide to assess a patient’s risk factors for the development dental caries.<sup>11</sup>

Each time food is consumed there is an opportunity for bacteria to produce an acid and begin the caries process. In fact, the frequency





Carbohydrates in the diet; fermentable and frequency
Presence of specific biofilm bacteria; <i>S. Mutans</i> and <i>Lactobacillus</i>
Susceptible tooth structure; malocclusion, newly erupted teeth, exposed cementum
Absence of fluoride; application of dentifrices and rinses
Salivary gland hypofunction; quality and quantity
Poor oral hygiene; homecare practices

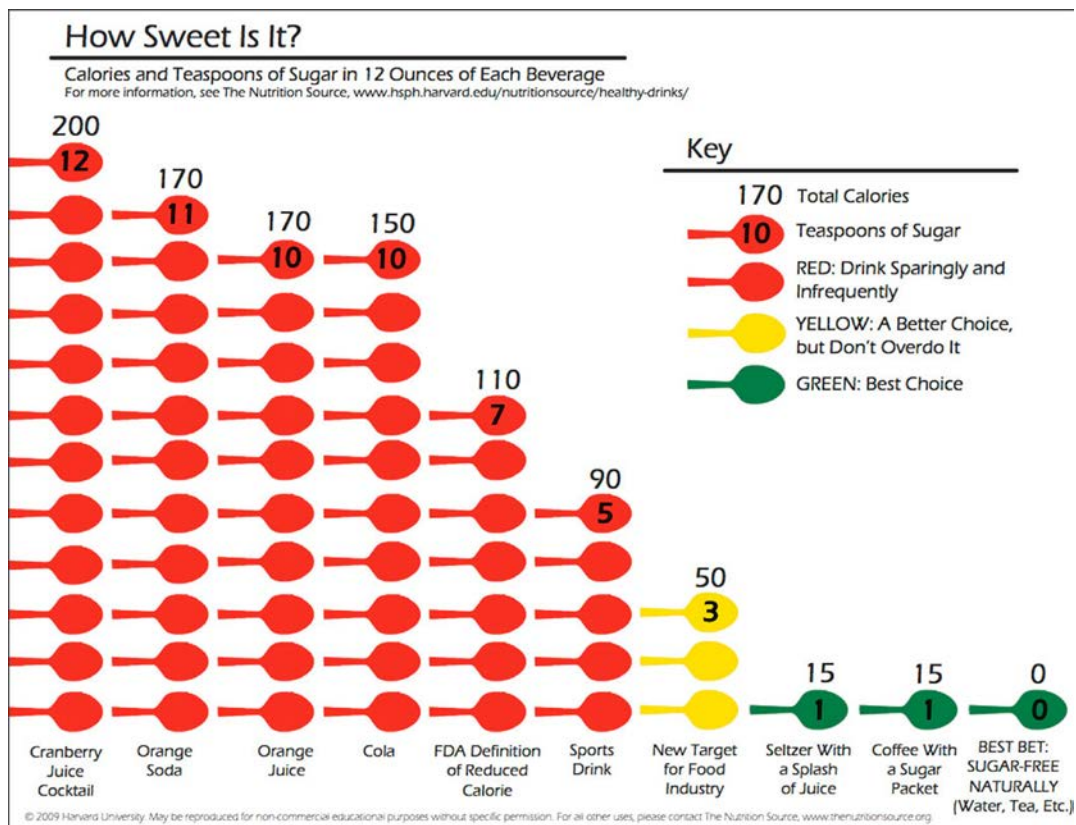


of sugar eaten is a primary factor in a patient's risk assessment. Sugary foods or liquids allows for separate opportunities for bacteria to feed and produce acid. Within 3 minutes of eating a cariogenic food, the pH of the dental plaque falls below 5.5 and the caries process begins. Once food clears the mouth, pH gradually returns to neutral, between 6.8-7.0. The goal is to prevent demineralization by keeping the oral pH neutral for as long as possible. Cariostatic foods are those that do not contribute to enamel demineralization and maintain a basic pH balance. Eating foods rich in protein, lipids, phosphorus and calcium such as meat, milk, cheese, and nuts can help neutralize acids. Brushing the teeth or rinsing with water after eating a cariogenic carbohydrate can also help neutralize acids.<sup>11</sup>

Stephan curve in the photo above, named after Dr. Robert Stephan, demonstrates how each eating and drinking event drops the critical pH of the mouth below 5.5 which initiates the demineralization process.

Destructive effects of soda, juice, and the popular energy drinks are a major cause of early childhood caries and decay among both children and teenagers, especially in low income and minority populations. One 12-ounce soda contains 10 teaspoons of sugar as well as acid. Diet soda and energy drinks includes both citric and phosphoric acid, which may cause direct demineralization of the tooth enamel. Rinsing the mouth with water, bypassing the teeth by using a straw, chewing gum with xylitol, and consuming the potential caries causing drinks with a meal can help reduce the negative effects of liquid fermentable carbohydrates.

To combat further the factors in the caries process, remember that water is the superior choice for quenching your thirst. It provides everything the body needs to restore fluid lost through metabolism, breathing, sweating, and removal of waste. Fluoride in both food and water will also help remineralize tooth enamel.



**Figure 9.** Calories and Teaspoons of Sugar in 12 Ounces of Each Beverage.<sup>15</sup>

To help increase your water consumption and infuse a bit of flavor, try;

- Slicing citrus fruits or zest.
- Crush fresh mint leaves.
- Add a slice of ginger.
- Crush berries.
- Add a splash of sparkling juice.

### Dietary Implications in Periodontal Disease

Diet and periodontal disease are not as clearly connected as diet and dental caries. Overall nutritional health status can affect host susceptibility and influence disease progression. Good nutrition can be protective by increasing resistance to periodontal infection and minimize its severity while poor nutrition can reduce resistance to periodontal infection. Bacteria are the primary etiology factors behind periodontal disease, however the diet plays a modifying role in the progression and severity in the host.<sup>11</sup>

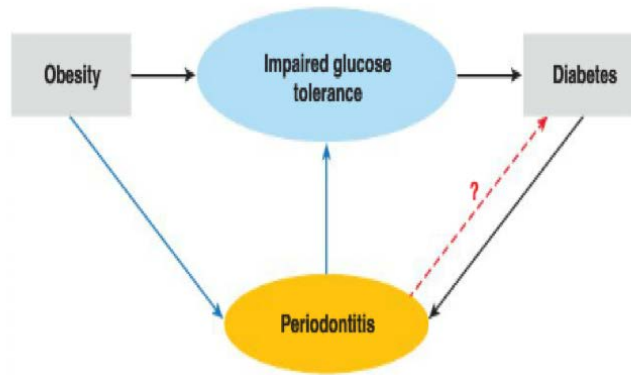
All nutrients are needed to synthesis the oral tissues and structures, keep them healthy throughout life, enhance the immune system to fight infection, and aid in wound healing. Table 6 describes the nutrients for oral health, their specific roles, and deficiency outcomes.

### Obesity and Oral Health

Obesity is diagnosed as, a person's body mass index score (BMI) is over 30, defined as a medical condition of excess body fat.<sup>11</sup> Obesity is a risk factor for periodontal disease by causing spikes in blood glucose metabolism, leading to an inflammatory response by the body. A poorly nourished host has difficulty fighting infection and inflammation. A recent study by the Third National Health and Nutrition Examination Survey showed body mass index is positively related to severity of periodontal attachment loss. The black arrows indicate established relationships; the blue arrows indicated proposed associations.<sup>11</sup>

**Table 6. Nutrients Important for a Healthy Periodontium.**

<b>Vitamin D</b> <ul style="list-style-type: none"> <li>• Calcium, phosphorus, and magnesium absorption</li> <li>• Deficiency linked to periodontal disease</li> <li>• Bone metabolism</li> </ul>	<b>Vitamin A</b> <ul style="list-style-type: none"> <li>• Builds and maintains epithelium</li> <li>• Enhances immune system</li> <li>• Salivary gland function</li> </ul>
<b>B-Complex Vitamins</b> <ul style="list-style-type: none"> <li>• Formation of new cells</li> <li>• Cofactor for nutrients</li> <li>• Periodontal wound healing</li> <li>• Collagen synthesis (biotin)</li> </ul>	<b>Protein</b> <ul style="list-style-type: none"> <li>• Promotes growth maintenance and repair of all tissues</li> </ul>
<b>Vitamin C</b> <ul style="list-style-type: none"> <li>• Aids in collagen formation</li> <li>• Deficiency causes ascorbic acid gingivitis</li> <li>• Enhances immune response</li> </ul>	<b>Iron, Zinc</b> <ul style="list-style-type: none"> <li>• Aids in collagen formation</li> <li>• Wound healing</li> <li>• Regulates inflammation</li> </ul>
<b>Calcium</b> <ul style="list-style-type: none"> <li>• Builds and maintains alveolar process</li> </ul>	<b>Lipids</b> <ul style="list-style-type: none"> <li>• Omega-3 fatty acids have anti-inflammatory properties</li> <li>• Obesity is a risk factor for periodontal disease</li> </ul>
<b>Fiber</b> <ul style="list-style-type: none"> <li>• Controls serum glucose and inflammatory response</li> <li>• Deficiency linked to periodontal inflammation</li> </ul>	<b>Probiotics</b> <ul style="list-style-type: none"> <li>• Strengthens immune system</li> <li>• Inhibits colonization of harmful microorganisms</li> <li>• May reduce lactobacillus</li> </ul>



## The Life Cycle: Dietary Considerations for the Dental Patient

### Prenatal

Optimal nutrition, body weight, and health before conception, during pregnancy, and after delivery is the goal for all pregnancies. Obesity increases the chance of hypertension, diabetes, preeclampsia, prolonged delivery and fetal complications. Foods rich in calcium, phosphorus and vitamin D are important nutrients for fetal tooth formation in utero. Tooth development begins as early as the sixth week after conception and calcification of primary teeth begins at 4 months in utero. The most vulnerable periods of fetal development are indicated in the red bars below, where major defects, such as cleft lip and palate appear. Damage to oral structures are most likely to occur between 5 and 8 weeks gestation.<sup>16</sup>

Dietary recommendations before conception include taking a prenatal vitamin and incorporating folic acid rich foods in the diet to prevent neural tube defects such as spina bifida, malformation of the brain and skull, anencephaly, and encephalocele.

Foods rich in folate include;

✓ Dark-green leafy vegetables, broccoli, and asparagus
✓ Citrus fruits and juices
✓ Fortified cereals
✓ Legumes, beans, nuts and peas

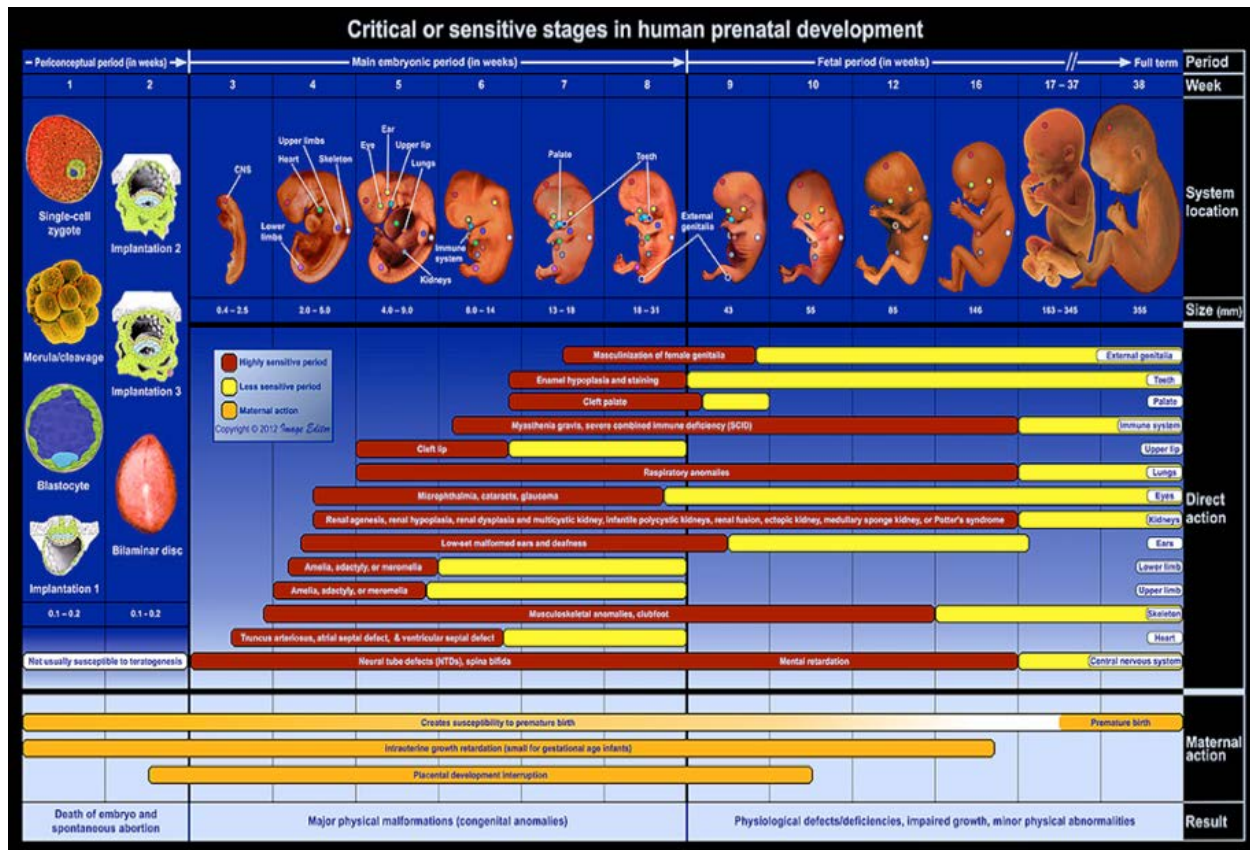
Cleft lip, cleft palate, and cleft lip & palate (CL, CP, CLP) are common congenital birth defects, affecting 1 in 600 births in the U.S. Cleft lip and palate may be unilateral (one side) or bilateral (both sides). Because the lips and palate develop at different times during pregnancy, it is possible to have a CL, CP, or both CL/CP. Genetic factors, exposure to medications and alcohol are known to play a role in the development of CL/CP. Dietary considerations include acquiring adequate protein, folic acid, and B12 during pregnancy.<sup>21</sup>

Feeding an infant with cleft lip/palate can be challenging. The main priority is to ensure adequate nutrient intake. The absence of negative pressure needed for sucking can make this difficult for new parents. Feeding in an upright position, frequent burping, limit feeding to 30 minutes every 3 to 4 hours and using special feeding bottles and nipples can enable the infant to feed more efficiently.<sup>22</sup>

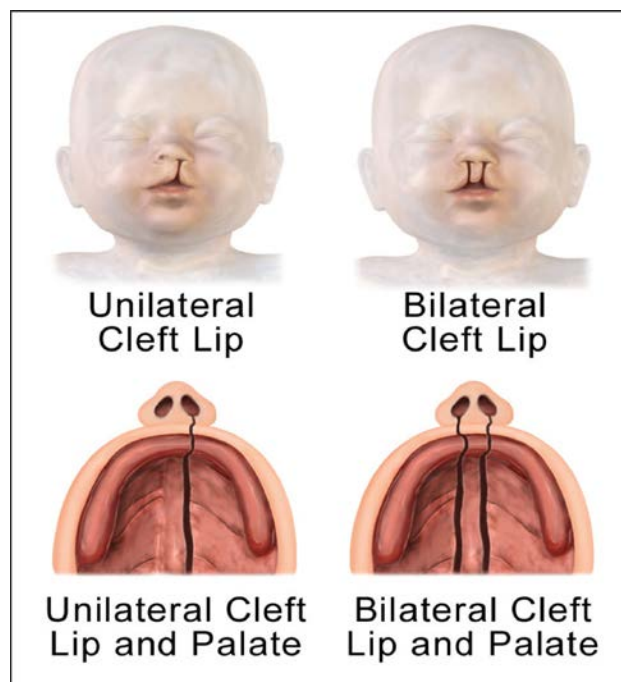
### Infants and Toddlers

Infants and toddlers have distinctive nutritional requirements. An infant's weight triples by his/her first birthday, but with intestinal absorption commonly inefficient and renal function immature, digestion may be challenged. Breast milk or formula should be feed exclusively for infants 4 to 6 months of age. Research shows infants breastfeed for 6 months or more have a lower incident of tooth decay.<sup>11</sup> A gradual introduction, one at a time, of solid foods generally occurs around 6 months of age, about the same time the primary dentition begins to erupt into the oral cavity. Parents should be counseled on cleaning newly erupted teeth with a soft toothbrush or wipes.





**Figure 10.** Vulnerable Periods of Fetal Development.<sup>16</sup>



**Figure 11.** Infant Cleft Palate.<sup>17</sup>



Self-feeding should be encouraged around age 1 to promote self-sufficiency, motor control, and a more varied diet. Offering healthy snack options and limiting fast foods is important modeling during this impressionable time.

Worldwide, Early Childhood Caries (ECC) is the most chronic infectious disease in childhood. It is defined as the presences of one or more missing, decayed or filled primary tooth within the first 3 years of life.<sup>18</sup> The etiology of ECC is a combination of oral bacteria, consumption of carbohydrate rich beverages and food, and poor oral hygiene. *Candida albicans* and *S. mutans*, and the two bacteria together that make for a virulent form of ECC.<sup>11</sup> As oral health educators, knowledge of cultural practices, feeding habits and emphasis on patient education are important considerations when communicating with our patients. Recent research concludes there is a lower incidence of ECC with breastfed verses bottle fed children younger than 12 months. The World Health Organization encourages breast-feeding for infants and children up to 2 years of age.<sup>30</sup>

School-age children need frequent meals to maintain healthy blood glucose levels necessary for optimal academic performance. This is also a time when eating takes on social, psychological, and emotional implications and children develop a lifelong relationship with food. The practice of “mindful eating” as a family, away from the television and electronic devices are good habits to instill at this age. A study by AC Nielsen, Co. found that 66% of American families watch television as they eat dinner.<sup>11</sup> While target advertising and a sedentary lifestyle contributes to the incidence of childhood obesity, encouraging healthy eating habits are important considerations during this rapid growth phase. The appetite at this age is usually very good and healthy snacks are an excellent way to incorporate nutrient dense foods into the diet. Involving children in meal preparation and never using food as a reward or a punishment can teach children healthy eating strategies.

### Healthy Snacks During & After School.

- Fruit Kabobs; Melons, Grapes and Berries
- Slivers of Carrots or Celery with Dip
- Whole Grain Bagel with Peanut Butter
- Tortillas with Cheese, Bean Dip or Hummus
- Mozzarella String Cheese with Whole Grain Crackers
- Smoothies made with Low-fat Yogurt and Frozen Berries
- Trail Mix made with Popcorn and Nuts
- Salsa and Chips
- Mini Pizzas made on a Whole Wheat English Muffin
- Turkey Roll-ups
- Whole Grain Cereal with Fresh Fruit
- Sliced Banana with Peanut Butter and Cereal Sprinkles

### Teenagers

Teenagers often make the least healthy food choices, which may be influenced by peers, social media, and diet trends. Recent studies show 40% of teenagers receive their daily calories from soda, fruit juices, dairy desserts, fried food and pizza.<sup>11</sup> Females by this time have reached their maximum linear growth and begin to increase their percentage of body fat. Males on the other hand are still building muscle and bone mass, their energy needs are greatly accelerated and can consume 4,000

calories each day just to maintain current body weight. When counseling this age encourage healthy snacks-nuts, popcorn, cereal, cheese, and fruit. Educate teenagers, with the use of visual aids, about the negative effects of soda and energy drink consumption on tooth and bone health. Also consider this is an impressionable time when eating disorders, smoking, drugs and alcohol consumption can impair physical and emotional health where professional counseling may be warranted.

According to the National Eating Disorders Organization, those afflicted with this mental disorder include 70 million people worldwide, 30 million in the United States.<sup>31</sup> Two thirds are young females ages 15-24 with remaining one-third being males, children, and the elderly.<sup>31</sup> The major categories include anorexia nervosa, (AN) bulimia nervosa, (BN) binge eating disorder, (BED) and other specified feeding or eating disorder (OSFED), which include anorexia athletic, body dysmorphic disorder, and pica. This epidemic has many factors which may start with emotional triggers and are often combined with substance abuse, anxiety, and depression. As a bio-physio-social disorder, treatment strategies include a multi-discipline approach of psychiatric nature. Dental care is part of the recovery process. Pain from erosion, dentinal sensitivity, and caries is addressed by meeting restorative needs. Dental preventive strategies include using a home fluoride rinse, limiting intake of acidic beverages, and using desensitizing agents for tooth sensitivity.

### Young Adults

Young adults lead an active lifestyle by working and raising families. This is also the time basal metabolic changes occur, causing weight gain. Chronic diseases may start to slowly manifest such as hypertension, cardiovascular disease, and diabetes. Other digestive irregularities such as gastroesophageal reflux disease (GERD) inflammatory bowel disease, (IBD) and lactose intolerance can challenge the digestive process and limit dietary choices.

Oral changes may occur if best practices for biofilm control are not routine. Periodontal disease, bone loss and dental caries may



**Figure 12.** Erosion caused by chronic vomiting in bulimia.

Image source: ©2003 Lippincott Williams & Wilkins.

become a concern during this lifecycle phase. Adults may also begin to experience root caries around the exposed roots of teeth and around existing dental fillings. This may also be associated with the onset of xerostomia, a condition of salivary gland hypofunction due to medications, hormones changes, dehydration, and other medical conditions.<sup>12</sup>

The goal of nutrition during adulthood is health promotion; maintain oral tissue and supporting structures and immune support. Encourage patients to stay physically active and follow the Dietary Guidelines for Americans to prevent future, chronic disease later in life.

### Older Adults

Elderly individuals have unique nutritional concerns, especially as life expectancy continues to increase. Depending on genetics and the ability to resist disease, our bodies age at different rates. Good nutrition can make a significant difference in keeping the body free from disease and the dentition intact.

Oral complications for older adults can cause dietary constraints by making chewing difficult and food less enjoyable. Even with advancements in dentistry, like implant therapy, patients still present with missing and mobile teeth due to neglect. Denture patients may have difficulty chewing efficiently and consume less fibrous type foods and animal protein. Over 25% of older adults have xerostomia, a condition of dry mouth, limiting chewing and speech.<sup>23</sup> Xerostomia is not a

disease, but may be a symptom of various medical conditions, radiation treatment, or medications. Many prescription and OTC medications cause dry mouth including antihistamines, decongestants, hypertensives and antidepressants. Patients with xerostomia are at increased risk of dental caries and halitosis.

The Blue Zone, the highest concentration of centenarians in the world, has been studied by researchers to determine if unique lifestyle habits support longevity. The five Blue zones are in Italy, Greece, Japan, Costa Rica, and the United States. They have identified nine common characteristics of older adults living past 100 years of age.<sup>19</sup>

The USDA MyPlate on the following page offers additional advice for the older adult. Additional highlights include making half you plate fruits and vegetables, choose low-fat dairy or lactose free milk, and vary your protein options.<sup>10</sup>

## Nutritional Counseling in the Dental Practice

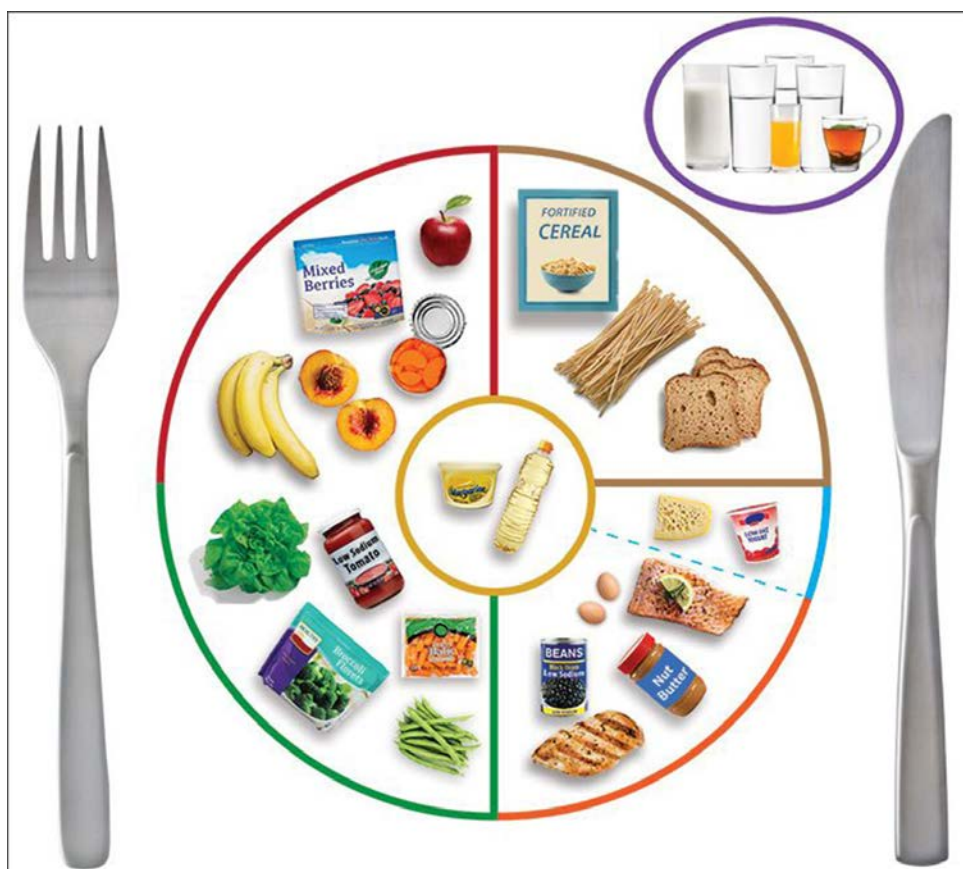
***Advise is like cooking -  
you should try it before  
you feed it to others.***

*- Croft Pente*

When do you counsel a dental patient? How can you initiate a conversation regarding nutrition into a regular prophylaxis appointment? It can be as formal as having a patient record a 3, 5, or 7-day food diary and return for dietary counseling. An informal approach may involve talking chair side, providing visual aids, brochures, or having a patient record a 24-hour recall. Counseling in the dental practice should focus upon reducing oral risks from diet and promoting good nutrition for health. Patients should be referred to a Registered Dietitian if there is an underlying medical condition.



**Figure 13.** Reverse Engineering Longevity.<sup>19</sup>



**Figure 14.** MyPlate for Older Adults.<sup>10</sup>

Table 7 will help determine when to counsel in the dental practice and when to refer a patient to a Registered Dietitian.

### Assessment

Collecting dietary information and looking for clues of oral health status is the first step in nutritional counseling. As oral health experts, we know the mouth is the window for viewing internal health. Looking at a person's rate of caries and tooth loss, disorders of the tongue such as atrophied papillae and glossitis, or other conditions such as a loss of lamina dura, angular cheilitis, or inadequate functioning salivary glands, just to name a few, may indicate nutritional deficiencies.

Caries Management by Risk Assessment (CAMBRA) is an evidence-based approach for patient-specific caries management at its earliest stages. The first step involves categorizing caries risk based on the clinician's overall assessment of patient's disease indicators,

caries protective factors, and caries predisposing factors. The guide below may be helpful as a visual aid during patient education to assess pathological challenges and whether a patient falls into a low, moderate, or high caries risk category.

### Counseling Tips

When diet changes are indicated, keep it simple. Make small changes, and let the patient choose one or two goals to practice between dental appointments. As a clinician, be aware of patient's cultural influence, education, current health status, and any financial restrictions that may inhibit food selection.

- To reduce carcinogenicity of the diet, for adults suggest limiting eating events to three times a day with no more than two between meal snacks and eliminating highly retentive foods such as crackers, chips, and soft candies.
- For children who need the energy

**Table 7. Determine When to Counsel and When to Refer.**

When to Counsel	When to Refer
<ul style="list-style-type: none"><li>• Chronic dieter</li><li>• Denture patient</li><li>• Early Childhood Caries</li><li>• Oral lesions</li><li>• Periodontal disease</li><li>• Recurrent decay</li><li>• Xerostomia</li></ul>	<ul style="list-style-type: none"><li>• Improving heart health</li><li>• Suspected diabetes</li><li>• Eating disorder</li><li>• Food allergies</li><li>• HIV/AIDS</li><li>• Malnutrition</li><li>• Osteoporosis</li></ul>

provided by between meal snacks, they should be healthy food choices low in cariogenic potential such as cheese, raw vegetables, meat roll-ups, and fresh fruit.

- When oral hygiene does not follow a meal, suggest ending a meal with cheese or milk, chewing gum with xylitol, or rinsing with water to raise salivary pH back to neutral (7.0.)
- To stimulate salivary production, include cool, sour, or tart nutrient dense foods (sugar free), increase water intake.
- Incorporate low-fat, calcium rich foods in the diet, spaced throughout the day for remineralization properties.
- Avoid diet soda, which contains acids that may demineralize the tooth surface independent of biofilm acid production.

- Resources for patient education:
  - [American Dental Association](#)
  - [Academy of Nutrition and Dietetics](#)
  - [Nutrition.gov](#)
  - [US Department of Health and Human Services](#)
  - [Medline Plus](#)

### Conclusion

Professional expertise and frequent patient contact make the dental professional the ideal oral health care expert to screen patients for dietary shortfalls and nutritional deficiencies that may impact oral health. *Healthy Eating Plates* and *The Dietary Guidelines for Americans* are sound resources to provide accurate dietary information to our dental patients.



Caries-risk Indicators	Low Risk	Moderate Risk	High Risk
Clinical conditions	<ul style="list-style-type: none"> <li>■ No carious teeth in past 24 mos.</li> <li>■ No enamel demineralization</li> <li>■ No visible plaque; no gingivitis</li> </ul>	<ul style="list-style-type: none"> <li>■ Carious teeth in past 24 mos.</li> <li>■ 1 area of enamel demineralization</li> <li>■ Gingivitis</li> </ul>	<ul style="list-style-type: none"> <li>■ Carious teeth in past 12 mos.</li> <li>■ More than 1 area enamel demineralization (enamel caries "white-spot lesion")</li> <li>■ Visible plaque on anterior (front) teeth</li> <li>■ Radiographic enamel caries</li> <li>■ High titers of mutans Streptococci</li> <li>■ Wearing dental or orthodontic appliances</li> <li>■ Enamel hypoplasia</li> </ul>
Environmental characteristics	<ul style="list-style-type: none"> <li>■ Optimal systemic and topical fluoride exposure</li> <li>■ Consumption of simple sugars or foods strongly associated with caries initiation primarily at meal times.</li> <li>■ High caregiver socioeconomic status</li> <li>■ Regular use of dental care in an established dental home</li> </ul>	<ul style="list-style-type: none"> <li>■ Suboptimal systemic fluoride exposure with optimal topical exposure</li> <li>■ Occasional (i.e., 1-2) between-meal exposures to simple sugars or foods strongly associated with caries</li> <li>■ Midlevel caregiver socioeconomic status (i.e. eligible for school lunch program or SCHIP)</li> <li>■ Irregular use of dental services</li> </ul>	<ul style="list-style-type: none"> <li>■ Suboptimal topical fluoride exposure</li> <li>■ Frequent (i.e., 3 or more) between meal exposures to simple sugars or foods strongly associated with caries.</li> <li>■ Low-level caregiver socioeconomic status (i.e., eligible for Medicaid)</li> <li>■ No usual source of dental care</li> <li>■ Active caries present in the mother</li> <li>■ Children with special health care needs</li> <li>■ Conditions impairing saliva composition / flow</li> </ul>
General health conditions			

Figure 15. AAPD Caries Risk Assessment Tool.<sup>20</sup>

## Course Test Preview

To receive Continuing Education credit for this course, you must complete the online test. Please go to: [www.dentalcare.com/en-us/professional-education/ce-courses/ce583/test](http://www.dentalcare.com/en-us/professional-education/ce-courses/ce583/test)

- 1. A patient is looking for better glycemic control from their diet. Which of the following snacks foods would you recommend?**
  - A. Plain yogurt and nuts
  - B. A glass of chocolate milk
  - C. Oatmeal with fresh pineapple
  - D. Whole-wheat bagel with cream cheese
- 2. An excellent source of plant protein included in a vegan diet include all of the following EXCEPT:**
  - A. Quinoa
  - B. Eggs
  - C. Chia seeds
  - D. Avocado
- 3. All of the following are characteristics of individuals living in the Blue Zone EXCEPT:**
  - A. 80% full
  - B. Wine at 5
  - C. Plant slant
  - D. Exercise 30 minutes/day
- 4. Phytochemicals are powerful antioxidants found in fruits and vegetables. What phytochemical can be found in kale, broccoli, tomatoes, red peppers and watermelon?**
  - A. Lutein
  - B. Lycopene
  - C. Resveratrol
  - D. Anthocyanins
- 5. This vitamin enhances the immune system, assist with the formation of collagen fibers and supports the absorption of calcium and iron:**
  - A. Vitamin C
  - B. Vitamin B
  - C. Vitamin D
  - D. Vitamin A
- 6. This vitamin is a cofactor in prothrombin formation, essential for clotting:**
  - A. Phylloquinone
  - B. Biotin
  - C. Riboflavin
  - D. Tocopherol
- 7. Using the interactive "Create your Plate" tool, which food group is represented in the largest quantity?**
  - A. Protein
  - B. Grains
  - C. C. Fruit
  - D. Non-starchy vegetables

8. Which of the following statements describe the assessment tool; CAMBRA?
- A. An evidence-based approach for patient-specific caries management
  - B. Helpful as a visual aid during patient education to assess pathological challenges
  - C. An assessment of patient's disease indicators, caries protective and predisposing factors
  - D. All of the above describe the CAMBA assessment tool.
9. Which of the following nutrients are considered antioxidants?
- A. Vitamins K, D, Pyroxidine, Copper
  - B. Vitamins B12, B6, Calcium, Selenium
  - C. Vitamins E, C, Beta-Carotene, CoQ10
  - D. Vitamins D, A, Cobalamin, Manganese
10. The most serious damage to oral structures from exposure to nutritional deficiencies are most likely to occur between \_\_\_\_\_.
- A. 2-4 weeks gestation
  - B. 5-8 weeks gestation
  - C. 12-14 weeks gestation
  - D. 15-16 weeks gestation
11. The relationship between diet and dental caries involves all of the following EXCEPT:
- A. A susceptible tooth surface
  - B. *Streptococcus mutans* and *Lactobacillus*
  - C. A fermentable carbohydrate
  - D. Adequate biofilm control
12. When oral hygiene does not follow a meal, caries counseling suggestions may include \_\_\_\_\_.
- A. ending a meal with a fat or protein rich food
  - B. chewing gum with xylitol
  - C. rinsing with water after a meal
  - D. All of the above.
13. Eating foods such as shellfish, eggs, and butter that contain cholesterol can raise overall cholesterol numbers. Total cholesterol should be 200 mg/dl or lower for reduced risk of heart disease.
- A. Both statements are true.
  - B. Both statements are false.
  - C. The first statement is true, the second statement is false.
  - D. The first statement is false, the second statement is true.
14. All of the following statements regarding obesity are correct EXCEPT:
- A. Obesity is a risk factor for periodontal disease
  - B. A poorly nourished host has difficulty fighting infection and inflammation
  - C. Body mass index is positively related to severity of periodontal attachment loss
  - D. Obesity is a diagnosis when a person's body mass index score (BMI) is over 35
15. Which mineral is the most abundant in the body and is necessary for hormone production?
- A. Calcium
  - B. Phosphorus
  - C. Fluoride
  - D. Magnesium

- 16. An eating disorder is most often associated with emotional triggers. Dental care is part of the recovery process that may include preventive strategies**
- A. Both statements are true.
  - B. Both statements are false.
  - C. The first statement is true, the second statement is false.
  - D. The first statement is false, the second statement is true.
- 17. The most important dietary consideration when counseling a patient about diet and dental caries is the frequency of carbohydrate ingestion. Cariostatic foods do not contribute to enamel demineralization and include foods such as nuts, cheese, and meats.**
- A. Both statements are true.
  - B. Both statements are false.
  - C. The first statement is true, the second statement is false.
  - D. The first statement is false, the second statement is true.
- 18. Involving children in meal preparation and never using food as a reward or a punishment can teach children healthy eating strategies. About 50% of American families watch television during dinner time.**
- A. Both statements are true.
  - B. Both statements are false.
  - C. The first statement is true, the second statement is false.
  - D. The first statement is false, the second statement is true.
- 19. Which of the two dietary approaches provide adequate scientific data to back their claims?**
- A. Mediterranean and DASH
  - B. Zone and Atkins
  - C. Paleo and South Beach
  - D. Ketogenic and Whole30
- 20. Which major nutrient is most important for salivary gland function?**
- A. Protein
  - B. Iron
  - C. Zinc
  - D. Vitamin A

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## Additional Resources

- No Additional Resources Available



## About the Author

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Diane Vernetti-Callahan is a dental hygiene faculty at Madison College, Madison, Wisconsin, since 2000. She received her BS degree from Marquette University and her MS degree from University of Wisconsin, Platteville. Diane was an associate professor at the University of Minnesota, School of Dental Hygiene, where she began her teaching career. She has a combined 30 years' experience in education and clinical practice with an interdisciplinary background in health and wellness. In addition to teaching, Diane is a regular contributor to Procter and Gamble's continuing education courses as well as a published author in

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