Nutrition & Oral Health:
Eating Well for a Healthy Mouth

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Continuing Education Units: 2 hours

Online Course: www.dentalcare.ca/en-CA/dental-education/continuing-education/ce301/ce301.aspx

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.

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

Conflict of Interest Disclosure Statement
• The author reports no conflicts of interest associated with this course.

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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 choices.

Learning Objectives
Upon the completion of this course, the dental professional will be able to:
- Classify carbohydrates, proteins, fats, and the role they play in the oral cavity.
- Identify the function of vitamins, minerals, and antioxidants and symptoms of excesses or deficits.
- Recognize specific nutrient requirements during the human life cycle.
- Understand the Healthy Eating Plates.
- 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.

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Glossary
- **anticirogenic** – A food that contributes favorably to dental health by discouraging acid production.
- **antioxidant** – A substance that prevents cell damage from free radicals.
- **beri-beri** – 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 demineralization.
- **cariostatic** – Caries-inhibiting.
- **cheilosis** – 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.
- **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.
**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 and may further complicate chewing healthy foods.

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**Nutrition 101**

Nutritional status is the condition of health as it relates to food and nutrient intake, absorption, and utilization. It is an important factor in immunity and resistance to oral infections.

Diet is essential to support nutritional status. A healthy diet 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.

- 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 Tran saturated fats.
• Consume naturally calorie free water or plain tea and coffee for optimal beverage choices. Limit sugary drinks, both soda and juice, and keep milk and dairy servings to two per day, since high intakes are associated with increased risk of prostate and ovarian cancer.
• 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.  

My Vegan Plate
Vegans need a reliable source of Vitamin B12. Fortified foods include soy milk, breakfast cereal, and meat analog. If fortified foods are not eaten daily, a vitamin B12 supplement of 25 micrograms is recommended. 

• Choose mainly whole grains.
• Eat a variety of foods from each food group.
• Adults age 70 and younger need 600 IU of vitamin D daily.
• Manage your protein requirements by consuming beans, nuts, and soy products.

Dietary Guidelines for Americans
The goal of the Dietary Guidelines is for individuals throughout all stages of the lifespan to have eating patterns that promote overall health and help prevent chronic disease.
Choose Your Plate

Click on the plate sections below to add your food choices.

Menu

- 25% Protein
- 25% Grains and Starchy Foods
- 50% Non-Starchy Vegetables

+ Fruit
+ Drink

My Vegan Plate

Fruits

Grains

Vegetables

Protein

Calcium (leafy greens, calcium-fortified soy milk, and juices, tofu, etc.)
some tips to keep the good quality carbohydrates in your diet:

- Start the day with whole grains; old fashion oats or a cereal with at least 4 grams of fiber.
- Use whole grains breads for snacks and sandwiches.
- Choose whole fruit instead of juice.
- Pass on the potatoes, bring on the beans.

Protein: Lean is Best

Protein is found in muscle, bone, skin, hair, and almost all body tissues. It is built from building blocks called amino acids. Our bodies make non-essential amino acids, but we also require essential amino acids from our diet. Animal proteins tend to deliver all the essential amino acids we need, while grains, nuts, seeds and beans can lack the full amino acid chain they are good sources of folate and fiber.

Vegetarians need to be certain to eat a variety of protein containing foods in order to get all the amnio acids needed to make a new protein.

The protein package is something to consider. For example, wild salmon is an excellent source of protein, low in sodium and saturated fat, and excellent source of heath healthy Omega-3. Beans also contain an excellent source of protein and...
fiber have virtually little saturated fat. On the other hand, a T-bone steak is an excellent source of protein but also contains saturated fat, calories, and sodium.  

Research studies indicate eating even small amounts of red or processed meat increase the risk of heart disease, stroke, type 2 diabetes, and both stomach and colon cancer.  

Eating healthy proteins is essential to health, but there is no need to go overboard; anywhere from 10% to 35% of our total calories will satisfy your protein requirements. Just make certain the protein is lean, heart healthy, and diverse.  

**Lipids: Choose the Best**

New research shows that healthy fats are necessary and beneficial for health, but once again, quality matters. We need fat in our diet to help absorb fat-soluble vitamins A, D, E, and K. Here are some guidelines when choosing the fats.

- Monounsaturated and polyunsaturated fats lower disease risk. Use oils such as olive, canola, sunflower, soy and corn. Include nuts, seeds, and fish in your diet.
- Trans fats increase risk of disease, even in small quantities. Known as the silent killer because of its ability to not only cause damage to the arteries but also to raise cholesterol levels, are created when oils are “partially hydrogenated.” Look for the word “partially hydrogenated” on the food label.
- Saturated fats, while not as harmful as trans fats, can still negatively impact health if not eaten in moderation. This includes red meat, butter, cheese, and ice cream.
- There are also two Essential Fatty Acids (EFAs) our bodies are unable to make so we must get them from foods in our diet. They are commonly referred to as Omega-3 and Omega-6. Good sources include salmon, tuna, flaxseed, walnuts, canola and olive oil, olives, and avocado.

No more than 30% of calories/day should come from fat.  

**What is Cholesterol?**

It is a waxy, fat-like substance but has a different structure than fat. Cholesterol comes from two sources; it is synthesized in our liver and comes from foods of animal origin. The ratio of HDL/LDL and triglycerides circulating in the bloodstream is an important predictor of heart disease and is affected by the amount and types of fat eaten. 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. LDL cholesterol should be less than 130 mg/dl, and HDL cholesterol should be between 50-75 mg/dl or higher. Ideally, at least a quarter of your total cholesterol should be HDL, with a desirable total cholesterol reading of less than 200.

**Coconut Oil**

Even though coconut oil is saturated, recent studies show it has a positive effect on raising HDL (good) cholesterol. It has a wonderful flavor, is a solid at room temperature, and is easy to include in cooking. The effects of coconut oil on heart disease is still inconclusive. It is suggested to use coconut oil sparingly.

**Vitamins**

Vitamins are calorie free, organic, essential molecules needed by the body in minute amounts. Vitamins belong in two groups: water-soluble and fat-soluble. Vitamins C and B are water-soluble and dissolve in water, while excesses are excreted by the body. Fat-soluble vitamins, A, D, E, and K dissolve in fat and excesses are stored in our fat cells. Tables 1 and 2 list the type of vitamins, their function, food sources, and deficiency symptoms.

**Minerals**

Minerals are similar to vitamins in that they are calorie free, essential molecules, but are inorganic, small elements that initiate many biological functions. Mineral content in our diet varies greatly depending on the types of foods consumed and the soil conditions in which plants have grown. Tables 3 and 4 describe how these minerals keep you healthy; their function, sources, and effects of getting too little.

**Electrolytes**

Salt, also known as sodium chloride, adds flavor to food and is used as a preservative, binder and stabilizer. Our body needs very little sodium...
Table 1. Water-soluble Vitamins: C, Bs.

<table>
<thead>
<tr>
<th>Vitamin</th>
<th>Source</th>
<th>Deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-Ascorbic acid</td>
<td>Citrus fruits, Kiwi, Strawberries</td>
<td>Scurvy, Anemia, Capillary fragility, Easy bruising, slow healing, Bleeding tissue</td>
</tr>
<tr>
<td></td>
<td>Cruciferous vegetables, Tomatoes, Leafy greens</td>
<td></td>
</tr>
<tr>
<td>B1-Thiamin or thiamine</td>
<td>Meats, organs products, grains, yeast</td>
<td>Beriberi (loss of appetite, muscle weakness, burning tongue)</td>
</tr>
<tr>
<td>B2-Riboflavin</td>
<td>Milk products, meat, poultry, fish, whole grains</td>
<td>Arboflavinosis: angular cheilosis, glossitis</td>
</tr>
<tr>
<td>B3-Niacin</td>
<td>Animal products, grains, green leafy vegetables</td>
<td>Pellagra (dermatitis, diarrhea, dementia)</td>
</tr>
<tr>
<td>B6-Pyridoxine</td>
<td>Animal products, fish, fruits and vegetables</td>
<td>Microcytic anemia; Depressed immunity, irritability, glossitis</td>
</tr>
<tr>
<td>B12-Cobalamin</td>
<td>Animal products exclusively. Need supplementation if you follow a vegan diet</td>
<td>Pernicious anemia</td>
</tr>
<tr>
<td>Folate/folic acid</td>
<td>Liver, green leafy vegetables, fruits</td>
<td>Megaloblastic anemia, Spina bifida, Commonly seen in alcoholics</td>
</tr>
<tr>
<td>Biotin</td>
<td>Egg yolk, liver, cereals</td>
<td>Pallor of tongue, Atrophy of lingual papillae</td>
</tr>
<tr>
<td>Pantothenic acid</td>
<td>Animal foods, whole-grain cereal, digestive track</td>
<td>N/A</td>
</tr>
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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 one teaspoon a day, but since 90% of adults will develop high blood pressure at some point in their lives, some advocates are suggesting to lower the limit to $\frac{2}{3}$ teaspoon per day.\(^7\)

Table 5 lists the type of electrolytes, their sources and deficiency symptoms.\(^7\)

**Antioxidants**
Antioxidants serve as protectors from damaging free radicals. Free radicals cause cell damage which may lead to the onset of other health problems. 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.\(^8\)

**Dietary Implications in Dental Caries**
Dental caries is a dynamic process that involves a susceptible tooth, cariogenic bacteria in dental plaque (*Streptococcus mutans* and *lactobacillus*), and a fermentable carbohydrate. Other considering factors also include absence of fluoride, salivary gland hypofunction, and poor oral hygiene.\(^10\) Fermentable carbohydrates are commonly considered to be primarily sucrose.
### Table 3. Minerals for Bones and Teeth.

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Source</th>
<th>Deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium: (Ca)</td>
<td>Dairy products, broccoli, dark leafy green vegetables, fortified orange juice and soy milk</td>
<td>Osteopenia/Osteoporosis, Rickets, Incomplete calcification of teeth, Susceptibility to dental caries, Increased tooth mobility, Convulsions</td>
</tr>
<tr>
<td>Phosphorus: (P)</td>
<td>Dairy products, poultry, whole grains, nuts, legumes</td>
<td>Demineralization of bone, calcium loss, Incomplete calcification of teeth, Susceptibility to dental caries, Periodontal disease</td>
</tr>
<tr>
<td>Fluorine: (F)</td>
<td>Fluoridated water, tea, seafood</td>
<td>Decreased resistance to dental caries</td>
</tr>
<tr>
<td>Magnesium: (Mg)</td>
<td>Green leafy vegetables, nuts, whole grains</td>
<td>Muscle tremors, convulsions, Gingival hypertrophy</td>
</tr>
</tbody>
</table>

### Table 4. Microminerals Needed in Smaller Amounts.

<table>
<thead>
<tr>
<th>Micromineral</th>
<th>Source</th>
<th>Deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron: (Fe)</td>
<td>Heme iron: meat, fish, poultry, Non-heme iron: plants, legumes</td>
<td>Anemia, decreased immunity, Angular cheilosis, pallor of lips and mucosa, glossitis, candidiasis, dysphagia</td>
</tr>
<tr>
<td>Zinc: (Zn)</td>
<td>Non-heme iron: plants, Protein rich foods</td>
<td>Loss of taste and smell, Delayed wound healing, Xerostomia, increased candidiasis, periodontal disease, and caries</td>
</tr>
<tr>
<td>Copper</td>
<td>Shellfish, liver, nuts, legumes</td>
<td>Osteoporosis, arthritis, lesions with in the connective tissue</td>
</tr>
<tr>
<td>Manganese</td>
<td>Whole grains, legumes, nuts, tea, leafy greens</td>
<td>Growth retardation, congenital malformations, poor reproduction</td>
</tr>
<tr>
<td>Selenium</td>
<td>Animal products</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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(table sugar). However, all simple sugars are potentially cariogenic. The universal sweetener in use today, high fructose corn syrup is made from the simple sugar, fructose.

The frequency of sugar eaten is the primary factor involved in the caries process. Sugary foods or liquids consumed 20 minutes apart allows for separate opportunities for bacteria to feed and produce acid. When the pH of the dental plaque falls below 5.5, the caries process begins. Form and composition of a fermentable carbohydrate plays a secondary role depending on how long it takes for a food or drink to clear the oral cavity. Liquids clear faster than soft, sticky foods. The total amount of sugar consumed is the least important factor to consider while counseling patients. A food that is 80% sucrose may not be any more harmful than one that is 40% sucrose.

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

<table>
<thead>
<tr>
<th>Electrolyte</th>
<th>Source</th>
<th>Deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium: (Na)</td>
<td>• Works with chloride and potassium • Water balance, acid-base balance • Nerve function</td>
<td>• Table salt, soups, cured meats, processed foods</td>
</tr>
<tr>
<td>Chloride: (Cl)</td>
<td>• Works with sodium • Regulates acid-base, water balance, and digestion (hydrochloric acid)</td>
<td>• Table salt, eggs, fish, meat</td>
</tr>
<tr>
<td>Potassium: (K)</td>
<td>• Second most abundant mineral • Acid-base balance • Sodium potassium pump • Water balance</td>
<td>• Bananas, potatoes, yams, dried fruits, legumes, meat, dairy</td>
</tr>
</tbody>
</table>

Table 5. Electrolytes Responsible for Fluid Homeostasis.

REQUIRES 3 FACTORS + time

Erosion: Caused by intake of carbonated beverages.

Image source: Washington Dental Service Foundation.

Image source: ©2003 Lippincott Williams & Wilkins.
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.

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. 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.

Protective factors from specific foods and diet sequencing may also be utilized in order to reduce the destructive influence of fermentable carbohydrates. Fats and proteins consumed in a meal help coat the tooth surface to protect it from sugars. Consuming dairy products keeps the saliva rich in calcium and phosphorus, offering benefits of remineralization by preventing the pH of the mouth falling below 5.5. Fluoride in both food and water will also help remineralize the enamel.

Diet and periodontal disease are not as clearly connected as diet and dental caries. Overall nutritional status can affect host susceptibility and influence disease progression. Good nutrition can be protective by helping increase resistance to periodontal infection and help minimize its severity while malnutrition can reduce resistance to periodontal infection.

The physical consistency of food has a direct effect on periodontal health. Crunchy, fibrous foods increase salivary flow which offers antibacterial properties. 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 major nutrients for oral health and their specific roles.

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

**Pregnancy**

Pregnancy is a time in a woman's life that has unique dietary needs. Individual nutritional requirements are unique for each person and should be discussed with the patient's obstetrician. Ideally, optimal nutrition should be practiced before conception, since many birth defects occur before a woman is aware she is pregnant. Vulnerable periods of fetal development are indicated in the box below. The most serious damage to oral structures from exposure to toxins and nutritional deficiencies are most likely to occur beginning at 6 to 8 weeks' gestation.7

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**Table 6. Major Nutrients for Oral Health and their Specific Roles.**

<table>
<thead>
<tr>
<th>Vitamin D</th>
<th>Vitamin A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium and phosphorus absorption</td>
<td>Forms oral epithelium</td>
</tr>
<tr>
<td>Builds skeletal bones and teeth</td>
<td>Enhances immune system</td>
</tr>
<tr>
<td>Alveolar process support</td>
<td>Wound healing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B-Complex Vitamins</th>
<th>Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formation of new cells</td>
<td>Supports growth of cells</td>
</tr>
<tr>
<td>Cofactor for nutrients</td>
<td>Resist infection</td>
</tr>
<tr>
<td></td>
<td>Makes antibodies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Vitamin C</th>
<th>Iron, Zinc, Copper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aids in collagen formation</td>
<td>Aids in collagen formation</td>
</tr>
<tr>
<td>Promotes capillary integrity</td>
<td>Wound healing</td>
</tr>
<tr>
<td>Enhances immune response</td>
<td>Regulates inflammation</td>
</tr>
</tbody>
</table>
Dietary recommendations before conception include taking a prenatal vitamin with 400 mcg of folic acid and incorporating foods rich in folate such as dark greens, citrus fruits, and fortified grains and cereals.

Dietary recommendations before and during pregnancy include an additional 300 calories/daily from the fourth month of pregnancy until delivery. (Warning: too many calories can increase a mother’s chance of developing hypertension, diabetes, preeclampsia, prolonged delivery, and congenital malformations.) Other dietary considerations include additional protein for fetal tissue development, calcium, phosphorus, and vitamin D for bone remineralization and calcification of deciduous teeth, and an additional 25% increase in fluids is necessary to support maternal blood volume.

Foods such as raw eggs, meat, soft cheese, and unpasteurized juice should be avoided as they may cause food-borne illness and harm to the developing fetus. Stimulates such as caffeine,
alcohol, tobacco, and both prescription and non-prescription drugs pass through the placental barrier and can affect growth and development.\textsuperscript{7}

Cleft lip and palate occurs in about 2 out of every 1,000 babies born each year, making it one of the most common birth defects. Cleft lip and palate is associated with a severe folic acid deficiency during pregnancy. Since the effects of folic acid deficiency occur in the first few weeks of pregnancy, often women realize they are pregnant, women of childbearing age should be careful to get sufficient folic acid on a daily basis. For this reason, bread has been fortified with folic acid since 2006.\textsuperscript{1}

### 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 will provide the necessary nourishment during the first 6 months of development. A gradual introduction of solid foods generally occurs around 6 months of age, but every child is different and it is readiness to feed, not the calendar that should determine when a child begins taking solid foods. As a rule, children should be off the bottle or breast by age 1.1 As a toddler begins self-feeding, an erratic appetite and food jags may become more common. Offering healthy snack options and limiting fast foods is important modeling during this impressionable time.\textsuperscript{7}

Orally, primary teeth are beginning to erupt. Parents can prevent early childhood caries by cleaning teeth with a gauze or toothbrush after meals. Having the child sip water instead of juice or milk before nap and bedtime can limit the exposure of fermentable carbohydrates. However, milk or milk substitutes are important sources of the calcium, phosphorus, and vitamin D essential for the calcification of permanent crowns.\textsuperscript{7}

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 taxing for a new mother. Enlarging the hole in the bottle and using special feeding devices will enable the infant to feed more efficiently. Refer patients to the American Cleft Palate Association for more information.\textsuperscript{1}

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 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.\textsuperscript{7}

### Healthy Snacks During & After School.

- Fruit Kabobs; Melons, Grapes and Berries
- Slivers of Carrots or Celery with Hummus
- Whole Grain Bagel with Peanut Butter
- Soft, Whole Wheat Taco Shell with Melted Low-fat Cheese
- 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

Calcium, phosphorus, and vitamin D requirements increase at this age due to growth spurts in the long bones. Orally, primary teeth are exfoliated
and the eruption of permanent teeth begins. Sealant placement on the first permanent molars is standard protocol for caries prevention at this stage of oral development.¹

**Teenagers**
Teenagers often have the worst diets and are the most difficult age to counsel. Peer pressure, weight control, rapid growth, hormones, and stress challenge the body and mind both psychologically and physically. Pizza, burgers, and soda and energy drinks hardly begin to provide the basic nutritional needs. 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, so their calorie needs will be much higher. When counseling this age, appeal to body image and 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. Better options include flavored sparkling and fitness waters, 100% fruit juice, and low-fat milk.⁷

Anorexia nervosa, bulimia nervosa, and binge eating, is a bio-physio-social illness that affects 8 million Americans – seven million woman and one million males annually. Patients suffering from eating disorders may use a combination of starvation, purging, and/or binging. Orally, erosion is normally limited to the lingual surfaces of the maxillary anterior teeth. Chronic regurgitation caused by purging may also cause sensitivity due to the exposure of dentin.¹

Treatment options include medical intervention, psychological and nutritional counseling, behavior modification, fluoride treatments, and sodium bicarbonate rinses.⁷

**Adults**
Adults between the ages of 30 and 40 may begin to feel the effects of a reduced basal metabolic rate (BMR). Weight gain, especially around the waistline, and bone resorption due to calcium loss places adults at risk for more serious health problems later in life.

Adults may also begin to experience root caries around the exposed roots of teeth and around existing dental fillings. Often this is associated with development of dry mouth and the use of hard candies or mints to increase salivary flow.

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 may help prevent future, chronic disease later in life.

**Elderly**
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.⁸

Xerostomia, dysphasia, tooth loss, and economics may pose some dietary restrictions. Incorporating fiber rich foods for a healthy G.I. tract, decreasing fat intake for weight control, supplementing with a senior multivitamin for osteoporosis prevention, and maintaining hydration are important dietary recommendations.

The USDA MyPlate below offers some additional advice for the older adult. Some highlights include making half you plate fruits and vegetables, choose low-fat dairy or lactose free milk, and vary your protein options.¹⁴
Table 7 will help determine when to counsel in the dental practice and when to refer a patient to a Registered Dietitian.

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.

Counseling Tips
• 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 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 stimulate salivary flow, include cool, sour, or tart nutrient dense foods (sugar free), increase water intake, and suck on sugar-free mints.
- Incorporate low-fat, calcium rich foods in the diet, spaced throughout the day for the best absorption rate.
- When reading a food label, don’t forget to look at the serving size and multiply accordingly.

Resources for patient education:
- American Dental Association – www.ada.org
- American Academy of Family Physicians – www.aafp.org
- American Dietetic Association – www.eatright.org
- NIH Resource Center on Osteoporosis – www.osteo.org
- Vegetarian Resource Group – www.vrg.org

Conclusion
Educational training and frequent patient contact makes the dental professional the ideal health care provider to screen patients for dietary shortfalls and nutritional deficiencies that may impact oral health. Healthy Eating Plate and The Dietary Guidelines for Americans are sound resources to provide accurate dietary information to our dental patients.
Course Test Preview
To receive Continuing Education credit for this course, you must complete the online test. Please go to: www.dentalcare.ca/en-CA/dental-education/continuing-education/ce301/ce301-test.aspx

1. All of the following are examples of a complex carbohydrate EXCEPT _______________.
   a. apples and oranges
   b. broccoli and carrots
   c. whole wheat crackers
   d. frosted flakes cereal

2. __________ has the ability to remove cholesterol from the arterial walls and take it back to the liver where it is excreted.
   a. Low-density lipoprotein (LDL)
   b. High-density lipoprotein (HDL)
   c. Triglycerides
   d. Trans fats

3. Which of the following stimulates pass through the placental barrier and can negatively affect growth and development of an embryo?
   a. Caffeine
   b. Alcohol
   c. Tobacco
   d. All of the above.

4. All of the following statements are true regarding cholesterol EXCEPT:
   a. It is a waxy, fat-like substance.
   b. Total cholesterol readings should be under 220.
   c. It is an important predictor of heart disease.
   d. It is synthesized in the liver.

5. A long-term deficiency of vitamin C may cause this oral condition:
   a. Scurvy
   b. Delayed dentition
   c. Pellagra
   d. Beriberi

6. A deficiency of vitamin K may cause this condition:
   a. Prolonged bleeding
   b. Muscle cramping
   c. Xerostomia
   d. Pernicious anemia

7. Using the interactive “Create your Plate” tool, which food group is represented in the largest quantity?
   a. Protein
   b. Grains
   c. Fruit
   d. Non-starchy vegetables
8. A folic acid deficiency during pregnancy may cause this oral condition during fetal development:
   a. Anemia
   b. Cleft lip/palate
   c. Delayed dentition eruption
   d. Candida

9. Which of the following are considered antioxidants?
   a. Vitamins K, D, and Pyridoxine
   b. Vitamins B12, B6, and Calcium
   c. Vitamins E, C, and Beta-Carotene
   d. Vitamins D, A, and Cobalamine

10. The most serious damage to oral structures from exposure to nutritional deficiencies are most likely to occur beginning ____________.
    a. 2-4 weeks gestation
    b. 6-8 weeks gestation
    c. 12-14 weeks gestation
    d. 15-16 weeks gestation

11. The relationship between diet and dental caries normally involves all of the following EXCEPT:
    a. A susceptible tooth surface.
    b. Streptococcus mutans and lactobacillus.
    c. A fermentable carbohydrate.
    d. Adequate oral hygiene.

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. Fat soluble vitamins include ____________.
    a. A, C, D, B1
    b. B12, C, D, K
    c. A, D, E, K
    d. B3, C, D, K

14. All of the following are examples of heart healthy fats EXCEPT ____________.
    a. olives
    b. walnuts
    c. avocado
    d. butter

15. Calcium is the most abundant mineral in the body.
    a. True
    b. False
16. An eating disorder may involve a combination of starvation, purging, and/or binging.
   a. True
   b. False

17. The most important dietary consideration when counseling a patient about diet and dental caries is the frequency of carbohydrate ingestion.
   a. True
   b. False

18. Involving children in meal preparation and never using food as a reward or a punishment can teach children healthy eating strategies.
   a. True
   b. False

19. Which combination of vitamins/minerals (is/are) essential for the calcification of teeth?
   a. Calcium, Phosphorus, Vitamin D
   b. Phosphorus, Selenium, Iron
   c. Vitamin C, A, B
   d. Iron, Zinc, Calcium

20. Vitamin C is important in periodontal health because it _______________.
   a. aids in collagen formation
   b. promotes capillary integrity
   c. enhances immune response
   d. All of the above.
References

Additional Resources
• American Dental Association – www.ada.org
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• Vegetarian Resource Group – www.vrg.org

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Diane Vernetti-Callahan, RDH, BS is a 1986 graduate of Marquette University, School of Dental Hygiene. She is a former clinical professor at the University of Minnesota and is currently a dental hygiene instructor at Madison College, Madison, WI, where she has been on the faculty since 2000. Diane has a combined 25 years’ experience in both education and private practice. Academic interest includes health and wellness, nutrition and oral health, public health, Dental Initiative of Dane County, and clinical instruction. In the public health sector, Diane has worked as Program Coordinator at the Madison Department of Public Health for the National Program, “Give Kids a Smile.”

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