

The RDs Role in Dental Health: How Traditional Diets Support Strong Teeth

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Today You Will Learn

- Bi-directional interrelationship between nutrition and oral health
- Association of traditional food patterns and food synergy to prevent oral infectious diseases
- Role of the RD in dental health care

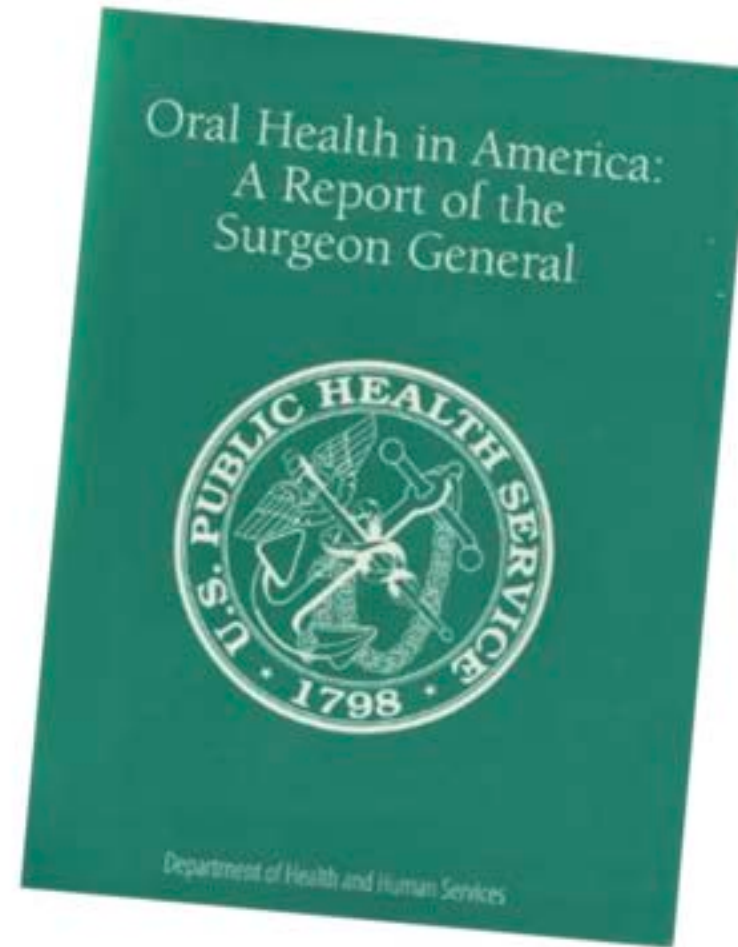
Synergistic Relationship: Diet and Oral Health

- Inextricable link
 - Mouth is initial point of contact with nutrients
 - Salivary amylase aids in first step of digestion process
 - Maintaining natural teeth allows consumption of nutrient-dense diet
 - Poor oral health leads to compromised food choices
 - Poor nutrition increases risk of oral disease



Key Message

- **Surgeon General's report**
 - Dietary choices affect oral health



Key Message

- **Academy of Nutrition and Dietetics**
 - “Nutrition is an integral component of oral health. The Academy supports the integration of oral health with nutrition services, education, and research. Collaboration between dietetics and dental professionals is recommended for oral health promotion and disease prevention and intervention.”



Key Message

- **American Academy of Pediatric Dentistry (AAPD)**
 - “Dental professional’s engagement in nutrition education and provision when necessary, of appropriate referral for dietary counseling from pediatrician or nutritional counseling.”





Hard Tissue of the Oral Cavity

Caries: Most Common Infectious Disease in Childhood

- Oral infectious disease of the teeth
- Primary teeth begin to erupt at 4-6 months of age
 - Susceptible to caries
- Caries incidence based on age:
 - 18% of children 2-5 years old
 - 45% of children 6-11 years old
 - 54% of adolescents 12-19 years old

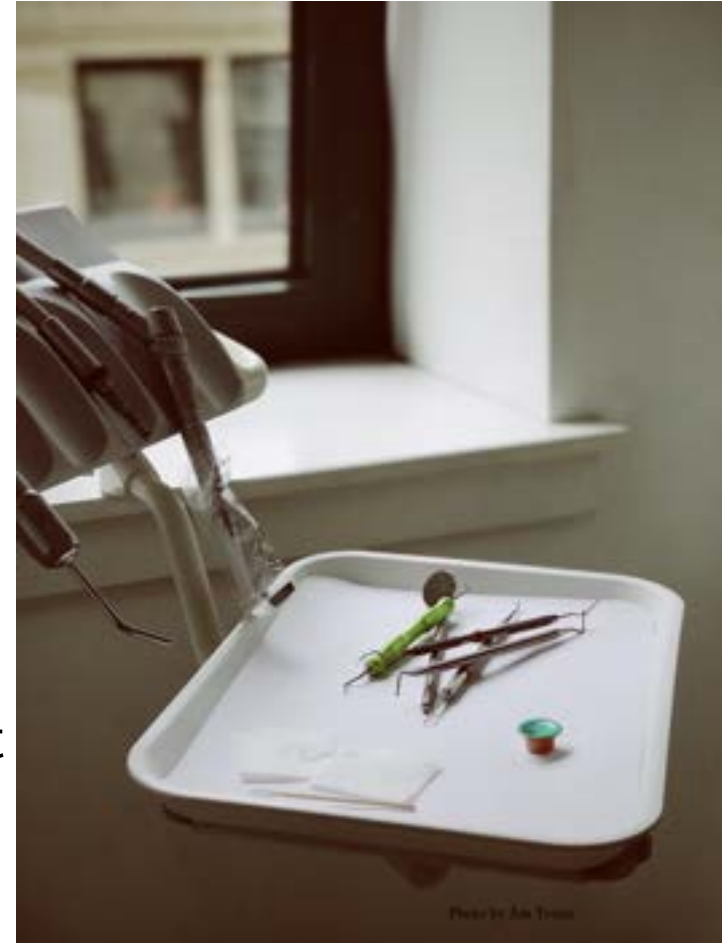
Cariogenic Process is Influenced by Diet

- Salivary amylase, produced by salivary glands breaks down fermentable carbohydrates into oligosaccharides
- Substrates for cariogenic bacteria
- *S. mutans* and *L. acidophilus*
- Shift in composition of biofilm and a decrease in salivary pH
- Teeth become weak and demineralized
- Tooth decay and chronic infection



Impact of Severe Early Childhood Caries (ECC)

- Chronic dental pain
- Difficulty eating
- Malnutrition
- Premature tooth loss
- Economic burden
- Difficulty sleeping
 - A cross-sectional study of 500 child-parent pairs looked at ECC and quality of life (QOL) and found a significantly lower QOL in both child and parent
- School absence



Oral Home Care is Protective Against Caries

- AAP and AAPD recommend early dental visits
 - Child's first dental visit should be within 6 months of eruption of first tooth or by age 12 months
 - Brushing and flossing
 - Topical fluoride
 - Regular check-ups

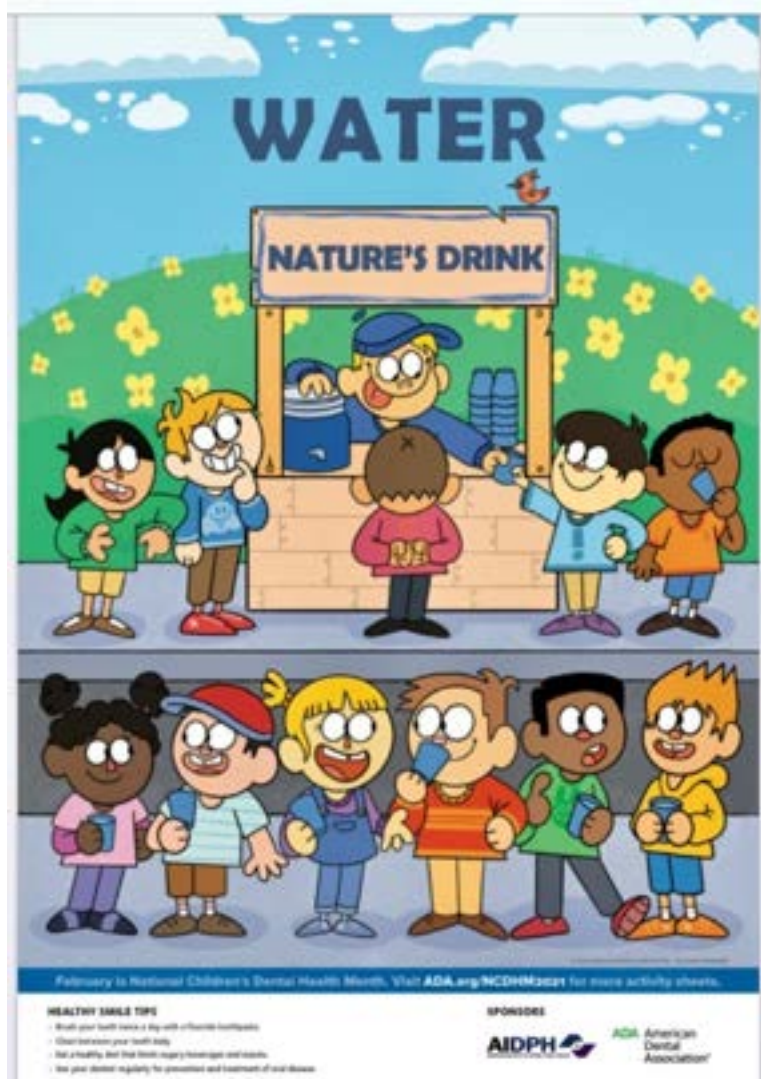


Healthy Diet is Protective Against Caries

- Genetics, hormones, medications, overall health
- Healthy dietary patterns
 - Form of food
 - Duration of exposure
 - Retention time
 - Nutrient composition and buffers
 - Fluoridated water



Fluoridated Water Recommendations



Establish a Healthy Beverage Pattern

An important part of establishing an overall healthy dietary pattern is careful consideration of beverages. Guidance for different beverage categories is provided below.

WATER

For healthy infants with adequate intake of human milk or infant formula, supplemental water is typically not needed in the first 6 months. Small amounts (up to 4 to 8 ounces per day) of plain, fluoridated drinking water can be given to infants with the introduction of complementary foods. Plain, fluoridated drinking water intake can slowly be increased after age 1 to meet hydration and fluoride needs.

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DGA Major Recommendations

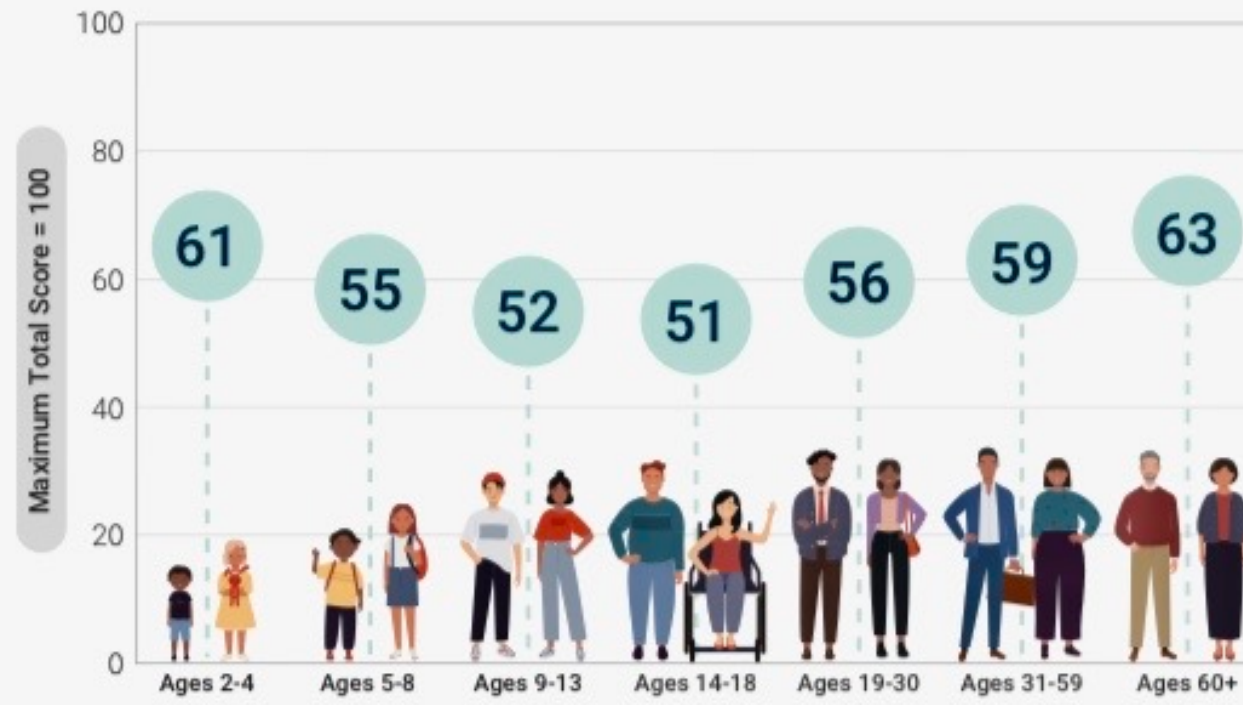


- Follow healthy dietary pattern
- Customize and enjoy nutrient-dense foods and beverages that reflect preference, culture and budget
- Meet nutrient needs with nutrient-dense foods
- Limit foods and beverages high in added sugars

HEI Scores in U.S.

Figure 1-4

Adherence of the U.S. Population to the *Dietary Guidelines* Across Life Stages, as Measured by Average Total Healthy Eating Index-2015 Scores



Nutrient Dense Diet Reduces Caries Risk

- Recent cross-sectional study
- Data from the National Health and Nutritional Examination Survey (NHANES)
- N = 7,751 adults
- Examined decayed, missing, filled teeth and untreated caries and looked at HEI scores
- Results
 - Higher HEI scores associated with less untreated caries
 - Less sugar, more whole fruits and total fruits, greens and beans were associated with lower caries risk
- “Integration of oral health promotion with nutrition education and guidance is crucial to ensure comprehensive care for patients of all ages.”



Severe Caries is Associated with Malnutrition

- Recent cross-sectional study published in the International Journal of Environmental Research and Public Health
 - Looked at diet, nutritional status and oral health
 - N = 273 Nepali children ages 6 months-12 years
 - Traditional diet in Nepal includes rice, lentils, vegetables (Dahl Bhat)
 - Traditional snacks: corn, popped corn, roasted soybeans; foods made from locally grown wheat and millet grains



Swapping Traditional Grains for Refined Carbs

- Children in Nepal are currently consuming “sweets, processed snacks, sugar-sweetened tea, other sugar sweetened beverages (SSBs) on a daily basis... a daily staple of the diet for many children”
- Increased intake of sugar consumption was associated with childhood malnutrition
 - Malnutrition defined by WHO criteria
 - 20% of the children had stunted growth, 14% underweight and 6% wasted
- Severe caries was associated with acute malnutrition in all ages and with chronic malnutrition in older children
- “The association between severe caries and malnutrition underscores the importance of caries prevention and early intervention” for optimal oral health, optimal nutritional status and optimal growth and development.

Intrinsic Natural Sugars

- Physically located in cellular structure and naturally present
 - Whole grains
 - Fruits and vegetables
 - Milk and dairy



Photo by Markus Spiske

Intrinsic Natural Sugars

- Do not contribute to caries
- May be protective against caries
 - Fiber
 - Fluid
 - Polyphenols
 - Mechanical stimulation of salivary flow
 - Calcium

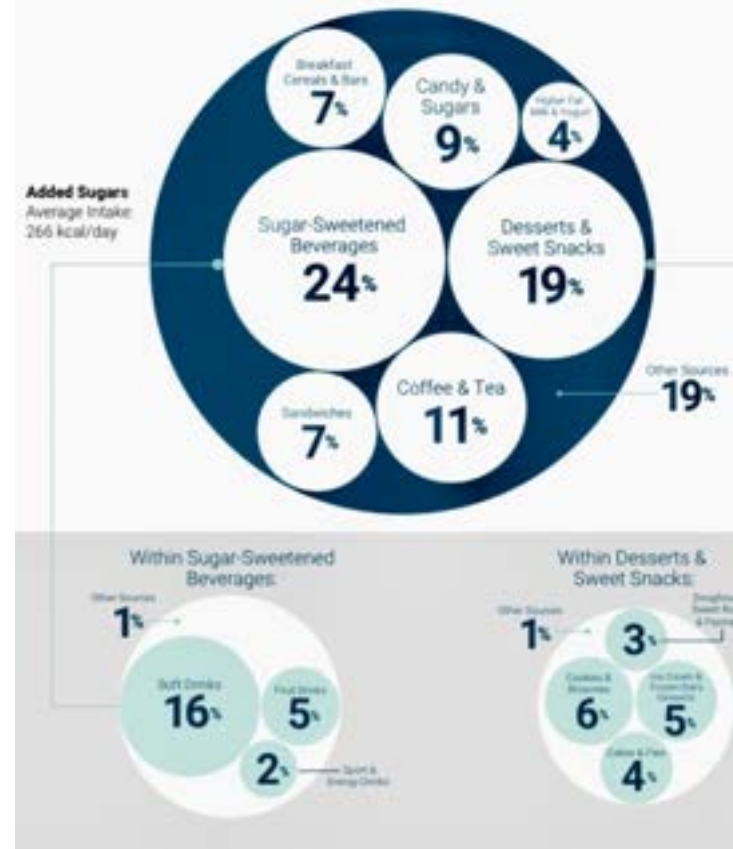


Extrinsic Cariogenic Sugars in Our Diets

- Brown sugar, table sugar, corn syrup, beet sugar, maple syrup, turbinado sugar, coconut sugar, agave nectar, molasses, honey, date sugar...

Figure 1-10

Top Sources and Average Intakes of Added Sugars: U.S. Population Ages 1 and Older



Data Source: Analysis of What We Eat in America, NHANES, 2013-2016, ages 1 and older; 2 days dietary intake data, weighted

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Sugar Sweetened Beverages (SSB)

- Cross-sectional study published in Journal of the American Dietetic Association, found that increased SSB intake was associated with decreased calcium intake in young children
- Recent cross-sectional study in JADA looked at > 14,000 people, ages 2-74 “independent association b/w SSB consumption and caries...encompassing childhood to old age.”



Parents' Ability to Identify Sugar in Beverages

- April, 2021 cross-sectional study of U.S. parents of children age 1-5, published in *Pediatric Obesity*
- Assess parents' ability to identify sugar and non-nutritive sweeteners in beverages commonly consumed by children
 - Viewed both front and back of beverage labels
 - Incorrect identification of beverages with non-nutritive sweeteners
 - Misconceptions: unsweetened juice contained added sugar, sweetened flavored water did not contain sugar, and that 100% fruit juice contained < 100% juice
- Parents are not able to recognize added sugars and/or non-nutritive sweeteners in beverages

Healthy Beverage Consumption in Early Childhood

Recommendations from Key National Health
and Nutrition Organizations

Healthy Eating
Research

September 2019

- Plethora of beverage choices
 - Waters
 - Dairy milks, toddler milks and plant-based milks
 - Caffeinated drinks
 - SSBs
 - Fruit juice and fruit blends
 - Culturally-specific drinks
 - Yerba mate or Brazilian tea
 - Bubble tea, popular Taiwanese beverage
 - Sweet lassi, popular drink in India

HEALTHY DRINKS. HEALTHY KIDS.

Research shows that what children drink from birth through age five has a big impact on their health – both now and for years to come. While every child is different, the nation's leading health organizations agree that for most kids, the following recommendations can help to set children on a path for healthy growth and development. As always, consult with your health care provider about your child's individual needs.

ALL KIDS 5 AND UNDER

All kids 5 and under should avoid drinking flavored milks, toddler formulas, plant-based/non-dairy milks*, caffeinated beverages and sugar- and low-calorie sweetened beverages, as these beverages can be big sources of added sugars in young children's diets and provide no unique nutritional value.

0-6 MONTHS



Babies need only **breast milk** or **infant formula** to get enough fluids and proper nutrition.

6-12 MONTHS



In addition to **breast milk** or **infant formula**, offer a small amount of drinking **water** once solid foods are introduced to help babies get familiar with the taste – just a few sips at meal times is all it takes. It's best for children under 1 not to drink juice. Even 100% fruit juice offers no nutritional benefits over whole fruit.

12-24 MONTHS



It's time to add **whole milk**, which has many essential nutrients, along with plain drinking **water** for hydration. A small amount of juice is ok, but make sure it's 100% fruit juice to avoid added sugar. Better yet, serve small pieces of real fruit, which are even healthier.

2-5 YEARS



Milk and **water** are the go-to beverages. Look for milks with less fat than whole milk, like skim (non-fat) or low-fat (1%). If you choose to serve 100% fruit juice, stick to a small amount, and remember adding water can make a little go a long way!

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Caregiver's Knowledge About Caries

- Cross-sectional study published in Pediatric Dentistry Journal assessed knowledge regarding sugar, simple carbohydrates and dental caries
- N = 55 caregivers of pediatric dental patients
- Results:
 - Poor understanding:
 - Caries etiology
 - Role of fermentable carbohydrates in pit and fissure caries development
 - Caries prevention
 - Good understanding:
 - Sugar is cariogenic, an “empty calorie food”
 - Child should avoid SSBs, candy and sweets



Research: Maternal Obesity and Child's Caries Risk

- Wigen et al conducted a study based on data from the Norwegian Mother and Child Cohort Study
- “Children with an obese mother or one whose diet was rich in sugar and fat early in pregnancy” were at higher risk of developing caries at age 5
 - Child with obese mother had a 2.3 times higher risk of caries development
 - When mom consumed more sugar or fat than recommended, child had 1.5 and 1.6 times higher risk
 - Other factors that increased caries risk included non-western origin and low education



Promote a Healthy Dentition

- Promote healthy eating patterns, behaviors and habits
 - Frequency of food and beverages should be at least 2 hours apart
 - Discourage frequent snacking
 - Discourage cariogenic foods and SSBs
- Families can select nutrient-dense, cariostatic foods




Shift to Whole Grains


- Nutrient-dense
- Contain fiber, vitamins, polyphenols, minerals, antioxidants, positively affect gut and oral microbiota
- Whole grains are associated with reduced caries risk

OLDWAYS WHOLE GRAINS COUNCIL **WHOLE GRAINS 101**


Whole grains are healthier, with more fiber, more protein, and higher levels of many essential nutrients. Most of the grain kernel's nutrients—and flavor—are in the bran and germ, which are routinely stripped out to make white flour.




Grain Anatomy



EXAMPLES OF WHOLE GRAINS. TRY A NEW ONE EVERYDAY!



HOW TO FIND WHOLE GRAINS



The different gram amount on each Stamp tells you how many grams of whole grain are in ONE serving of the product.

THE 100% STAMP	THE 50% STAMP	THE BASIC STAMP
Products where 100% of the grain is whole grain.	Products where at least 50% of the grain is whole grain.	Products that contain a significant amount of whole grain, but which contain primarily refined grains.
Minimum requirement: 16 grams whole grains per serving.	Minimum requirement: 8 grams whole grains per serving.	Minimum requirement: 6 grams whole grains per serving.

LOOK FOR THESE WORDS IN THE INGREDIENTS:

- Whole Grains: whole [grain], whole [grain] flour, wheat berries, stoneground whole [grain], oats, oatmeal, brown or wild rice, millet, quinoa, amaranth, hulled or hull-less barley.
- May or May Not be Whole Grain: flour, wheat, wheat flour, organic unbleached, semolina, multigrain, stoneground [grain].
- Not Whole Grain: enriched flour, bran, germ, wheat germ, degenerated, pearled barley, degenerated corn, white rice.

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Soft Tissue of Oral Cavity

Gum Disease

- Gingivitis
 - Inflammation of the soft tissue component of the periodontium
 - Initial condition that predisposes patient to periodontal disease
- Good oral hygiene, regular dental visits and a diverse nutrient-dense diet can reduce the severity of the gingivitis
 - Adequate calcium, vitamins D, K, magnesium, phosphorus are needed to support optimal alveolar bone density
 - Adequate calories, protein, vitamins C, A, E, omega-3 fatty acids, Fe, Zn, antioxidants are needed for healthy oral soft tissue

Periodontal Disease

- Affects 50% of adults in U.S.
- Chronic inflammatory disease that leads to systemic inflammation and tooth loss, if untreated
 - Caused by bacteria and lipopolysaccharides
 - Resulting in osteoclastic activity and alveolar bone loss
- Linked to:
 - High blood pressure
 - Cardiovascular disease
 - Diabetes
 - Adverse pregnancy outcomes, such as preterm delivery
 - Severity of COVID-19 infections
 - Recent case-control study published in Journal of Clinical Periodontology, n= 568 patients found that periodontitis was associated with COVID-19 complications and death

Omega-3 Fatty Acids

- α -Linolenic acid (ALA) , Eicosapentaenoic acid (EPA) , Docosahexaenoic acid (DHA)
 - Lower risk of chronic disease, including cardiovascular disease
 - Protective against periodontitis
 - Anti-inflammatory and antibacterial effect on common oral pathogens
- Inverse relationship between high dietary intake of DHA and periodontitis
 - Nationally representative cross-sectional study published in the Journal of the American Dietetic Association, n = >9,000 adults from NHANES
 - Authors suggest that 2 servings of fatty fish q week may help decrease risk for periodontitis



Tooth Loss and Dentures

- Partial or full removable dentures impact ability to bite, chew and swallow
- Ability to chew with dentures is only 20-25% that of natural teeth, due to reduced bite force
- Nutrition intervention
 - Cut foods into small sizes
 - Offer mechanical soft diet
 - Moisten hard to chew food
- Dental intervention
 - Dental implants may help to restore mastication and lead to intake of more nutrient-dense foods





How What we Eat Impacts our Oral Health

Nutrient Deficiencies Affect Oral Health

Deficiency	Oral developmental disease
Protein	Delayed tooth eruption Decreased enamel solubility
Vitamin A	Impaired epithelial tissue development Impaired tooth formation Enamel hypoplasia
Vitamin D and Calcium	Hypomineralization Delayed tooth eruption Abnormal alveolar bone
Vitamin C	Delayed wound healing Dentin malformation Defective collagen formation

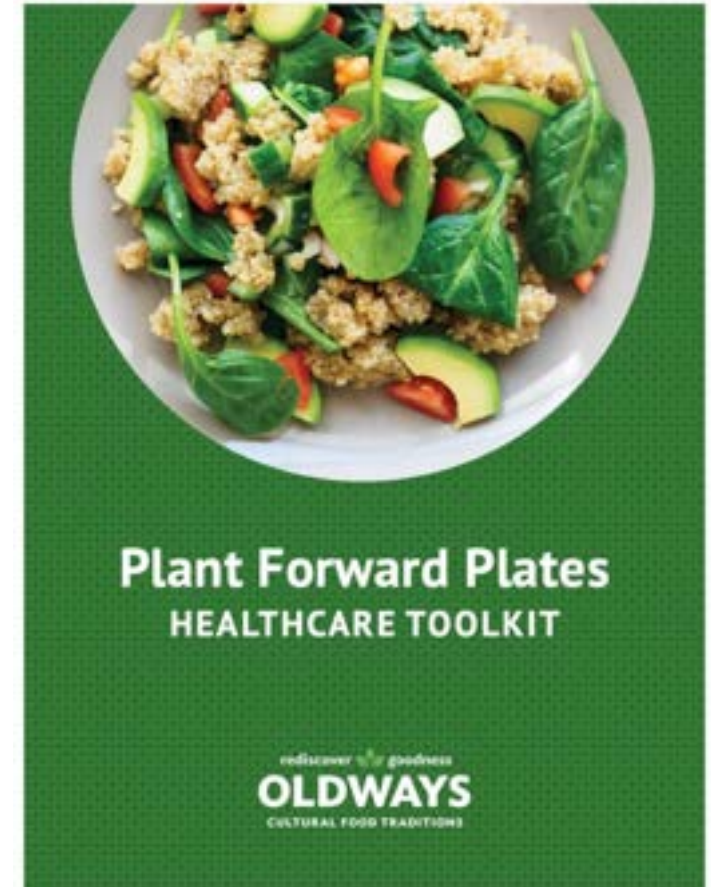
Food Synergy

- “In recent years researchers, public health experts and RDs have acknowledged that nutrients and foods are not consumed in isolation. Rather, people consume them in various combinations over time-a dietary pattern-and these foods and beverages act synergistically to affect health.” DGA



Healthy Plant-based Diet Associated with Lower Risk CVD

- A recent study published in the Journal of the American Heart Association
 - Community-based cohort of 12,168 middle-aged adults in Atherosclerosis Risk in Communities Study
- Median follow-up 25 years
- Used established plant-based diet scores to assess dietary intakes
- Results: healthy plant-based diet group (whole grains, fruits, vegetables, nuts, legumes, tea, coffee) had a 19% lower risk of cardiovascular disease (CVD)
 - “...potential synergistic and interactive effects of foods and nutrients on disease risk.”



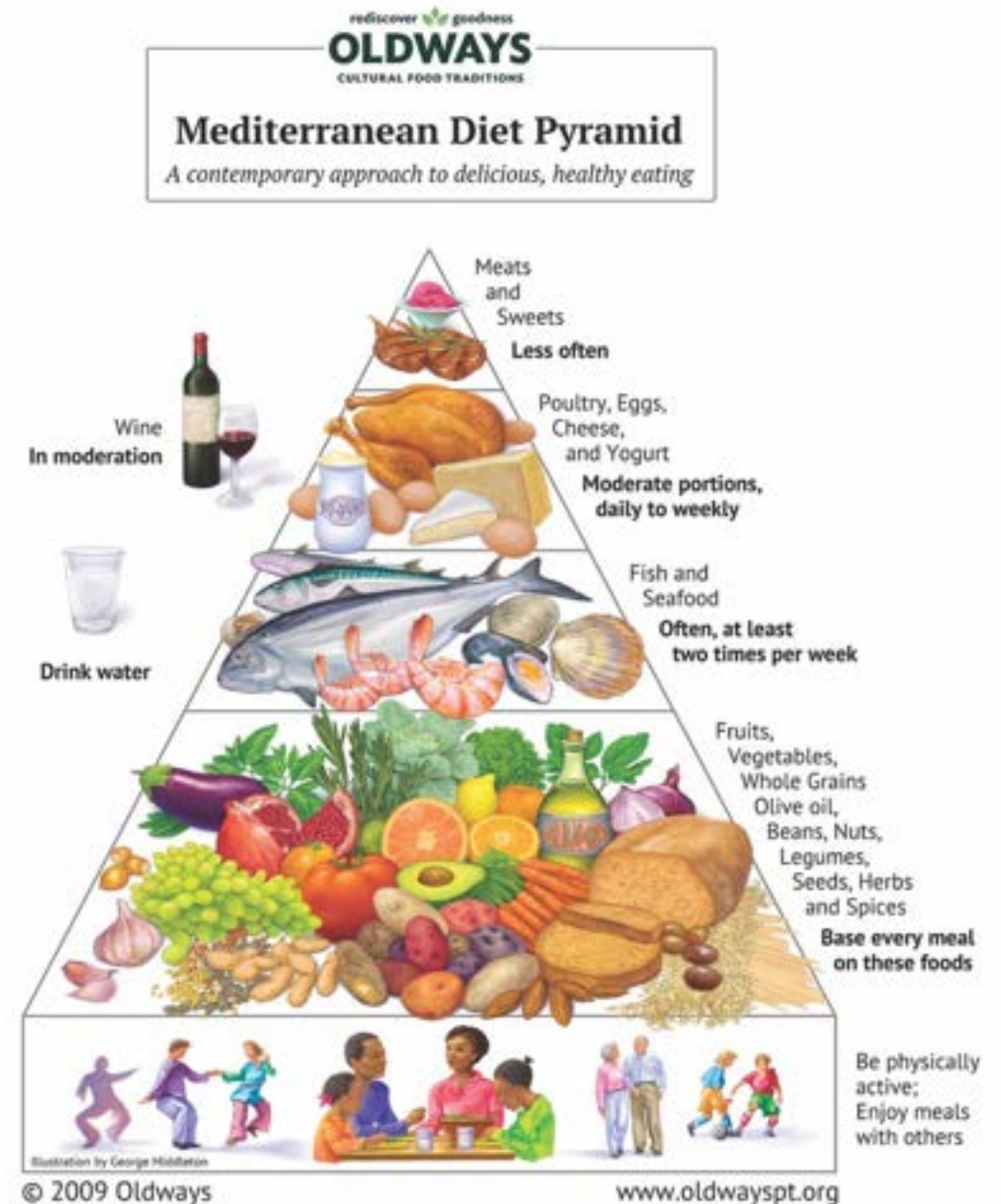
Plant-based Diet may Reduce Gingivitis

- A recent German study
 - Randomized controlled trial
 - N = 32 adults
 - Half ate plant-based whole foods for 4 weeks (low in processed food, high in plants) and half no change to current eating habits
 - Results showed significant reduction in gingival bleeding in plant-based whole foods group
 - “Dental teams should address dietary habits and give adequate recommendations in the treatment of gingivitis, since it might be a side effect of a pre-inflammatory Western diet.”



Traditional Dietary Patterns

- “Combination of foods and beverages that constitute an individual’s complete dietary intake over time” DGA
- Cultural beliefs, lifestyles, physical activity and healthy eating patterns work together to optimize overall health



Time to Spice up your Life!

- Including herbs and spices in diet is a healthy way to help cut out sodium and flavor dishes that are unique to specific cultures
- Culinary herbs and spices used in Thai cuisine may benefit oral health
- All essential oils reduced *S. mutans* biofilm
 - In vitro study performed at Mahidol University in Thailand
 - Extracted essential oils from sweet basil, cinnamon bark, sweet fennel, kafir lime, black pepper, peppermint, spearmint showed anti-plaque and anti-cariogenic properties



Sialogogues

- Fennel
- Cardamom
- Ginger
- Cayenne pepper

Common Foods & Flavors of the
ASIAN HERITAGE DIET

*** eat most often ** eat moderately * eat less often

Vegetables & Tubers *** bamboo shoots, bean sprouts, bitter melon, bok choy, broccoli, cabbage, carrots, daikon, eggplant, leeks, lettuce, lotus root, kale, kombu, mushrooms, mustard greens, peppers, seaweed, snow peas, spinach, sweet potatoes, taro root, turnips, water chestnuts, yams	Fruits *** apricots, bananas, cherries, coconut, dates, dragon fruit, grapes, kiwifruit, kumquat, lemons, limes, longan, lychee, mandarins, mangoes, mangosteen, melons, milk fruit, oranges, papaya, pears, pineapple, plums, pumpkin, rambutan, tangerines, yuzu	Nuts, Seeds, & Legumes *** almonds, cashews, hazelnuts, peanuts, sesame seeds beans (adzuki, edamame, mung, soy), lentils, miso, tempeh, tofu
Grains *** barley, breads (dumplings, chapatis, mantou, naan, roti), buckwheat, millet, noodles (rice, soba, somen, udon), rice	Herbs & Spices *** amchoor, asafoetida, basil (Thai), cardamom, chiles, clove, coriander, curry leaves, fennel, fenugreek, galangal, garlic, ginger, ginseng, lemongrass, makrut lime leaves, masala, mint, parsley, pepper, scallion, star anise, turmeric, wasabi	Poultry, Eggs, & Dairy ** chicken, duck, quail chicken eggs, duck eggs, quail eggs ghee, paneer yogurt (chaas, lassi) non-lactose: almond milk, rice milk, soy milk
Fish & Seafood ** abalone, bonito, clams, cockles, crab, eel, king fish, mussels, octopus, oysters, roe, salmon, scallops, sea bass, shrimp, squid, tuna, whelk, yellowtail	Meats * beef, pork	Sweets * treats made with fruits, nuts, whole grains, and minimal sugars Chinese mooncakes, Indian rice pudding, Japanese sugared sweet potatoes, Thai mango-coconut pudding

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CULTURAL FOOD TRADITIONS

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Dark Chocolate

- In vitro study published in the European Journal of Oral Sciences, found that using extracted cocoa polyphenols from cocoa beans resulted in bacteriostatic inhibition of *S. mutans*, *S. Sanguinis*, biofilm formation and inhibited acid production



“Healthy Nutrition for Healthy Teeth”

- Academy of Nutrition and Dietetics (Feb 2, 2021)
 - Eat a variety of nutrient-dense foods
 - Calcium and phosphorus for strong teeth and bones
 - Vitamin C for gum health
 - Snack on raw fruits, vegetables, plain yogurt, popcorn
 - Do not put baby to bed with bottle
 - Limit juice, flavored milks and SSBs



Photo by Thana Dykstra

RDs in Clinical Setting, Community and Research

- Include oral health screening in nutrition assessment
- Look for potential oral manifestations of systemic disease
- Work closely with dental team to assess oral-nutrition issues and treatment plans
- Evaluate potential impaired nutrient intake
- Collaborate with dental teams to provide comprehensive oral health and nutrition programs in community
- Integrate oral and nutrition initiatives into employee wellness programs
- Incorporate oral health into nutrition research



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Thank you!

**The RD's Role in Dental
Health: How Traditional Diets
Can Support Strong Teeth**

References

- Tungare S, Paranjpe AG. Diet and Nutrition To Prevent Dental Problems. [Updated 2020 Aug 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK534248/>
- Touger-Decker R, Mobley CC; American Dietetic Association. Position of the American Dietetic Association: Oral health and nutrition. *J Am Diet Assoc.* 2003;103(5):615-625. doi:10.1053/jada.2003.50130
- Touger-Decker R, Mobley C; Academy of Nutrition and Dietetics. Position of the Academy of Nutrition and Dietetics: oral health and nutrition. *J Acad Nutr Diet.* 2013;113(5):693-701. doi:10.1016/j.jand.2013.03.001
- <https://www.nidcr.nih.gov/research/data-statistics/surgeon-general>
- *Contemp Clin Dent.* 2011 Apr-Jun; 2(2): 98–101. doi: [10.4103/0976-237X.83069](https://doi.org/10.4103/0976-237X.83069)
- Moynihan PJ, Ferrier S, Jenkins GN. The cariostatic potential of cheese: cooked cheese-containing meals increase plaque calcium concentration. *Br Dent J.* 1999;187(12):664-667. doi:10.1038/sj.bdj.4800362
- Zahid N, Khadka N, Ganguly M, et al. Associations between Child Snack and Beverage Consumption, Severe Dental Caries, and Malnutrition in Nepal. *Int J Environ Res Public Health.* 2020;17(21):7911. Published 2020 Oct 28. doi:10.3390/ijerph17217911
- <https://www.internationalcuisine.com/nepali-dal-bhat/>
- Gift HC, Reisine ST, Larach DC. The social impact of dental problems and visits [published correction appears in *Am J Public Health* 1993 Jun;83(6):816]. *Am J Public Health.* 1992;82(12):1663-1668. doi:10.2105/ajph.82.12.1663
- Martins VJ, Toledo Florêncio TM, Grillo LP, et al. Long-lasting effects of undernutrition. *Int J Environ Res Public Health.* 2011;8(6):1817-1846. doi:10.3390/ijerph8061817
- Touger-Decker R, van Loveren C. Sugars and dental caries. *Am J Clin Nutr.* 2003;78(4):881S-892S. doi:10.1093/ajcn/78.4.881S
- doi: 10.1081/FRI-200040579
- Kaye EA, Sohn W, Garcia RI. The Healthy Eating Index and coronal dental caries in US adults: National Health and Nutrition Examination Survey 2011-2014. *J Am Dent Assoc.* 2020;151(2):78-86. doi:10.1016/j.adaj.2019.09.009
- https://www.dietaryguidelines.gov/sites/default/files/202012/Dietary_Guidelines_for_Americans_2020-2025.pdf
- Keller KL, Kirzner J, Pietrobelli A, St-Onge MP, Faith MS. Increased sweetened beverage intake is associated with reduced milk and calcium intake in 3- to 7-year-old children at multi-item laboratory lunches. *J Am Diet Assoc.* 2009;109(3):497-501. doi:10.1016/j.jada.2008.11.030
- Laniado N, Sanders AE, Godfrey EM, Salazar CR, Badner VM. Sugar-sweetened beverage consumption and caries experience: An examination of children and adults in the United States, National Health and Nutrition Examination Survey 2011-2014. *J Am Dent Assoc.* 2020;151(10):782-789. doi:10.1016/j.adaj.2020.06.018

References

- Harris JL, Pomeranz JL. Misperceptions about added sugar, non-nutritive sweeteners and juice in popular children's drinks: Experimental and cross-sectional study with U.S. parents of young children (1-5 years) [published online ahead of print, 2021 Apr 7]. *Pediatr Obes.* 2021;e12791. doi:10.1111/ijpo.12791
- Kim J, Zhan L, Le T, Cheng J. Caregivers' Knowledge of Sugar and Control Over Children's Sugar Consumption. *Pediatr Dent.* 2019;41(3):191-199.
- Lingström P, van Houte J, Kashket S. Food starches and dental caries. *Crit Rev Oral Biol Med.* 2000;11(3):366-380. doi:10.1177/10454411000110030601
- Silva MJ, Kilpatrick NM, Craig JM, et al. Genetic and Early-Life Environmental Influences on Dental Caries Risk: A Twin Study. *Pediatrics.* 2019;143(5):e20183499. doi:10.1542/peds.2018-3499
- Wigen TI, Wang NJ. Maternal health and lifestyle, and caries experience in preschool children. A longitudinal study from pregnancy to age 5 yr. *Eur J Oral Sci.* 2011;119(6):463-468. doi:10.1111/j.1600-0722.2011.00862.x
- Kamal Y, O'Toole S, Bernabé E. Obesity and tooth wear among American adults: the role of sugar-sweetened acidic drinks. *Clin Oral Investig.* 2020;24(4):1379-1385. doi:10.1007/s00784-019-03079-5
- [ada.org/~media/ADA/Public%20Programs/Files/NCDHM%202021/2021NCDHM_Poster_English.pdf?la=en](https://media/ADA/Public%20Programs/Files/NCDHM%202021/2021NCDHM_Poster_English.pdf?la=en)
- <https://healthydrinkshealthykids.org/app/uploads/2019/09/HER-HealthyBeverageTechnicalReport.pdf>
- Nirunsittirat A, Pitiphat W, McKinney CM, et al. Breastfeeding Duration and Childhood Caries: A Cohort Study. *Caries Res.* 2016;50(5):498-507. doi:10.1159/000448145
- [Int J Dent.](https://doi.org/10.1155/2018/1415873) 2018; 2018: 1415873. Published online 2018 May 22. doi: [10.1155/2018/1415873](https://doi.org/10.1155/2018/1415873)
- Al-Zahrani MS. Increased intake of dairy products is related to lower periodontitis prevalence. *J Periodontol.* 2006;77(2):289-294. doi:10.1902/jop.2006.050082
- Huang CB, Ebersole JL. A novel bioactivity of omega-3 polyunsaturated fatty acids and their ester derivatives. *Mol Oral Microbiol.* 2010;25(1):75-80. doi:10.1111/j.2041-1014.2009.00553.x
- Naqvi AZ, Buettner C, Phillips RS, Davis RB, Mukamal KJ. n-3 fatty acids and periodontitis in US adults. *J Am Diet Assoc.* 2010;110(11):1669-1675. doi:10.1016/j.jada.2010.08.009
- Hegde R, Awan KH. Effects of periodontal disease on systemic health. *Dis Mon.* 2019;65(6):185-192. doi:10.1016/j.disamonth.2018.09.011
- Beck J, Garcia R, Heiss G, Vokonas PS, Offenbacher S. Periodontal disease and cardiovascular disease. *J Periodontol.* 1996;67(10 Suppl):1123-1137. doi:10.1902/jop.1996.67.10s.1123
- Marouf N, Cai W, Said KN, et al. Association between periodontitis and severity of COVID-19 infection: A case-control study. *J Clin Periodontol.* 2021;48(4):483-491. doi:10.1111/jcpe.13435

References

- Sheiham A, Steele J. Does the condition of the mouth and teeth affect the ability to eat certain foods, nutrient and dietary intake and nutritional status amongst older people?. *Public Health Nutr.* 2001;4(3):797-803. doi:10.1079/phn2000116
- Tungare S, Paranjpe AG. Diet and Nutrition To Prevent Dental Problems. [Updated 2020 Aug 11]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK534248/>
- Jacobs DR Jr, Gross MD, Tapsell LC. Food synergy: an operational concept for understanding nutrition. *Am J Clin Nutr.* 2009;89(5):1543S-1548S. doi:10.3945/ajcn.2009.26736B
- Scambler S, Klass C, Wright D, Gallagher JE. Insights into the oral health beliefs and practices of mothers from a north London Orthodox Jewish community. *BMC Oral Health.* 2010;10:14. Published 2010 Jun 7. doi:10.1186/1472-6831-10-14
- Dodds, M., Roland, S., Edgar, M. *et al.* Saliva A review of its role in maintaining oral health and preventing dental disease. *BDJ Team* 2, 15123 (2015). <https://doi.org/10.1038/bdjteam.2015.123>
- doi: 10.1161/JAHA.119.012865 Journal of the American Heart Association. 2019;8:e012865
- Badgujar SB, Patel VV, Bandivdekar AH. Foeniculum vulgare Mill: a review of its botany, phytochemistry, pharmacology, contemporary application, and toxicology. *Biomed Res Int.* 2014;2014:842674. doi:10.1155/2014/842674
- The Effect of ginger herbal spray on reducing xerostomia in patients with type II diabetes. *Avicenna J Phytomed.* 2017;7(4):308-316.
- Shin YH, Kim JM, Park K. The Effect of Capsaicin on Salivary Gland Dysfunction. *Molecules.* 2016;21(7):835. Published 2016 Jun 25. doi:10.3390/molecules21070835
- Sharma R. Cardamom comfort. *Dent Res J (Isfahan).* 2012 Mar;9(2):237. doi: 10.4103/1735-3327.95243. PMID: 22623945; PMCID: PMC3353705
- Percival RS, Devine DA, Duggal MS, Chartron S, Marsh PD. The effect of cocoa polyphenols on the growth, metabolism, and biofilm formation by *Streptococcus mutans* and *Streptococcus sanguinis*. *Eur J Oral Sci.* 2006;114(4):343-348. doi:10.1111/j.1600-0722.2006.00386.x
- Wiwattanarattanabut K, Choonharuangdej S, Srithavaj T. In Vitro Anti-Cariogenic Plaque Effects of Essential Oils Extracted from Culinary Herbs. *J Clin Diagn Res.* 2017;11(9):DC30-DC35. doi:10.7860/JCDR/2017/28327.10668
- <https://www.eatright.org/food/vitamins-and-supplements/nutrient-rich-foods/healthy-nutrition-for-healthy-teeth>

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