



# A Palette of Plant-based Dietary Patterns: How do they Impact Dental Health?



Course Author(s): Ellen Karlin, MMSc, RDN, LDN, FADA;

Sara Karlin, DDS **CE Credits:** 1 hour

**Intended Audience:** Dentists, Dental Hygienists, Dental Assistants, Office Managers, Dental Students, Dental Hygiene

Students, Dental Assistant Students **Date Course Online:** 07/22/2021 **Last Revision Date:** N/A

Course Expiration Date: 07/21/2024

Cost: Free

Method: Self-instructional AGD Subject Code(s): 150

Online Course: <a href="https://www.dentalcare.com/en-us/professional-education/ce-courses/ce659">www.dentalcare.com/en-us/professional-education/ce-courses/ce659</a>

#### **Disclaimers:**

- P&G is providing these resource materials to dental professionals. We do not own this content nor are we responsible for any material herein.
- 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**

- Ms. Karlin reports no conflicts of interest associated with this course. She has no relevant financial relationships to disclose.
- Dr. Karlin reports no conflicts of interest associated with this course. She has no relevant financial relationships to disclose.

#### **Introduction - Plant-based Diets**

Participants in this video course will be introduced to evidence-based science surrounding the impact of whole-food, plant-based dietary patterns on dental health. Consuming a healthy, diverse, plant-based eating style is key to obtaining the nutrition that is critical for both our dental and overall health.

#### **Course Contents**

- Overview
- Learning Objectives
- Video
- Course Test
- References / Additional Resources
- About the Authors

#### Overview

Participants in this course will be introduced to evidence-based science surrounding whole-food, plant-based dietary patterns, food synergy, phytonutrients, prebiotics and probiotics; how they impact the integrity of the oral cavity and their ability to optimize oral health.

# **Learning Objectives**

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

- Discuss plant-based dietary patterns and plant-forward cooking and eating styles.
- Discuss the synergy between whole-food, plant-based nutrition and the integrity of the oral microbiome and oral cavity.
- Discuss the growing body of research supporting the benefits of plant-based dietary patterns for optimal oral and systemic health.

#### Video



Click on image to view video online.

#### **Course Test Preview**

To receive Continuing Education credit for this course, you must complete the online test. Please go to: <a href="https://www.dentalcare.com/en-us/professional-education/ce-courses/ce659/test">www.dentalcare.com/en-us/professional-education/ce-courses/ce659/test</a>

# 1. All of the following statements related to the 2020-2025 Dietary Guidelines for Americans are correct EXCEPT which one?

- A. There are 3 healthy dietary patterns: U.S. Style, Vegetarian and Mediterranean-Style.
- B. Limit added foods and beverages that contain added gluten, salt and sugar.
- C. Stay within calorie limits.
- D. At least 34 of your plate should be plant-based.

# 2. A plant-forward eating style includes only plant-based foods and reflects evidence-based principles of health.

- A. True
- B. False

# 3. All of the following statements related to intrinsic sugars are correct EXCEPT which one?

- A. Naturally present and physically located in cellular structures of whole plant-based foods.
- B. Contribute to caries and weight gain and should be limited in a healthy dietary pattern.
- C. Are found in fruits, vegetables, grains and dairy.
- D. Foods that contain intrinsic sugars have protective factors against caries.

# 4. All of the following statements related to extrinsic sugars are correct EXCEPT which one?

- A. There are over 50 synonyms for added sugars.
- B. NHANES data shows that most of our added sugars are in the form of SSB, desserts, sweet snacks, sweetened coffee and tea and candy.
- C. The Dietary Guidelines suggest that we reduce added sugar in the diet of young children by substituting non-nutritive sweeteners.
- D. The Dietary Guidelines suggest that we can reduce our added sugar by reducing portions.

# 5. All of the following statements related to ascorbic acid are correct EXCEPT which one?

- A. Water soluble vitamin, must be consumed daily.
- B. Supports synthesis of collagen which we need to support connective tissue for healthy gums and bones.
- C. When taken as a supplement, has been shown to offer additional clinical benefit in terms of improving treatment outcomes for patients with periodontitis.
- D. Has anti-inflammatory properties.

## 6. All of the following statements related to Vitamin D are correct EXCEPT which one?

- A. Vitamin D is a fat-soluble vitamin.
- B. Vitamin D deficiency can lead to caries, gingival inflammation and periodontal disease.
- C. Essential for mineralization of teeth and alveolar process, enhances calcium absorption in the intestine.
- D. We should recommend a Vitamin D supplement to all of our patients, even if their current Vitamin D level is adequate.

## 7. Which of the following foods are good sources of prebiotics?

- A. Yogurt
- B. Kombucha
- C. Apple, oats, banana
- D. Both A and B

# 8. All of the following statements related to probiotics are corrects EXCEPT which one?

- A. A probiotic is a substrate that is selectively utilized by host microorganisms conferring a health benefit.
- B. Consuming fermented dairy has been shown to be correlated with a decrease in elastase activity and MMP3 in gingival crevicular fluid.
- C. Consuming fermented soy beverage has been shown to be correlated with beneficial changes in the oral microbiome.
- D. Eating yogurt has been associated with decreased S. mutans and lactobacilli in saliva.

# 9. Plant-based, whole-food dietary patterns reduce risk for many inflammatory diseases, including cardiovascular disease, gingivitis and periodontitis.

- A. True
- B. False

# 10. All of the following statements related to research behind plant-based eating and periodontitis are true EXCEPT which one

- A. A recent cross-sectional study found that probing depth and bleeding on probing were significantly lower in raw vegans.
- B. A clinical study found that patients who were vegetarians for over 2 years had generalized periodontitis.
- C. A small randomized controlled trial found that eating plant-based whole foods for 4 weeks showed a significant reduction in gingival bleeding.
- D. A systematic review found that eating at least 5 servings of fruits and vegetables a day may help prevent progression of periodontal disease.

### References

- 1. USDA. Dietarty Guidelines for Americans. 2020-2025 Dietary Guidelines and Online Materials. Accessed July 20, 2021.
- 2. Melina V, Craig W, Levin S. Position of the Academy of Nutrition and Dietetics: Vegetarian Diets. J Acad Nutr Diet. 2016 Dec;116(12):1970-1980. doi: 10.1016/j.jand.2016.09.025.
- 3. Oldways. Traditional Diets. Vegetarian & Vegan Diet. Accessed July 20, 2021.
- 4. Tuso PJ, Ismail MH, Ha BP, Bartolotto C. Nutritional update for physicians: plant-based diets. Perm J. 2013 Spring;17(2):61-6. doi: 10.7812/TPP/12-085.
- 5. Derbyshire EJ. Flexitarian Diets and Health: A Review of the Evidence-Based Literature. Front Nutr. 2017 Jan 6;3:55. doi: 10.3389/fnut.2016.00055.
- 6. The Culinary Institute of America. Plant-Forward Kitchen. Accessed July 20, 2021.
- 7. 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). Accessed July 20, 2021.
- 8. Costalonga M, Herzberg MC. The oral microbiome and the immunobiology of periodontal disease and caries. Immunol Lett. 2014 Dec;162(2 Pt A):22-38. doi: 10.1016/j.imlet.2014.08.017.
- 9. van Loveren C. Sugar Restriction for Caries Prevention: Amount and Frequency. Which Is More Important? Caries Res. 2019;53(2):168-175. doi: 10.1159/000489571. Epub 2018 Aug 8.
- 10. Edgar WM. Extrinsic and intrinsic sugars: a review of recent UK recommendations on diet and caries. Caries Res. 1993;27 Suppl 1:64-7. doi: 10.1159/000261605.
- 11. Sheiham A. Dietary effects on dental diseases. Public Health Nutr. 2001 Apr;4(2B):569-91. doi: 10.1079/phn2001142.
- 12. Dawes C, Pedersen AM, Villa A, et al. The functions of human saliva: A review sponsored by the World Workshop on Oral Medicine VI. Arch Oral Biol. 2015 Jun;60(6):863-74. doi: 10.1016/j. archoralbio.2015.03.004. Epub 2015 Mar 10.
- 13. Johansson G, Ravald N. Comparison of some salivary variables between vegetarians and omnivores. Eur J Oral Sci. 1995 Apr;103(2 ( Pt 1)):95-8. doi: 10.1111/j.1600-0722.1995.tb00123.x.
- 14. USDA. Scientific Report of the 2020 Dietary Guidelines Advisory Committee: Advisory Report to the Secretary of Agriculture and the Secretary of Health and Human Services. U.S. Department of Agriculture, Agricultural Research Service, Washington, DC. 2020 Jul. Accessed July 20, 2021.
- 15. 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 Oct;151(10):782-789. doi: 10.1016/j.adaj.2020.06.018.
- 16. Keller KL, Kirzner J, Pietrobelli A, et al. 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 Mar;109(3):497-501. doi: 10.1016/j.jada.2008.11.030.
- 17. Mani JS, Johnson JB, Hosking H, et al. Antioxidative and therapeutic potential of selected Australian plants: A review. J Ethnopharmacol. 2021 Mar 25;268:113580. doi: 10.1016/j. jep.2020.113580. Epub 2020 Nov 13.
- 18. NIH. COVID-19 Treatment Guidelines. Vitamin C. 2021 Apr 21. Accessed July 20, 2021.
- 19. Jacobs DR Jr, Gross MD, Tapsell LC. Food synergy: an operational concept for understanding nutrition. Am J Clin Nutr. 2009 May;89(5):1543S-1548S. doi: 10.3945/ajcn.2009.26736B. Epub 2009 Mar 11.
- 20. Graziani F, Discepoli N, Gennai S, et al. The effect of twice daily kiwifruit consumption on periodontal and systemic conditions before and after treatment: A randomized clinical trial. J Periodontol. 2018 Mar;89(3):285-293. doi: 10.1002/JPER.17-0148. Epub 2018 Feb 27.
- 21. Staudte H, Sigusch BW, Glockmann E. Grapefruit consumption improves vitamin C status in periodontitis patients. Br Dent J. 2005 Aug 27;199(4):213-7, discussion 210. doi: 10.1038/sj.bdi.4812613.
- 22. Stanton G. The relation of diet to salivary calculus formation. J Periodontol. 1969 Mar;40(3):167-72. doi: 10.1902/jop.1969.40.3.167.

- 23. Fageeh HN, Fageeh HI, Prabhu A, Bhandi S, Khan S, Patil S. Efficacy of vitamin C supplementation as an adjunct in the non-surgical management of periodontitis: a systematic review. Syst Rev. 2021 Jan 4;10(1):5. doi: 10.1186/s13643-020-01554-9.
- 24. Flemming J, Meyer-Probst CT, Speer K, Kölling-Speer I, Hannig C, Hannig M. Preventive Applications of Polyphenols in Dentistry-A Review. Int J Mol Sci. 2021 May 5;22(9):4892. doi: 10.3390/ijms22094892.
- 25. Cueva C, Silva M, Pinillos I, Bartolomé B, Moreno-Arribas MV. Interplay between Dietary Polyphenols and Oral and Gut Microbiota in the Development of Colorectal Cancer. Nutrients. 2020 Feb 27;12(3):625. doi: 10.3390/nu12030625.
- 26. Petti S, Scully C. Polyphenols, oral health and disease: A review. J Dent. 2009 Jun;37(6):413-23. doi: 10.1016/j.jdent.2009.02.003. Epub 2009 Mar 19.
- 27. Kong L, Qi X, Huang S, Chen S, Wu Y, Zhao L. Theaflavins inhibit pathogenic properties of P. gingivalis and MMPs production in P. gingivalis-stimulated human gingival fibroblasts. Arch Oral Biol. 2015 Jan;60(1):12-22. doi: 10.1016/j.archoralbio.2014.08.019. Epub 2014 Sep 10.
- 28. Majumdar A. Preclinical animal tumor models to study prevention of colon cancer recurrence by curcumin. Animal Models in Cancer Drug Discovery. Academic Press; Cambridge, MA, USA: 2019.; pp. 293–307.
- 29. Harvard Health Publishing. Foods that fight inflammation. Harvard Medical School. 2020 Aug 29. Accessed July 20, 2021.
- 30. Wiwattanarattanabut K, Choonharuangdej S, Srithavaj T. In Vitro Anti-Cariogenic Plaque Effects of Essential Oils Extracted from Culinary Herbs. J Clin Diagn Res. 2017 Sep;11(9):DC30-DC35. doi: 10.7860/JCDR/2017/28327.10668. Epub 2017 Sep 1.
- 31. 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. Epub 2014 Aug 3.
- 32. Sharma R. Cardamom comfort. Dent Res J (Isfahan). 2012 Mar;9(2):237. doi: 10.4103/1735-3327.95243.
- 33. Mardani H, Ghannadi A, Rashnavadi B, Kamali R. The Effect of ginger herbal spray on reducing xerostomia in patients with type II diabetes. Avicenna J Phytomed. 2017 Jul-Aug;7(4):308-316.
- 34. Shin YH, Kim JM, Park K. The Effect of Capsaicin on Salivary Gland Dysfunction. Molecules. 2016 Jun 25;21(7):835. doi: 10.3390/molecules21070835.
- 35. 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 Aug;114(4):343-8. doi: 10.1111/j.1600-0722.2006.00386.x.
- 36. Premnath P, John J, Manchery N, Subbiah GK, Nagappan N, Subramani P. Effectiveness of Theobromine on Enamel Remineralization: A Comparative In-vitro Study. Cureus. 2019 Sep 17;11(9):e5686. doi: 10.7759/cureus.5686.
- 37. Botelho J, Machado V, Proença L, Delgado AS, Mendes JJ. Vitamin D Deficiency and Oral Health: A Comprehensive Review. Nutrients. 2020 May 19;12(5):1471. doi: 10.3390/nu12051471.
- 38. Zhou C, Li Y, Wang X, Shui X, Hu J. 1,25Dihydroxy vitamin D(3) improves titanium implant osseointegration in osteoporotic rats. Oral Surg Oral Med Oral Pathol Oral Radiol. 2012 Nov;114(5 Suppl):S174-8. doi: 10.1016/j.oooo.2011.09.030. Epub 2012 May 12.
- 39. NIH. Health Information. Vitamin D. Fact Sheet for Health Professionals. Accessed July 20, 2021.
- 40. Huang CB, Ebersole JL. A novel bioactivity of omega-3 polyunsaturated fatty acids and their ester derivatives. Mol Oral Microbiol. 2010 Feb;25(1):75-80. doi: 10.1111/j.2041-1014.2009.00553.x.
- 41. Naqvi AZ, Buettner C, Phillips RS, Davis RB, Mukamal KJ. n-3 fatty acids and periodontitis in US adults. J Am Diet Assoc. 2010 Nov;110(11):1669-75. doi: 10.1016/j.jada.2010.08.009.
- 42. Gibson GR, Hutkins R, Sanders ME, et al. Expert consensus document: The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of prebiotics. Nat Rev Gastroenterol Hepatol. 2017 Aug;14(8):491-502. doi: 10.1038/nrgastro.2017.75. Epub 2017 Jun 14.

- 43. Rubido S, García-Caballero L, Abeleira MT, Limeres J, García M, Diz P. Effect of chewing an apple on dental plaque removal and on salivary bacterial viability. PLoS One. 2018 Jul 18;13(7):e0199812. doi: 10.1371/journal.pone.0199812
- 44. Markowiak P, Śliżewska K. Effects of Probiotics, Prebiotics, and Synbiotics on Human Health. Nutrients. 2017 Sep 15;9(9):1021. doi: 10.3390/nu9091021.
- 45. Hill C, Guarner F, Reid G, et al. Expert consensus document. The International Scientific Association for Probiotics and Prebiotics consensus statement on the scope and appropriate use of the term probiotic. Nat Rev Gastroenterol Hepatol. 2014 Aug;11(8):506-14. doi: 10.1038/nrgastro.2014.66. Epub 2014 Jun 10.
- 46. Haukioja A. Probiotics and oral health. Eur J Dent. 2010 Jul;4(3):348-55.
- 47. Petti S, Tarsitani G, D'Arca AS. A randomized clinical trial of the effect of yoghurt on the human salivary microflora. Arch Oral Biol. 2001 Aug;46(8):705-12. doi: 10.1016/s0003-9969(01)00033-4.
- 48. Staab B, Eick S, Knöfler G, Jentsch H. The influence of a probiotic milk drink on the development of gingivitis: a pilot study. J Clin Periodontol. 2009 Oct;36(10):850-6. doi: 10.1111/j.1600-051X.2009.01459.x. Epub 2009 Aug 12.
- 49. Dioletis E, Paiva RS, Kaffe E, Secor ER, Weiss TR, Fields MR, Ouyang X, Ali A. The fermented soy beverage Q-CAN® plus induces beneficial changes in the oral and intestinal microbiome. BMC Nutr. 2021 Mar 4;7(1):6. doi: 10.1186/s40795-021-00408-4.
- 50. Laiola M, De Filippis F, Vitaglione P, Ercolini D. A Mediterranean Diet Intervention Reduces the Levels of Salivary Periodontopathogenic Bacteria in Overweight and Obese Subjects. Appl Environ Microbiol. 2020 Jun 2;86(12):e00777-20. doi: 10.1128/AEM.00777-20.
- 51. 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 Feb;151(2):78-86. doi: 10.1016/j.adaj.2019.09.009. Epub 2019 Dec 16.
- 52. Kim H, Caulfield LE, Garcia-Larsen V, et al. Plant-Based Diets Are Associated With a Lower Risk of Incident Cardiovascular Disease, Cardiovascular Disease Mortality, and All-Cause Mortality in a General Population of Middle-Aged Adults. J Am Heart Assoc. 2019 Aug 20;8(16):e012865. doi: 10.1161/JAHA.119.012865. Epub 2019 Aug 7.
- 53. Woelber JP, Gärtner M, Breuninger L, et al. The influence of an anti-inflammatory diet on gingivitis. A randomized controlled trial. J Clin Periodontol. 2019 Apr;46(4):481-490. doi: 10.1111/jcpe.13094. Epub 2019 Apr 2.
- 54. Skoczek-Rubińska A, Bajerska J, Menclewicz K. Effects of fruit and vegetables intake in periodontal diseases: A systematic review. Dent Med Probl. 2018 Oct-Dec;55(4):431-439. doi: 10.17219/dmp/99072.
- 55. Atarbashi-Moghadam F, Moallemi-Pour S, Atarbashi-Moghadam S, Sijanivandi S, Baghban AA. Effects of raw vegan diet on periodontal and dental parameters. Tzu Chi Med J. 2020 Jan 17;32(4):357-361. doi: 10.4103/tcmj\_161\_19.
- 56. Staufenbiel I, Weinspach K, Förster G, Geurtsen W, Günay H. Periodontal conditions in vegetarians: a clinical study. Eur J Clin Nutr. 2013 Aug;67(8):836-40. doi: 10.1038/ejcn.2013.101. Epub 2013 May 29.

## **Additional Resources**

No Additional Resources Available.

### **About the Authors**

# Ellen Karlin, MMSc, RDN, LDN, FADA



Ellen Karlin is a nutrition consultant with vast personal and professional knowledge in nutrition, food allergy and dental health. She was a nutrition consultant to dental healthcare professionals in Owings Mills, Maryland and a nutrition consultant at the Comprehensive Asthma and Allergy Center for over 30 years. Ellen holds a Master of Medical Science degree in nutrition education from Emory University. She became a fellow of the American Dietetic Association in 1999. Ellen is a spokesperson for the American Dairy Association North East and a nationally recognized speaker. She has delivered numerous

webinars and nutrition lectures at healthcare conferences. She was the co-author of "Dental and Oral Considerations in Pediatric Celiac Disease" published in J Dent Child, May 2016. Ellen has contributed to a variety of other resources, including "Trendy Diets and Oral Health" published in Access Journal, December 2019.

Email: karlinellen@gmail.com

# Sara Karlin, DDS



Dr. Sara Karlin is a board-certified pediatric dentist working as Dental Director at Children's Rehabilitative Services in Phoenix, Arizona and Clinical Adjunct Assistant Professor at Arizona School of Dentistry and Oral Health. She received her Bachelor of Science degree from the University of Maryland, College Park and completed her D.D.S. at the University of Maryland School of Dentistry. Dr. Karlin pursued her specialty training at New York University and Bellevue Hospital Center, earning a certificate in Pediatric Dentistry. Dr. Karlin is a member of the American Academy of Pediatric Dentistry, the American Dental

Association, and the Arizona Dental Association. Dr. Karlin is a nationally invited speaker on the subject of nutrition and oral health. She is the primary author of "Dental and Oral Considerations in Pediatric Celiac Disease" published in J Dent Child, May 2016 and has contributed to other resources.

Email: sarakarlin4@gmail.com