

**Mundgesundheit durch Ernährung**

**PD Dr. Johan Wölber**

**Literatur**

- [1] Adler CJ, Dobney K, Weyrich LS, Kaidonis J, Walker AW, Haak W, Bradshaw CJA, Townsend G, Soltysiak A, Alt KW, Parkhill J, Cooper A: Sequencing ancient calcified dental plaque shows changes in oral microbiota with dietary shifts of the Neolithic and Industrial revolutions. *Nat Genet* 45, 450–455, 455e1 (2013).
- [2] Anon. Guideline: Sugars intake for adults and children. Geneva: World Health Organization; 2015. [www.ncbi.nlm.nih.gov/books/NBK285537/](http://www.ncbi.nlm.nih.gov/books/NBK285537/) [letzter Zugriff: 23.4.2019].
- [3] Augustin LSA, Kendall CWC, Jenkins DJA, Willett WC, Astrup A, Barclay AW, Björck I, Brand-Miller JC, Brighenti F, Buyken AE, Ceriello A, La Vecchia C, Livesey G, Liu S, Riccardi G, Rizkalla SW, Sievenpiper JL, Trichopoulou A, Wolever TMS, Baer-Sinnott S, Poli A: Glycemic index, glycemic load and glycemic response: An International Scientific Consensus Summit from the International Carbohydrate Quality Consortium (ICQC). *Nutr Metab Cardiovasc Dis* 25, 795–815 (2015).
- [4] Baggerly CA, Cuomo RE, French CB, Garland CF, Gorham ED, Grant WB, Heaney RP, Holick MF, Hollis BW, McDonnell SL, Pittaway M, Seaton P, Wagner CL, Wunsch A: Sunlight and vitamin D: necessary for public health. *J Am Coll Nutr* 34, 359–365 (2015).
- [5] Basu S, Yoffe P, Hills N, Lustig RH: The relationship of sugar to population-level diabetes prevalence: An econometric analysis of repeated cross-sectional data. *PLOS ONE* 8, e57873 (2013).
- [6] Baumgartner S, Imfeld T, Schicht O, Rath C, Persson RE, Persson GR: The impact of the stone age diet on gingival conditions in the absence of oral hygiene. *J Periodontol* 80, 759–768 (2009).
- [7] Bosma-den Boer MM, van Wetten M-L, Pruijboom L: Chronic inflammatory diseases are stimulated by current lifestyle: how diet, stress levels and medication prevent our body from recovering. *Nutr Metab (Lond)* 9, 32 (2012).
- [8] Carlson JL, Erickson JM, Lloyd BB, Slavin JL: Health effects and sources of prebiotic dietary fiber. *Curr Dev Nutr* 2, nzy005 (2018).
- [9] Cashman KD, Dowling KG, Škrabáková Z, Gonzalez-Gross M, Valtueña J, De Henauw S, Moreno L, Damsgaard CT, Michaelsen KF, Mølgaard C, Jorde R, Grimnes G, Moschonis G, Mavrogianni C, Manios Y, Thamm M, Mensink GB, Rabenbergh M, Busch MA, Cox L, Meadows S, Goldberg G, Prentice A,

- Dekker JM, Nijpels G, Pilz S, Swart KM, van Schoor NM, Lips P, Eiriksdottir G, Gudnason V, Cotch MF, Koskinen S, Lamberg-Allardt C, Durazo-Arvizu RA, Sempos CT, Kiely M: Vitamin D deficiency in Europe: pandemic? *Am J Clin Nutr* 103, 1033–1044 (2016).
- [10] Chapple ILC, Milward MR, Dietrich T: The prevalence of inflammatory periodontitis is negatively associated with serum antioxidant concentrations. *J Nutr* 137, 657–664 (2007).
- [11] Chee B, Park B, Fitzsimmons T, Coates AM, Bartold PM: Omega-3 fatty acids as an adjunct for periodontal therapy-a review. *Clin Oral Investig* 20, 879–894 (2016).
- [12] Chopra A, Thomas BS, Sivaraman K, Prasad HK, Kamath SU: Green tea intake as an adjunct to mechanical periodontal therapy for the management of mild to moderate chronic periodontitis: A randomized controlled clinical trial. *Oral Health Prev Dent* 14, 293–303 (2016).
- [13] Coogan MM, Mackeown JM, Galpin JS, Fatti LP. Microbiological impressions of teeth, saliva and dietary fibre can predict caries activity. *J Dent* 36, 892–899 (2008).
- [14] Deore GD, Gurav AN, Patil R, Shete AR, Naiktari RS, Inamdar SP: Omega 3 fatty acids as a host modulator in chronic periodontitis patients: a randomised, double-blind, placebo-controlled, clinical trial. *J Periodontal Implant Sci* 44, 25–32 (2014).
- [15] Deutsche Gesellschaft für Ernährung. 12. Ernährungsbericht. Bonn (2012).
- [16] Dinu M, Abbate R, Gensini GF, Casini A, Sofi F: Vegetarian, vegan diets and multiple health outcomes: A systematic review with meta-analysis of observational studies. *Crit Rev Food Sci Nutr* 57, 3640–3649 (2017).
- [17] Dommisch H, Kuzmanova D, Jönsson D, Grant M, Chapple I: Effect of micronutrient malnutrition on periodontal disease and periodontal therapy. *Periodontol* 2000 78, 129–153 (2018).
- [18] Ebersole JL, Lambert J, Bush H, Huja PE, Basu A: Serum nutrient levels and aging effects on periodontitis. *Nutrients* 10, (2018).
- [19] Elkhoul AM: The efficacy of host response modulation therapy (omega-3 plus low-dose aspirin) as an adjunctive treatment of chronic periodontitis (clinical and biochemical study). *J Periodont Res* 46, 261–268 (2011).
- [20] El-Sharkawy H, Aboelsaad N, Eliwa M, Darweesh M, Alshahat M, Kantarci A, Hasturk H, Van Dyke TE: Adjunctive treatment of chronic periodontitis with daily dietary supplementation with omega-3 Fatty acids and low-dose aspirin. *J Periodontol* 81, 1635–1643 (2010).
- [21] Elwakeel NM, Hazaa HH: Effect of omega 3 fatty acids plus low-dose aspirin on both clinical and biochemical profiles of patients with chronic periodontitis

- and type 2 diabetes: a randomized double blind placebo-controlled study. *J Periodont Res* 50, 721–729 (2015).
- [22] Frei B, Birlouez-Aragon I, Lykkesfeldt J: Authors' perspective: What is the optimum intake of vitamin C in humans? *Crit Rev Food Sci Nutr* 52, 815–829 (2012).
- [23] Fuchs MA, Sato K, Niedzwiecki D, Ye X, Saltz LB, Mayer RJ, Mowat RB, Whittom R, Hantel A, Benson A, Atienza D, Messino M, Kindler H, Venook A, Ogino S, Wu K, Willett WC, Giovannucci EL, Meyerhardt JA: Sugar-sweetened beverage intake and cancer recurrence and survival in CALGB 89803 (Alliance). *PLoS ONE* 9, e99816 (2014).
- [24] Fuhrman J, Sarter B, Glaser D, Acocella S: Changing perceptions of hunger on a high nutrient density diet. *Nutr J* 9, 51 (2010).
- [25] Gaur S, Agnihotri R: Trace mineral micronutrients and chronic periodontitis – a review. *Biol Trace Elem Res* 176, 225–238 (2017).
- [26] Graziani F, Discepoli N, Gennai S, Karapetsa D, Nisi M, Bianchi L, Rosema NAM, Van der Velden U: The effect of twice daily kiwifruit consumption on periodontal and systemic conditions before and after treatment: A randomized clinical trial. *J Periodontol* 89, 285–293 (2018).
- [27] Greer A: An anti-inflammatory diet: the next frontier in preventive medicine. *JAAPA* 25, 38, 40, 42 passim (2012).
- [28] Howes M-JR, Simmonds MSJ: The role of phytochemicals as micronutrients in health and disease. *Curr Opin Clin Nutr Metab Care* 17, 558–566 (2014).
- [29] Hublin J-J, Ben-Ncer A, Bailey SE, Freidline SE, Neubauer S, Skinner MM, Bergmann I, Le Cabec A, Benazzi S, Harvati K, Gunz P: New fossils from Jebel Irhoud, Morocco and the pan-African origin of *Homo sapiens*. *Nature* 546, 289–292 (2017).
- [30] Hujoel PP: Dietary carbohydrates and dental-systemic diseases. *J Dent Res* 88, 490–502 (2009).
- [31] Hujoel PP: Vitamin D and dental caries in controlled clinical trials: systematic review and meta-analysis. *Nutr Rev* 71, 88–97 (2013).
- [32] Jafar N, Edriss H, Nugent K: The effect of short-term hyperglycemia on the innate immune system. *Am J Med Sci* 351, 201–211 (2016).
- [33] Jockel-Schneider Y, Goßner SK, Petersen N, Stölzel P, Hägele F, Schweiggert RM, Haubitz I, Eigenthaler M, Carle R, Schlagenhauf U: Stimulation of the nitrate-nitrite-NO-metabolism by repeated lettuce juice consumption decreases gingival inflammation in periodontal recall patients: a randomized, double-blinded, placebo-controlled clinical trial. *J Clin Periodontol* 43, 603–608 (2016).

- [34] Kassebaum NJ, Bernabé E, Dahiya M, Bhandari B, Murray CJL, Marcenes W: Global burden of severe tooth loss: A systematic review and meta-analysis. *J Dent Res* 93, 20S–28S (2014).
- [35] Knüppel A, Shipley MJ, Llewellyn CH, Brunner EJ: Sugar intake from sweet food and beverages, common mental disorder and depression: prospective findings from the Whitehall II study. *Sci Rep* 7, 6287 (2017).
- [36] Kobayashi J, Ohtake K, Uchida H: NO-rich diet for lifestyle-related diseases. *Nutrients* 7, 4911–4937 (2015).
- [37] Kollath W: *Die Ordnung unserer Nahrung*. Stuttgart: Georg Thieme Verlag (2005).
- [38] Kotsakis GA, Chrepa V, Shivappa N, Wirth M, Hébert J, Koyanagi A, Tyrovolas S: Diet-borne systemic inflammation is associated with prevalent tooth loss. *Clin Nutr Band*, (2017).
- [39] Krall EA, Wehler C, Garcia RI, Harris SS, Dawson-Hughes B: Calcium and vitamin D supplements reduce tooth loss in the elderly. *Am J Med* 111, 452–456 (2001).
- [40] Lang NP, Schätzle MA, Loe H: Gingivitis as a risk factor in periodontal disease. *J Clin Periodontol* 36 (Suppl 10), 3–8 (2009).
- [41] Lidder S, Webb AJ: Vascular effects of dietary nitrate (as found in green leafy vegetables and beetroot) via the nitrate-nitrite-nitric oxide pathway. *Br J Clin Pharmacol* 75, 677–696 (2013).
- [42] Lips P: Vitamin D physiology. *Prog Biophys Mol Biol* 92, 4–8 (2006).
- [43] Liu C-Y, Hsu Y-H, Wu M-T, Pan P-C, Ho C-K, Su L, Xu X, Li Y, Christiani DC, Kaohsiung Leukemia Research Group: Cured meat, vegetables, and bean-curd foods in relation to childhood acute leukemia risk: a population based case-control study. *BMC Cancer* 9, 15 (2009).
- [44] Loe H, Theilade E, Jensen SB: Experimental gingivitis in man. *J Periodontol* 36, 177–187 (1965).
- [45] Machida T, Tomofuji T, Ekuni D, Azuma T, Takeuchi N, Maruyama T, Mizutani S, Kataoka K, Kawabata Y, Morita M: Severe periodontitis is inversely associated with coffee consumption in the maintenance phase of periodontal treatment. *Nutrients* 6, 4476–4490 (2014).
- [46] Maniam J, Antoniadis CP, Youngson NA, Sinha JK, Morris MJ: Sugar consumption produces effects similar to early life stress exposure on hippocampal markers of neurogenesis and stress response. *Front Mol Neurosci* 8, 86 (2015).

- [47] Miller SC, Roth H, Witkin GJ: Nutrition and diet in periodontic practice. *J Periodontol* 21, 59–66 (1950).
- [48] Miller WD: The micro-organisms of the human mouth. The local and general diseases which are caused by them. 1890. Reprinted by S Karger, Basel (1973).
- [49] Mohanty P, Hamouda W, Garg R, Aljada A, Ghanim H, Dandona P: Glucose challenge stimulates reactive oxygen species (ROS) generation by leucocytes. *J Clin Endocrinol Metab* 85, 2970–2973 (2000).
- [50] Moynihan P: Sugars and dental caries: evidence for setting a recommended threshold for intake. *Adv Nutr* 7, 149–156 (2016).
- [51] Myles IA: Fast food fever: reviewing the impacts of the Western diet on immunity. *Nutr J* 13, 61 (2014).
- [52] Narotzki B, Reznick AZ, Aizenbud D, Levy Y: Green tea: a promising natural product in oral health. *Arch Oral Biol* 57, 429–435 (2012).
- [53] NCD Risk Factor Collaboration (NCD-RisC): Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19.2 million participants. *Lancet* 387, 1377–1396 (2016).
- [54] Ng N, Kaye EK, Garcia RI: Coffee consumption and periodontal disease in males. *J Periodontol* 85, 1042–1049 (2014).
- [55] Petersen PE, Ogawa H: Strengthening the prevention of periodontal disease: the WHO approach. *J Periodontol* 76, 2187–2193 (2005).
- [56] Rauma AL, Törrönen R, Hänninen O, Verhagen H, Mykkänen H: Antioxidant status in long-term adherents to a strict uncooked vegan diet. *Am J Clin Nutr* 62, 1221–1227 (1995).
- [57] Rizzo G, Laganà AS, Rapisarda AMC, La Ferrera GMG, Buscema M, Rossetti P, Nigro A, Muscia V, Valenti G, Sapia F, Sarpietro G, Zigarelli M, Vitale SG: Vitamin B12 among vegetarians: status, assessment and supplementation. *Nutrients* 8, Seitenzahlen (2016).
- [58] Salazar CR, Laniado N, Mossavar-Rahmani Y, Borrell LN, Qi Q, Sotres-Alvarez D, Morse DE, Singer RH, Kaplan RC, Badner V, Lamster IB: Better-quality diet is associated with lower odds of severe periodontitis in US Hispanics/Latinos. *J Clin Periodontol* 45, 780–790 (2018).
- [59] Sanchez A, Reeser JL, Lau HS, Yahiku PY, Willard RE, McMillan PJ, Cho SY, Magie AR, Register UD: Role of sugars in human neutrophilic phagocytosis. *Am J Clin Nutr* 26, 1180–1184 (1973).
- [60] Schulze-Lohmann P: Slow Carb statt Low Carb. *ZWR – Das Deutsche Zahnärzteblatt* 124, 176–179 (2015).

- [61] Simopoulos AP: Evolutionary aspects of diet, the omega-6/omega-3 ratio and genetic variation: nutritional implications for chronic diseases. *Biomedicine & Pharmacotherapy* 60, 502–507 (2006).
- [62] Sleeth ML, Thompson EL, Ford HE, Zac-Varghese SEK, Frost G: Free fatty acid receptor 2 and nutrient sensing: a proposed role for fibre, fermentable carbohydrates and short-chain fatty acids in appetite regulation. *Nutr Res Rev* 23, 135–145 (2010).
- [63] Slomka V, Hernandez-Sanabria E, Herrero ER, Zaidel L, Bernaerts K, Boon N, Quirynen M, Teughels W: Nutritional stimulation of commensal oral bacteria suppresses pathogens: the prebiotic concept. *J Clin Periodontol* 44, 344–352 (2017).
- [64] de Soet JJ, Nyvad B, Kilian M: Strain-related acid production by oral streptococci. *Caries Res* 34, 486–490 (2000).
- [65] Souza JGS, Cury JA, Ricomini Filho AP, Feres M, Faveri M de, Barão VAR: Effect of sucrose on biofilm formed in situ on titanium material. *J Periodontol* 90, 141–148 (2019).
- [66] Staudte H, Kranz S, Völpel A, Schütze J, Sigusch BW: Comparison of nutrient intake between patients with periodontitis and healthy subjects. *Quintessence Int* 43, 907–916 (2012).
- [67] Staudte H, Sigusch BW, Glockmann E: Grapefruit consumption improves vitamin C status in periodontitis patients. *Br Dent J* 199, 213–217, discussion 210 (2005).
- [68] Staufenbiel I, Weinspach K, Förster G, Geurtsen W, Günay H: Periodontal conditions in vegetarians: a clinical study. *Eur J Clin Nutr* 67, 836–840 (2013).
- [69] Ströhle A, Wolters M, Hahn A: Präventives Potenzial von Ballaststoffen – Ernährungsphysiologie und Epidemiologie. *Aktuelle Ernährungsmedizin* 43, 179–200 (2018).
- [70] Sutton G: Putrid gums and “dead men”s cloaths’: James Lind aboard the *Salisbury*. *J R Soc Med* 96, 605–608 (2003).
- [71] Te Morenga LA, Howatson AJ, Jones RM, Mann J: Dietary sugars and cardiometabolic risk: systematic review and meta-analyses of randomized controlled trials of the effects on blood pressure and lipids. *Am J Clin Nutr* 100, 65–79 (2014).
- [72] The Lancet null: We need to talk about meat. *Lancet* 392, 2237 (2018).
- [73] Van der Velden U, Kuzmanova D, Chapple ILC: Micronutritional approaches to periodontal therapy. *J Clin Periodontol* 38 (Suppl 11), 142–158 (2011).

- [74] Van Der Weijden F, Slot DE: Oral hygiene in the prevention of periodontal diseases: the evidence. *Periodontology* 2000 55, 104–123 (2011).
- [75] Varela-López A, Giampieri F, Bullón P, Battino M, Quiles JL: A systematic review on the implication of minerals in the onset, severity and treatment of periodontal disease. *Molecules* 21, (2016).
- [76] Vigüiliouk E, Stewart SE, Jayalath VH, Ng AP, Mirrahimi A, de Souza RJ, Hanley AJ, Bazinet RP, Blanco Mejia S, Leiter LA, Josse RG, Kendall CWC, Jenkins DJA, Sievenpiper JL: Effect of replacing animal protein with plant protein on glycemic control in diabetes: A systematic review and meta-analysis of randomized controlled trials. *Nutrients* 7, 9804–9824 (2015).
- [77] Vos MB, Kaar JL, Welsh JA, Van Horn LV, Feig DI, Anderson CAM, Patel MJ, Cruz Munos J, Krebs NF, Xanthakos SA, Johnson RK, American Heart Association Nutrition Committee of the Council on Lifestyle and Cardiometabolic Health; Council on Clinical Cardiology; Council on Cardiovascular Disease in the Young; Council on Cardiovascular and Stroke Nursing; Council on Epidemiology and Prevention; Council on Functional Genomics and Translational Biology; and Council on Hypertension: Added sugars and cardiovascular disease risk in children: A scientific statement from the American Heart Association. *Circulation* 135, e1017–e1034 (2017).
- [78] Widén C, Coleman M, Critén S, Karlgren-Andersson P, Renvert S, Persson GR: Consumption of bilberries controls gingival inflammation. *Int J Mol Sci* 16, 10665–10673 (2015).
- [79] Willershäusen B, Ross A, Försch M, Willershäusen I, Mohaupt P, Callaway A: The influence of micronutrients on oral and general health. *Eur J Med Res* 16, 514–518 (2011).
- [80] Woelber J, Bremer K, Vach K, König D, Hellwig E, Ratka-Krüger P, Al-Ahmad A, Tennert C: An oral health optimized diet can reduce gingival and periodontal inflammation in humans – a randomized controlled pilot study. *BMC Oral Health* 17, 28 (2016).
- [81] Woelber JP, Gärtner M, Breuninger L, Anderson A, König D, Hellwig E, Al-Ahmad A, Vach K, Dötsch A, Ratka-Krüger P, Tennert C: The influence of an anti-inflammatory diet on gingivitis. A randomized controlled trial. *J Clin Periodontol Band, Seitenzahlen* (2019).
- [82] Wölber J: Zuckerreduktion zur Prävention von Zahnerkrankungen – warum und wie? *Aktuel Ernährungsmed* 43, S76–S79 (2018).
- [83] Wölber J, Tennert C: Potenzieller Einfluss der prozessierten, einfachen Kohlenhydrate auf parodontale Erkrankungen. *Parodontologie* 28, 385–389 (2017).
- [84] Wölber J, Tennert C: Einfluss von Ballaststoffen auf parodontale Entzündungen. *Parodontologie* 30, 37–41 (2019).

- [85] van Woudenberg GJ, Theofylaktopoulou D, Kuijsten A, Ferreira I, van Greevenbroek MM, van der Kallen CJ, Schalkwijk CG, Stehouwer CDA, Ocké MC, Nijpels G, Dekker JM, Blaak EE, Feskens EJM: Adapted dietary inflammatory index and its association with a summary score for low-grade inflammation and markers of glucose metabolism: the Cohort study on Diabetes and Atherosclerosis Maastricht (CODAM) and the Hoorn study. *Am J Clin Nutr* 98, 1533–1542 (2013).
- [86] Yates CM, Calder PC, Ed Rainger G: Pharmacology and therapeutics of omega-3 polyunsaturated fatty acids in chronic inflammatory disease. *Pharmacol Ther* 141, 272–282 (2014).
- [87] Zong G, Holtfreter B, Scott AE, Völzke H, Petersmann A, Dietrich T, Newson ^ RS, Kocher T: Serum vitamin B12 is inversely associated with periodontal progression and risk of tooth loss: a prospective cohort study. *J Clin Periodontol* 43, 2–9 (2016).