The Preventive Angle
Preventive & Hygiene Insights from The Richmond Institute

Volume VII, Issue II
$10

Soft Drinks, Sicker Patients and Social Changes

Understanding the Battle Against Enamel Disease

By Anne Guignon, RDH, MPH

Abstract

Demineralization and carious lesions in susceptible tooth surfaces are complex phenomena. Caries is more than just a loss of tooth structure; it is an infectious enamel disease process. Multiple factors influence this bacterial disease process including changing demographics, social issues and diet. Increasing consumption of both carbonated and non-carbondated beverages is a critical factor in the development of carious lesions.

Learning Objectives

- *Understand the role of specific bacteria in the developing carious lesion.*
- *Learn about the impact of changing dietary habits that increase the risk for demineralization and caries.*
- *Appreciate the role of carbonated and non-carbonated soft drinks in demineralization.*
- *Understand the factors that increase the risk of decay in the dependent population.*
- *Discover how low salivary flow and poor buffering capacity impact the caries process.*

Editor

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Times have changed. We can no longer be content to tell people to brush and floss, use fluoride toothpaste, come in every six months to get their teeth "cleaned" and have a professional fluoride treatment. It is time to end the passive approach that advocates a "sit back and watch" protocol while a tooth surface deteriorates to the point of needing to be reconstructed in a pseudo back-to-normal function with man-made materials.

A Snapshot of Decay in the US

A brief look at national data provides a snapshot of the pervasiveness of the silent epidemic, called caries. Long term oral health goals outlined in the CDC Healthy People 2010 are not being met all over the nation.[1] Analysis of data from the 1999-2004 National Health and Nutrition Examination Survey (NHANES) indicate the prevalence of enamel disease has declined in adults, adolescents and youth while dental caries in the primary teeth increased during the same time period.[2] NHANES data from 1999-2002 indicated that 41% of children between age 2-11 developed caries in primary teeth. Forty-two percent of children age 6-19 and 90% of adults had experienced caries in permanent teeth.[3] A recent paper reviewed national data from 2003, finding 72% of US children reported a preventive dental care visit within the last year, however children at highest risk were the least likely to receive preventive care.[4]

While the term caries may be an all inclusive term to describe a chronic infectious disease involving the dentition, there are differences between decay patterns between adults and children. All age groups are susceptible to caries in virgin teeth, with the occlusal surface demonstrating the highest risk.[5] By virtue of their age, young children are susceptible to caries on primary teeth. The term Early Childhood Caries (ECC) refers to infants and toddlers with a high incidence of decay, a term that has evolved away for the misnomers Baby Bottle Caries, or Nursing Caries. Adolescents and adults are also at risk for decay in both virgin teeth and teeth with prior caries experience, whether or not they have been restored.[6] Patients with significant root exposure are at risk for developing root caries.[7,8] Exposed dentin and cementum on the root demineralize faster than enamel due to the chemical structure.

There are significant differences in caries risk and prevalence with respect to age, race, income, education, urban/rural, primary/permanent dentition, annual dental visit as well as regional differences. Fewer children and adults living in rural areas have dental benefits as compared to those living in urban areas and rural adults and children exhibit more unmet dental needs and experience fewer dental visits.[9-10] Compared to US-born white children, all minority children were less likely to receive preventive care and Afro-American had the highest odds for unmet preventive needs.[11] One study concluded that minority children experience multiple disparities in oral health, access to care, and use of services. Latino children ranked the highest among all groups with sub-optimal dental health and lack of dental benfits.[12]

Demineralization

Bacterial infection, chemical erosion, physical abrasion and destructive occlusal forces each have the potential to cause or accelerate the loss of tooth structure.[13-14] Dental caries, once considered an inevitable outcome for many, is a communicable, infectious disease. This shift in definition demands that clinicians rethink their way of assessing, preventing, intervening and managing this multifactorial infection.

Along with the obvious visual changes that occur when the tooth surfaces demineralize, dentinal hypersensitivity can be one of the first symptoms that patients report. Once an area becomes sensitive to touch, patients often shy away from effective biofilm removal in order to avoid discomfort, resulting in more rapid demineralization of the tooth surface.

Clinicians need to focus their attention on both the subtle as well as the obvious risk factors for loss of mineralized tooth structure. Demineralized tooth surfaces are just the tip of the iceberg, while a frank carious lesion is a specific disease indicator.[15]

Adding Bacteria to the Mix

While it is not necessary for chemical erosion of the tooth surface to have a bacterial component, specific microbes frequently play a key role in the demineralization process for two reasons. Certain bacteria, classified as acidogenic organisms, thrive under acidic (low pH) conditions. Mineral-leaching acids, the metabolic by-products of breaking down fermentable carbohydrates, are introduced into the oral cavity via meals, liquid beverages, between meal snacks, and other carbohydrate-laden confections. Malpositioned teeth and the presence of dental appliances for straightening or replacing teeth create their own unique challenges. Crowded dentition or the presence of these devices creates a natural haven for plaque biofilm. It is unlikely that most patients thoroughly clean their teeth each time they ingest food or beverages during the day.[16]

Some patients exhibit high levels of acidogenic bacteria and are therefore at elevated risk of developing an enamel lesion due to low pH.[17-19] Tests are available to check for mutans streptococci (MS) and lactobacillus (LB). High levels of MS, in particular identify patients who would benefit from aggressive antibacterial interventions to reduce the levels of MS in addition to therapies designed to buffer the acidic oral pH.[19-24]

Other Sources of Acid in the Oral Cavity

Diet and oral bacteria aren't the only source of a low oral pH. Teeth exposed to gastric acid on a regular basis are subject to accelerated loss of mineral structure. An increasing number of patients have gastric esophageal reflux disease, GERD, resulting in gastric acid entering the oral cavity, particularly during sleep.[25-27] GERD patients can exhibit small pothole-like depressions in the occlusal or smooth lingual surfaces. Bulimia, involves frequent self-induced vomiting. Classic bulimia symptoms include shiny lingual surfaces that have lost significant anatomy. In severe cases, existing restorations appear to be rising above the tooth structure, a phenomena directly related to the loss of adjacent tooth structure. Vomiting is also a frequent side effect of chemotherapy, pregnancy and other gastrointestinal disorders.

Fueling the Fire with Social and Medical Issues

Dependent elderly[28], young children[29,30] and those that have complex physical or mental disabilities are particularly at risk simply because how they live, what they eat, the care they receive may be simply out of their control. Ultimately, the caregiver/parent/guardian in these situations is responsible. Poor food choices, inadequate oral hygiene measures, lack of preventive professional care can all impact on caries development.[31,32] There are those who do not believe that caries, at any age, presents a significant health issue and often minimize the pain created by oral infections.[31-33]

As people age, the relative risk for demineralization increases. Numerous medical conditions[20,21,28] complex pharmaceutical regimens[20], social issues and dietary intake all impact caries development. These risk factors are covered in subsequent articles. Patients with dementia or other forms of cognitive impairment may be unable to perform adequate plaque biofilm removal on a daily basis.[28] Oral care by marginally trained nurses is a challenge when the residents are combative or resistant. Often dependant adults in long-term care facilities do not receive appropriate oral care. Many state statures prevent licensed dental hygienists from caring for the mouth of these residents.

Arthritis and other rheumatoid disorders, affecting the hands, arms or shoulders severely compromise effective oral self care. Motivation is an issue for patients suffering from various types of mental disorders, including depression, bipolar disorders and schizophrenia.

Dietary intake can be an issue. Patients suffering from dry mouth find it uncomfortable to chew raw, unprocessed foods high in fiber and water in favor of highly processed, high carbohydrate, sticky foods that require minimal preparation or limited chewing. Inadequate saliva causes food to stick to teeth and also limits the body's natural ability to buffer acids.[17-19]

Caregivers are not be well equipped emotionally or technically to deliver effective oral care. Inadequacies that can negatively impact providing oral care include disinterest, intimidation, disgust, feeling overwhelmed or overworked, lack of appreciation for oral care or worry about being bitten.

The dependant elderly are not the only at risk population. Access to care creates significant barriers in early intervention and treatment. Many parents, especially the working poor do not have sufficient financial resources[4,9,11], adequate transportation or risk loosing employment if they miss work for health care visits. Inadequate numbers of health care providers or facilities in a particular geographic area will further compound the problem.[4,9]

Putting the Spot Light on Soft Drinks

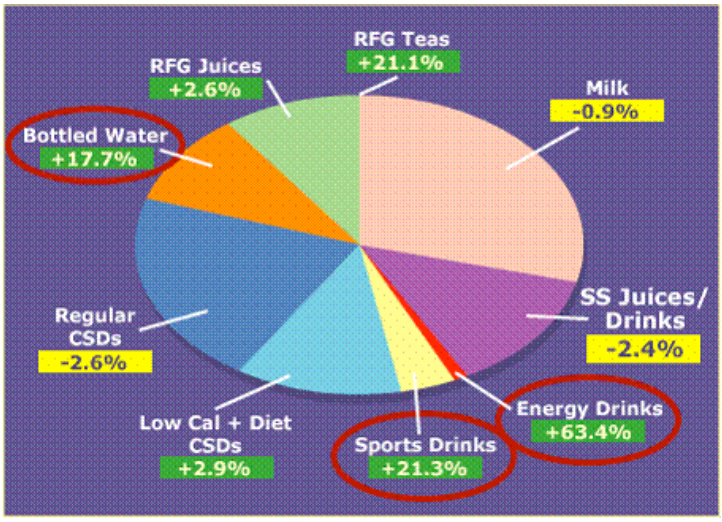
Soft drinks, both carbonated and non-carbonated now represent over twenty-seven percent of all beverages consumed in the United States. While the consumption of sugared carbonated drinks is decreasing, the intake of sugar-free carbonated beverages is rising steadily. Consumption of milk and traditional fruit juice is declining.[35-37]

Soft drink manufacturers are the single largest user of refined sugar in the United States. The average can of soda contains the maximum recommended daily allowance (RDA) of sugar, ten teaspoons. Today's soft drink can or bottle is typically four times larger than thirty years ago and often contains two to three RDA servings. Labels often list high fructose corn syrup, a rich source of fermentable carbohydrates for acidogenic bacteria. Sugar in itself is not the issue in demineralization but rather the acid produced by mutans streptococci and other acidogenic organisms.[14,38,39] Soft drinks consumed with meals do not have the same potential to damage tooth structure as those that are consumed over a protracted time. Sipping acidic beverages,

often for hours at a time, destroys much more mineralized tooth structure.[40, 41]

Tooth structure can demineralize any time the pH falls below the neutral point of 7. The critical point for rapid demineralization begins at pH 5.5.[42] The pH of all carbonated drinks ranges from 2.3 to 3.4, except root beer which is much higher at 4.6. Non-carbonated sports drinks can have a pH as low as 2.8.[41,43] Many flavored waters contain citric acid and flavored sparkling waters have pH values that range from 2.74 to 3.34.[44] Coffee-based beverages are typically around pH 5. Clearly, the beverages can have a negative effect on enamel, but exposed root surfaces are at an even greater risk, especially in the presence of inadequate saliva or saliva with a low buffering capacity.[45] In addition, certain cultures have dietary intakes that include heavy use of acidic juices, vinegars or acidic powdered confections.
The frequency of these acid assaults to the tooth structure can overwhelm even healthy salivary function. It is critical to the health of the enamel to address salivary function with patients who present with any demineralization or enamel lesions.

2005 Total Beverage Sales - Year at a Glance Dollar Gains / Losses



2005 total beverage - % dollar change vs. YAG. Accessed March 24, 2008. http://www.retailwire.com/TIPS/

Sales of carbonated soft drinks, sports and energy drinks and refrigerated teas are increasing while purchases of milk, shelf stable juices and regular carbonated soft drinks decrease.

Beverages That Are Melting Teeth

A 2004 a landmark pilot study looked at the pH of both sugared and sugar-free carbonated and non-carbonated soft drinks and loss of tooth structure over time. The findings were astounding. Enamel samples exposed to non-cola beverages lost two to five times more enamel by than samples immersed in cola drinks. Canned iced tea dissolved thirty times more enamel that freshly brewed coffee or black tea. Brewed coffee and black tea dissolved seven times more enamel by weight than water or root beer, however cola drinks dissolved 55-65 times more enamel than water or root beer. Finally, non-cola drinks dissolved 90-180 times more enamel than water.[42]

One popular high-caffeine citrus-based beverage dissolved more than four times more enamel any popular cola beverages, regardless of the sweetening agent. This finding supports what clinicians have observed for years. The authors speculated beverage composition, rather than pH, could be the determining factor in the aggressive enamel dissolution related to the intake of specific beverages. Many beverages are made with varying amounts of organic acids, which can maintain the local pH at the tooth surface below the threshold value of 5.5, even with marked dilution. These beverages are known to cause significant enamel dissolution through calcium chelation rather than a simple acid attack.[42]

Numerous research studies have supported the original findings and been the impetus to investigate other highly erosive beverages.[44, 46-55] Research has now demonstrated that energy drinks and sports drinks,[46-48,54] and commercial lemonades[54] are also highly detrimental to tooth enamel. Additional research is speculating that beverage composition is key to understanding the role of soft drinks in eroding tooth structure.[51] Even though healthy saliva is protective, relatively large volumes were required to neutralize the acid.[53] Enamel loss by erosion is exacerbated by subsequent toothbrush abrasion,[55] however most research suggests that toothpaste, not the action of brushing, is responsible for loss of tooth structure.[56,57] One study demonstrated that fluoride varnish did not exhibit a protective effect for enamel exposed to erosive beverages.[48] These beverages can have a negative effect on the surface hardness of enamel, dentin, microfilled composite and resin modified glass ionomer materials.[52]

Shifting Dietary Habits

Other social factors affecting dietary intake include fewer home-cooked family-centered meals,[29] frequent meals from fast food restaurants, increased use of processed foods containing dozens of additives, including high levels of corn syrup, a fermentable carbohydrate. Easy access to vending machines, which are used as a moneymaker in educational institutions area a ready source for both beverages and other high carbohydrate snacks.[58-60] Consumers purchasing decisions can reflect lack of education about empty-calorie foods versus nutrient-dense choices and the escalating cost of nutrient-rich unprocessed foods.[58]

Our Role in Winning the War Against Caries

Dental professionals are in a unique position to help reduce or even eliminate, dental caries, one of the most widespread chronic infectious diseases in the world. Enamel disease is a complex, multifactorial problem, which deserves a comprehensive discussion of the etiology, contributing factors, risk assessment and the wide range of successful and practical therapies available to today's dental professionals. Three sequential issues of The Preventive Angle are devoted to this critical subject.

This issue focused on basic factors affecting demineralization, changing demographics, social issues and the impact of diet, with a particular attention to the effects of the increasing consumption of both carbonated and non-carbonated beverages.

We need to view caries as a bacterial infection, not as a process of lost tooth structure. The next issue concentrates on understanding and implementing risk assessment, an effective method to identify people at risk for developing caries. It is critical that clinicians understand the unique role of saliva in the caries process as well as its role in restoring the tooth back to

health via remineralization.

Products and behaviors that interfere with or stop enamel dissolution long before an enamel lesion develops are the focus of the final installment in this series. It is important that clinicians know how to assess and heal an uncavitated lesion via aggressive antibacterial and remineralization protocols.

The author wishes to acknowledge the invaluable contributions of Shirley Gutkowski, RDH, BSDH in the preparation of this document.

References

1. Kentucky's oral health indicators and progress towards Healthy People 2010 objectives. Chattopadhyay A, Arevalo O, Cecil JC 3rd. J Ky Med Assoc. 2008 Apr;106(4):165-74.
2. Trends in oral health status: United States, 1988-1994 and 1999-2004. Dye BA, Tan S, Smith V, Lewis BG, Barker LK, Thornton-Evans G, Eke PI, Beltrán-Aguilar ED, Horowitz AM, Li. Vital Health Stat 11. 2007 Apr;(248):1-92.
3. Surveillance for dental caries, dental sealants, tooth retention, edentulism, and enamel fluorosis--United States, 1988-1994 and 1999-2002. Beltrán-Aguilar ED, Barker LK, Canto MT, Dye BA, Gooch BF, Griffin SO, Hyman J, Jaramillo F, Kingman A, Nowjack-Raymer R, Selwitz RH, Wu T; Centers for Disease Control and Prevention (CDC). MMWR Surveill Summ. 2005 Aug 26;54(3):1-43.
4. Preventive dental care for children in the United States: a national perspective. Lewis CW, Johnston BD, Linsenmeyar KA, Williams A, Mouradian W. Pediatrics. 2007 Mar;119(3):e544-53.
5. Lussi A, Francescut P. Performance of conventional and new methods for the detection of occlusal caries in deciduous teeth. Caries Res. 2003;37(1):2-7.
6. New coronal caries in older adults: implications for prevention. Griffin SO, Griffin PM, Swann JL, Zlobin N. J Dent Res. 2005 Aug;84(8):715-20.
7. Estimating rates of new root caries in older adults. Griffin SO, Griffin PM, Swann JL, Zlobin N. J Dent Res. 2004 Aug;83(8):634-8.
8. Twenty-four month incidence of root caries among a diverse group of adults. Gilbert GH, Duncan RP, Dolan TA, Foerster U. Caries Res. 2001 Sep-Oct;35(5):366-75.
9. Oral health status of children and adolescents by rural residence, United States. Vargas CM, Ronzio CR, Hayes KL. J Rural Health. 2003 Summer;19(3):260-8.
10. Oral health status of rural adults in the United States. Vargas CM, Dye BA, Hayes KL. J Am Dent Assoc. 2002 Dec;133(12):1672-81.
11. Disparities in dental insurance coverage and dental care among US children: the National Survey of Children's Health. Liu J, Probst JC, Martin AB, Wang JY, Salinas CF.Pediatrics. 2007 Feb;119 Suppl 1:S12-21.
12. Racial and ethnic disparities in medical and dental health, access to care, and use of services in US children. Flores G, Tomany-Korman SC. Pediatrics. 2008 Feb;121(2):e286-98. Epub 2008 Jan 14.
13. Non carious cervical lesions. A review. Non carious cervical lesions. A review. Ceruti P, Menicucci G, Mariani GD, Pittoni D, Gassino G.Minerva Stomatol. 2006 Jan-Feb;55(1-2):43-57.
14. Analysis of etiological factors involved in noncarious cervical lesions. Tomasik M. Ann Acad Med Stetin. 2006;52(3):125-36
15. Clinical protocols for caries management by risk assessment. Jenson L, Budenz AW, Featherstone JD Ramos-Gomez, FJ, Spolsky VW, Young DA. J Calif Dent Assoc. 2007 Oct;35(10):714-23.
16. Twenty-four month coronal caries incidence: the role of dental care and race. Gilbert GH, Foerster U, Dolan TA, Duncan RP, Ringelberg ML. Caries Res. 2000 Sep-Oct;34(5):367-79.
17. Oral mucosal wetness in hypo- and normosalivators. Wolff M, Kleinberg I. Arch Oral Biol. 1998 Jun;43(6):455-62.
18. Relationships between medication intake, complaints of dry mouth, salivary flow rate and composition, and the rate of tooth demineralization in situ. Bardow A, Nyvad B, Nauntofte B. Arch Oral Biol. 2001 May;46(5):413-23.
19. Salivary factors affecting dental erosion in children. O'Sullivan EA, Curzon ME. Caries Res. 2000 Jan-Feb;34(1):82-7.
20. Ten-year cross-sectional and incidence study of coronal and root caries and some related factors in elderly Swedish individuals. Fure S. Gerodontology. 2004 Sep;21(3):130-40.
21. Five-year incidence of caries, salivary and microbial conditions in 60-, 70- and 80-year-old Swedish individuals. Fure S. Caries Res. 1998;32(3):166-74.
22. Longitudinal study of the presence of mutans streptococci and lactobacilli in relation to dental caries development in 3-24 month old Thai children. Teanpaisan R, Thitasomakul S, Piwat S, Thearmontree A, Pithpornchaiyakul W, Chankanka O. Int Dent J. 2007 Dec;57(6):445-51.
23. Lactobacilli, mutants streptococci and dental caries: a longitudinal study in 2-year-old children up to the age of 5 years. Roeters FJ, van der Hoeven JS, Burgersdijk RC, Schaeken MJ. Caries Res. 1995;29(4):272-9.
24. Comparison of levels of mutans streptococci and lactobacilli in children with nursing bottle caries, rampant caries, healthy children with 3-5 dmft/DMFT and healthy caries free children. Krishnakumar R, Singh S, Subba Reddy VV. J Indian Soc Pedod Prev Dent. 2002 Mar;20(1):1-5.
25. Oral health of children with gastro-esophageal reflux disease: a controlled study. Linnett V, Seow WK, Connor F, Shepherd R. Aust Dent J. 2002 Jun;47(2):156-62.
26. Oral and dental manifestations of gastroesophageal reflux disease in children: a preliminary study. Ersin NK, Onçağ O, Tümgör G, Aydoğdu S, Hilmioğlu S.Pediatr Dent. 2006 May-Jun;28(3):279-84.
27. Oral impact of gastro-oesophageal reflux disease: a case report. Liberali S. Aust Dent J. 2008 Jun;53(2):176-9.
28. Caries incidence and increments in community-living older adults with and without dementia. Chalmers JM, Carter KD, Spencer AJ. Gerodontology. 2002 Dec;19(2):80-94.
29. The relationship between healthful eating practices and dental caries in children aged 2-5 years in the United States, 1988-1994. Dye BA, Shenken JD, Ogden CL, Marshall TA, Levy SM, Kanellis MJ. J Amer Dent Assoc. 2004 Jan;135(1):55-66.
30. Oral health behaviors of children in low and high socioeconomic status families. Hamasha AA, Warren JJ, Levy SM, Broffitt B, Kanellis MJ. Pediatr Dent. 2006 Jul-Aug;28(4):310-5.
31. Parental perceptions of children's oral health: the Early Childhood Oral Health Impact Scale (ECOHIS). Pahel BT, Rozier RG, Slade GD. Health Qual Life Outcomes. 2007 Jan 30;5:6.
32. Parental knowledge, beliefs and behaviours for oral health of toddlers residing in rural Victoria. Gussy MG, Waters EB, Riggs EM, Lo SK, Kilpatrick NM. Aust Dent J. 2008 Mar;53(1):52-60.
33. Social and biological early life influences on severity of dental caries in children aged 6 years. Peres MA, de Oliveira Latorre Mdo R, Sheiham A, Peres KG, Barros FC, Hernandez PG, Maas AM, Romano AR, Victora CG. Community Dent Oral Epidemiol. 2005 Feb;33(1):53-63.
34. 2005 total beverage - % dollar change vs. YAG. Accessed March 24, 2008. http://www.retailwire.com/TIPS/
35. Dietary patterns of adolescent girls in Hawaii over a 2-year period. Lee SK, Novotny R, Daida YG, Vijayadeva V, Gittelsohn J. J Am Diet Assoc. 2007 Jun;107(6):956-61.
36. Beverage consumption patterns in elementary school aged children across a two-year period. Blum JW, Jacobsen DJ, Donnelly JE. J Am Coll Nutr. 2005 Apr;24(2):93-8.
37. Dental caries and beverage consumption in young children. Marshall TA, Levy SM, Broffitt B, Warren JJ, Eichenberger-Gilmore JM, Burns TL, Stumbo PJ. Pediatrics. 2003 Sep;112(3 Pt 1):e184-91.
38. Beverage choices of young females: changes and impact on nutrient intakes. Bowman SA. J Am Diet Assoc. 2002 Sep;102(9):1234-9.
39. Fluoride, beverages and dental caries in the primary dentition. Levy SM, Warren JJ, Broffitt B, Hillis SL, Kanellis MJ. Caries Res. 2003 May-Jun;37(3):157-65.
40. Dental caries and dietary patterns in low-income African American children. Kolker JL, Yuan Y, Burt BA, Sandretto AM, Sohn W, Lang SW, Ismail AI. Pediatr Dent. 2007 Nov-Dec;29(6):457-64.
41. Comparison of the intakes of sugars by young children with and without dental caries experience. Marshall TA, Eichenberger-Gilmore JM, Larson MA, Warren JJ, Levy SM. J Am Dent Assoc. 2007 Jan;138(1):39-46.
42. Dissolution of dental enamel in soft drinks. von Fraunhofer JA, Rogers MM. Gen Dent. 2004 Jul-Aug;52(4):308-12.
43. Stop the pop. Missouri Dental Board October 6, 2005 http://www.modental.org/mx/hm.asp?id=stopthepop
44. The erosive potential of flavoured sparkling water drinks. Brown CJ, Smith G, Shaw L, Parry J, Smith AJ. Int J Paediatr Dent. 2007 Mar;17(2):86-91.
45. Salivary pH changes during soft drinks consumption in children. Sánchez GA, Fernandez De Preliasco MV. Int J Paediatr Dent. 2003 Jul;13(4):251-7.
46. The potential effects of pH and buffering capacity on dental erosion. Owens BM. Gen Dent. 2007 Nov-Dec;55(6):527-31.
47. The erosive potential of soft drinks on enamel surface substrate: an in vitro scanning electron microscopy investigation. Owens BM, Kitchens M. J Contemp Dent Pract. 2007 Nov 1;8(7):11-20.
48. Effect of carbonated beverages, coffee, sports and high energy drinks, and bottled water on the in vitro erosion characteristics of dental enamel. Owens BM, Kitchens M. J Clin Pediatr Dent. 2007 Spring;31(3):153-9.
49. Enamel erosion by some soft drinks and orange juices relative to their pH, buffering effect and contents of calcium phosphate. Larsen MJ, Nyvad B. Caries Res. 1999;33(1):81-7.
50. Commercial soft drinks: pH and in vitro dissolution of enamel. Jain P, Nihill P, Sobkowski J, Agustin MZ. Gen Dent. 2007 Mar-Apr;55(2):150-4; quiz 155, 167-8.
51. Influence of beverage composition on the results of erosive potential measurement by different measurement techniques. Jager DH, Vieira AM, Ruben JL, Huysmans MC. Caries Res. 2008;42(2):98-104. Epub 2008 Feb 15.
52. Effect of acidic food and drinks on surface hardness of enamel, dentine, and tooth-coloured filling materials. Wongkhantee S, Patanapiradej V, Maneenut C, Tantbirojn D. J Dent. 2006 Mar;34(3):214-20. Epub 2005 Aug 8.
53. Erosive effects of common beverages on extracted premolar teeth. Seow WK, Thong KM. Aust Dent J. 2005 Sep;50(3):173-8; quiz 211.
54. Effects of sports drinks and other beverages on dental enamel. von Fraunhofer JA, Rogers MM. Gen Dent. 2005 Jan-Feb;53(1):28-31.
55. Erosion of enamel by non-carbonated soft drinks with and without toothbrushing abrasion. Hemingway CA, Parker DM, Addy M, Barbour ME. Br Dent J. 2006 Oct 7;201(7):447-50; discussion 439; quiz 466.
56. Investigation of erosion and abrasion on enamel and dentine: a model in situ using toothpastes of different abrasivity. Hooper S, West NX, Pickles MJ, Joiner A, Newcombe RG, Addy M. J Clin Periodontol. 2003 Sep;30(9):802-8.
57. The measurement in vitro of dentine abrasion by toothpastes. Vicentini BC, Braga SR, Sobral MA. Int Dent J. 2007 Oct;57(5):314-8.
58. Medically administered antibiotics, dietary habits, fluoride intake and dental caries experience in the primary dentition. Mariri BP, Levy SM, Warren JJ, Bergus GR, Marshall TA, Broffitt B. Community Dent Oral Epidemiol. 2003 Feb;31(1):40
59. The roles of meal, snack, and daily total food and beverage exposures on caries experience in young children. Marshall TA, Broffitt B, Eichenberger-Gilmore J, Warren JJ, Cunningham MA, Levy SM. J Public Health Dent. 2005 Summer;65(3):166-73.
60. Dental caries and childhood obesity: roles of diet and socioeconomic status. Marshall TA, Eichenberger-Gilmore JM, Broffitt BA, Warren JJ, Levy SM. Community Dent Oral Epidemiol. 2007 Dec;35(6):449-58.

CE Questions

Soft Drinks, Sicker Patients and Social Changes

Understanding the Battle Against Enamel Disease

Test Instructions- Please fill in the bubble corresponding to the answer you believe to be correct for each question. Mail or fax completed tests to the Richmond Institute to receive CE Credit.

1. True or False: Over ninety percent of all children ages 6-19 have experienced carious lesions in their permanent teeth. Young children are less susceptible than adults to developing a carious lesion.
   a. True
   b. False

2. Soft drink consumption is at epidemic proportions. Demineralization of tooth surfaces is accelerated by the following factor/s.
   a. Drinking a soft drink during a meal.
   b. Low buffering capacity in the saliva.
   c. Selecting clear, citrus-based drink over a cola beverage.
   d. B and C

3. Which statement is true about dentinal hypersensitivity?
   a. It is a painful condition triggered by sensitivity to cold, air or touch.
   b. The term is analogous to a carious lesion.
   c. The condition is easy to detect and treat.
   d. The term defines the final stage of a carious lesion.

4. All tooth demineralization can be classified as a carious lesion. Low salivary pH contributes to demineralization of tooth structures.
   a. Both statements are TRUE.
   b. Both statements are FALSE
   c. The first statement is FALSE and the second statement is TRUE.
   d. The first statement is TRUE and the second statement is FALSE.

5. Carious lesions exhibit the following characteristics. Which statement is false?
   a. The bacterial responsible for carious lesions are transmissible.
   b. True carious lesions only involve enamel.
   c. All carious lesions are bacterial infections.
   d. A and C are false.

6. Which of the following factor/s place a patient at higher risk for future tooth demineralization?
   a. High salivary buffering capacity
   b. Chronic gastrointestinal esophageal reflux
   c. Sipping on a carbonated soft drink for more than three hours a day
   d. B and C

7. The average size of a bottled carbonated soft drink has remained at 12 ounces for the past thirty years. Sipping a soft drink over time does not increase tooth demineralization. Milk consumption is on the increase.
   a. All statements are false.
   b. The first statement is true. The others are false.
   c. All statements are true.

8. Studies indicate that clear, citrus-flavored carbonated beverages have the following effects on oral and general health. Which statement is true?
   a. Citrus-flavored carbonated beverages will naturally lighten teeth with out damage to enamel.
   b. Frequent ingestion reduces the risk of kidney stones.
   c. Citrus-flavored beverages destroy more tooth structure over time than cola favored drinks.
   d. Swishing with a citrus-flavored beverage after meals kills MS and LB bacteria.

9. According to government studies, dietary habits in the US are improving and should not be a concern to dental professionals. Enamel disease is a simple problem easily controlled with frequent professional visits. Which statement is most accurate?
   a. Government data is old and the studies are not valid.
   b. The first statement is true. The second statement is false.
   c. Neither statement is accurate.
   d. Both statements are a true reflection of health care issues in the US.

10. High levels of *Mutans streptococci* (MS) and *Lactobacillus* (LB) are involved in the development of carious lesions. MS and LB have buffering capacities and protect vulnerable tooth surfaces. Which statement is true?
    a. Each statement is false.
    b. No specific species of bacteria are important in caries development.
    c. The first statement is false. The second is true.
    d. It is impossible to test for the presence of either bacteria, so their impact is unknown.

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Enamel Disease

By Anne Guignon, RDH, MPH

1.	○ A	○ B			6.	○ A	○ B	○ C	○ D
2.	○ A	○ B	○ C	○ D	7.	○ A	○ B	○ C	
3.	○ A	○ B	○ C	○ D	8.	○ A	○ B	○ C	○ D
4.	○ A	○ B	○ C	○ D	9.	○ A	○ B	○ C	○ D
5.	○ A	○ B	○ C	○ D	10.	○ A	○ B	○ C	○ D

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