

# Therapeutic Mouthrinsing: An Effective Component to Oral Hygiene

*This course is no longer offered for Continuing Education credit.*



**Course Author(s):** Pam Hughes, RDH, MS; Susan S. Wingrove, RDH, BS  
**CE Credits:** 1 hour  
**Intended Audience:** Dentists, Dental Hygienists, Dental Assistants, Dental Students, Dental Hygiene Students, Dental Assistant Students  
**Date Course Online:** 01/15/2008  
**Last Revision Date:** 04/19/2019  
**Course Expiration Date:** 04/18/2022  
**Cost:** Free  
**Method:** Self-instructional  
**AGD Subject Code(s):** 730

**Disclaimer:** Participants must always be aware of the hazards of using limited knowledge in integrating new techniques or procedures into their practice. Only sound evidence-based dentistry should be used in patient therapy.

## Conflict of Interest Disclosure Statement

- Ms. Hughes had done consulting work for Procter & Gamble.
- Ms. Wingrove does consulting work for Procter & Gamble.

## Introduction - Therapeutic Mouthrinsing

Brushing, flossing and use of a therapeutic mouthrinse are the preferred method for plaque control and defense against plaque biofilm accumulation. Unfortunately, many patients lack the motivation or ability to maintain low plaque levels, leading to periodontal disease, peri-implant disease, dental caries and other oral health conditions. Chemotherapeutic rinses provide a convenient, cost-effective way to enhance plaque control achieved with mechanical hygiene. This course reviews three common agents used in chemotherapeutic rinses and recommends factors to consider when advising patients to add a rinse to their oral hygiene routine.

## Course Contents

- Overview
- Learning Objectives
- Introduction
- Chlorhexidine
- Cetylpyridinium Chloride (CPC)
- Essential Oils
- Regimen Data
- Practical Clinical and Patient Implications
- Conclusion
- Course Test
- References
- About the Authors

## Overview

Dental disease remains prevalent in the population. Clinical data show three antibacterial active systems chlorhexidine (Rx), cetylpyridinium chloride and essential oils reduce gingival inflammation and bleeding and help maintain good gingival health in conjunction with mechanical hygiene. Data also support incremental benefits of antibacterial rinses even when used in conjunction with an antibacterial dentifrice. This course reviews supporting evidence showing safety and efficacy of each agent and discusses ways to help ensure compliance to a regimen involving rinsing.

## Learning Objectives

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

- List agents used in rinses to provide bacterial reduction and gingival health benefits.
- Understand the clinical data supporting the antiplaque and antigingivitis benefits of each agent.
- Identify plaque control rinses that will address specific patient needs.

## Introduction

An online national survey conducted March 2015 on behalf of the American Academy of Periodontology (AAP) has uncovered that adult Americans require a great deal of improvement in their dental education regarding gingivitis. Gingivitis has been reported affecting one in every two adults 30 years and older. These findings are not surprising since additional survey results indicate 36% of adults prefer to

perform unpleasant activities such as washing dishes or sitting in gridlock traffic versus daily flossing.<sup>1</sup> Suboptimal plaque control is not only detrimental for our patients' oral health, but prolonged oral inflammation may also affect their overall health status.<sup>3-5</sup>

Mechanical hygiene — specifically brushing and flossing has been updated to include therapeutic mouthrinses for bacterial control and are the first line of defense against plaque biofilm accumulation. However, a large proportion of patients continue to fall short of desired oral hygiene.<sup>2</sup> Use of chemotherapeutic antiplaque/ antigingivitis formulations in addition to mechanical hygiene can serve as an effective and successful adjunct to patients' daily hygiene routine. Recently, there has been a dramatic increase in the number of rinses, including new flavors and formulations, offering patients more options to address prevention of biofilm accumulation and meet their unique needs and preferences. The expansion of rinses also increases the need for dental professionals to be familiar with their modes of administration, mechanisms of action, and clinical effectiveness to ensure successful outcomes.

Three common therapeutic agents have been clinically proven to produce significant gingival and plaque control benefits when formulated at specific therapeutic concentrations: chlorhexidine; cetylpyridinium chloride (CPC); and essential oils.<sup>6,7</sup> The latter two active ingredients are the only two the US Food and Drug Administration (FDA) Dental Plaque Subcommittee of the Nonprescription Drugs Advisory Committee recommended to be classified as safe and effective for use in over-the-counter mouthrinses to treat plaque-induced gingivitis.<sup>7</sup> This course reviews the clinical evidence behind each agent and discusses practical implications of incorporating rinses into patients' daily routine.

## Chlorhexidine

Chlorhexidine gluconate rinses are prescription treatments commonly marketed in formulations containing 0.12% chlorhexidine gluconate with 11.6% alcohol (Peridex®, 3M ESPE Dental Products). An alcohol-free formula has been introduced in the United States that is reportedly as effective as formulas with alcohol (Sunstar GUM®, Paroex™).<sup>8</sup> Chlorhexidine is strongly adsorbed to oral

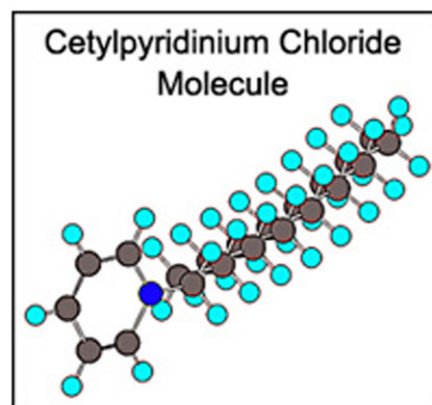
surfaces. Approximately 30% is reported to be retained in the oral cavity post-rinsing, creating a reservoir for sustained antibacterial activity against a broad range of bacteria.<sup>9</sup> Chlorhexidine rinses are indicated for use between dental visits as part of a professional program for the treatment of gingivitis and was considered the gold standard for therapeutic rinses. Their effect on periodontitis or acute necrotizing ulcerative gingivitis has not been determined.<sup>9</sup>

Numerous long-term clinical studies have evaluated the effects of chlorhexidine rinses with concentrations ranging from 0.12% to 0.2%.<sup>6,10-14</sup> Excellent efficacy has been reported for gingivitis, gingival bleeding and plaque. Formulations with 0.12% chlorhexidine demonstrated gingivitis reductions from 17% to 40% and plaque reductions from 35% to 61%.<sup>6</sup> Despite its clinical potency, extended use of chlorhexidine is generally avoided due to the potential development of extrinsic stain, taste alteration, and calculus formation.<sup>15</sup> New research now linked to adverse effects of use of Chlorhexidine can alter the physicochemistry and cytocompatibility of titanium surfaces. Chlorhexidine can remove the oxide layer on the dental implant, compromise the biocompatibility of the titanium surface and is now not recommended to detoxify implants.<sup>39</sup>

### Cetylpyridinium Chloride (CPC)

CPC is a well-known, broad-spectrum antimicrobial agent used in over-the-counter rinses to promote gingival health. It acts by penetrating the cell membrane, causing cell components to leak, which eventually leads to cell death.<sup>16</sup> This action can be described to patients using the analogy of puncturing a water balloon. Recently, over-the-counter therapeutic CPC rinses have been introduced in alcohol-free formulations (Crest® PRO-HEALTH™ Mouthwash, Procter & Gamble).<sup>17</sup>

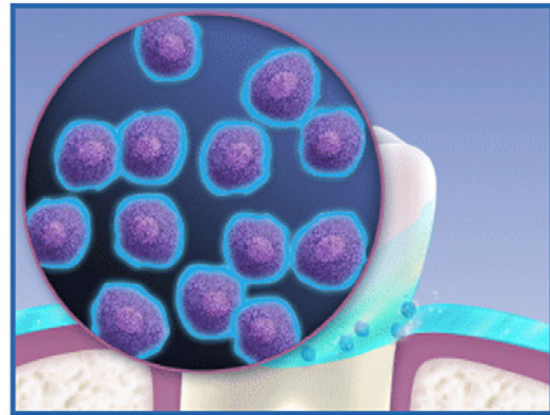
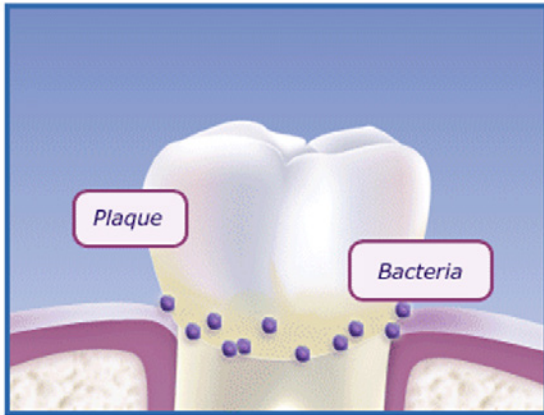
CPC is recognized to be effective against plaque and gingivitis when formulated at concentrations of 0.045% to 0.1% with at least 72% to 77% chemically available cetylpyridinium chloride.<sup>7</sup> CPC's efficacy can be affected by other ingredients in the product formulation thus necessitating



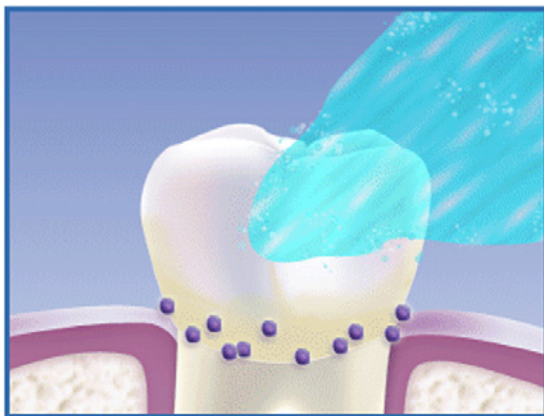
specific criteria to be established for its concentration and bioavailability.<sup>18</sup> Studies have reported formulations with high bioavailable CPC are associated with greater biological activity, consequently indicating an increased probability for clinical efficacy.<sup>19</sup> Rinses with lower CPC concentrations or with less chemically available CPC are long standing marketed products identified as cosmetic products used for the temporary control of halitosis.

Numerous 6-month clinical studies have shown statistically significant reductions in plaque and gingivitis for therapeutic CPC rinses relative to negative controls.<sup>10,20,21</sup> Reductions ranged from 15% to 24% for gingivitis, 27% to 67% for bleeding, and 16% to 28% for plaque. Other extended use research has shown parity benefits to a positive control rinse.<sup>22,23</sup>

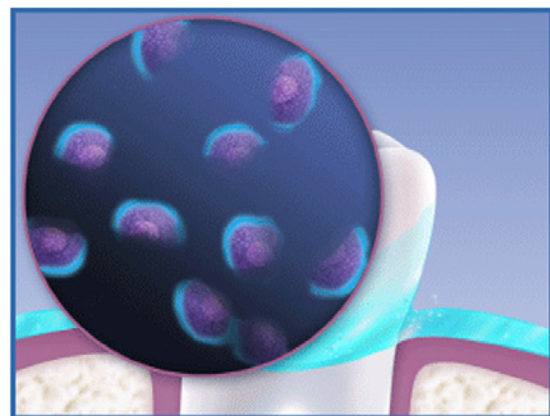
CPC's safety has been well-documented.<sup>10,20-23</sup> A small percent of patients may experience temporary taste alteration and/or transient staining as documented with any effective antimicrobial rinse.<sup>17</sup> These side effects are usually observed more frequently from the use of prescription rinses (e.g., chlorhexidine) and occur less often in the over-the-counter formulations. With the 0.07% CPC rinse, (Crest® PRO-HEALTH™ Mouthwash) user acceptability was favorable along with a high patient compliance.<sup>24</sup> This CPC therapeutic mouthrinse has further demonstrated excellent bioavailability success with bactericidal activity and antibacterial retention.<sup>25</sup>



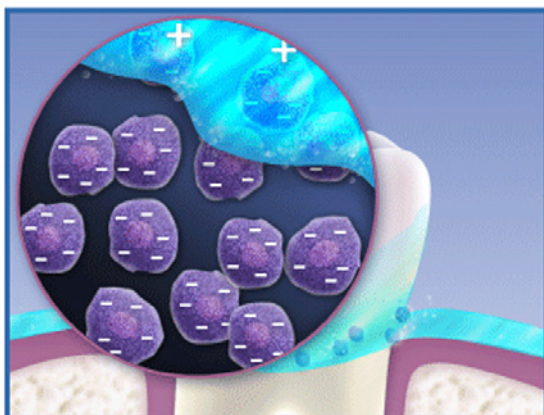
**2** CPC quickly interacts with the bacterial membrane and solubilizes it.



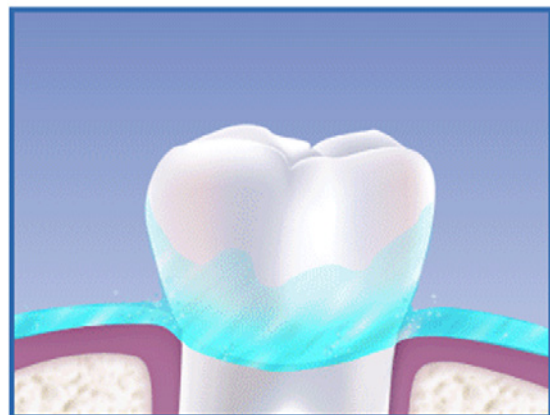
Crest® Pro-Health Rinse



**3** Membrane solubilization alters permeability allowing the escape of key internal bacterial components.



**1** Positively charged Cetylpyridinium Chloride (CPC) encounters negatively charged bacteria.



**4** CPC remains in the oral cavity for long periods after use.



## Essential Oils

The other active system recommended by the FDA Dental Plaque Subcommittee as safe and effective for an over-the-counter antiplaque/antigingivitis rinse is essential oils (Listerine®, Johnson & Johnson).<sup>7</sup> The specific formulation that has been approved combines 0.092% eucalyptol, 0.042% menthol, 0.06% methyl salicylate, and 0.064% thymol in a hydroalcoholic vehicle containing 21.6% to 26.9% alcohol.<sup>26</sup> Essential oils rinses work by disrupting the bacterial cell wall and inhibiting the cell's enzymatic activity.

The efficacy of essential oils for antiplaque and antigingivitis activity has been well-documented in the literature.<sup>27-31</sup> Long-term trials, including those involving flossing and rinsing, have shown reductions in gingivitis from 12% to 30% and plaque reductions from 21% to 56% when compared to a placebo. The safety of rinses containing essential oils is also well-established.<sup>27-31</sup> The burning associated with the alcohol in the formula may be difficult for some patients to tolerate<sup>32</sup> which could affect compliance. Light extrinsic staining, a potential occurrence with use of antimicrobial rinses, has also been reported in clinical research.<sup>27</sup>

## Regimen Data

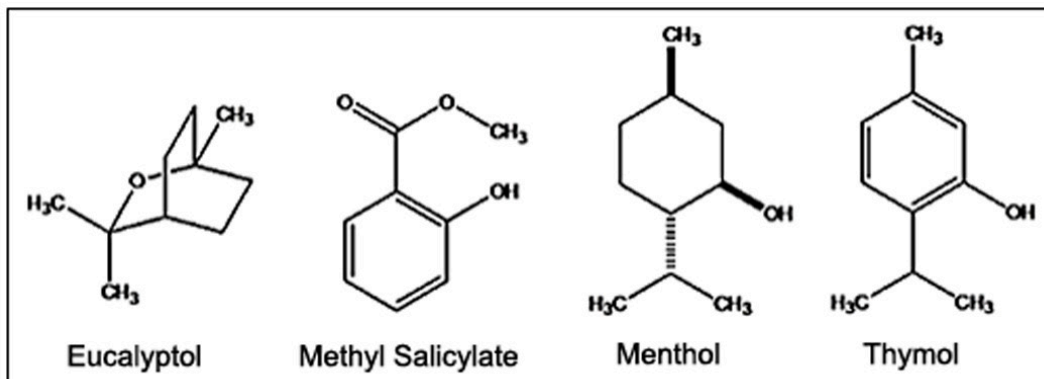
Most long-term research evaluating the gingival health benefits of chemotherapeutic rinses has involved twice a day brushing with a standard fluoride dentifrice (i.e., not containing an antiplaque agent). However, during the last few years antibacterial dentifrice formulations (e.g., stannous fluoride) have become more widespread. The value of adding an antibacterial

rinse to a regimen involving an antibacterial dentifrice has been assessed in two recent clinical trials.<sup>33,34</sup> Both studies confirm significant incremental plaque inhibition is achieved by adding the CPC rinse and a stannous fluoride dentifrice into daily home-care regimen. Thus, patients brushing with an antiplaque toothpaste can further enhance plaque control by using a therapeutic rinse. Research demonstrating statistically significant findings provides valuable information for clinicians in assisting their patients with daily oral health care regimens.<sup>33</sup>

## Practical Clinical and Patient Implications

After a thorough risk assessment is completed, the dental professional should advise the patient when to utilize additional plaque control measures that will improve treatment outcomes leading to maintaining optimal oral health. The team of dental professionals can effectively add a daily rinse to the patient's home care routine based on the knowledge we now have. Adding a rinse that is tailored to the individual patient's needs will create a dramatic difference in conjunction with daily oral hygiene care. Here are some considerations to help ensure compliance:

- **Stress that rinsing is not a replacement for mechanical hygiene** – Remind patients therapeutic rinses are not intended to replace proper mechanical hygiene methods, but rather provide an additional means for improved plaque and gingivitis control. Brushing and flossing are the primary means to disrupt plaque/biofilm plaque while rinsing reduces plaque build-up, facilitates plaque removal, and prevents biofilm accumulation for 8-12 hours.



- **Advise patients to choose a product with a pleasant usage experience** – Rinses are available in various flavors so patients can choose one that best fits their personal preference. If patients enjoy using the product, they are more likely to be compliant and realize the maximum level of benefits.
- **Consider a product without alcohol** – Any patient taking medications where adverse reactions with alcohol may occur should select alcohol-free mouthrinses. Patients exhibiting and/or suffering from xerostomia should also be advised to select an alcohol-free mouthrinse, to prevent further dry mouth implications from alcohol.<sup>35,36</sup> Alcohol-free rinses can prove beneficial for those patients immunocompromised, suffering from severe mucositis, and undergoing radiation therapy for head and neck cancers<sup>37</sup> as well as recovering alcoholics and/or substance abusers. Conditions such as xerostomia and ulcerative gingivitis can be exacerbated by alcohol<sup>38</sup> creating painful and unpleasant experiences thus preventing long-term compliance with adjunctive plaque removal.
- **Follow usage instructions** – For example, some patients have been known to dilute alcohol-containing rinses to help with tolerability. Dilution may lower the

effectiveness of some formulations, so it should only be done if stated in the usage instructions. Alcohol has been shown to primarily kill single bacteria but not as effective with biofilm prevention. Advise patients to read the label and contact the manufacturer if questions remain.

## Conclusion

As dental professionals, with the emphasis on biofilm accumulation in the oral cavity, it is now more important than ever to add mouthrinses to patients daily recommended oral health care routine. In addition to educating them on proper brushing and flossing technique, recommending use of a chemotherapeutic rinse after mechanical hygiene provides improved gingival health, the additional benefit of biofilm prevention for 8-12 hours and a simple way to improve their gingival health. Chlorhexidine is a widely used prescription agent that should be used for only three to six weeks, and CPC and essential oils rinses are widely available over-the-counter, can be used long-term in various flavors. Various flavors and alcohol-free formulations (chlorhexidine and CPC) can be recommended to help assist with a pleasant usage experience and compliance.

## Course Test Preview

*This course is no longer offered for Continuing Education credit.*

- 1. Research studies have indicated effectiveness from a chlorhexidine gluconate rinsing agent against bacterial plaque and gingivitis can be attributed to:**
  - A. High alcohol content
  - B. Low pH
  - C. Oxygenating properties
  - D. Adsorption properties to oral surfaces
- 2. Which of the following factors requires the MOST consideration when recommending mouthrinsing as an adjunctive plaque control method:**
  - A. Flavor of rinse
  - B. Breath freshening
  - C. Individual patient needs
  - D. Affordability of rinse
- 3. Mouthrinsing can effectively serve as a viable and practical adjunctive approach to mechanical home care regimens that can:**
  - A. Also replace mechanical hygiene
  - B. Eliminate subgingival pathogens
  - C. Be used alone to treat advanced periodontitis
  - D. Improve gingival health
- 4. The role of mouthrinsing has become increasingly important in reducing plaque and gingivitis thereby requiring the dental professional to become aware of the efficacy of the rinsing products, modes of administration, mechanisms of action, and clinical effectiveness.**
  - A. True
  - B. False
- 5. What antimicrobial rinse is not recommended to use to detoxify titanium surfaces on dental implants?**
  - A. Essential oils
  - B. Xylitol
  - C. Povidone iodine
  - D. Chlorhexidine
- 6. According to the Food and Drug Administration (FDA) Dental Plaque Subcommittee, only two antimicrobial systems for over-the-counter rinses have been determined safe and effective for the treatment of plaque-induced gingivitis, including:**
  - A. High bioavailable Cetylpyridinium chloride (CPC)
  - B. Chlorhexidine
  - C. Essential oils
  - D. A and C
- 7. Alcohol-free mouthrinses are suitable and/or desirable for patients suffering from:**
  - A. Xerostomia
  - B. Severe mucositis
  - C. Radiation therapy from head and neck cancers
  - D. All of the above.
- 8. According to the FDA Dental Plaque Subcommittee, the acceptable concentration range**

**for high bioavailable Cetylpyridinium chloride formulas to be considered safe and effective in over-the-counter antiplaque/antigingivitis rinses is:**

- A. 0.1% - 0.2%
- B. 0.12%
- C. 0.045% - 0.1%
- D. 0.12% - 0.2%

- 9. All of the following are effects from long-term use of chlorhexidine gluconate rinses except \_\_\_\_\_.**
- A. taste alteration
  - B. increased calculus formation
  - C. white pitting of teeth
  - D. potential development of extrinsic stain
- 10. New flavors and alcohol-free formulas of mouth rinses now offer assistance with bacterial reduction, gingival improvements and pleasant usage experiences.**
- A. True
  - B. False
- 11. Overall, therapeutic rinses are not intended to replace proper mechanical hygiene methods, yet can and will provide assistance in improving gingival health when specifically designed recommendations are followed properly.**
- A. True
  - B. False
- 12. The following mouthrinsing agents have been clinically proven to reduce gingivitis and plaque in long-term trials:**
- A. Essential oils
  - B. Cetylpyridinium chloride
  - C. Chlorhexidine gluconate
  - D. All of the above.
- 13. Clinical studies have shown that incorporating a therapeutic rinse in an oral hygiene regimen with a therapeutic dentifrice \_\_\_\_\_ plaque levels.**
- A. further reduces
  - B. greatly increases
  - C. has no affect on
  - D. None of the above.
- 14. Factors to consider when recommending a mouthrinsing agent to assist with compliance include:**
- A. Reminding patient to follow usage instructions
  - B. Advising patients to choose one with a pleasant usage experiences
  - C. Considering an alcohol-free product
  - D. All of the above.
- 15. The active ingredient available in an over-the-counter alcohol-free rinse formulation for the treatment of plaque-induced gingivitis is:**
- A. Iodine
  - B. Baking soda
  - C. Essential oils
  - D. Cetylpyridinium chloride (CPC)



## References

1. More Than A Quarter of U.S. Adults Are Dishonest with Dentists About How Often They Floss Their Teeth. American Academy of Periodontology. Accessed April 11, 2019.
2. American Dental Association (ADA) Division of Science. For the patient. Keeping your gums healthy. *J Am Dent Assoc.* 2015 Apr;146(4):A46. doi: 10.1016/j.adaj.2015.01.021.
3. Guynup S. Our Mouths, Ourselves. *Sci Am* 2006;Supplemental Issue: 3-5. Accessed April 11, 2019.
4. Hughes P. Aging, Systemic Disease and Oral Health: Implications for Women Worldwide (Part I). *dentalcare.com*. Accessed April 11, 2019.
5. Ross PE. Invaders and the body's defenses. *Sci Am* 2006;Supplemental Issue:6-11. Accessed April 11, 2019.
6. Paraskevas S. Randomized controlled clinical trials on agents used for chemical plaque control. *Int J Dent Hyg.* 2005 Nov;3(4):162-78. doi: 10.1111/j.1601-5037.2005.00145.x
7. Food and Drug Administration, HHS. Oral health care drug products for over-the-counter human use antigingivitis/antiplaque drug products; establishment of a monograph; proposed rules. *Fed Regist.* 2003 May 29;68(103):32232-87. Accessed April 11, 2019.
8. Eldridge KR, Finnie SF, Stephens JA, et al. Efficacy of an alcohol-free chlorhexidine mouthrinse as an antimicrobial agent. *J Prosthet Dent.* 1998 Dec;80(6):685-90.
9. Drugs.com Peridex prescribing information. Accessed April 11, 2019.
10. Stookey GK, Beiswanger B, Mau M, et al. A 6-month clinical study assessing the safety and efficacy of two cetylpyridinium chloride mouthrinses. *Am J Dent.* 2005 Jul;18 Spec No:24A-28A.
11. Quirynen M, Soers C, Desnyder M, et al. A 0.05% cetyl pyridinium chloride/0.05% chlorhexidine mouth rinse during maintenance phase after initial periodontal therapy. *J Clin Periodontol.* 2005 Apr;32(4):390-400. doi: 10.1111/j.1600-051X.2005.00685.x
12. Lorenz K, Bruhn G, Heumann C, et al. Effect of two new chlorhexidine mouthrinses on the development of dental plaque, gingivitis, and discolouration. A randomized, investigator-blind, placebo-controlled, 3-week experimental gingivitis study. *J Clin Periodontol.* 2006 Aug;33(8):561-7. doi: 10.1111/j.1600-051X.2006.00946.x
13. Hase JC, Attström R, Edwardsson S, et al. 6-month use of 0.2% delmopinol hydrochloride in comparison with 0.2% chlorhexidine digluconate and placebo. (I). Effect on plaque formation and gingivitis. *J Clin Periodontol.* 1998 Sep;25(9):746-53.
14. Lang NP, Hase JC, Grassi M, et al. Plaque formation and gingivitis after supervised mouthrinsing with 0.2% delmopinol hydrochloride, 0.2% chlorhexidine digluconate and placebo for 6 months. *Oral Dis.* 1998 Jun;4(2):105-13.
15. Ciancio SG. Antiseptics and antibiotics as chemotherapeutic agents for periodontitis management. *Compend Contin Educ Dent.* 2000 Jan;21(1):59-62, 64, 66 passim; quiz 78.
16. Scheie AA. Modes of action of currently known chemical antiplaque agents other than chlorhexidine. *J Dent Res.* 1989;68 (Spec Iss):1609-1616. Accessed April 11, 2019.
17. White DJ. An alcohol-free therapeutic mouthrinse with cetylpyridinium chloride (CPC)--the latest advance in preventive care: Crest Pro-Health Rinse. *Am J Dent.* 2005 Jul;18 Spec No:3A-8A.
18. Jenkins S, Addy M, Wade W, et al. The magnitude and duration of the effects of some mouthrinse products on salivary bacterial counts. *J Clin Periodontol.* 1994 Jul;21(6):397-401.
19. Hunter-Rinderle SJ, Bacca LA, McCaughlin KT, et al. Evaluation of Cetylpyridinium Chloride-Containing Mouthwashes Using In Vitro Disk Retention and Ex Vivo Plaque Glycolysis Methods. *J Clin Dent.* 1997;8:107-113
20. Mankodi S, Bauroth K, Witt JJ, et al. A 6-month clinical trial to study the effects of a cetylpyridinium chloride mouthrinse on gingivitis and plaque. *Am J Dent.* 2005 Jul;18 Spec No:9A-14A.
21. Allen DR, Davies R, Bradshaw B, et al. Efficacy of a mouthrinse containing 0.05% cetylpyridinium chloride for the control of plaque and gingivitis: a 6-month clinical study in adults. *Compend Contin Educ Dent.* 1998;19(2 Suppl):20-6.
22. Witt JJ, Walters P, Bsoul S, et al. Comparative clinical trial of two antigingivitis mouthrinses. *Am J Dent.* 2005 Jul;18 Spec No:15A-17A.

23. Albert-Kiszely A, Pjetursson BE, Salvi GE, et al. Comparison of the effects of cetylpyridinium chloride with an essential oil mouth rinse on dental plaque and gingivitis - a six-month randomized controlled clinical trial. *J Clin Periodontol*. 2007 Aug;34(8):658-67. doi: 10.1111/j.1600-051X.2007.01103.x
24. Blenman TV, Morrison KL, Tsau GJ, et al. Practice implications with an alcohol-free, 0.07% cetylpyridinium chloride mouthrinse. *Am J Dent*. 2005 Jul;18 Spec No:29A-34A.
25. Busscher HJ. Cetylpyridinium chloride rinse bioavailability assessed by plaque vitality kinetics. [287] *J Dent Res (AADR/IADR)* 2006;85, Abstract 691.
26. Fine DH. Mouthrinses as adjuncts for plaque and gingivitis management. A status report for the American Journal of Dentistry. *Am J Dent*. 1988 Dec;1(6):259-63.
27. Charles CH, Mostler KM, Bartels LL, et al. Comparative antiplaque and antigingivitis effectiveness of a chlorhexidine and an essential oil mouthrinse: 6-month clinical trial. *J Clin Periodontol*. 2004 Oct;31(10):878-84. doi: 10.1111/j.1600-051X.2004.00578.x
28. Lang NP, Hase JC, Grassi M, et al. Plaque formation and gingivitis after supervised mouthrinsing with 0.2% delmopinol hydrochloride, 0.2% chlorhexidine digluconate and placebo for 6 months. *Oral Dis*. 1998 Jun;4(2):105-13.
29. Sharma N, Charles CH, Lynch MC, et al. Adjunctive benefit of an essential oil-containing mouthrinse in reducing plaque and gingivitis in patients who brush and floss regularly: a six-month study. *J Am Dent Assoc*. 2004 Apr;135(4):496-504.
30. Bauroth K, Charles CH, Mankodi SM, et al. The efficacy of an essential oil antiseptic mouthrinse vs. dental floss in controlling interproximal gingivitis: a comparative study. *J Am Dent Assoc*. 2003 Mar;134(3):359-65.
31. Sharma NC, Charles CH, Qaqish JG, et al. Comparative effectiveness of an essential oil mouthrinse and dental floss in controlling interproximal gingivitis and plaque. *Am J Dent*. 2002 Dec;15(6):351-5.
32. Charles CH, Sharma NC, Galustians HJ, et al. Comparative efficacy of an antiseptic mouthrinse and an antiplaque/antigingivitis dentifrice. A six-month clinical trial. *J Am Dent Assoc*. 2001 May; 132(5):670-5.
33. Gerlach RW, Biesbrock AR, Bartizek RD, Terezhalmay GT. Incremental clinical plaque effects with CPC and essential oils rinses. *J Dent Res* 2007;86 (Spec Iss). Abstract 2501.
34. White DJ, Kozak KM, Barker ML. Antiplaque efficacy of combined therapeutics. *J Dent Res* 2007; 86(Spec Iss). Abstract 1072.
35. Daniel SJ, Harfst SA. *Dental Hygiene Concepts, Cases, and Competencies*. St. Louis: Mosby;2004:418.
36. ADA Division of Communications. For the dental patient. Do you have dry mouth? *J Am Dent Assoc*. 2002 Oct;133(10):1455.
37. Cacchillo D, Barker GJ, Barker BF. Late effects of head and neck radiation therapy and patient/dentist compliance with recommended dental care. *Spec Care Dentist*. 1993 Jul-Aug;13(4):159-62.
38. Blanco-Carrion A, Rodriguez-Nunez I, Gandara-Rey JM, et al. A new mouthrinse formulation for painful lesions of the oral mucosa [in Spanish]. *Rev Eur Odontol Estomatol*. 1996;3:169-172.
39. Kotsakis GA, Lan C, Barbosa J, et al. Antimicrobial Agents Used in the Treatment of Peri-Implantitis Alter the Physicochemistry and Cytocompatibility of Titanium Surfaces. *J Periodontol*. 2016 Jul;87(7):809-19. doi: 10.1902/jop.2016.150684. Epub 2016 Feb 28. doi: 10.1902/jop.2016.150684

### Additional Resources

- No Additional Resources Available

## About the Authors

### Pam Hughes, RDH, MS



*The P&G team wishes to express its sadness over the loss of our colleague and friend, Ms. Pam Hughes, on December 14, 2017. She was a dedicated, passionate dental hygiene educator and clinician who touched so many lives through her teaching and patient care. We will miss her.*

Pam was a recognized speaker throughout the United States on advances in therapeutic oral care products, women's aging complexities, oral risk assessment and improving patient care with evidence-based decision making. She was a past President of the California Dental Hygiene Educators' Association and the California Dental Hygienists' Association.

Pam was clinically active in a general practice with over 37 years of experience and held a faculty position in the BSDH and MSDH graduate program at the Ostrow School of Dentistry of University of Southern California in the Division of Periodontology, Diagnostic Sciences and Dental Hygiene. Pam was the recipient of the 2016 Most Outstanding Part-time Faculty award and the 2017 Excellence in Teaching Award.

### Susan S. Wingrove, RDH, BS



Susan is an International speaker, writer, instrument designer, and 2016 RDH Award of Distinction recipient. She practiced in Minnesota and Iowa for over 43 years in the dental profession and now resides in Montana.

Susan is a member of the American Dental Hygienist's Association, International Federation of Dental Hygienists, Oral-B International Implant Board (P&G), & Western Society of Periodontology. Published author for multiple journal articles, Scientific Panel for ACP Clinical Practice Guidelines, as well as Implant Maintenance Textbook: *Peri-Implant Therapy for the Dental Hygienist: Clinical Guide to Maintenance and Disease Complications*.  
wingrovedynamics.com

Email: [sswinrdh@gmail.com](mailto:sswinrdh@gmail.com)