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**AN EVALUATION OF DENTAL HYGIENE EDUCATION OF CHEMOTHERAPEUTIC  
RINSES: A SURVEY**

**By**

**MARISSA T. ARAGON**

**B.S., DENTAL HYGIENE, THE UNIVERSITY OF NEW MEXICO, 2017**

**THESIS**

Submitted in Partial Fulfillment of the  
Requirements for the Degree of

**Master of Science  
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## **Dedication**

To my mother, Angela, whose love has supported me my entire life and academic career. I would not be the person I am today if it was not for her and her ideals that drove me down this path. I also dedicate this thesis to my Fiancé, Pedro, whose unconditional love, encouragement and humor kept me going, I couldn't have done this without you.

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# **AN EVALUATION OF DENTAL HYGIENE OF CHEMOTHERAPEUTIC RINSES: A SURVEY**

**By**

**Marissa Aragon**

**B.S., Dental Hygiene, The University of New Mexico, 2017**

**M.S., Dental Hygiene, The University of New Mexico 2020**

## **Abstract**

The purpose of this study was to learn which oral chemotherapeutic rinses dental hygiene educators cover within dental hygiene curriculum. A survey was created to include dental hygiene educators responsible for oral chemotherapeutic curriculum within dental hygiene programs. Participants were asked which oral chemotherapeutic agents they included within their curriculum, their knowledge regarding several oral chemotherapeutic agents and evidence based/non evidence based oral chemotherapeutic agents. The survey was sent to 375 dental hygiene directors and 77 (20.5%) participated in the survey study. Upon survey completion, findings suggested that the majority of dental hygiene educators teach students how to determine if chemotherapeutic agents are evidence based (81.6%) and the majority of respondents also covered trending agents within their curriculum (57.9%). Lastly, findings suggested that 86.6% of respondents wanted more education regarding sodium hypochlorite. However, limitations present in this study could impact the statistical information received and how the results are interpreted and the survey formatting, small sample size and survey delivery method all need to be taken into consideration. Therefore, in future studies, it would be beneficial to obtain

qualitative information regarding how dental hygiene instructors decide which chemotherapeutic rinses they include within their curriculum and why they choose certain products over others.

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## **Chapter I: Introduction**

### **Introduction**

There are many effective daily use oral chemotherapeutics available to patients for daily use that help reduce biofilm and the subsequent disease burden. These oral chemotherapeutics are available in both prescriptive and over-the-counter formulas. Although many chemotherapeutics have been on the market for decades, new chemotherapeutics emerge annually. One recent example is the use of sodium hypochlorite or bleach rinse as a chemotherapeutic. Sodium hypochlorite is used as an antiseptic in hospitals, portable water supplies, and agricultural settings and is the most commonly used antiseptic in dental clinics for endodontic treatment. Three studies have been conducted on the use of varying diluted forms of sodium hypochlorite, used as a rinse, to decrease periodontitis. It is important for dental hygiene programs to educate their students on all available forms of chemotherapeutics, regardless of proven effectiveness, as patients have access to these products. This provides students with the knowledge to best educate their patients on the various oral chemotherapeutic options.

### **Statement of the Problem**

The basic research question in this study was: Do dental hygiene instructors teach evidence based chemotherapeutic agents within their curriculum as opposed to trending chemotherapeutic agents?

### **Significance of the Problem**

Oral plaque biofilm comprised of many pathogenic microorganisms directly contributes to many oral diseases such as periodontitis and dental caries. Periodontitis is an inflammatory disease of the periodontium that results from progression of gingivitis; caused by specific microorganisms; characterized by progressive destruction of the periodontal ligament and

alveolar bone, recession, clinical attachment loss, pocket formation, and possible tooth mobility which can lead to a possible loss of dentition.<sup>1</sup> Dental caries is an infectious disease that is caused by bacteria and fermentable carbohydrates that in turn causes demineralization of the tooth structure and causes irreversible damage to the tooth.<sup>1</sup> The control of oral plaque biofilm is essential to preventing and controlling oral disease.

The inhibition of oral plaque biofilm accumulation via mechanical disruption has been the standard of care for periodontal disease and caries prevention. Examples of mechanical disruption range from tooth brushing, interproximal cleaning, to dental cleanings with hand instrumentation and electromagnetic scaling. Removal of oral plaque biofilm is commonly practiced when it comes to managing oral disease. However, conventional methods of controlling periodontal disease are not always sufficient in stopping disease progression since daily compliance is necessary. For this reason, adjunct therapies are needed to halt or control the progression of oral disease. Oral chemotherapeutic agents are often used as an adjunct to mechanical removal of oral plaque biofilm in order to prevent or control disease, such as periodontitis. The mechanism of action of oral chemotherapeutics is to alter microorganisms, ultimately reducing their pathogenicity and thereby decrease the overall bacterial load to the host. Adjunct subgingival chemotherapeutics are used when the patient does not respond to scaling and root planning alone. As a result, oral chemotherapeutic agents have an adjunctive benefit for reducing biofilm, rather than mechanical removal alone.<sup>1</sup>

Chlorhexidine gluconate is a prescription oral rinse in a concentration of 0.12%.<sup>1</sup> It is considered to be effective at reducing bacterial plaque and gingivitis and can be administered in an undiluted 15mL dosage for use as an oral rinse. The rinse is to be swished in the mouth for

30- 60 seconds two times per day and spit out. The patient is not to rinse or brush for 30 minutes after rinsing in order to receive the full benefits of the oral rinse.<sup>1</sup>

A therapeutic mouth rinse consisting of essential oils of Eucalyptol 0.092%, Menthol 0.042%, and Methyl salicylate is an option for an antiseptic mouth rinse. An antiseptic mouth rinse is used for both plaque and gingivitis prevention and reduction. It does not change bacterial composition, and there is no evidence of opportunistic oral pathogens or antimicrobial resistance and unlike CHG, does not have associated stain production. The most concerning factor regarding this rinse option is a possible “sharp” taste.<sup>1</sup>

Sodium hypochlorite’s mechanism of action is via oxidizing and disrupting the cell membrane and the cell wall of proteins, nucleotides and lipids which in turn disrupts various macromolecules and microorganisms and is effective against infections that are caused and due to oral plaque biofilm.<sup>3</sup> In concentrations of 1.0-5.25% it has been used in root canal therapy for over a century and remains the favored irrigation antiseptic within endodontic treatment.<sup>6</sup> Diluted forms of sodium hypochlorite, used as a rinse professionally and for self-application, may be a new method to be used in combination with periodontal treatment. With this rinse as an option, it will allow patients to choose between other options that may be more accessible than professionally applied methods that need a prescription.

There are various oral chemotherapeutics available to the public. Many oral chemotherapeutics are available regardless of evidence-based research and efficacy. As a result, dental hygiene programs may exclusively focus their curriculum toward oral chemotherapeutics that have been proven effective, and in turn limit education aimed toward trending products that lack evidence of efficacy. However, since these chemotherapeutics are available to the public, it

is important that dental hygiene students attain knowledge regarding all oral chemotherapeutics, regardless of proven efficacy.

**Operational Definitions:**

**Sodium Hypochlorite-** Chlorine compound with the formula NaOCl or NaClO, comprising a sodium cation and a hypochlorite anion. Sodium hypochlorite is often used as a disinfectant or an oxidizing bleaching agent.

**Antimicrobial agent-** Chemical agent that has a bacteriostatic or bactericidal effect on microbial plaque.

**Chemotherapy-** The treatment of disease by means of a chemical agent.

**Antiseptic-** Substances that prevent the growth of disease-causing microorganisms.

**Bactericidal-** Substance that kill microbes directly.

**Bacteriostatic-** Substance of agent that prevents the metabolism and reproduction of the microbe is affected.

**Gingivitis-** Inflammation of the gingival tissue with no apical migration of the junctional epithelium beyond the cemento-enamel junction.

**Periodontitis-** Inflammatory disease of the periodontium that results from progression of gingivitis; caused by specific microorganisms; characterized by progressive destruction of the periodontal ligament and alveolar bone, recession, clinical attachment loss, pocket formation, and possible tooth mobility.

**Caries-** Infectious and transmissible disease caused by bacterial action on fermentable carbohydrates, which affects the mineralized tissues of the teeth.

## **Chapter II: Review of the Literature**

### **Introduction**

The purpose of the literature review is to review the factors that determine which chemotherapeutic agents are taught with dental hygiene programs and to examine sodium hypochlorite and its use as a chemotherapeutic agent. Previous studies have looked into the association of the oral irrigation of sodium hypochlorite and the use of sodium hypochlorite to treat periodontal disease and symptoms within the oral cavity. Through the review of medical and dental literature through the PubMed/Mesh search engines, and the University of New Mexico's Health Sciences Library, literature was found using the keywords such as "sodium hypochlorite," "periodontal disease," and "oral irrigation" and "factors influencing teaching modalities in dental education." General information and statistics regarding periodontal disease will also be discussed as well as the role of sodium hypochlorite in the prevention and treatment of periodontal disease. Specifically, the use of sodium hypochlorite as an oral rinse, will be analyzed and how it effects periodontal disease.

### **Periodontitis Defined**

Periodontitis, or inflammation of the periodontium, is an irreversible bacterial infection that is characterized by chronic inflammation that eventually results in irreversible bone loss. Inflammation that advances the gingival tissue into the connective tissue and into the alveolar bone progressively diminishes the foundational support to the dentition. Apical migration of the junctional epithelium is present and there is loss of attachment of the gingiva and loss or destruction of the alveolar bone. Periodontal disease is categorized based upon severity of bone loss and whether the disease status is active or maintained.

The American Academy of Periodontology classifies periodontitis into grades and stages; however, this review focuses on chronic periodontitis. Chronic periodontitis is most prevalent in adults, affecting about 47% of the adult population, with an average of 0.25mm of attachment loss per year. Mild cases of periodontitis affect about 8.7% of the population, moderate cases 30%, and severe cases 8.5%.<sup>1</sup> Chronic periodontitis occurs over a long period and may occur in episodes where it is active and inactive. Since periodontitis is cyclic in nature and has phases of inactivity and exacerbation, chronic periodontitis can cause minor changes in the periodontium or may also cause immense tissue and bone loss.

The severity of the disease is determined by the amount of clinical attachment loss that is present and can further be classified into grading systems that identify rate of disease progression. When determining the severity of periodontitis and disease progression, the periodontal pocket is taken into consideration and periodontal probing depths are recorded. These “pockets” represent the level of attachment around each individual tooth. In a state of periodontal health, a periodontal probing depth should be shallow, measuring only 1 to 3. When there is loss of attachment and alveolar bone loss, periodontal pocket depths of 4mm or greater are typically present.<sup>1</sup>

All forms of inflammatory periodontal disease are directly related to gram-negative anaerobic bacteria found within dental plaque within the periodontal pocket. As plaque matures within the periodontal pocket, the bacterial population grows to an abundance of gram- negative anaerobic flora and causes signs of inflammation and bacterial infection within the oral cavity.

<sup>1</sup>Such gram- negative anaerobic bacteria can be treated with the use of antimicrobials, like sodium hypochlorite, when it comes to periodontal treatment.<sup>6</sup>

The control of oral plaque biofilm is the main concept when it comes to preventing and controlling oral disease. Prevention through the disruption of oral plaque biofilm through mechanical means and professional care are the backbone of periodontal disease and caries prevention. Oral plaque biofilm leads to oral diseases which include gingivitis, caries, and periodontitis.

The goal of periodontal debridement is to remove disease causing pathogens, such as biofilm in order to stop the progression of disease. However, clinical studies have shown that the mechanical removal of debris, through scaling and root planning, removed all calculus and biofilm in only 11% of periodontal pockets over 5mm.<sup>6</sup> Hand instrumentation failed to remove subgingival calculus in 10% of periodontal pockets with a depth of <5mm, in 23% of pockets with a depth of 5-6mm, and in 35% of pockets with a depth of >6mm. <sup>6</sup> Another scaling study found that there was residual calculus in 19% of < 4mm pockets, in 38% of 4-5mm pockets, and in 43% of pockets with a depth of >5mm and in 10% of single rooted teeth and in 30% of multicoated teeth. Also, scaling performed in combination with access flap surgery, failed to remove all calculus in 24% of the sites with pocket depths of 4-6mm and in 50% of sites with pocket depths of over 6mm. <sup>6</sup> Residual calculus and biofilm in periodontal pockets contributes to chronic periodontitis and disease progression. As a result, adjunct chemotherapeutics may be used when providing comprehensive periodontal treatment.

### **Chemotherapeutic Agents Defined**

The progression of periodontal disease is related to bacterial enzymes or a pathogenic agent, such as those found within biofilm and a susceptible host. The prevention of disease is directly influenced by interventions that affect pathogenic activity, particularly by disrupting bacterial plaque biofilm through oral and professional care. Mechanical removal alone is not



always sufficient in controlling the disease process and further treatment is necessary through the use of oral chemotherapeutic agents. Oral chemotherapeutic agents or antiseptics are an adjunctive treatment that decrease pathogenic agents and alter microorganisms to decrease their pathogenic potential. Antiseptics attack periodontal pathogens directly or manipulate their chemical makeup in order to disrupt their pathogenic activity within the periodontal pocket.

Oral rinses and various forms of oral irrigation are recommended as an adjunct to mechanical removal in order to reduce plaque which results in a decrease in the presence of gingivitis. Oral rinses can access areas that are often missed during mechanical removal and are a good treatment method for patients to apply at home. The use of professional subgingival irrigation as an alternative adjunctive form of therapy in combination with professional plaque removal is optimal when it comes to the treatment of periodontal disease. <sup>1</sup> Professional oral irrigation is used with a cannula that reaches the base of the periodontal pocket and flushes pathogenic agents and debris out the periodontal pocket, ultimately inhibiting their attachment to the tooth surface. <sup>1</sup>

### **Sodium Hypochlorite Defined**

Sodium hypochlorite is also known as diluted chlorine bleach. Sodium hypochlorite is used as an antiseptic in hospitals, portable water supplies, and agricultural settings and in dental clinics for endodontic treatment. <sup>2</sup> In concentrations of 1.0-5.25%, sodium hypochlorite has been used in root canal therapy for a century and remains the favored irrigation antiseptic within endodontic treatment. In addition, it is the most common chlorine-releasing agent that is used and occurs naturally in human neutrophils/macrophages and plays a vital role in the human innate response as an antimicrobial agent. When analyzing the components within bleach it contains water, 8.25% sodium hypochlorite, sodium chloride, sodium carbonate, sodium

chlorate, sodium hydroxide, and sodium polyacrylate. Sodium hypochlorite ionizes in water to  $\text{Na}^+$  and the hypochlorite ion and establishes an equilibrium with hypochlorous acid ( $\text{HClO}$ ) which is the key bactericidal agent.<sup>2</sup> Through the mechanism of action, sodium hypochlorite oxidizes and disrupts the cell membrane and the cell wall of proteins, nucleotides and lipids which in turn disrupts various macromolecules and microorganisms and is effective against infections caused by oral plaque biofilm.<sup>3</sup> Disadvantages of use through research have been noted. Among research participants, brown staining on the teeth, redness of the tongue, and a bleach taste were identified.

### **Relationship between Sodium Hypochlorite and Periodontal Disease**

A study on the periodontal effects of 0.25% sodium hypochlorite in an oral rinse was conducted on fifteen patients that rinsed with 15mL of 0.25% sodium hypochlorite (5mL of 6% Clorox with 120mL water) for 30 seconds twice per day. At a two-week baseline, the patients received professional subgingival irrigation but no subgingival scaling was performed. The absence or presence of supragingival plaque was recorded and bleeding on probing was examined on the six sites of every tooth. According to Galvin, the study found that both the sodium hypochlorite group and the water rinse group showed there was an increase from baseline to 3 month of 94% and 29% in plaque free facial surfaces, of 195% and 30% (3.2 fold difference) in plaque free surfaces of the lingual aspect, and of 421% and 29% ( 14.5 fold difference) in number of teeth without bleeding on probing. Secondly, the sodium hypochlorite group displayed clinical changes more than those of the control group for every study variable, in which there was a 3.2 fold increase in plaque free facial surface ( $p=0.04$ ), a 6.5 fold increase in plaque free lingual surfaces ( $p=0.04$ ) and a 14.5 fold increase in bleeding on probing free teeth ( $p=0.01$ ). The improvements found clinically between both groups were statistically significant.

The only adverse effects noted by study patients were minor regarding the taste of bleach.<sup>3</sup> Therefore, it was stated that a twice-weekly oral rinse with 0.25% sodium hypochlorite produced a decrease in the plaque levels and decrease in bleeding on probing which may suggest a new form of oral irrigation to adjunctively treat periodontal disease. The results of the study are limited due to low subject number and again, the study was sponsored by Clorox and may have had predisposing factors of bias.

According to Gonzalez, a study was conducted that analyzed the ability of 0.25% sodium hypochlorite oral rinse to convert periodontal pockets, comparing bleeding on probing sites to non-bleeding on probing sites. Patients were requested to rinse with 15mL of fresh solution for 30 seconds every Wednesday and Sunday. The single blinded study was performed at random and 7 patients since twice per day for 3 months with 15 mL of fresh sodium hypochlorite solution and 5 patients rinse with water. The 12 patients did not receive subgingival scaling and at a baseline of 3 month visits, bleeding upon probing was examined after probing with a force of 0.75N. The study concluded that a total of 470 (38%) of 1230 periodontal pockets in the controlled sodium hypochlorite oral rinse group at the first initial visit, 71 (9%) of 828 pockets became bleeding negative ( $p < 0.001$ ). Bleeding upon probing in 4 to 7 mm pockets decreased by 53% when the sodium hypochlorite oral rinse was used and 6% when the oral rinse was water ( $p < 0.001$ ). At the 3 month recall, 97 pockets showed depth increases of greater than or equal to 2mm and 60 (62%) of those pockets showed bleeding upon probing at both the initial an recall appointments. As a result, it was determined rinsing 2 times per day with 0.25% sodium hypochlorite dilute bleach proved to provide a significant decrease in bleeding upon probing in pockets, even when deep pockets were present and a 49% decrease in gingival bleeding in greater than or equal to 5mm was found.<sup>4</sup> Again, this study was limited with only 12 subjects.

In a study conducted by Nardo, a 0.05% sodium hypochlorite rinse was used on 40 prison inmates with healthy gingiva or initial periodontitis. The study was a controlled, investigator blind study in which there was a predatory period in which scaling was performed before the study to obtain a plaque and gingivitis free dentition. Toothbrushing was then replaced with oral rinsing with 15mL of 0.05% sodium hypochlorite or 15mL of distilled water. Plaque and was then assessed using the Quigley Hein Plaque Index and the Loe and Silness Gingival index, as well as bleeding on probing. Upon completion of the study it was found that the QHIPI score on average had increased to 3.82 in the water rinse group and 1.98 in the sodium hypochlorite rinse group. The L&SGI score on average had increased to 2.1 in the water rinse group and 1.0 in the sodium hypochlorite rinse group and the average of bleeding upon probing sites had increased to 93.1% in the water rinse group and 56.7% in the sodium hypochlorite rinse group. Extrinsic brown stain on the surfaces of the enamel tooth surface were present in 100% of the subjects that were exposed to the sodium hypochlorite rinse and concretely in 35% of the subjects in the water rinse group. Upon further examination of the oral mucosa, redness of the tongue was found in 35% of the subjects that used the sodium hypochlorite oral rinse. Also, 95% of participants experienced a “bleach taste” and 85% of the subjects determined the sodium hypochlorite mouth rinse to be tolerable. Therefore, that the findings were statistically significant at (P=0.001). Also, the 0.05% sodium hypochlorite oral rinse provided a significant reduction in supragingival plaque biofilm and reduction in gingival inflammation. As a result, a sodium hypochlorite oral rinse may provide a healthy and alternative antimicrobial agent that is affordable and accessible in the treatment of periodontal disease. <sup>5</sup>

## **Gaps in Research**

When analyzing the studies, the DeNardo and Galvin studies were investigator single blinded studies. The studies would have benefited from being double blinded in order to prevent bias or error. However, with the bitter taste that was experienced with the sodium hypochlorite rinse, it may have been difficult to attain a true double-blind study in which the participant was unable to identify the sodium hypochlorite. Also, each study differed in the mode of delivery and ranged from three weeks to three months. However, the Galvin study was sponsored by Clorox® and may have predisposing factors such as bias. It would have been more beneficial if the studies would have been performed over a six month period or longer in order to determine safety of use and possible long term effects and also on a larger scale, with larger sample sizes, with randomized clinical trials since the studies that were performed are limited due to smaller sample size.

Lastly, each concentration of sodium hypochlorite differed among the several studies. The De Nardo study used a concentration of 0.05%, both the Galvan and Gonzalez studies used 0.25% and the Lorene study used a 0.5% concentration. Due to the fact that the concentrations widely differed from study to study, there is not a common denominator that has been identified in order to yield specific and common results.

## **Teaching Chemotherapeutics Factors**

Oral rinses have been widely used for the prevention of periodontal disease and are widely taught to be used during dental hygiene therapy.<sup>1</sup> Within dental hygiene programs, the ideal properties of an oral rinse are one that is biocompatible, safe to use over long periods of time, inexpensive, effective, has a broad spectrum of effectiveness, highly soluble and stable in storage, and has minimal side effects. Therapeutic uses include plaque reduction, the control and

education of periodontal disease and caries prevention. Throughout education programs, the prescription rinse, chlorhexidine gluconate, has been taught as the gold standard for therapeutic efficacy for preventing and reducing dental plaque and gingival inflammation.<sup>1</sup> As a result, to date, chlorhexidine gluconate is the only prescription rinse to receive an ADA Seal of Approval, which is a voluntary process to aid in product marketing and is based on a set of specific guidelines that qualifies a product as satisfactory, safe and effective. <sup>1</sup> Although oral rinses have proven to be an effective means of plaque removal, it has been determined that only half of the population uses an oral rinse of some type and most do not use it following the manufacturer's directions. <sup>1</sup>

### **Determining Dental Hygiene Curriculum**

Dental hygiene curriculum includes education on chemotherapeutics that are supported by evidence-based research and treatment. However, including emerging chemotherapeutics within dental hygiene curriculum prepares students for treatment modalities that may be encountered within the practical field of dental hygiene. As the dental hygiene field progresses, trending chemotherapeutics and emerging solutions should be added to dental hygiene curriculum such as such as sodium hypochlorite, so that students are familiar with agents that may be used or inquired about by patients.

The Commission on Dental Accreditation (CODA) outlines a general theme on what dental hygiene curriculum should include in order to follow CODA standards. According to the CODA, dental hygiene curriculum must include content in general education, biomedical sciences, dental sciences, and dental hygiene sciences.<sup>13</sup> Furthermore, dental hygiene science must include oral health education, health promotion, patient management, clinical dental hygiene and community oral health. The CODA standards require that dental hygiene program

must teach these topics, but does not specifically outline if and which chemotherapeutic agents are to be discussed within dental hygiene curriculum.

Dental hygiene faculty are provided flexibility in which dental hygiene textbooks they choose in order to determine dental hygiene curriculum, although CODA is explicit that dental hygiene students learn evidence-based science and critical decision making skills to understand the importance of scientific evidence when evaluating the effectiveness of treatments, therapies and medications. Dental hygiene textbooks have set information that is readily accessible and trusted within dental hygiene programs. Texts such as *Dental Hygiene Theory and Practice* by Darby and Walsh can be a resource when creating dental hygiene curriculum such as when presenting information about chemotherapeutic agents.<sup>1</sup> However, when discussing emerging products, information about such agents is not usually found within such textbooks since there is not enough evidence to warrant presentation.

Because there are minimal studies, sodium hypochlorite as an oral rinse is not widely discussed in dental hygiene textbooks under the use as a chemotherapeutic agent. Due to the fact that references to sodium hypochlorite or other emerging chemotherapeutics as an effective chemotherapeutic are limited in dental hygiene textbooks, dental hygiene curricula may also lack its inclusion. It is important that dental hygienists keep current with all forms of chemotherapeutic agents, including trending agents that are available for patient use but lack evidence of effectiveness. The influence dental hygiene educator's curriculum choices have regarding emerging chemotherapeutic education, including sodium hypochlorite is important, as it reflects the importance for dental hygiene students to be taught all adjuncts that are being practice, regardless of evidence.

## **Summary**

The prevention of oral plaque biofilm accumulation through the disruption of mechanical means and professional care are the backbone of periodontal disease and caries prevention. Treating periodontal disease adjunctively with chemotherapeutic agents is taught in dental hygiene school. Although it is imperative to teach the importance of evidence-based products for this, it is also important to teach about products that patients may be using. An example of this trend, is the diluted forms of sodium hypochlorite, used as a professional or self-applied rinse for periodontal disease treatment. Dental hygiene faculty influence what students learn by choosing which chemotherapeutics to review and apply in clinical courses.

## **Chapter III: Methods and Materials**

### **Introduction**

Faculty were asked to report their teaching curriculum and knowledge on the education of chemotherapeutics with a special interest on sodium hypochlorite as a chemotherapeutic agent.

### **Hypothesis**

Dental hygiene instructors favor evidence based chemotherapeutic agents within their curriculum versus trending chemotherapeutic agents.

### **Sample Description**

A self-administered survey was sent to program directors of all U.S. dental hygiene programs, with directions for them to forward the survey to faculty responsible for teaching chemotherapeutics in the curriculum. The intended population for this study was dental hygiene instructors who were teaching within accredited dental hygiene programs that reside within the United States.



## **Research Design**

Each survey contained various questions assessing chemotherapeutic curriculum as well as their current knowledge on sodium hypochlorite. The survey also contained several Likert scale questions. These questions allowed for interpretation through quantitative and qualitative analysis methods. The survey asked participants to answer several demographic questions regarding their age, gender, years teaching within dental hygiene programs, and program level they currently teach. For example, questions such as, “Does your dental hygiene program exclusively educate on chemotherapeutic agents proven effective by evidence-based research?” were asked. The survey inquired about the program’s or school’s curriculum mechanism to determine which oral chemotherapeutic agents are discussed within the curriculum. With questions such as, “Does your dental hygiene program educate students on trending chemotherapeutic agents that lack proof of effectiveness from evidence based research” and “Is your dental hygiene program knowledgeable of all chemotherapeutic agents and takes a proactive approach and currently teaches on all chemotherapeutic agents,” it helped assess their school’s knowledge on the subject and how curriculum is chosen whether it is determined by research based or emerging modalities. Each survey and data analysis method were analyzed by a statistician. This study was submitted for HRPO review for approval before starting the study. The survey link was emailed to the email addresses of the program directors of the various schools and dental hygiene programs within the United States. Program directors were contacted from each program through email and asked if they would like to participate in the survey. Once program directors agreed to participate, they were asked to forward the survey to program instructors via the email listserv. Each email that was sent consisted of the survey website link, the purpose of the study, and contact information.

When the surveys were completed, the data was summarized via platforms through the RedCap tool which was available through the University of New Mexico. As a result, the various answers from the surveys were placed within their corresponding groups of similar answers. The categories were analyzed further and stratified based on percentages. The information was also analyzed and assessed by a local statistician to reconfirm the data for reliability.

### **Data Collection**

A survey link and study information were sent through email to dental hygiene program directors with the request to forward the email to faculty responsible for teaching oral chemotherapeutics. The electronic survey was created and sent through RedCap. This online software was used in order to collect and format the data that was collected. Informed consent was obtained prior to respective instructors starting the survey. By completing and participating in the survey it was determined that informed consent was obtained, and their consent was given. An initial email was sent to US program directors requesting they forward the email to the faculty member responsible for teaching chemotherapeutic agents. Dental hygiene program instructor had two weeks to complete the electronic survey. After one week, a reminder email was sent. After the 14 day completion period, all surveys and data collected were assessed and analyzed.

### **Data Analysis**

When the surveys were completed, the data were summarized via the RedCap tool which was available through the University of New Mexico. Frequencies and percentages were calculated for response categories of each survey question. Once the surveys were collected, the corresponding questions and answers were divided and placed into categories based on the frequency of similar answers that were elected by the participants. Measures of dispersion further

assessed the frequency of answers in order to demonstrate and determine the frequency of each answer. Furthermore, this was a descriptive study and data were presented with descriptive statistics.

## Chapter IV: Results, Discussion and Conclusion

### Results

#### Summary of Results

The survey opened on Monday, January 13, 2020. The informed consent cover letter and active RedCap survey link were sent via email to Dental Hygiene Directors on January 13, 2020 via list serve. A reminder email was sent January 20th, 2020.

RedCap recorded 77 survey participants and every survey was completed, however, not every question answered. The response rate was recorded at 20.5%. The majority of respondents reported their programs offered an Associate's degree (67.1%), where as 40.8% offered a Bachelor's degree and 6.6% offered a Master's degree.

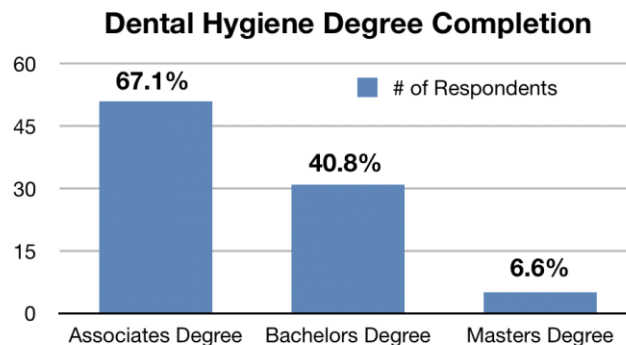


Figure 1: Surveyed Dental Hygiene Instructors response to degrees offered upon program completion

A majority of survey respondents, 50.0%, reported that they had been teaching chemotherapeutic oral rinses for 10 or more years and a majority of respondents had been a dental hygiene instructor for 10 or more years (57.9%).

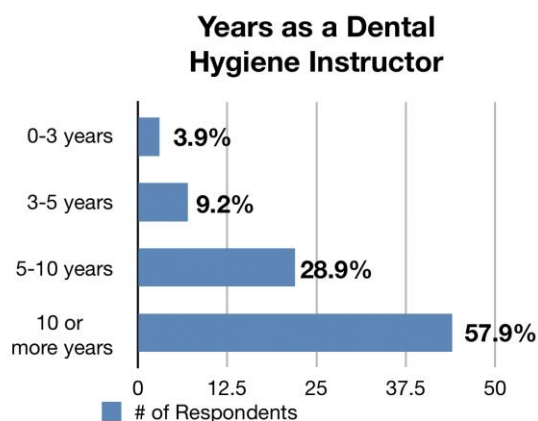


Figure 3: Surveyed Instructors response to number of years as a dental hygiene instructor

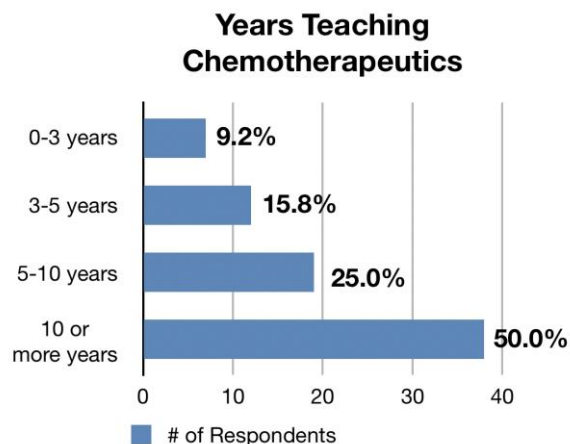


Figure 2: Surveyed Instructors response to number of years teaching chemotherapeutics

When asked if their respective dental hygiene programs exclusively educated on chemotherapeutic agents proven effective by evidence-based research, 56.6% reported that they strongly agreed, whereas 26.3% somewhat agreed.

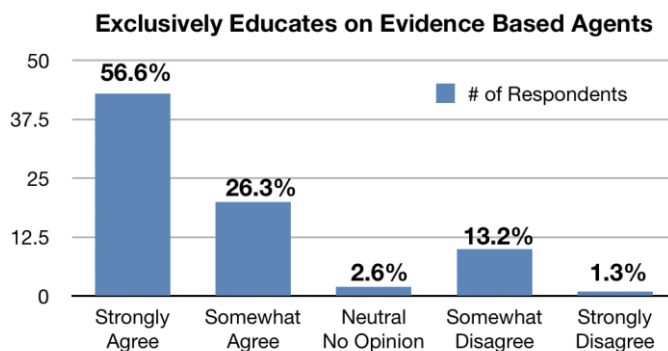


Figure 4: Surveyed Instructors response to program exclusively educates on chemotherapeutic agents proven effective by evidence based research

When asked if their respective dental hygiene program educated students on trending chemotherapeutic agents that lack proof of effectiveness from evidence-based research, 19.7% of respondents strongly agreed, 38.2% of respondents somewhat agreed. However, 13.2% (n=10) said they strongly disagreed.

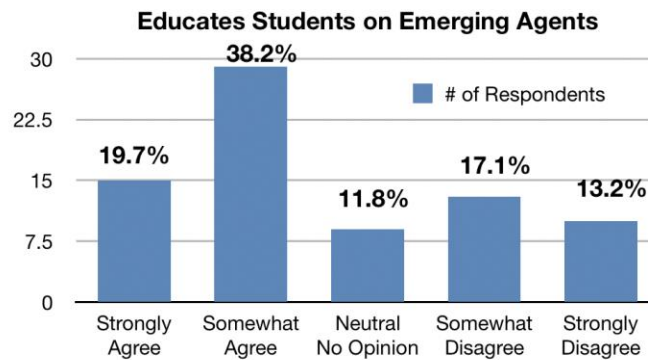


Figure 5: Surveyed Instructors response to program that educates on chemotherapeutic agents that lack proof of effectiveness from evidence based research

When asked if respondents had participated in additional training or continuing education on emerging (trending) oral chemotherapeutic rinses in order to teach updated material to students, 30.7% of respondents strongly agreed, whereas 46.7% somewhat agreed. Next, respondents were asked if their dental hygiene program was knowledgeable of all chemotherapeutic agents and if they took a proactive approach and currently taught on all chemotherapeutic agents regardless if they were emerging or research based. Overall, 22.4% of

respondents strongly agreed, 48.7% somewhat agreed, 10.5% had no opinion, 15.8% somewhat disagreed and 2.6% strongly disagreed.

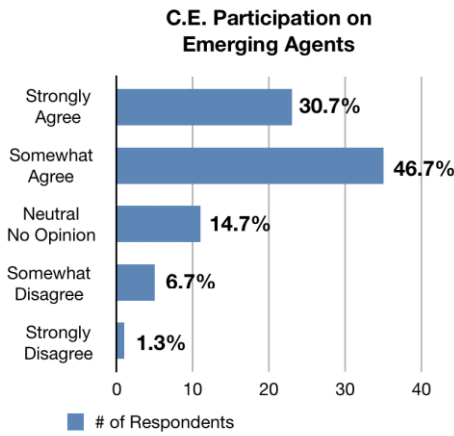


Figure 6: Surveyed Instructors response to participating in continuing education courses on emerging or trending chemotherapeutic rinses to teach updated material

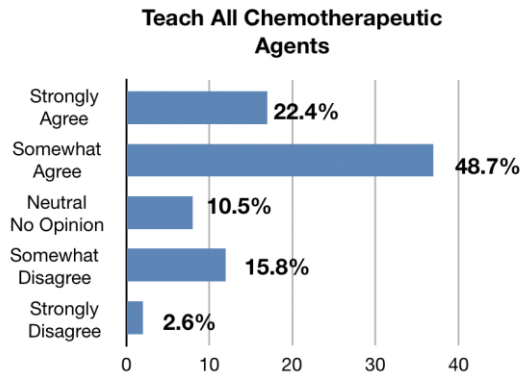


Figure 7: Surveyed Instructors response to program being knowledgeable on/teaching all chemotherapeutic agents whether emerging or evidence based

Next, respondents were asked about their knowledge of emerging research involving sodium hypochlorite as a chemotherapeutic agent. Out of those that responded, 14.5% strongly agreed whereas 44.7% somewhat agreed. Ten respondents had no opinion, whereas thirteen (17.1%) said they somewhat disagreed and 8 (10.5%) reported they strongly disagreed.

Respondents were then asked if they had used sodium hypochlorite as an adjunct chemotherapeutic agent in the treatment of periodontal disease in an education or clinical setting.

It was found that 52% strongly disagreed and 17.3% somewhat disagreed. Sixteen percent of respondents had no opinion, 12.0% said they somewhat agreed and 2.7% strongly agreed.

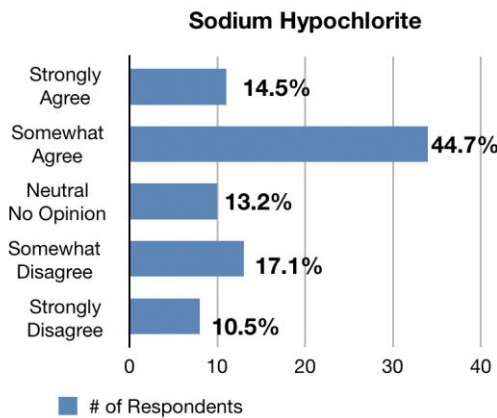


Figure 8: Surveyed Instructors response to knowledge of emerging research regarding sodium hypochlorite as a chemotherapeutic agent

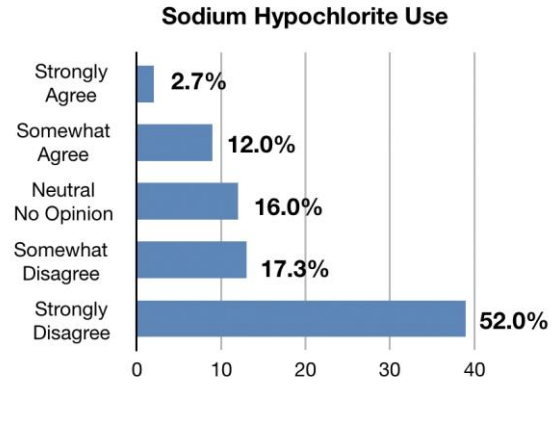


Figure 9: Surveyed Instructors response to the use of sodium hypochlorite in the treatment of periodontal disease in a clinical or educational setting

When asked which chemotherapeutic agents they discussed within their dental hygiene programs, 98.7% discussed Chlorhexidine gluconate, 85.3% discussed Essential oils, 72.0% discussed hydrogen peroxide, 69.3% discussed Cetylpyridinium chloride, 52.0% discussed GUM PerioShield®, and 29.3% discussed sodium hypochlorite.

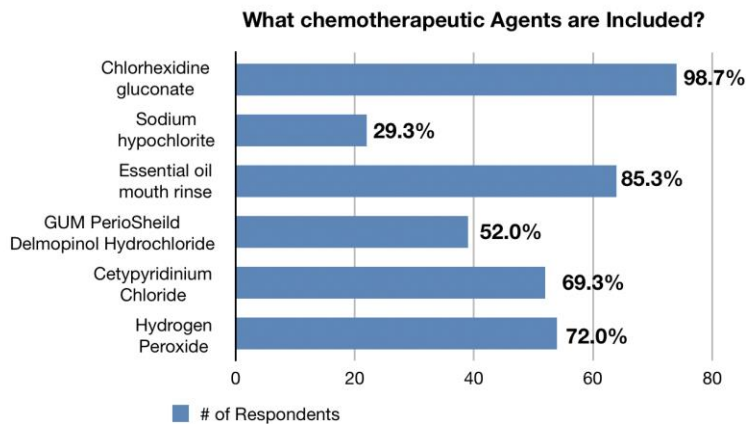


Figure 10: Surveyed Instructors response to chemotherapeutic agents discussed within their respective dental hygiene programs

Participants were asked if there were any chemotherapeutic agents they would like more resources or education on. Fifty-eight (86.6%) said they would like more research or education on Sodium hypochlorite, 58.2% said GUM PerioShield, 32.8% said Cetylpyridinium, 28.4% said Hydrogen peroxide, and 19.4% said Chlorhexidine gluconate. However, 10 respondents (13.0%) did not answer.

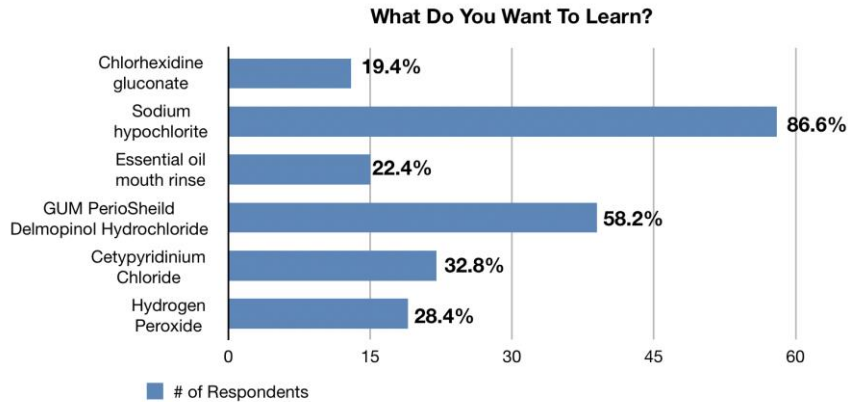


Figure 11: Surveyed Instructors response to which chemotherapeutic agents instructors would like more research or education on

Lastly, respondents were asked if their dental hygiene program taught students how to determine if a chemotherapeutic agent is evidence-based. Out of the 76 respondents, 81.6% strongly agreed, 14.5% somewhat agreed and 3.9% had no opinion.

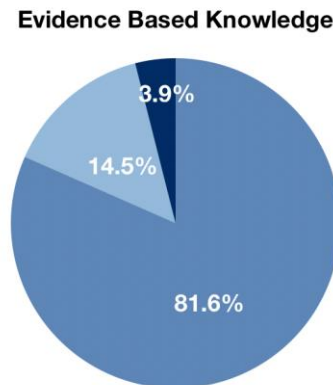


Figure 12: Surveyed Instructors Response to Student Evidence Based Knowledge Regarding Agents



## **Discussion**

### **Principle Findings**

Data from this study revealed that the majority of dental hygiene instructors favor chemotherapeutic oral agents supported by evidence-based research and these rinses are commonly included within curriculum. Chemotherapeutic oral rinses such as Chlorhexidine gluconate are well known among dental hygiene instructors whereas other rinses are not, influencing which rinses are included within dental hygiene curriculum. It was also noted that most respondents acknowledged that their programs educated students on trending chemotherapeutic agents that lacked proof of effectiveness from evidence-based research. Respondents also noted that they continued to pursue continuing education on emerging chemotherapeutic rinses in order to teach the newest material and products offered. Both categories of chemotherapeutic rinses can be found in the dental hygiene field and it is important for students to have a well-rounded background on all products they may encounter. The majority of respondents acknowledged this fact and twenty-two percent strongly agreed and forty-eight percent somewhat agreed that they acquired knowledge regarding all chemotherapeutic agents and teach on all agents whether they are emerging, or research based. Specifically, over forty-four percent of respondents were aware of emerging research involving sodium hypochlorite as a chemotherapeutic agent. However, most respondents had not used sodium hypochlorite within an educational or clinical setting. Although respondents were aware of sodium hypochlorite, they had never used it in the treatment of periodontal disease but did report including other chemotherapeutic agents such as essential oils (85.3%) and Cetylpyridinium chloride (69.3%). This does reveal how dental hygiene instructors ultimately decide what to include within their curriculum. This is interesting, since the majority of dental hygiene instructors seem to include two agents without evidence based, but not a third agent with

evidence. The reason could be that instructors did not realize that sodium hypochlorite was an option, or this could be because they are opposed to sodium hypochlorite, therefore choose not to cover this agent in their course. Ultimately the instructor does seem to have influence over what is included within their curriculum.

Since the majority of respondents (56.6%) did note that they exclusively included evidence-based rinses within their curriculum, but then majority of respondents also reported including trending chemotherapeutic agents, it does make the results unclear. Exclusivity cannot be reported regarding evidence-based products if the majority of respondents reported including emerging products within their curriculum. Therefore, it may be noted that dental hygiene instructors for the majority, do include both categories within their curriculum and although a high percentage reported exclusively teaching evidence based, survey data suggested otherwise. This does make sense since dental hygienists are taught the importance of evidence-based recommendations, but also the importance of knowing all products that patients may be using, whether they have adequate evidence of effectiveness or not. This was an interesting aspect of the survey and leads to further questions of how dental hygiene instructors decide what to include within their curriculum. This may open further discussion on what criteria instructors look for when it comes to relaying information to students and what they see as important information to teach. This may also indicate that although the recommended use of evidence-based is discussed and recommended, they do include those without evidence just as a point of reference, so that students know they may encounter questions about these products but should not recommend them to patients.

## Limitations

The limitations present in this study could impact the statistical information received and how the results are interpreted. The survey was given via email to dental hygiene program directors and was limited to when and if the email was received. The email was also intended for dental hygiene instructors who taught chemotherapeutic agents in their curriculum. If the email was not forwarded to the intended recipient, some of the projected 375 recipients may have not received the email or alternative recipients may have participated.

The wording and formatting of survey questions could have altered results since questions may have been taken in a different context than their original intent. For example, instructors were asked if their dental hygiene program *exclusively* educated on chemotherapeutic agents proven effective by evidence-based research. The wording may have influenced answers and it seemed that data from that question did not complement data received by other survey questions. It would have been beneficial for better results to include open ended questions for clarification on certain questions regarding why a chemotherapeutic agent was or was not included within their curriculum or how new information on emerging agents was attained either from C.E's outside of school curriculum, personal research or self-taught education. There are questions that remain unanswered since follow up questions or open-ended questions were not included within the survey.

Sample size also needs to be taken into consideration when it comes to analyzing the results. The small sample size of 77 respondents is too small in order to classify the results as statistically significant. The small sample size cannot be used to generalize results or findings and therefore, limits the reliability of the study.

## **Recommendations for Future Studies**

In future studies, it would be beneficial to obtain qualitative information regarding how dental hygiene instructors decide which chemotherapeutic rinses they include within their curriculum and why they choose certain products over others. It is also important to further question where or how dental hygiene instructors attain their information, whether from texts, articles, or continuing education courses outside of dental hygiene schools. This in turn influences how and what dental hygiene instructors teach within their perspective programs and it is important to know where and how they are getting this information. Dental hygiene is a profession that is ever evolving and changing. As a result, dental hygiene professionals practice continual learning and attainment of techniques and information in order to best treat their patients. Therefore, future studies would determine how one is influenced to include evidence based versus emerging products within their curriculum.

## **Conclusion**

The majority of faculty teach how to determine if a chemotherapeutic agent is based on clinical evidence. Findings from this study suggest that dental hygiene instructors value information of both evidence-based agents and emerging chemotherapeutic agents lacking evidence of efficacy. Therefore, most dental hygiene instructors include aspects of each category within their curriculum. Although, respondents did not report including sodium hypochlorite within their curriculum, they were receptive to learning more information regarding the oral rinse and majority were aware of emerging research on sodium hypochlorite. There are many effective oral chemotherapeutic agents available on the market and many are used in dental hygiene treatment. More research needs to be done to determine how dental hygiene instructors

choose which products to include within their curriculum and why some products are discussed over others.

**Chapter V: Article for Submission**

**Journal of Dental Hygiene**

**Title Page**

An Evaluation of Dental Hygiene Education of Chemotherapeutic Rinses: A survey

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University of New Mexico  
[MarisAragon@salud.unm.edu](mailto:MarisAragon@salud.unm.edu)

## ABSTRACT

**Purpose:** The purpose of this study was to learn which oral chemotherapeutic rinses dental hygiene educators cover within dental hygiene curriculum, including evidence-based products as well as emerging products, such as sodium hypochlorite.

**Methods:** A survey was created via RedCap to include dental hygiene educators responsible for oral chemotherapeutic curriculum within dental hygiene programs. Participants had two weeks to complete the survey and were asked which oral chemotherapeutic agents they included within their curriculum, their knowledge regarding several oral chemotherapeutic agents and evidence based/ non evidence based oral chemotherapeutic agents.

**Results:** A total of 77 instructors responded to the descriptive study, with a response rate of 20.5%. Data from this study revealed that the majority of dental hygiene instructors, 56.6%, favor chemotherapeutic oral agents supported by evidence-based research and these rinses are commonly included within curriculum. Chemotherapeutic oral rinses such as Chlorhexidine gluconate are well known among dental hygiene instructors whereas other rinses are not, influencing which rinses are included within dental hygiene curriculum.

**Conclusion:** Findings from this study suggest that dental hygiene instructors value information on both evidence-based agents and emerging chemotherapeutic agents lacking proof of research. Therefore, most dental hygiene instructors include aspects of each category within their curriculum. Although, respondents did not report including sodium hypochlorite within their curriculum, they were receptive to learning more information regarding the oral rinse and majority were aware of emerging research on sodium hypochlorite.

## INTRODUCTION

There are many effective oral chemotherapeutics available to patients for daily use that help reduce biofilm and the subsequent disease burden. These oral chemotherapeutics are available in both prescriptive and over-the-counter formulas. Although many chemotherapeutics have been on the market for decades, new chemotherapeutics emerge annually. One recent example is the use of sodium hypochlorite or bleach rinse as a chemotherapeutic.

### **Teaching Chemotherapeutics Factors**

Oral rinses have been widely used for the prevention of periodontal disease and are widely taught to be used during dental hygiene therapy.<sup>1</sup> Within dental hygiene programs, the ideal properties of an oral rinse are one that is biocompatible, safe to use over long periods of time, inexpensive, effective, has a broad spectrum of effectiveness, highly soluble, remains stable in storage, and has minimal side effects. Therapeutic uses include plaque reduction, the control and education of periodontal disease and caries prevention. Throughout education programs, the prescription rinse, chlorhexidine gluconate, has been taught as the gold standard for therapeutic efficacy for preventing and reducing dental plaque and gingival inflammation.<sup>1</sup> As a result, to date, chlorhexidine gluconate is the only prescription rinse to receive an ADA Seal of Approval, which is a voluntary process to aid in product marketing and is based on a set of specific guidelines that qualifies a product as satisfactory, safe and effective.<sup>1</sup> Although oral rinses have proven to be an effective means of plaque removal, it has been determined that only half of the population uses an oral rinse of some type and most do not use it following the manufacturer's directions.<sup>1</sup>



## Determining Dental Hygiene Curriculum

Dental hygiene curriculum includes education on chemotherapeutics that are supported by evidence-based research and treatment. However, including emerging chemotherapeutics within dental hygiene curriculum prepares students for treatment modalities that may be encountered within the practical field of dental hygiene. As the dental hygiene field progresses, trending chemotherapeutics and emerging solutions can be should be added to dental hygiene curriculum such as such as sodium hypochlorite, so that students are familiar with agents that may be used or inquired about by patients.

The Commission on Dental Accreditation (CODA) outlines general topics on what dental hygiene curriculum should include in order to follow CODA standards. According to the CODA dental hygiene curriculum must include content in general education, biomedical sciences, dental sciences, and dental hygiene sciences.<sup>13</sup> Furthermore, dental hygiene science must include oral health education, health promotion, patient management, clinical dental hygiene and community oral health. The CODA standards require that dental hygiene program must teach these topics, but does not specifically outline if and which chemotherapeutic agents are to be discussed within dental hygiene curriculum.

Dental hygiene faculty are provided flexibility with which dental hygiene textbooks are used in their dental hygiene curriculum, although CODA is explicit that dental hygiene students learn evidence-based science and critical decision making skills to understand the importance of scientific evidence when evaluating the effectiveness of treatments, therapies and medications. Dental hygiene textbooks have set information that is readily accessible and trusted within dental hygiene programs. Texts such as *Dental Hygiene Theory and Practice* by Darby and Walsh can be a resource when creating dental hygiene curriculum such as when presenting information

about chemotherapeutic agents.<sup>1</sup> However, when discussing emerging products, information about such agents is not usually found within such textbooks since there is not enough evidence to warrant presentation.

Because there are minimal studies, sodium hypochlorite as an oral rinse is not widely discussed in dental hygiene textbooks under the use as a chemotherapeutic agent. Due to the fact that references to sodium hypochlorite or other emerging chemotherapeutics as an effective chemotherapeutic are limited in dental hygiene textbooks, dental hygiene curricula may also lack its inclusion. It is important that dental hygienists keep current with all forms of chemotherapeutic agents, including trending agents that are available for patient use but lack evidence of effectiveness. The influence dental hygiene educators' curriculum choices have regarding emerging chemotherapeutic education, including sodium hypochlorite is important, as it reflects the importance for dental hygiene students to be taught all adjuncts that are being practice, regardless of evidence.

## HYPOTHESIS

Dental hygiene instructors favor research based chemotherapeutic agents within their curriculum versus trending chemotherapeutic agents.

## METHODS AND MATERIALS

A self-administered survey through the online tool, RedCap, was sent to program directors on all US dental hygiene programs, with directions for them to forward the survey to faculty responsible for teaching chemotherapeutics in the curriculum. The intended population for this study was dental hygiene instructors who are teaching within accredited dental hygiene programs that reside within the United States.

Each survey contained various questions assessing chemotherapeutic curriculum as well as their current knowledge on sodium hypochlorite. The survey also contained multiple choice questions. These questions allowed for interpretation through quantitative analysis methods. The survey asked participants to answer several demographic questions regarding their age, gender, years teaching within dental hygiene programs, and program level they currently teach. The survey inquired about the program's curriculum mechanism to determine which oral chemotherapeutic agents are discussed within the curriculum. Each survey and data analysis method was analyzed by a statistician. This study was approved by the UNM Human Research Protection Office (HRPO) before starting the study. The survey link was emailed to the email addresses of the program directors of the various schools and dental hygiene programs within the United States. Program directors were contacted from each program through email and asked if they would like to participate in the survey. Once program directors agreed to participate, they were asked to forward the survey to program instructors via the email listserv and participants had two weeks to complete the survey.

Once the surveys were collected, the corresponding questions and answers were divided and placed into categories based on the frequency of similar answers that were elected by the participants. Measures of dispersion further assessed the frequency of answers in order to demonstrate and determine the frequency of each answer. Furthermore, this is a descriptive study and data was presented with descriptive statistics.

## RESULTS

RedCap recorded 77 survey participants and every survey was completed, however, not every question answered. The response rate was recorded at 20.5% with a margin of error of

10%. The majority of respondents reported their programs offered an Associate's degree (67.1%), where as 40.8% offered a Bachelor's degree and 6.6% offered a Master's degree.

A majority of survey respondents, 50.0%, reported that they had been teaching chemotherapeutic oral rinses for 10 or more years and a majority of respondents had been a dental hygiene instructor for 10 or more years (57.9%).

When asked if their respective dental hygiene programs exclusively educated on chemotherapeutic agents proven effective by evidence-based research, 56.6% reported that they strongly agreed, whereas 26.3% somewhat agreed.

When asked if their respective dental hygiene program educated students on trending chemotherapeutic agents that lack proof of effectiveness from evidence based research, 19.7% of respondents strongly agreed, 38.2% of respondents somewhat agreed. However, 13.2% (n=10) said they strongly disagreed.

When asked if respondents had participated in additional training or continuing education on emerging (trending) oral chemotherapeutic rinses in order to teach updated material to students, 30.7% of respondents strongly agreed, whereas 46.7% somewhat agreed. Next, respondents were asked if their dental hygiene program was knowledgeable of all chemotherapeutic agents and if they took a proactive approach and currently taught on all chemotherapeutic agents regardless if they were emerging or research based. Overall, 22.4% of respondents strongly agreed, 48.7% somewhat agreed, 10.5% had no opinion, 15.8% somewhat disagreed and 2.6% strongly disagreed.

Next, respondents were asked about their knowledge of emerging research involving sodium hypochlorite as a chemotherapeutic agent. Out of those that responded, 14.5% strongly agreed whereas 44.7% somewhat agreed. Ten respondents had no opinion, whereas thirteen

(17.1%) said they somewhat disagreed and 8 (10.5%) reported they strongly disagreed.

Respondents were then asked if they had used sodium hypochlorite as an adjunct chemotherapeutic agent in the treatment of periodontal disease in an education or clinical setting. It was found that 52% strongly disagreed and 17.3% somewhat disagreed. Sixteen percent of respondents had no opinion, 12.0% said they somewhat agreed and 2.7% strongly agreed.

When asked which chemotherapeutic agents they discussed within their dental hygiene programs, 98.7% discussed Chlorhexidine gluconate, 85.3% discussed Essential oils, 72.0% discussed hydrogen peroxide, 69.3% discussed Cetylpyridinium Chloride, 52.0% discussed GUM PerioShield®, and 29.3% discussed sodium hypochlorite.

Participants were asked if there were any chemotherapeutic agents they would like more resources or education on. Fifty-eight (86.6%) said they would like more research or education on Sodium hypochlorite, 58.2% said GUM PerioShield®, 32.8% said Cetylpyridinium, 28.4% said Hydrogen peroxide, and 19.4% said Chlorhexidine gluconate. However, 10 respondents (13.0%) did not answer.

Lastly, respondents were asked if their dental hygiene program taught students how to determine if a chemotherapeutic agent is evidence-based. Out of the 76 respondents, 81.6% strongly agreed, 14.5% somewhat agreed and 3.9% had no opinion.

## DISCUSSION

Data from this study revealed that the majority of dental hygiene instructors favor chemotherapeutic oral agents supported by evidence-based research and these rinses are commonly included within curriculum. Chemotherapeutic oral rinses such as Chlorhexidine gluconate are well known among dental hygiene instructors whereas other rinses are not, influencing which rinses are included within dental hygiene curriculum. It was also noted that

most respondents did acknowledge that their programs did educate students on trending chemotherapeutic agents that lacked proof of effectiveness from evidence-based research. Respondents did note that they continued to pursue continuing education on emerging chemotherapeutic rinses in order to teach the newest material and products offered. Both categories of chemotherapeutic rinses can be found in the dental hygiene field and it is important for students to have a well-rounded background on all products they may encounter. The majority of respondents acknowledged this fact and twenty-two percent strongly agreed and forty-eight percent somewhat agreed that they acquired knowledge regarding all chemotherapeutic agents and teach on all agents whether they are emerging or research based. Specifically, over forty-four percent of respondents were aware of emerging research involving sodium hypochlorite as a chemotherapeutic agent. However, most respondents had not used sodium hypochlorite within an educational or clinical setting. Although respondents were aware of sodium hypochlorite, they had never used it in the treatment of periodontal disease but did report including other chemotherapeutic agents such as essential oils (85.3%) and Cetylpyridinium chloride (69.3%). This does reveal how dental hygiene instructors ultimately decide what to include within their curriculum. This is interesting, since the majority of dental hygiene instructors seem to include two agents without evidence-based, but not a third agent with evidence. The reason could be that instructors did not realize that sodium hypochlorite was an option, or this could be because they are opposed to sodium hypochlorite, therefore choose not to cover this agent in their course. Ultimately the instructor does seem to have influence over what is included within their curriculum.

Since the majority of respondents (56.6%) did note that they *exclusively* included evidence-based rinses within their curriculum, but then majority of respondents also reported

including trending chemotherapeutic agents, it does make the results unclear. Exclusivity cannot be reported regarding evidence-based products if the majority of respondents reported including emerging products within their curriculum. Therefore, it may be noted that dental hygiene instructors for the majority, do include both categories within their curriculum and although a high percentage reported exclusively teaching evidence based, survey data suggested otherwise. This was an interesting aspect of the survey and leads to further questions of how dental hygiene instructors decide what to include within their curriculum. This may open further discussion on what criteria instructors look for when it comes to relaying information to students and what they see as important information to teach. This may also indicate that although the recommended use of evidence-based is discussed and recommended, they do include those without evidence just as a point of reference, so that students know they may encounter questions about these products but should not recommend them to patients.

## CONCLUSION

Findings from this study suggest that dental hygiene faculty value information on both evidence-based agents and emerging chemotherapeutic agents lacking proof of research. Therefore, most dental hygiene instructors include aspects of each category within their curriculum. Although, respondents did not report including sodium hypochlorite within their curriculum, they were receptive to learning more information regarding the oral rinse and majority were aware of emerging research on sodium hypochlorite. There are many effective oral chemotherapeutic agents available on the market and many are used in dental hygiene treatment. Further research needs to be done to determine how dental hygiene instructors choose which products to include within their curriculum and why some products are discussed over others.

## **Appendices**

### **Appendix A. Informed Consent Letter**

**The University of New Mexico Health Sciences Center  
Consent and Authorization to Participate in a Research Study**

**STUDY TITLE**

An Evaluation of Dental Hygiene Education of Chemotherapeutic Rinses: A survey

Dear Prospective Participant,

Researchers at the University of New Mexico are inviting you to take part in a survey. The purpose of the study is to determine which chemotherapeutic rinses are covered within dental hygiene curriculum. You are being asked to participate in this study because you are a director or faculty of a dental hygiene educational program.

Although you may not get personal benefit from taking part in this research study, your responses may help us understand more about chemotherapeutic rinses covered in dental hygiene curriculum. The findings from this project will provide information on chemotherapeutic curriculum within dental hygiene programs. If published, results will be presented in summary form only.

The survey/questionnaire will take about 5 minutes to finish. Your involvement in the study is voluntary, and you may choose not to participate. There are no names or identifying information associated with this survey. The survey includes questions such as which type of chemotherapeutics do you teach in your curriculum. You can refuse to answer any of the questions at any time.

There are no known risks to participating in this study. Although we have tried to minimize this, some questions may make you upset or feel uncomfortable and you may choose not to answer them.

Your response to the survey is anonymous which means no names will appear or be used on research documents, or be used in presentations or publications. The research team will not know that any information you provided came from you, nor even whether you participated in the study

Your response to the survey will be kept confidential to the extent allowed by law. When we write about the study and its results you will not be identified.

We hope to receive completed questionnaires from every dental hygiene program, so your answers are important to us. Of course, you have a choice about whether or not to complete the



survey/questionnaire, but if you do participate, you are free to skip any questions or discontinue at any time.

The data will be stored in the online software system, RedCap. RedCap has safeguards in place for data protection such as password protection and encryption. Please be aware, while we make every effort to safeguard your data once received on our servers via REDCap, given the nature of online surveys, as with anything involving the Internet, we can never guarantee the confidentiality of the data while being transmitted to us.

If you have questions about the study, please feel free to ask; my contact information is given below. If you have questions regarding your legal rights as a research subject, you may call the UNM Human Research Protections Office at (505) 272-1129.

Thank you in advance for your assistance with this important project. To ensure your responses/opinions will be included, please submit your completed survey/questionnaire in 2 weeks time. By clicking on the link below, you will be agreeing to participate in the above described research study.

Survey Link Here: <https://ctsctrials.health.unm.edu/redcap/surveys/?s=ERA9NH4RYH>

Sincerely,

Christine Nathe RDH, MS  
Principal Investigator  
Division of Dental Hygiene, University of New Mexico Health Sciences  
[CNathe@salud.unm.edu](mailto:CNathe@salud.unm.edu)

## Appendix B: Survey

1. My dental hygiene program offers the following dental hygiene degree upon program completion.

Select all that apply.

- a. Associate's degree
- b. Bachelor's degree
- c. Master's degree

2. I have been teaching chemotherapeutic oral rinses for:

- a. 0-3 years
- b. 3-5 years
- c. 5-10 yours
- d. 10 or more years

3. I have been a dental hygiene instructor for:

- a. 0-3 years
- b. 3-5 years
- c. 5-10 years
- d. 10 or more years

4. My dental hygiene program exclusively educates on chemotherapeutic agents proven effective by evidence based research

- a. Strongly Agree
- b. Somewhat Agree
- c. Neutral / No Opinion
- d. Somewhat Disagree
- e. Strongly Disagree

5. My dental hygiene program educates students on trending chemotherapeutic agents that lack proof of effectiveness from evidence based research

- a. Strongly Agree
- b. Somewhat Agree
- c. Neutral / No Opinion
- d. Somewhat Disagree
- e. Strongly Disagree

6. I have participated in additional training or continuing education on emerging (trending) oral chemotherapeutic rinses in order to teach updated material to students

- a. Strongly Agree
- b. Somewhat Agree
- c. Neutral / No Opinion
- d. Somewhat Disagree
- e. Strongly Disagree

7. My dental hygiene program is knowledgeable of all chemotherapeutic agents and takes a proactive approach and currently teaches on all chemotherapeutic agents whether they are emerging products or research based

- a. Strongly Agree
  - b. Somewhat Agree
  - c. Neutral / No Opinion
  - d. Somewhat Disagree
  - e. Strongly Disagree
8. I am aware of the emerging research involving sodium hypochlorite as a chemotherapeutic agent.
- a. Strongly Agree
  - b. Somewhat Agree
  - c. Neutral / No Opinion
  - d. Somewhat Disagree
  - e. Strongly Disagree
9. I have used sodium hypochlorite as an adjunct chemotherapeutic agent in the treatment of periodontal disease in an educational or clinical setting
- a. Strongly Agree
  - b. Somewhat Agree
  - c. Neutral / No Opinion
  - d. Somewhat Disagree
  - e. Strongly Disagree
10. Which chemotherapeutic agents do you discuss within your dental hygiene program? Select all that apply.
- a. Chlorhexidine gluconate
  - b. Sodium hypochlorite
  - c. Essential oil mouth rinses
  - d. GUM PerioShield (Delmopinol Hydrochloride)
  - e. Cetylpyridinium Chloride
  - f. Hydrogen peroxide
11. Are there any chemotherapeutic agents you would like more research or education on?
- a. Sodium hypochlorite
  - b. Chlorhexidine gluconate
  - c. Essential oil mouthiness
  - d. GUM PerioShield (Delmopinol Hydrochloride)
  - e. Cetylpyridinium Chloride
  - f. Hydrogen peroxide
12. My dental hygiene program teaches students how to determine if a chemotherapeutic agent is evidenced-based
- a. Strongly Agree
  - b. Somewhat Agree
  - c. Neutral / No Opinion
  - d. Somewhat Disagree
  - e. Strongly Disagree

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