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Get in the Zone: A survey of Dental Professionals' Knowledge of Ozone Therapy

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GET IN THE ZONE: A SURVEY OF DENTAL PROFESSIONALS' KNOWLEDGE OF OZONE THERAPY

A Capstone Experience/ Thesis Project

Presented in Partial Fulfillment of the Requirements for

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Honors College Graduate Distinction at Western Kentucky University

By:

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ABSTRACT

Ozone therapy has been used in medicine for many years to treat a variety of ailments. Ozone is an unstable triatomic molecule made up of three oxygen atoms. This molecule has the ability to kill bacteria, fungi, parasites, and viruses. The researcher first was curious if there has been research done on uses of Ozone Therapy in the dental setting. After reviewing the literature there is indeed a use for Ozone Therapy to treat a host of dental problems including periodontal disease, ulcers, and carious lesions (also known as cavities). However, there are conflicting conclusions in the literature as to whether or not Ozone Therapy is the most effective treatment against oral pathogens. The research done on the subject in dentistry is limited. The researcher sent out a brief survey to inquire if dentists in the state of Kentucky are aware of Ozone Therapy and its uses in dentistry. The researcher also inquired about the dentists' location, the year of graduation from dental school, and if they specialize in a certain area of dentistry. The survey will give insight into whether or not dentists are aware of this treatment alternative. The research suggest that more dentist are unaware of Ozone Therapy than those that are aware of Ozone Therapy. There seems to be no significant relationship between knowledge of Ozone Therapy and the year that the dentist graduated dental school. Nor is there a relationship between knowledge and whether or not the dentist practices general dentistry or specializes.

Keywords: Ozone Therapy, Dentistry, Periodontal Disease, Caries, Pathogens

Dedicated to my family, friends, and the WKU Dental Hygiene Faculty

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I would like to express my gratitude to everyone who has supported me during my time at WKU.

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importance of a good work ethic. Everything that I have accomplished began with their guidance.

VITA

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CHAPTER 1

INTRODUCTION

Over the years, as with almost all fields, there has been a change in the way dentistry is performed. For many people going to the dentist can be a cause of great anxiety. What if there was a less invasive procedure that would change a person's mind about what it means to go to the dentist? Could there be a natural alternative that could be used in a variety of ways in the dental office? Ozone therapy is a holistic treatment that was first use in medicine in 1870 but it wasn't until 1932 that it was studied in dentistry by Dr. E. A. Fisch in Switzerland. Ozone is a triatomic oxygen molecule that is formed when ultraviolent rays or a discharge of electricity causes oxygen atoms to combine in groups of three temporarily. It has been found to kill bacteria, fungi, viruses, and parasites (Gupta & Mansi 2012). Ozone kills the anaerobic bacteria that cause dental disease by oxidation. How this works is that the ozone molecule produces thousands of tiny holes in the cell wall of the anaerobic bacterium cell membrane causing the cell to lose its structural integrity and it dies. Ozone does not damage healthy human cells because these cells have an antioxidant enzyme that allows the ozone to pass through the cell membrane without destruction. It has also been shown that ozone boosts the patient's own immune system by stimulating the productions of immunoglobulins, allowing the patient to have a stronger host response in order to fight off these pathogens. In dentistry, it has been shown to be useful as a disinfectant, in controlling bleeding, and as an agent

to help increase wound healing. Ozone may be applied through water, as gas, or mixed with oils. These properties give Ozone the ability to be used in Periodontics, Endodontics, Orthodontics, Restorative Dentistry, and much more (Pattanaik, et.al, 2011).

CE/T Statement

The researcher predicts that there will not be many offices, if any, which use ozone as a treatment for their patients in the state of Kentucky. Further, it is predicted that most dental professionals will not have heard of Ozone Therapy as a means to treat dental diseases. Ozone Therapy is not taught in dental schools and requires special training which does not make it common knowledge to all graduates of dental programs. It is also necessary to purchase the equipment to produce ozone in the office because of its instability. If the dental professionals do know about Ozone Therapy and its potential benefits, the price could be a barrier to them introducing it into their practice. However, the bigger barrier is knowledge. Dentists cannot offer a treatment to their patients if they do not know about the treatment.

CHAPTER 2

LITERATURE REVIEW

Ozone therapy has been used for decades in Europe in the field of medicine. The use of Ozone Therapy in dentistry is relatively new and the current research on the topic is still limited. There have been a range of studies done in different aspects of dentistry from use as a disinfectant in the dental unit water supply to use in treatment of carious lesions. This chapter will discuss a few of the studies that have been conducted about Ozone Therapy in dentistry.

Thabusum, Reddy, and Rajesh (2015) conducted a study comparing the effects of ozonated oil and sesame oil on aphthous stomatitis, also known as aphthous ulcers or canker sores. A person with aphthous ulcers can experience trouble in normal function and activities including oral hygiene and eating. This study aimed to discover which substance had the capacity to shorten the time it takes an ulcer to heal and also decrease the amount of pain that is associated with these ulcers.

The study was a single blinded study that compared a total of 30 participants of both sexes who were over the age of 16 years and who presented with 1 to 5 ulcers with duration of less than 48 hours since its first appearance. The researchers conducted the experiment on the most painful ulcer recorded by the patient. The participants were

randomly assigned to three groups. Each group received a different treatment of ozonated oil, sesame oil, and a placebo of distilled water. Each treatment was applied directly to the ulcer using a cotton tip applicator and approximately 0.2 ml of the assigned agent four times a day for five days. Evaluations were taken on days 2, 4, and 6. During each evaluation, an ulcer grade description was recorded based on the pain of the ulcer using a visual analog scale (VAS), the size of the ulcer measured with a periodontal probe, and the severity of the erythema using an erythema grade scale. A score of 0-4 depending on the healing response during treatment was given. The scores were as follows: grade 4= the ulcer was cleared; grade 3= the ulcer is barely perceivable with minimal to no pain; grade 2= the ulcer is visible with moderate decrease in erythema, pain, and size; grade 1= ulcer is visible with slight decrease in erythema, pain, and size; grade 0=no change from day 1. Pretreatment and post treatment photographs were also taken.

The mean pain scores for the group who received the ozonated oil treatment dropped form a baseline score of 8.10 to 6.50, 4.10, and 1.50 on days 2, 4, and 6 respectively. For the participants who received the sesame oil treatment, their VAS scores went from a baseline score of 8.20 to 5.70, 3.50, and 1.80 respectively. As for the third group that received the placebo, their VAS scores were recorded as 7.90 as baseline score and dropped to only 7.60, 7.40, and 4.60 respectively. The researchers stated that the ulcers treated with ozonated oil showed a significant reduction in size, erythema, and pain compared to the baseline recordings. On the 6^{th} day of treatment there was significant healing in both the ozonated oil group and the sesame oil group. The group that received the placebo showed no significant difference from their baseline data. The

researchers stated that it can be implied that the ozonated oil possesses inherent healing properties compared to the sesame oil and the placebo.

Hikal, Zaki, and Sabry (2015) found similar favorable outcomes while using ozone as a disinfectant in dental unit waterlines. Ozone is commonly used as a disinfectant for drinking water and wastewater treatment. Ozone is 1-5 times stronger than chlorine and is effective against a wider spectrum of microorganisms. This study was conducted by studying the presence of *Acanthamoeba* before and after application of ozone gas into the waterlines. *Acanthamoeba* are known to cause disease in both humans and animals. This species of free-living amoebae have been isolated from freshwater, seawater, chlorinated water in swimming pools, and dental units. There are four different pathways for waterborne microorganisms that can cause infection in a dental patient. These include: hematogenous spread during a surgical procedure, local mucosal contact, ingestion, and inhalation.

During this study, fifty water samples were collected from January, 2013 to December 2013 from dental unit waterlines at the medical services unit of National Research Center, Dokki, Giza, Egypt. Two different collections were taken from dental hand pieces, air-water syringes, and cup fillers, along with tap water. The first collection was in the morning before patients were treated. The second collection was taken at the end of the working day. After the water was collected, it was immediately taken to the parasitology laboratory at the National Research Center for analysis and culture. Overall 500mL of each water sample was filtered through a cellulose acetate filter under a weak vacuum. The filters were then oculated on to NNA plates overlaid with *E. coli*. The plates were then incubated at 37 and 40 degrees Celsius and observed daily for the

presence of *Acanthamoeba*. After being treated with the determined 50ml of the required concentration of ozonized water and incubated for 10 minutes, the samples were divided into two groups. The first group was stained with trypan blue and counted microscopically using hemocytometer to determine the number of dead amoeba after exposure to ozone. The second group was inoculated onto agar plates overlaid with *E. coli* and incubated at 30 degrees Celsius for 7 days to determine the viability of amoeba after exposure to ozone.

Two dental unit waterlines were treated with ozone, the first one for 5 minutes and the second for 10 minutes. The lines were then flushed with ozonated water for 5 minutes and immediately sampled via the high-speed hand piece into sterile containers. This procedure was repeated for 7 consecutive days both before and after treatment. All these samples were cultured on nutrient agar plates and incubated at 37 degrees Celsius to determine the presence of *Acanthamoeba*.

The authors reported that *Acanthamoeba* were isolated from 100 of 100 water samples collected from the high-speed hand pieces, air-water syringes, and the cup fillers. There was an overall point prevalence of 100% from these sources, but 72% prevalence in the tap water samples. When *Acanthamoeba* was exposed to ozonated water for 4 minutes, the cell viability decreased to 52%. The amoeba was killed 100% very rapidly after 5 minutes of ozonated water and the cell wall was ruptured. In the two dental unit waterlines that were examined, *Acanthamoeba* was present before ozone treatment. The first unit with 5 minutes of exposure to ozone showed growth of the amoeba after 3 days. The second unit with 10 minutes of exposure showed no growth during the 7 days after incubation. This study showed that ozone is highly effective against pathogenic

organisms in dental waterlines. It also does not take long exposure the benefits of ozone can start to be seen.

Gunes, Bashi, Ince, Colak, at.el, (2014) found slightly less supportive data for the use of ozone as a disinfectant when used with microleakage in dental restorations when compared with diode laser and traditional cavity disinfectants. This study was done under in vitro conditions using ninety extracted third molars. All of the teeth were prepared with a class five cavity on the buccal surface using a cylindrical diamond drill. The cavity preparation measured 3mm from mesial to distal, 2mm from gingival to occlusal, and had a depth of 2mm. The teeth were then placed into one of six groups. The groups were as follows: group 1 treated with benzalkonium chloride; group 2 treated with chlorhexidine gluconate; group 3 treated with sodium hypochloride; group 4 treated with diode laser; group 5 treated with ozone gas; group 6 treated with no disinfectant. Next, primer, bonding agent, and composite from the same company were applied to all six groups. The primer and bonding agent were applied and polymerized for 10 seconds. A hybrid composite was used and polymerized for 20 seconds. The teeth were then subjected to 1000 thermal changes lasting 30 seconds each in baths with temperatures ranging from 5 degrees Celsius to 55 degrees Celsius. The samples were then placed in a 0.5% basic phuxine solution before being examined and photographed at 15x magnification. Scanning Electron Microscope analysis was performed and the results were statistically evaluated using the Kruskal-Wallis test. This test scores microleakage with scores ranging from 0 (no stained leakage) to 4 (stained leakage partially or completely reaching the pulp).

The results of this study did show that the group that received the ozone gas did receive the lowest mean value for microleakage on both the occlusal and gingival edges. The highest mean value for microleakage was the control group. Although these results seem favorable for the use of ozone, the results of this study were not significant ($p>0.05$). This means that the results may be due to an outside factor and that a definite conclusion cannot be made whether or not ozone is the best treatment against microleakage.

Dhingra and Vandana (2011) found a more statistically favorable outcome with the use of ozonated water irrigation and the management of gingival inflammation in orthodontic patients. However, they stated that more randomized studies need to be done in order to validate the use of ozonated water with orthodontic patients. During orthodontic treatment, the occurrence of gingival inflammation is increased along with lactate dehydrogenase (LDH) enzyme in gingival crevicular fluid. The goal of this study was to evaluate the effects of a single subgingival irrigation using ozonated water in orthodontic patients with gingival inflammation. The study also aimed to correlate the clinical effects with LDH enzyme activity in gingival crevicular fluid.

Seven men and eight women with a mean age of 17.3 years and having full mouth orthodontic brackets were used in this cross-sectional clinical and laboratory study. A baseline measurement of LDH enzyme and gingival crevicular fluid was obtained followed by subgingival irrigation using ozonated water at 0.1ppm. The amount of LDH enzyme and gingival crevicular fluid were measured again on day 14 and day 28.

The results of this study showed a significant ($p<0.05$) reduction in the LDH and gingival crevicular fluid activity and reduction in the volume of gingival crevicular fluid after a single irrigation with ozonated water. There was also a significant correlation ($r=0.50$, $p=0.01$) observed between post-treatment plaque index and LDH values. This study showed that a single subgingival irrigation of ozonated water at 0.1ppm can effectively reduce gingival inflammation in patients undergoing orthodontic treatment. The amount of LDH enzyme is also reduced.

Holmes (2003) studied the effects of ozone gas on incipient root caries in an older population. In this double-blind study, 89 participants ranging in from 60-82 with two leathery primary root carious lesions were selected. Upon clinical evaluation the lesions were categorized as soft, leathery or hard, and scored with a validated root caries severity index. In each participant, one of the carious lesions was selected to receive ozone and the second carious lesion was given air each applied for 40 seconds. At the initial visit, scaling and polishing along with oral hygiene instruction that included the use of non-fluoridated toothpaste was given. Each participant was also instructed not to consume fermentable carbohydrates in between meals. The participants were recalled at three, six, twelve, and eighteen months.

Two separate dentists were involved in the study. One dentist performed the application of gases and the second evaluated the lesions. After the treatment was given, a professionally-applied remineralizing solution containing xylitol, fluoride, calcium, phosphate, and zinc was applied to the lesions. Post-operative instructions were given to the participants to use the re-mineralizing tooth-paste twice each day and a mineral mouthwash twice a day along with a remineralizing spray used four times a day after

breakfast, lunch, snack, and supper. The participants were given a soft bristled toothbrush and instructed to replace the toothbrush every month.

After three months, 69% of the ozone-treated lesions had become hard and none had deteriorated. At this same time the lesions in the control group had 4% of the lesions deteriorate ($p<0.01$). At six months, 8% of the ozone-treated lesions had remained leathery and the remaining 92% had become hard. In the control group, 11% of the lesions had worsened and one lesion became hard ($p<0.01$). By the twelfth and eighteenth month, two of the participants had dropped out of the study. At twelve months, only two of the ozone-treated lesions remained leathery and 98% had hardened. The control group had 24% of the lesions progress from leathery to soft, 75% remained leathery, and one lesion remained hard ($p<0.01$). At eighteen months, 100% of the ozone-treated lesions had arrested, while in the control group 37% had worsened from leathery to soft, 62% remained leathery and one had remained hard ($p<0.01$).

The authors concluded that leathery carious lesions that are non-cavitated can be arrested with the use of ozone gas along with remineralizing agents. This could prevent the need for drilling and filling incipient carious lesions.

The preceding studies show that there has been some research done in order to determine the effectiveness of Ozone Therapy in the dental office. Still missing from the literature is data concerning the amount of awareness that is present concerning Ozone Therapy and its various uses in the field of dentistry. This paper attempts to fill this gap in the literature.

CHAPTER 3

METHODS AND METHODOLOGY

A survey was conducted of dentists in the state of Kentucky to evaluate the knowledge about Ozone therapy. The Western Kentucky University Institutional Review Board (IRB) approved the research in February 2016 (WKU IRBNet ID #862613-2). The survey was comprised of six questions (Appendix A) beginning with inquiring about the location of the dental practice, what year did the respondent graduate dental school, and whether the respondent practiced general dentistry or specialized. The last two questions about the awareness of Ozone Therapy. First asking if the respondent was aware of Ozone Therapy, and then if the respondents were aware of Ozone Therapy they were asked of which uses they were aware.

Email addresses of Kentucky dentists were provided by The Kentucky Board of Dentistry. Each participant received an email with information about the purpose of the research with an attachment of the official stamped consent form provided by WKU IRB and a link to the survey. The survey was conducted using Qualtrics® software provided by Western Kentucky University. The software protected each participant's identity by assigning an anonymous identification number. There were no associated risks with participation. The survey was active for four weeks.

Once the survey was closed, the results were statistically analyzed. The data were

were used to describe the amount of awareness of Ozone therapy and its uses among dentists in the state of Kentucky. The next chapter discusses the results that were gathered from the research

CHAPTER 4

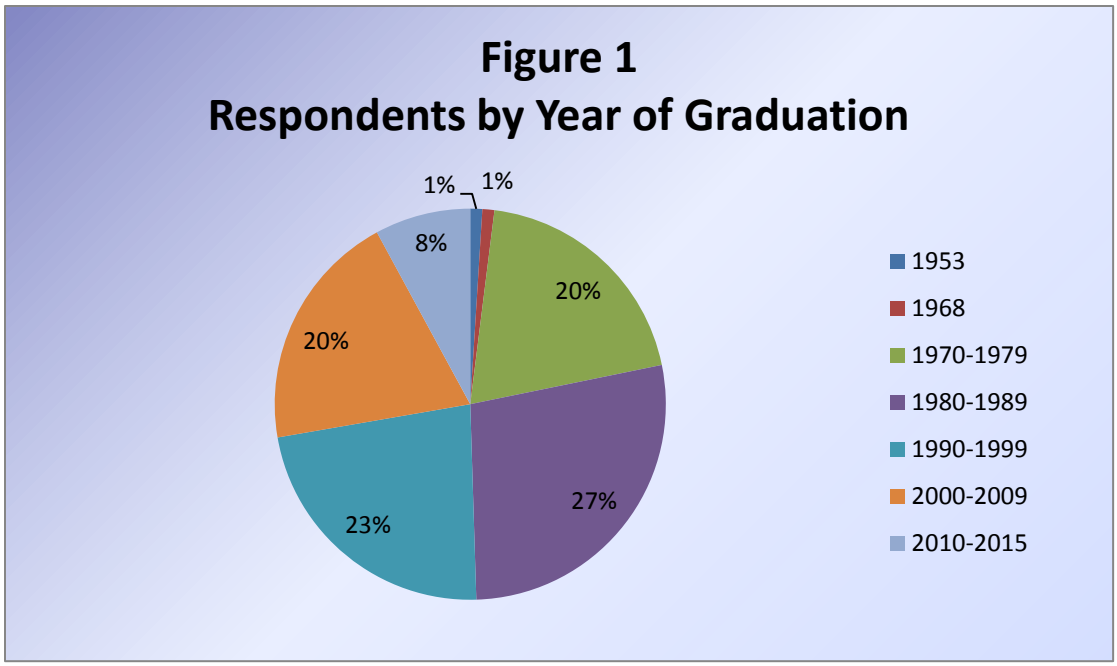
RESULTS

This chapter will discuss the results collected by the survey between the dates of March 14, 2016 and April 9, 2016. The questionnaire surveyed dentists in Kentucky regarding the city in which they practice, the year they graduated from dental school, and whether or not they specialize or practice general dentistry. The remaining two questions asked if the dentist was familiar with Ozone Therapy in dentistry and, if so they were asked of which uses of Ozone Therapy they are aware.

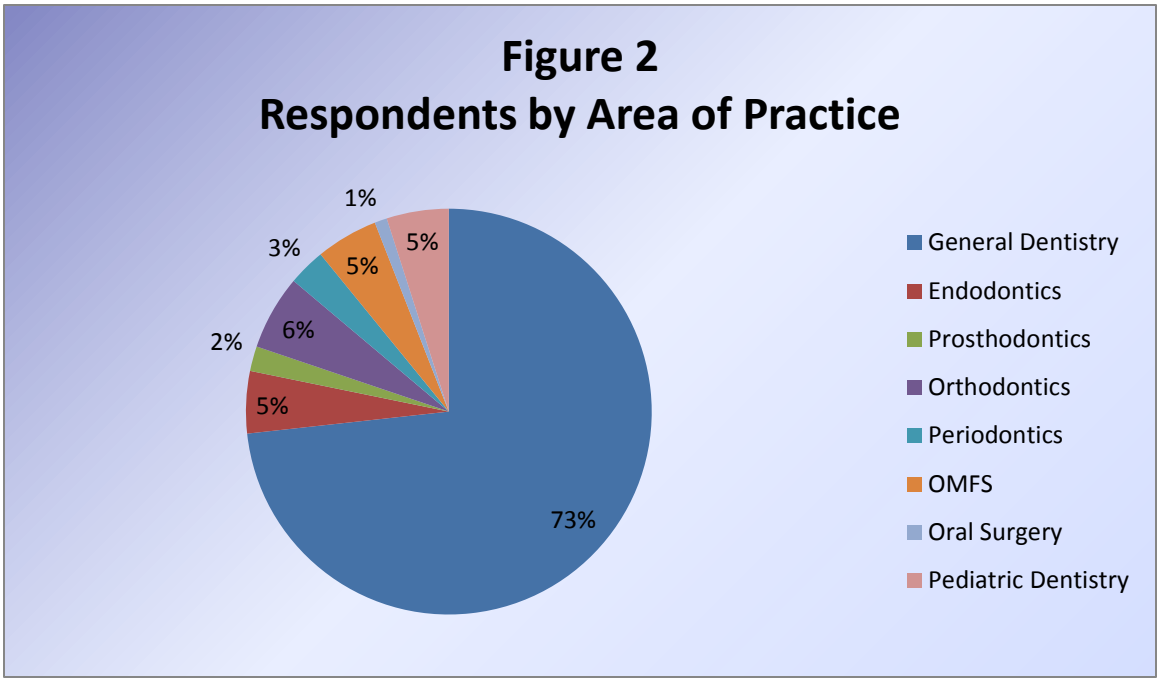
There were a total of 124 surveys that were submitted. However, 23 of the 124 were from out-of-state or were not completed and those surveys were not used in the results. Therefore, a total of 101 respondents were included in this study. Most of the respondents practiced in Louisville, KY (n = 29). The city with the second-highest number of respondents was Lexington, KY (n = 14). This is not too surprising in that these are the 2 most populated cities in Kentucky. There were 6 dentists who responded from Bowling Green, KY and 5 dentists who responded from Elizabethtown, KY. The remaining 47 respondents practiced in one of 39 cities throughout Kentucky.

The survey also asked each participant what year they graduated from dental school. (Figure 2) One respondent (0.99%) reported graduating in 1953 and one respondent (0.99%) reported graduating in 1968. Twenty respondents (19.8%) graduated

between the years of 1970-1979. Twenty-eight respondents (27.7%) graduated between the years of 1980-1989. Twenty-three respondents (22.8%) graduated between the years of 1990-1999. Twenty respondents (19.8%) graduated between the years of 2000-2009. Last, eight respondents (7.9%) graduated between the years of 2010-2015.



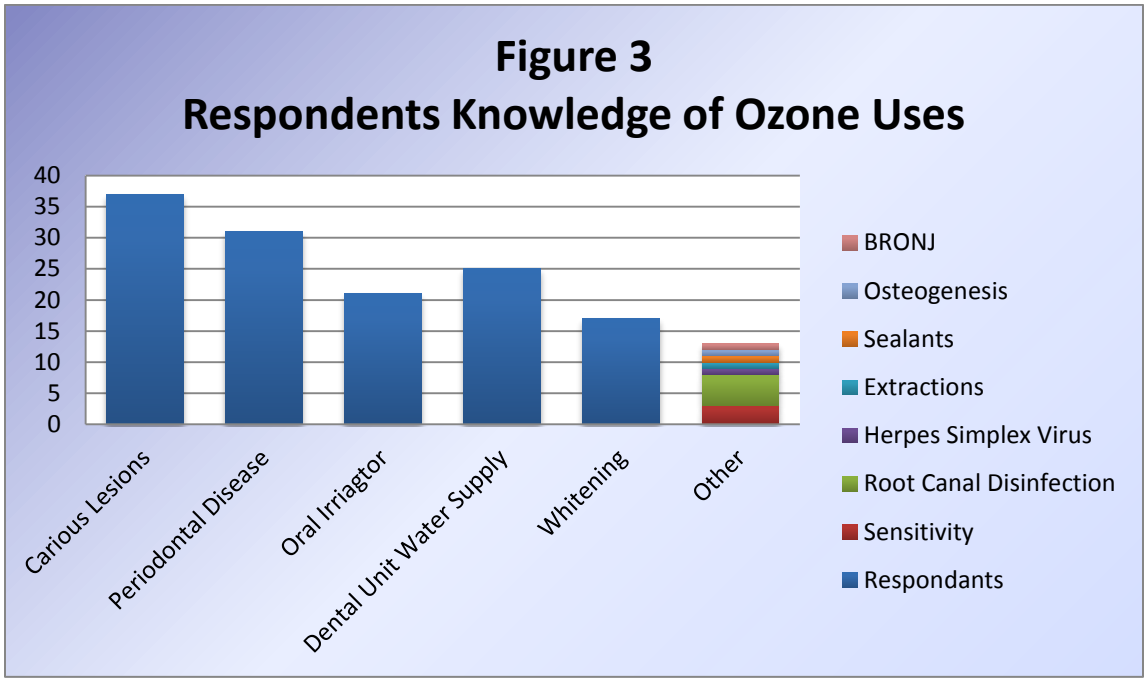
The survey asked each participant if they practice general dentistry and, if not, what their specialty is. (Figure 1) Seventy-four (73.3%) participants stated that they practice general dentistry. A total of 27 (26.7%) participants stated they specialized in a certain field of dentistry. Of those 27 participants, 5 (4.95%) stated that they practice Endodontics. An additional 2 (1.98%) participants stated that their specialty was Prosthodontics; 6 (5.94%) participants stated that they practice Orthodontics; 3 (2.97%) participants stated that their specialty was Periodontics; 5 (4.95%) participants stated that they practice Oral Maxillofacial Surgery (OMFS); 1 (0.99%) participant stated that his specialty was Oral Surgery; and the remaining 5 (1.98%) participants stated that they practice Pediatric Dentistry.



The total number of participants that reported being aware of Ozone Therapy in dentistry was 37 (36.6%). The remaining 64 (63.4%) reported not being aware of Ozone Therapy. Of those participants that specialized, 7 (25.9%) were aware of Ozone Therapy and 20 (74.1%) were not aware of Ozone Therapy. Of the participants that practice general dentistry, 30 (40.5%) were aware of Ozone Therapy in dentistry and 44 (59.5%) were not aware of Ozone Therapy.

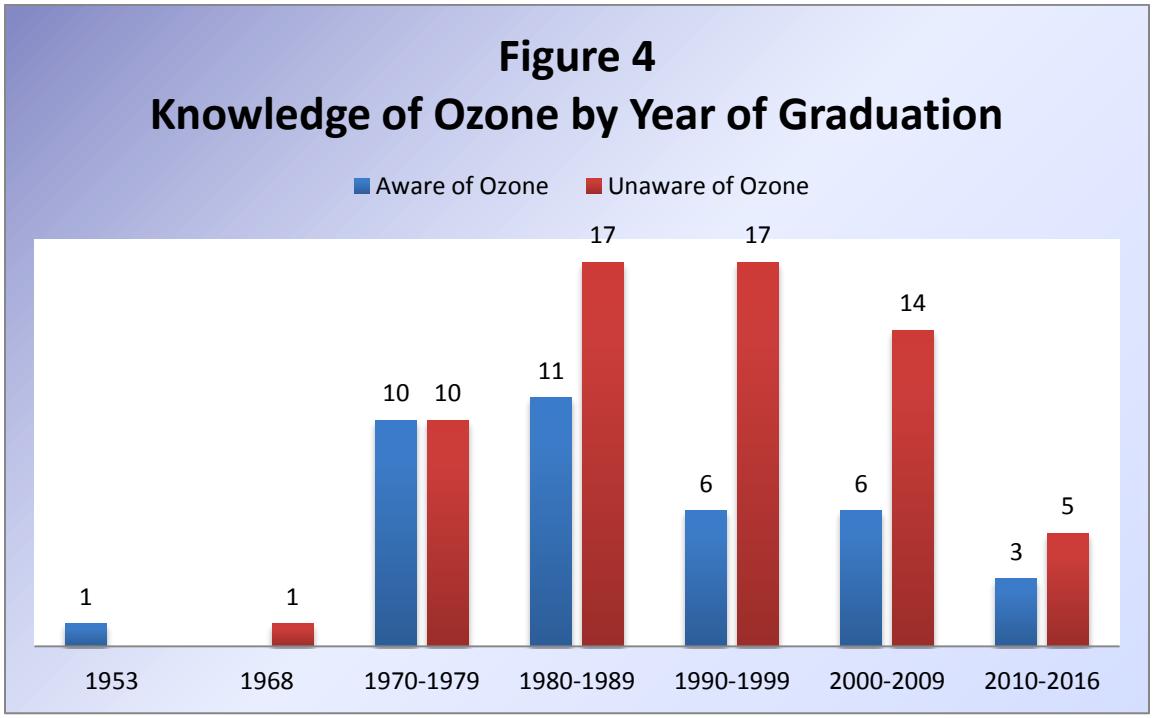
The survey asked the dentists that stated they are aware of Ozone Therapy which uses of Ozone Therapy are they aware (Figure 3). Theses respondents stated being aware of the following uses: 37 (100%) treatment of caries, 31 (83.8%) periodontal disease, 21 (56.8 %) oral irrigator, 25 (67.6%) dental unit water supply, 17 (45.9%) whitening, 15 (40.5%) other. Of those that stated they were aware of other uses, they reported knowing of the following uses: 3 (8.1%) sensitivity, 5 (13.5%) root canal disinfection, 1 (2.7%)

treatment of herpes simplex virus, 1 (2.7%) extractions, 1 (2.7%) sealants, 1 (2.7%) osteogenesis, 1 (2.7%) bisphosphonate-related osteonecrosis of the jaw (BRONJ).



When looking at each cohort of graduates individually, the survey results indicated that the graduate from 1953 was aware of Ozone Therapy while the graduate from 1968 was not aware of Ozone Therapy. Fifty percent of the individuals who graduated between the years of 1970-1979 were aware of Ozone Therapy, 50% were not aware. For those who graduated between the years of 1980-1989, 39.3% were aware of Ozone Therapy, 60.7% were not aware. The survey results also indicated that 26.1% of the participants who graduated between the years of 1990-1999 were aware of Ozone Therapy and, 73.91% were not aware. For those who graduated between the years of 2000-2009, 30% were aware of Ozone Therapy, 70% were not aware. Last, for those who graduated between the years of 2010-2015, 37.5% were aware of Ozone Therapy, 62.5% were not aware. Figure 4 illustrates those participants who were aware of Ozone

Therapy and those who were not aware of Ozone Therapy grouped by the year they graduated from dental school.



The next chapter will discuss practical implications of these findings. Specifically, the researcher will discuss ways that knowledge of Ozone Therapy can be increased and the possible results of more common knowledge of this treatment option.

CHAPTER 5

CONCLUSION

The preceding chapter detailed analysis of the information that was submitted in response to the survey of dentists in Kentucky about their knowledge of Ozone Therapy. Based on the results, the overall awareness of Ozone Therapy is higher than what the researcher anticipated. However, over half of the participants were not aware of the uses of Ozone Therapy in a dental practice. Knowledge of Ozone Therapy does not seem to be related to the date that the dentist graduated from dental school nor whether or not the doctor went on to specialize in a certain field. Much like the researcher's hypothesis, in each group of graduates, there are more dentists that were not aware of Ozone Therapy than those that were aware of Ozone Therapy.

Of those dentists who were aware of Ozone Therapy in the dental office, treatment of carious lesions was the one application known by all of the respondents. Treatment of periodontal disease was the second most-commonly known use of Ozone Therapy. Most of the positive responses were from dentists who had graduated between the years 1980-1989. However, those dentists who had graduated between the years 1970-1979 had the greatest percentage of awareness of Ozone Therapy. Conversely, the graduates from the years 1990-1999 had the smallest percentage of awareness of Ozone Therapy. This finding was surprising to the researcher since Ozone Therapy is a relatively new addition to the practice of dentistry and more research has been done in

recent years; however, the knowledge of Ozone Therapy in dentistry has not increased in the groups of more recent graduates. It is unclear exactly why certain groups were more aware of Ozone Therapy than others. This could be due to the fact that the dentists who have been out of school quite a while have had more time to take continuing education courses covering such subjects as Ozone Therapy. Perhaps, the more recent graduates are less aware of Ozone Therapy because it may not be part of the curriculum in dental school. Also, once the newer graduates start their own dental practice, it is possible that they are more interested in attending continuing education courses that help them to build their practice and are less concerned with topics such as Ozone Therapy. It is also possible that the reason Ozone Therapy is not commonly known among the dental community is that it is not yet FDA approved and more research will need to be done before it is considered a viable treatment by the mainstream dental community.

This study gave a small glimpse into the lack of awareness of the uses of Ozone Therapy in dentistry. At the same time, the study showed the wide range of possibilities that Ozone Therapy is currently considered to have in the dental office because of the responses given by those dentists that are aware of Ozone Therapy. Further research is needed to determine the true awareness of this alternative treatment option in the United States. There also needs to be further research into the effectiveness of Ozone Therapy to determine if this is truly a viable treatment option for patients. As healthcare providers, it is our obligation to be aware of all beneficial treatments that are available so that we can educate patients and assist them in making an informed decision regarding the treatment modality that benefits their individual needs. It is possible that Ozone Therapy may one

day be a common treatment in the dental office, if future scientific research confirms that it is truly a good alternative to current treatment.

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APPENDIX A

Ozone Therapy in Dentistry

1) In which city is your practice located?

2) What year did you graduate from dental school?

3) Do you practice general dentistry?

Yes ☐ Please go to question 5
No ☐ Please go to question 4

4) What is your area of specialty?

5) Are you aware of uses for Ozone therapy?

Yes ☐ Please go to question 6
No ☐ Thank you for youE time!

6) Of which of the following uses for Ozone are you aware?

Treatment of Carious lesions ____

Treatment of Periodontal disease ____

Oral irrigator ____

Use in the dental unit water supply ____

Whitening ____

Other ____

APPENDIX B

INFORMED CONSENT DOCUMENT

Project Title: A Survey of Knowledge of Dental Professionals Regarding Ozone Therapy
Investigator: Emily Hannah, Department of Allied Health, 615-336-7515,
Emily.hannah452@topper.wku.edu

You are being asked to participate in a project conducted through Western Kentucky University. The University requires that you give your agreement to participate in this project.

The investigator will explain to you in detail the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation. You may ask any questions you have to help you understand the project. A basic explanation of the project is written below. Please read this explanation and discuss with the researcher any questions you may have. You should keep a copy of this form for your records.

1. **Nature and Purpose of the Project:** The researcher is conducting a survey of dentists in Kentucky to find out if dentist are aware of Ozone therapy and if they are what types of offices use or are at least familiar with the alternative therapy.

2. **Explanation of Procedures:** Please follow the link below to complete the survey. Please complete the researcher within 2 weeks.

3. **Discomfort and Risks:** There are no known discomforts or risks involved in this research.

4. **Benefits:** Improving awareness of the potential benefits ozone therapy among dental professionals.

5. **Confidentiality:** All survey responses will be maintained securely for a minimum of three years.

6. **Refusal/Withdrawal:** Refusal to participate in this study will have no effect on any future services you may be entitled to from the University. Anyone who agrees to participate in this study is free to withdraw from the study at any time with no penalty.

You understand also that it is not possible to identify all potential risks in an experimental procedure, and you believe that reasonable safeguards have been taken to minimize both the known and potential but unknown risks.

Your continued cooperation with the following research implies your consent.

THE DATED APPROVAL ON THIS CONSENT FORM INDICATES THAT
THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY
THE WESTERN KENTUCKY UNIVERSITY INSTITUTIONAL REVIEW BOARD
Paul Mooney, Human Protections Administrator
TELEPHONE: (270) 745-2129

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