Background: Hypertension, also known as the “silent killer,” affects 1 in 3 adults over the age of 20. As the disease progresses, those affected are at an increased risk for heart attack, heart failure, stroke, kidney failure, and other major health problems.

Objective: To examine and evaluate the prevalence of elevated blood pressure among emergency dental patients in the Advanced Care Emergency Clinic at the ECU School of Dental Medicine.

Methods: Records of de-identified adult patients over the age of 18 who have visited ECU SoDM Emergency Dental Clinic were examined.

Results: Since June 2015, about 36% of patients visiting ECU SoDM Emergency Dental Clinic present with elevated blood pressure. 57% of patients with elevated blood pressure levels are not taking medication for it. Most patients are not taking medication, whether diabetic or hypertensive. 57% of patients presenting with elevated blood pressure are not taking medication for it.

Conclusion: Of the 3,535 patients that visited either the emergency or advanced care clinic, 1,333 presented with elevated blood pressures. Eight of these records were excluded due to missing systolic pressures or input errors, bringing the number of patients analyzed to 1,925. As shown in the figures, Stage 1 Hypertension has the highest prevalence amongst this sample population. This high population needs to be kept under control before these patients reach Stage 2 or critical levels. Most patients are not taking medication, whether diabetic or hypertensive. 57% of patients presenting with elevated blood pressure are not taking medication for it.

Discussion

The prevalence of elevated blood pressure in ECU SoDM emergency patients is slightly higher than the national average and NC average. The readings in this study were taken in an emergency dental clinic. Factors affecting elevated blood pressure include pain, white coat syndrome, and medications. Going forward, there needs to be more coordination between health professionals to get blood pressure levels controlled in its earlier stages, i.e. the pre-hypertensive stage. If blood pressure levels are not controlled, it leads to increased health problems.

Limitations

Majority of the patients with elevated blood pressure are not taking medications. From the data, a particular point that stuck out was a 26 year old with a reading of slightly higher than the national average and NC average. This could be because they were recommended lifestyle changes or they are undiagnosed and unaware.

In order to increase patient awareness, this study hopes to provide a foundation for future research to develop and encourage interprofessional collaboration.

Acknowledgments

We would like to thank Gerard Camargo, Business Application Technician, for providing the data. Thank you Dr. Gordon and the Office of Research for the support throughout this project.

References

1. American Heart Association blood pressure guidelines were used to define cases:

<table>
<thead>
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<th>Blood Pressure Category</th>
<th>Systolic Blood Pressure</th>
<th>Diastolic Blood Pressure</th>
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<td>&lt;80 mmHg</td>
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<tr>
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</tr>
<tr>
<td>Stage 1 Hypertension</td>
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<td>90-99 mmHg</td>
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<tr>
<td>Stage 2 Hypertension</td>
<td>140-159 mmHg</td>
<td>100-109 mmHg</td>
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<tr>
<td>Hypertension</td>
<td>160-179 mmHg</td>
<td>&gt;100-110 mmHg</td>
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<tr>
<td>Hypertensive Crisis</td>
<td>&gt;180 mmHg</td>
<td>&gt;110 mmHg</td>
</tr>
</tbody>
</table>
Abstract

The incidence of serious morbidity and mortality in dental patients associated with administration of sedative drugs, deep sedation and general anesthesia are not known due to lack of prospective data collection and the failure of state boards and liability insurance companies to make reports and closed claims available in redacted form. Information in the public domain of deaths in dental offices, however, provides evidence of cases and factors associated with serious adverse outcomes.

Cases identified, 12 cases involved administration of two or more drugs in 6 deaths. Among the 20 cases in which the drugs were identified, 10 deaths involved anesthetics (7 of the 20 cases) chloral hydrate (2 cases) and nitrous oxide (4 cases). Drugs most frequently associated with the cases. The most prevalent causes of death were identified as respiratory depression, anoxia, or cardiac arrest secondary to anoxia. General dentists were identified as the clinician in 12 cases, oral surgeons were identified in 10 cases and pediatric dentists listed as the dentist in 6 deaths. The practitioners’ specialty status was not identified in 9 reports. Drugs most frequently associated with the adverse outcomes were opioids (N=9 of the cases in which the drugs were identified), benzodiazepines (12 of the 20 cases), general anesthetics (7 of the 20 cases) chloral hydrate (2 cases) and nitrous oxide (4 cases). Among the 39 cases in which the drugs were identified, 12 cases involved administration of two or more drugs in combination. Very little information could be identified on the method of monitoring or the individual responsible for administering the medication and monitoring the patient while the dental procedure was being performed. These data support attempts to improve the safety of anesthesia and sedation administered to dental patients and suggest the need to re-evaluate the risks of deep sedation/general anesthesia. These data do not include deaths in dental offices that were not reported in the public domain but the overall incidence is likely much higher (3).

Introduction

Recurring concerns over the safety of anesthesia and sedation performed on dental outpatient settings are often coupled with recommendations for documentation of the safety of drugs, combinations, monitoring methods and the qualifications of personnel who administer and monitor anesthesia and sedation procedures. Guidelines for outpatient sedation in the absence of an evidentiary basis are consequently based on expert opinion or extrapolated from medical indications. While expert opinion represents the lowest form of scientific evidence to support clinical practices, case reports and case series are recognized as a higher tier of evidence.

We report here the results of a review of case reports of serious morbidity and mortality associated with dental outpatient sedation and anesthesia available in the public domain.

Methods

• Cases were identified by an internet search using the term ‘deaths in dental offices’ that yielded numerous, often duplicative, reports (last accessed November 21, 2016)
• Unique reports were identified by inspection of newspaper reports, summaries of television broadcasts, and reports from dental boards, medicolegal actions and criminal charges
• This resulted in 39 unique cases in the public domain from January 2005 thru September 2016
• Numerous reports were reviewed to assure that the information in the original reports were confirmed or expanded as additional information became available

Discussion

• These data provide imprecise but compelling evidence of serious adverse outcomes associated with outpatient sedation and anesthesia
• General anesthesia and IV parenteral sedation are the methods most commonly associated with serious morbidity and mortality
• Enteral sedation was identified in 7 deaths with chloral hydrate (3 deaths) and trizolam (4 deaths) as the only drugs identified
• Oral surgeons and general dentists are most often identified in the reported cases in which the specialty status was identified, likely reflecting the higher use of sedation/anesthesia by oral surgeons and the greater number of general dentists
• Among the 20 cases in which the drugs were identified, 10 deaths involved the administration of 2 to 4 drugs; opioids and benzodiazepines were the drugs most often reported
• The deaths associated with trizolam involved doses 3-fold (N=3) to 8-fold higher than the dose approved for insomnia or recommended in the dental literature (4-6)
• These data provide evidence that oral/enteral sedation is the route of administration least likely to result in significant adverse effects

Conclusions

• While the limitations of using non-scientific reports in the public domain do not permit calculations of incidence or statistical analyses, the unequivocal nature of death provides case reports that constitute a higher level of evidence than expert opinion.
• This case series and concerns raised in the media (Sunday Night with Megyn Kelly, NBC News, July 9, 2017) about the safety of general anesthesia and parenteral sedation performed in outpatient settings by dentists indicates the need for more prospective data collection using objective outcomes and criteria (7,8) to provide evidence of safety and identify risk factors for adverse outcomes rather than continued reliance on expert opinion.

Bibliography

Antifungal Properties of Berberine Chloride on Various Species of Candida in vitro
Danish Hasan1, James R Parker1, Bryan Yang1, Jered C Meyers1,2, Luiz Ferreira1, Ramiro M Murata1,3

School of Dental Medicine
Greenville, North Carolina, United States

Abstract

Oral candidiasis is the most rampant fungal infection amongst humans and has begun to show more resistance to antifungal drugs which are being used to treat it. Research has pointed towards alkaloids being useful in treating Candida albicans as well as other infections of this sort. Berberine Chloride has shown antifungal activity against Candida spp. in recent studies.

Hypothesis: Berberine Chloride should be an effective antifungal agent against Candida albicans while still not being very toxic on human cells.

Methods: The Minimal Inhibitory Concentration (MIC) and Minimal Fungicidal Concentrations (MFC) were determined in order to check the lowest concentration needed for the drug to inhibit visible growth of Candida spp. Fluconazole and 1% DMSO were used as the positive and vehicle controls. There was also a negative control without any treatment. The MIC was determined by the microtubes method and the agar-dextrose plates were used to see if there were colonies for the MFC. The cytotoxicity of the drug’s were determined using human gingival fibroblasts (HGF). The cytotoxicity test was performed by using CellTiter blue assay. HGF were seeded in 96 well plates and incubated for 24 hours in 5% CO2 at 37 degrees Celsius. After the incubation, the treatments of Berberine Chloride (25-400 µM) were added. After incubating for another 24 hours, the results were read from the microplate reader.

Results: The MIC was determined to be between 250 µM and 300 µM for C. albicans, C. glabrata and C. tropicalis. C. dubliniensis was between 300 and 350 µM. The MFC for C. albicans, C. glabrata and C. tropicalis was about 300 µM whereas C. dubliniensis was 350. However, the drug was very effective in killing the Human Cells as well.

Conclusion

The data shows that Berberine Chloride can be an effective antifungal agent against C. albicans but it is very toxic against human cells as well. A co-culture test may be done in order to confirm this.

Acknowledgements

This work was supported by NIAID/NIH (R21AI127640) and the School of Dental Medicine, Office of Research. The funders had no role in study design, data collection and analysis.

References

Background: Community water fluoridation is one of the top ten greatest public health achievements of the last century.[1] Water fluoridation leads to a reduction in dental caries prevalence when comparing populations who have access to community water fluoridation against those without access.[2] While North Carolina’s (NC) access to fluoridated water is higher than the US population’s access, 88% and 74% respectively, there is still a lack of research on the impact of water fluoridation on caries prevalence amongst children living in NC.[2]

Objective: To assess the prevalence of dental caries (dmfs scores) on children 6 to 8 years old presenting to ECU SoDM’s CSLCs from counties with fluoridated or non-fluoridated public water systems in NC.

Methods: A sample of 658 children, ages 6 to 8 years old with a dmfs score equal to or greater than one, were reviewed through de-identified EHR data which was obtained from ECU SoDM’s database comprised of patients-of-record. Using CDC data, ECU SoDM’s clinics were separated into two groups: fluoridated & non-fluoridated.

Results: Children from non-fluoridated counties had a higher dental caries prevalence as shown by a higher average dmfs score (14.7) when compared to children from fluoridated counties (11.2). The highest average dmfs score (22.1) was found at Spruce Pine (non-fluoridated) and the lowest average dmfs score (4.7) was found in Ahoskie (non-fluoridated). With regards to fluoridated CSLCs, Ross Hall’s average dmfs score was the lowest (5.7), while Brunswick had the highest average dmfs score (19.9) among fluoridated CSLCs.

Conclusion: Our preliminary pilot data indicates a trend between access to fluoridated water and children’s dental caries experiences. More specifically, there seems to be a decreased average dmfs scores for children having access to fluoridated water systems. Interestingly, one of our non-fluoridated populations, Ahoskie, had the lowest average dmfs score. Future studies should investigate the association between dmfs scores and water fluoridation amongst children in NC and also take into account confounding factors such as well water access which may influence exposure to naturally occurring fluoride.

Abstract

Introduction

- Children between 5 and 13 years accounted for 51% of the entire population under 18 years of age in NC.[8]
- The National Health and Nutritional Examination Survey found 56% of children ages 6-8 had caries involving primary teeth, and 14% on permanent teeth.[9]
- Community water fluoridation has been studied for almost 17 years and confirmed as safe and cost effective method to reduce tooth decay in all ages.[10]
- North Carolina ranks 18th in water fluoridation percentage, compared to all other U.S. states, with about 80% of North Carolinians receiving fluoridated water.[16]
- Water fluoridation not only leads to a lower prevalence of dental caries, but it also reduces the effect of SES inequalities on oral health.[16]
- Researchers have also found that the risk of decay on one or more teeth (both primary and permanent) decreased over 50% after 18 years of water fluoridation.[17]

Hypothesis: Children between 6 and 8 years of age, presenting to ECU SoDM’s fluoridated CSLCs, who also live in fluoridated counties in NC, have a lower total average dental caries prevalence (dmfs scores) as compared to children presenting to non-fluoridated CSLCs and who also live in non-fluoridated NC counties.

Study Design:
- Retrospective
- Cross-sectional

Sample: A convenience data sample of children (N=658) from ECU SoDM’s Community Oral Health Outcomes and Risk Tracking Database

- Age: 6 to 8 years of age
- dmfs: greater than or equal to one

Data Abstraction: Data was abstracted and split into 2 groups based on the patient’s county of residence and de-identified by the data technician:
- fluoridated (n=358)
- non-fluoridated (n=300)

Descriptive Analysis: CSLCs were categorized as fluoridated or non-fluoridated based on CDC’s water system fluoridation data yielding:
- 3 non-fluoridated CSLCs: Spruce Pine, Sylva, & Ahoskie
- 6 fluoridated CSLCs: Ross Hall-Peds, Davidson, Lillington, Pitt, Robeson, & Brunswick

Results

Average dmfs vs. CSLC Fluoridation Status

Preliminary Findings:

- Children from non-fluoridated counties had a higher average dmfs of 14.7, while children from fluoridated counties had an average dmfs of 11.2.
- Major Findings for fluoridated counties: Brunswick had the highest average dmfs, 19.9, as compared to Ross Hall-Peds with the lowest average dmfs, 5.7.
- Major Findings for non-fluoridated counties: Spruce Pine had the highest average dmfs, 22.1, while Ahoskie had the lowest average dmfs, 4.7.
- In general, non-fluoridated CSLCs showed increased dmfs scores as compared to fluoridated CSLCs. However, an interesting finding was that Ahoskie (non-fluoridated) had a lower average dmfs as compared to Ross Hall-Peds (fluoridated).
- A possible explanation is that children in Ahoskie could be receiving their recommended fluoride intake from other water sources, such as well-water, bottled water, beverages, or routine topical fluoride applications.

Conclusion:

- Information on the length of residence of children in the county was not available.
- Inter-examiner reliability.
- In summary, further in-depth research should be conducted in order to determine the magnitude of association between the two variables, dmfs score and water fluoridation, as well as how the association changes over time based on long term effects of fluoridation while taking family’s SES, educational level, and residency timespan into consideration.

Acknowledgments

We would like to thank Dr. Wright, Dr. Murata and Mr. Camargo for guiding our research process and aiding us during this pilot study, as well as our classmates: Taylor Hewett, Ryan Le, Laura Mercier, Clementina Oguejiofor, Andrew O’Keefe, Zac Williams, Meredith Wimberly and Colin Wint, who contributed to the pilot research during the Spring of 2017.

References

**Abstract**

**Introduction**

Linoleic Pathway to HNE

![Image](image1)

**Methods**

- **Patients were recruited verbally and through flyer as healthy volunteers and informed consent obtained.**
  - *Dr. Gordon performed oral evaluation*

**Results**

- **Amount of HNE-modified protein adducts in saliva quantified by ELISA approach developed and validated in the laboratory of Dr. Anderson.**

**Conclusion**

- The presence of HNE in stimulated and unstimulated saliva of healthy volunteers provides a noninvasive method of evaluating oxidative stress.
- HNE levels in stimulated saliva may be lower than unstimulated because there is an increase in the total volume of saliva produced, thereby diluting the concentration of HNE in saliva samples.
- Unstimulated saliva may have greater variability because it reflects a more accurate oxidative state of each subject.
- Saliva is a noninvasively diagnostic fluid because it is noninvasive and easily repeatable.
- Offers a broad spectrum of biologically relevant compounds that can be measured.

**Limitations/Future Directions:**
- Sample size was limited to healthy volunteers, only. A larger population size of healthy and unhealthy volunteers will be needed in further research on whether HNE in saliva can serve as convenient biomarkers of chronic disease.
- Comparison between HNE-adducts in saliva and blood need to be performed to determine whether these markers of oxidative stress in saliva are indicative of systemic oxidative stress, or if localized in the oral compartments.
- Xerostomia, also known as dry mouth, is a potential drawback for future studies of unhealthy patient populations as it may prove difficult to procure unstimulated saliva. However, the stimulated method of choosing paraffin may possibly provide a more accurate measure.

**Origins of Salivary markers of Oxidative Stress**

**Fig. 4. Three sources oxidative stress originate from: blood plasma (A), oral bacteria (B), and immune cells (C).**

**Acknowledgments**

We would like to thank Debra Peardon, Jerved Gope Meyers, and Amy Hammer for their exemplary support for this preliminary study.

**References**


**Fig. 3. HNE levels are greater in unstimulated saliva than in stimulated saliva per subject exception of P3 and P4.**

**Fig. 4. Stimulated saliva has much less variability than unstimulated saliva.**
**Background:** Improving access to care relies on the ability of patients to find sites that provide affordable health services. This can be difficult in areas where there are cultural differences concerning health care and low literacy rates. Geofencing, a technology that uses global positioning systems (GPS) to create a virtual barrier around a specific area, can be an innovative way to reach the masses to provide access to care. The purpose of this study is to analyze the pre- and post-survey results on awareness of the dental clinic.

**Objective:** To use geofencing technology to raise awareness of the East Carolina University School of Dental Medicine Lumberton Community Service Learning Center (CSLC).

**Methods:** A community intercept survey on awareness of and knowledge about the Lumberton CSLC was conducted among a convenience sample of adults in Robeson County, pre- and post- intervention of geofencing technology.

**Results:** Before the geofencing intervention 65.5% of survey respondents were aware of the CSLC, this percentage increases to 71.45% post-intervention. 6.5% of respondents reported that they or a family member had ever had an appointment at the CSLC; post-intervention 15.0% had an appointment.

**Conclusion:** Geofencing has the potential to increase the awareness of health care services and ultimately increase the number of patients receiving care.

**Introduction**

The CSLCs provide a variety of dental care, such as preventive, restorative, periodontal, endodontic, surgical and prosthetic at a reduced cost. However, the clinics are underutilized, relative to population size, need, and eligibility.

- **Robeson County:**
  - Population of 134,000
  - 38% Native American, 25% African American, 4.9% Hispanic Americans
  - Average per capita income of $13,244
  - A Health Resources and Services Administration (HRSA) designated Medically Underserved Community (MUC)
  - A Dental Health Professional Shortage Area (DHPSA)

- **Smartphones:**
  - Enter the virtual boundaries, or geofences, and banner ads are sent to the user via numerous applications. These ads lead to a website that informs users of the CSLC and allows them to make an appointment.

- **Objective:** To increase the number of patients receiving treatment at the Lumberton CSLC

## Survey Results

**Survey Methods**

- **Design:** Pre- and post- cross sectional surveys
- **Sample:** Convenience sample of Robeson County adults at the following locations:
  - Robeson County Courthouse
  - Robeson County Health Department
  - Robeson County Department of Social Services
  - Walmart located in Lumberton

**Survey**:

15-item Oral Health Community Awareness Survey

**Analysis:** Descriptive statistics

### Table 1: Sample characteristics

<table>
<thead>
<tr>
<th>Age</th>
<th>Pre</th>
<th>Post</th>
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<tr>
<td>18-44 years old</td>
<td>51.5%</td>
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<tr>
<td>45-64 years old</td>
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<th>Race/Ethnicity</th>
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<td>Black or African American</td>
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### Table 2: Respondents that had heard about the Lumberton CSLC

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<tr>
<th>Awareness of CSLC</th>
<th>Percentage</th>
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</thead>
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<tr>
<td>Pre-Intervention</td>
<td>65.5%</td>
</tr>
<tr>
<td>Post-Intervention</td>
<td>71.4%</td>
</tr>
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### Table 3: Respondents or family member had ever had an appointment at the CSLC

<table>
<thead>
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<th>CSLC Appointments</th>
<th>Percentage</th>
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<td>Pre-Intervention</td>
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<td>Post-Intervention</td>
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### Table 4: Respondents knowledge about CSLC

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<td>The CSLC only accepts Medicaid Insurance</td>
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<td>CSLC only accepts Private Dental Insurance</td>
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<tr>
<td>CSLC only accepts Medicare Insurance</td>
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<td>The cost of dental care is free</td>
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<td>The cost of dental care is reduced</td>
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<td>The cost of dental care is increased</td>
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<tr>
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<td>False</td>
</tr>
<tr>
<td>CSLC accepts Private Dental Insurance</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>CSLC accepts Medicare Insurance</td>
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<td>False</td>
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### Table 5: Rate of respondents that had had appointments at the CSLC

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<th>Population who are CSLC patients</th>
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<th>Post-</th>
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<td>15.0%</td>
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</table>

## Discussion/Conclusions

**Preliminary Geofencing Results**

**Duration:** April 17– June 30, 2017

**Target:** income < $50,000, males and females 18 years or older

Impressions: over $16,000

**Conclusion:** The implementation of geofencing technology in the Robeson County area during a 60 day period seems to have increased the awareness of the CSLC. Further analysis will explore whether the number of individuals receiving care at the clinic increased.

**Limitations:** Convenience sample and self-reported data

**Future Research:** Administer surveys at other counties in North Carolina that have CSLC’s and implement the geofencing technology in these areas. Target cultural communications to raise awareness.

## Acknowledgements

We would like to thank Carina Lucia Cowo, Jaylyn Wynn, Austin Locklear, and Gavin Locklear for their help in this study, as well as, the Robeson County Health Department, the Robeson County Department of Social Services, the Robeson County Courthouse, Lumberton Walmart Pharmacy, and the Wynn Law Firm. This study was funded by the East Carolina School of Dental Medicine.

## References

3. www.quickfacts.census.gov

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**Abstract**

The purpose of this study is to analyze the pre- and post-survey results on awareness of the dental clinic.

**Methods**

Survey to estimate baseline awareness of CSLC in Robeson County (n=200)

- Geofencing technology using Global Positioning System (GPS) was used to define a geographic area in Robeson County based on 3 zipcodes

- Smartphone users entered the geofenced area, and then particular apps or websites displayed the message. The message said: “ECU Dental Care: Medicaid, Insurance and Self-Pay – for more information click here.

- The message was linked to a landing page that contained information from the CSLC’s website at http://www.ecu.edu/dhsu/dental/locator

- After about 60 days, a post-intervention survey was conducted (n=200). This post survey used the same questionnaire and protocol as the pre-intervention survey.

**Survey Results**

- **Survey Methods**
  - **Design:** Pre- and post- cross sectional surveys
  - **Sample:** Convenience sample of Robeson County adults at the following locations:
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  - **Survey:** 15-item Oral Health Community Awareness Survey
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<table>
<thead>
<tr>
<th>CSLC Appointments</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Intervention</td>
<td>6.5%</td>
</tr>
<tr>
<td>Post-Intervention</td>
<td>15.0%</td>
</tr>
</tbody>
</table>

**Table 4:** Respondents knowledge about CSLC

<table>
<thead>
<tr>
<th>CSLC Knowledge</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>The CSLC is a school and does not use patients</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>The CSLC only accepts Medicaid Insurance</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>CSLC only accepts Private Dental Insurance</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>CSLC only accepts Medicare Insurance</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>The cost of dental care is free</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>The cost of dental care is reduced</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>The cost of dental care is increased</td>
<td>True</td>
<td>True</td>
</tr>
<tr>
<td>CSLC accepts Medicaid Insurance</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>CSLC accepts Private Dental Insurance</td>
<td>False</td>
<td>False</td>
</tr>
<tr>
<td>CSLC accepts Medicare Insurance</td>
<td>False</td>
<td>False</td>
</tr>
</tbody>
</table>

**Table 5:** Rate of respondents that had had appointments at the CSLC

<table>
<thead>
<tr>
<th>Population who are CSLC patients</th>
<th>Race/Ethnicity</th>
<th>Pre</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race/Ethnicity</td>
<td>Pre</td>
<td>Post</td>
<td></td>
</tr>
<tr>
<td>Black or African American</td>
<td>10.5%</td>
<td>16.1%</td>
<td></td>
</tr>
<tr>
<td>Native American or Indian</td>
<td>6.5%</td>
<td>15.5%</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>0.0%</td>
<td>20.0%</td>
<td></td>
</tr>
<tr>
<td>White or Caucasian</td>
<td>2.4%</td>
<td>4.8%</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0.0%</td>
<td>15.0%</td>
<td></td>
</tr>
</tbody>
</table>

---

**Figure 1:** Comparison of what sources informed the respondents of the CSLC

**Figure 2:** Comparison of where respondents accessed the website

---

**Figure 3:** Comparison of what sources informed the respondents of the CSLC
The main purpose and scope of this study was to understand whether oral health literacy (OHL) and orthodontic literacy (OrthoL) were correlated with oral health and orthodontic status. The hypothesis was that lower OHL and OrthoL would be correlated to lower oral health outcomes or orthodontic status. We enrolled (N=137) adults and utilized 6 separate metrics as part of 3 validated instruments in order to determine levels of OHL and OrthoL. We identified oral health and orthodontic status by accessing electronic health record data including decayed teeth, missing teeth due to caries, and filled tooth surfaces (DMFS), periodontal status, and malocclusion using the index of orthodontic treatment need (IOTN). Statistical methods are detailed in the methods section. An overall metric of OHL, OHL Total, was inversely correlated (r=-0.26, p-value 0.0056) with those who had experienced severe manifestations of dental caries, missing teeth. This inverse correlation means, for example, as OHL decreases the number of missing teeth increase. OrthoL was also inversely correlated (r=-0.31, p-value 0.0017) with missing teeth. OHL and another metric of OHL, REALM-DO, were also inversely correlated with DMFS (r=-0.31 and -0.21; p-values 0.0016 and 0.0246). Thus, there is a correlation between OHL, OrthoL and oral health and orthodontic status. Though these correlations are not high, they are statistically significant (p-value < 0.05) and, taken with the fact that these correlations are not isolated to one instrument, one metric or one variable, there is a real, consistently persuasive effect of OHL and OrthoL on oral health status and orthodontic status.

This study was approved by the ECU Medical Center IRB. After providing consent, participants (N=137) were given a short screening form to determine basic demographic data. They were also asked to complete multiple validated instruments, including the Oral Health Literacy Index (OHLI) and its separate scales (knowledge, comprehension, numeric4), the Rapid Estimate of Adult Literacy in Medicine and Dentistry (REALM-DO)5, a questionnaire designed to test knowledge related specifically to orthodontic literacy6, and the Index of Orthodontic Treatment Needs (IOTN), an oral exam to determine the extent of malocclusion. Correlation coefficients were calculated between each pair of continuous variables, such as missing tooth count and OHLI total score. Means, standard deviations, and other summary statistics were calculated for continuous variables at each level of every categorical variable, with comparisons among levels of the categorical variable using Kruskal-Wallis tests. Frequencies and percentages were calculated for each pair of categorical variables, with chi-square tests used to test associations between the categorical variables.

Table 1. Correlations of DMFS, DMFT, and Missing Teeth with OHL Instruments

<table>
<thead>
<tr>
<th>Instrument</th>
<th>N</th>
<th>Correlated (OHL)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OHL Knowledge</td>
<td>137</td>
<td>-0.31 (0.0016)</td>
<td>0.0056</td>
</tr>
<tr>
<td>OHL Literacy</td>
<td>137</td>
<td>-0.31 (0.0017)</td>
<td>0.0017</td>
</tr>
<tr>
<td>REALM-DO</td>
<td>137</td>
<td>-0.31 (0.0016)</td>
<td>0.0056</td>
</tr>
</tbody>
</table>

Table 2. Perceptions of dental treatment and missing teeth

<table>
<thead>
<tr>
<th>Instrument</th>
<th>N</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OHL Total</td>
<td>137</td>
<td>14.69 (2.36)</td>
</tr>
<tr>
<td>OrthoL</td>
<td>137</td>
<td>18.20 (4.31)</td>
</tr>
</tbody>
</table>

Table 3. Tobacco use and health literacy

<table>
<thead>
<tr>
<th>Tobacco Use</th>
<th>N</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>82</td>
<td>12.82</td>
</tr>
<tr>
<td>Former</td>
<td>45</td>
<td>14.69</td>
</tr>
</tbody>
</table>

Table 4. Orthodontic and primary physician care

<table>
<thead>
<tr>
<th>Care Provider</th>
<th>N</th>
<th>Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OrthoL</td>
<td>137</td>
<td>18.20</td>
</tr>
<tr>
<td>OHL</td>
<td>137</td>
<td>14.69</td>
</tr>
</tbody>
</table>

References


Conclusions

Our hypothesis that low OHL would correlate to lower oral health status was confirmed in this study. This was also the case for OrthoL and orthodontic status inasmuch as missing teeth contribute to malocclusion and its complexity due to, for example, a missing or multiple dimension, bone loss, and collapse of the dental arch. We also found no significant correlation between increased dental utilization and increased OHL (data not shown). Our next study continues to focus on these OHL points but in a pediatric population.

Acknowledgements

We thank Dr. Sharon Gordon and the SoD Office of Research staff for their support. We also thank Gerard Camargo for EHR support. Dr. McCarlie, the PI, gratefully acknowledges the American Association of Orthodontists Foundation (AAOF) for providing funding for this study.

Discussion

- A severe manifestation of dental caries, missing teeth, is correlated with lower OHL (Table 1), including OrthoL, REALM-DO, OHLI comprehension, OHLI knowledge, and OHLI Total.
- All OHL instruments have moderate to strong correlations with one another (data not shown).
- The orthodontic literacy instrument, OrthoL, is correlated with other OHL instruments.
- The more missing teeth the lower REALM-DO.
- This means that low OHL contributes to more missing teeth due to caries.
- The lower the REALM-DO the higher DMFS.
- This means that low OHL contributes to a more severe manifestation of dental caries.
- The lower the OrthoL the higher the DMFT, DMFS and missing teeth.
- This means that low OrthoL captures those characteristics which contribute to more disease in dental caries and malocclusion.
- Ancillary findings:
  - Those who use tobacco have more dental caries and more severe periodontitis than counterparts (Figures 1 and 2).
  - Conforming to the US Census Bureau’s racial categories, black had lower OHL (Table 2).
  - Those with lower educational had lower OHL (Table 3).

Abstract

Oral Health Literacy Correlates with Oral Health Status in Eastern North Carolina

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Greeville, North Carolina, and *Indiana University, Indiana, United States
The Detrimental Manifestations Surrounding Betel Quid

Use: A Narrative Review

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2. Dental Student, UK Dentistry
3. Assistant Professor of Orofacial Pain, ECU SoDM

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Abstract

Purpose: The purpose of this review is to investigate the available literature on betel quid/areca nut chewing and present a conglomerate of the products’ negative effects. Further aim is to raise public awareness of lack of regulation as well as an increase in use in the United States.

Methods: An electronic search of Betel Quid health manifestations was performed with the only restriction being publication dates during the years of 1996 through 2016. The studies were selected by three independent reviewers and the systematic review included 40 research articles.

Results: Betel Quid use has been linked in numerous publications to both oral and systemic detrimental health manifestations. Oral squamous cell carcinoma, various cancers, histologic epithelial changes, oral submucous fibrosis, and periodontal diseases are amongst those repeatedly stated.

Conclusion: Betel Quid has a growing user base and this review implicates the dire necessity for legal regulations on the age of purchase of these products, as well as the placement of a hazard label on the products’ packaging.

Introduction

- Global estimates report that up to 600 million men and women use some variety of betel quid.
- Its use is more prevalent in the South Asian community, whose population is rapidly growing in the United States.
- Despite an observed decrease in overall cancer death rates for the overall U.S. population, immigrant minorities continue to experience disproportionately higher cancer incidence and mortality rates for many cancers.
- Federal control of smokeless tobacco has largely missed the smokeless tobacco habits in diverse immigrant communities.
- Numerous articles published speak on both the oral and systemic effects of betel quid’s use.
- The product is largely unregulated in the United States and easily accessible to all ages.
- Of the dental health manifestations, oral squamous cell carcinoma as well as potentially carcinogenic epithelial changes are cited in multitudinous publications.
- Among the systemic presentations, breast cancer gene polymorphisms, cancer of the esophagus, liver, pancreas, and lung, low infant birth weights as well as numerous markers of DNA damage have been discovered and highlighted.

Methods

An electronic search was performed with the only restriction being publication dates during the years of 1996 through 2016. The studies were selected by three independent reviewers and the systematic review included 40 research articles. The articles were then subdivided into the following topics: organs affected, disease association, and prevalence by geographic location.

Results

- According to the available literature, Betel Quid use has been linked in copious publications to both oral and systemic detrimental health manifestations. Publications linked to such were reviewed from Southeast Asia, India, the United States, and certain European countries with prevalent Asian populations.
- Oral Health Manifestations: Oral squamous cell carcinoma, various assorted oral cancers, histologic epithelial changes, oral submucous fibrosis, and periodontal diseases are amongst those predominating in numerosity.
- Systemic Manifestations: Major organ distant site carcinogenic activity. These metastatic cancer sites include, but are not limited to: hepatocellular, pancreas, breast, lung, larynx and esophageal cancers.
- Other Reported Manifestations: Low infant birth weights and numerous markers of DNA damage.

Discussion/Conclusions

This review implicates the due diligence needed for legal regulations on the age of purchase of these products, as well as the placement of a hazard label on the products’ packaging. With a growing user base, Betel Quid has the potential to create the next public health crisis unless intervention for control is implemented. Ramifications from the major carcinogenic manifestations discussed will impact not only the well being of the public, but health care expenditure as well.

- The Agency for Healthcare research and Quality estimates that the direct medical cost for cancer in the US annually is $87.7 billion*. Through regulation and education to consumers of this product, both fiscal impact and vitality improvements will be immense.

Acknowledgements/References

We would like to thank Atul Upadhyaya, BDS for providing clinical photographs.

Antifungal Effect of Capric Acid Against Candida albicans in vitro

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East Carolina University 1) School of Dental Medicine, Dept. of Foundational Sciences; 2) Office of Research; 3) Brody School of Medicine, Dept. of Microbiology and Immunology. Greenville, North Carolina.

Abstract

Background: Natural compounds are currently being studied as antimicrobial therapeutic agent. Medium chain saturated fatty acids have been found to have a broad spectrum of microbial activity against enveloped viruses and various bacteria in vitro. They have shown a strong inhibitory effect against C. albicans yeast growth as well. Capric acid is a medium-chain fatty acid found in saturated fats. Small amounts are present in cow’s milk and goat’s milk, but it is abundant in tropical oils such as coconut oil and palm kernel oil. Capric acid, together with other medium-chain triglycerides, is responsible for the health benefits attributed to coconut oil. The objective of this study was to test the susceptibility of C. albicans to various concentrations of capric acid.

Hypothesis: Capric acid should be effective as an antifungal agent.

Methods: C. albicans strains (321128, 90028, MYA 274, and MYA 2876) were seeded onto Sabouraud Dextrose Agar for 24-48h. The minimum inhibitory concentration (MIC) was determined using an inoculum of 1x10^4 to 5x10^4 CFU/ml. C. albicans grown in RPMI-1640. Serial dilutions of capric acid (1M-100mM) with C. albicans strains were placed in 96-well plates and incubated for 24h. The minimum fungidal concentration (MFC) was determined by subcuturing 10ul of each well that had concentrations at or above MIC on Sabouraud Dextrose Agar for 24h. The MIC and MFC of capric acid was compared to the serial dilutions of fluconazole (1µM-1000µM) and vehicle control (1% ethanol).

Results: Susceptibility of capric acid against C. albicans showed antifungal activity. The MIC and MFC for each strain were as follows: 321128 (MIC:10-25mM, MFC:100mM), 90028 (MIC:50-100mM, MFC:100mM), MYA 274 (MIC:25-100mM, MFC:25mM), and MYA 2876 (MIC:50-100mM, MFC:50mM).

Conclusion: This data suggests that capric acid may be a potential antifungal agent against C. albicans. Future testing of capric acid against C. albicans will include a time-kill assay, biofilm assay, cytotoxicity test with fibroblast, and a co-culture model test.

Introduction

- Candida albicans (C. albicans) is a prevalent opportunistic human fungal pathogen that lives commensally in the gut, oral pharyngeal, genital-urinary tract and skin.
- It is the most common fungal pathogen responsible for oral candidiasis, which has a high prevalence among immunocompromised patients. Oral candidiasis is often manifested in denture stomatitis and oral thrush.
- Individuals exposed to multiple treatments, such as broad-spectrum antibiotics, chemotherapy, immunosuppressive therapy, and anti-retroviral therapy are at risk as well.
- Currently, treatments for C. albicans infections consist of topical and systemic pharmaceutical antifungal agents (ex. nystatin, fluconazole, amphotericin B). Triazoles have been best as the first line of defense against most Candida species.
- The increasing use of these antifungal agents for the long-term prophylaxis and treatment of recurrent and invasive candidiasis, and the limited number of antifungal treatments available have led to an increased of antifungal resistance of Candida species to antifungal agents.
- The objective of this study was to test the susceptibility of C. albicans to various concentrations of capric acid.

Fig. 1a and 1b: Oral candidasis caused by C. albicans

Methods

\[
\text{H}_{12}\text{CO}\]

Candida albicans strains: 321128, 90028, MYA 274, and MYA 2876

Conclusion

This data suggests that capric acid may be a potential antifungal agent against C. albicans. Future testing of capric acid against C. albicans will include a time-kill assay, biofilm assay, cytotoxicity test with fibroblast, and a co-culture model test.

Table 1: MIC and MFC for capric acid and fluconazole against C. albicans strains

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Capric Acid (mM)</th>
<th>Fluconazole (µM)</th>
<th>MFC (mM)</th>
<th>MFC (µM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C. albicans</td>
<td>321128</td>
<td>10-25</td>
<td>50-100</td>
<td>10-100</td>
</tr>
<tr>
<td></td>
<td>90028</td>
<td>25-100</td>
<td>50-100</td>
<td>25-100</td>
</tr>
<tr>
<td></td>
<td>MYA 274</td>
<td>25-100</td>
<td>50-100</td>
<td>25-100</td>
</tr>
<tr>
<td></td>
<td>MYA 2876</td>
<td>25-100</td>
<td>50-100</td>
<td>25-100</td>
</tr>
</tbody>
</table>

Acknowledgements

This work was supported by NIAID/NIH (R21AI127640) and the School of Dental Medicine, Office of Research. The funders had no role in study design, data collection and analysis.

References

Antimicrobial Activity of Honokiol Against the Periodontal Pathogen Aggregatibacter actinomycetemcomitans: An In Vitro Study
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1Fundational Sciences, ECU SoDM; 2Department of Surgical Sciences, ECU SoDM; 3Department of Microbiology and Immunology, Brody SOM
Greenville, North Carolina, United States

Abstract
Background: Aggregatibacter actinomycetemcomitans is a putative periodontal pathogen associated with aggressive periodontitis (AP). Although scaling and root planing are the foundations of periodontal therapy, adjunctive antimicrobial chemotherapy can improve treatment outcomes in individuals with AP. Honokiol (HNK), a biflavonoid from Magnolia officinalis, has previously shown antibacterial properties against various periodontal pathogens to treat patients with various infections; therefore, it may represent a novel, adjunctive therapy for AP.
Objective: The purpose of this study is to evaluate whether HNK has antimicrobial effects against A. actinomycetemcomitans and any cytotoxic effects on host cells. This study is based on the hypothesis that HNK has antibacterial activity against A. actinomycetemcomitans as demonstrated by a minimal inhibitory concentration (MIC) and low host cell toxicity as demonstrated by fibroblast cell integrity.
Materials and Methods: Human gingival fibroblasts (HGF) and A. actinomycetemcomitans (DT75-1) were used for this in vitro investigation. The MIC of HNK was determined by plating 1×10^5 cfu/mL of A. actinomycetemcomitans in 96-well plates and cultured with 0 (negative control), 100 and 1000 µg/mL of HNK for 24 and 48 hours. A spectrophotometer at 620nm evaluated bacterial culture growth. HNK toxicity on fibroblasts was tested by plating 5×10^4 cfu/mL cells on a 96-well plate and adding HNK concentrations of 0, 25, 50 and 100µg/mL. At 24 and 48 hours, fibroblasts were enumerated using Cell Titer Blue Viability Assay according to manufacturer instructions. Three experiments were performed in triplicate (n=9), and the data was analyzed using ANOVA and pairwise t-tests.
Results: The significance level was set at p<0.05.
Results: The significant antibacterial activity of HNK against A. actinomycetemcomitans was detected at the highest concentration (1000 µg/mL) in comparison to the negative control, but not for any of the lower concentrations (100 or 500 µg/mL). The cytotoxicity results indicated that cell viability of HGF-1 cell line was preserved between 20 to 25 µg/mL of HNK; however, higher HNK concentrations (50 and 100 µg/mL) resulted in cell death.
Conclusion: HNK demonstrated in vitro antibacterial activity against A. actinomycetemcomitans at a MIC of 1000 µg/mL, a concentration not compatible with host fibroblast survival.

Introduction
Periodontal disease is multifactorial in nature. Chronic forms of periodontitis occur in older individuals and encompass more than 700 species; whereas, aggressive form of periodontitis occur on younger individuals, usually below the age of 25, demonstrating a rapid clinical attachment loss and mainly characterized by the presence of Aggregatibacter actinomycetemcomitans1,2.

Why is A. actinomycetemcomitans unique?
- Facilitative Gram-negative species
- Produces unique toxins that selectively affect host cell and immune function
- Lipopolysaccharide (LPS)
  - Stimulate interleukins and cytokines involved in tissue inflammation and bone resorption
- Cytotoxic lysing activity (CLR)
- Host cell death & bone resorption
- Selectively target human leukocytes

Antibiotic Resistance
Caused by the indiscriminate consumption of antibiotics and favoring survival of resistant bacterial strains. Therefore, there is a critical need to search for additional antibiotic compounds for treatments.

Honokiol
An alternative compound found on the bark of a plant known as Magnolia officinalis.
Used in traditional Chinese medicine to address anxiety to promote sleep
Multiple pharmacological activities
- Anti-plaque
- Antioxidative
- Anti-inflammatory
- Free radical scavenger
- Antibacterial

OBJECTIVE: To test the antimicrobial activity of HNK against A. actinomycetemcomitans as demonstrated by inhibition of bacterial growth and low cytotoxicity in human fibroblast cell line using an in vitro approach.

This study is based on the hypothesis that HNK has antibacterial activity against A. actinomycetemcomitans as demonstrated by a minimal inhibitory concentration (MIC) and low host cell toxicity as demonstrated by fibroblast cell integrity.

Results

Minimum Inhibitory Concentration

<table>
<thead>
<tr>
<th>Treatments</th>
<th>A. actinomycetemcomitans MIC (µg/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSB Only</td>
<td>1000 µg/mL</td>
</tr>
<tr>
<td>TSB + 1% EMIO</td>
<td>Growth</td>
</tr>
<tr>
<td>1000 µg/mL (HNK)</td>
<td>Growth</td>
</tr>
<tr>
<td>500 µg/mL (HNK)</td>
<td>Growth</td>
</tr>
<tr>
<td>100 µg/mL (HNK)</td>
<td>Growth</td>
</tr>
<tr>
<td>50 µg/mL (HNK)</td>
<td>Growth</td>
</tr>
<tr>
<td>25 µg/mL (HNK)</td>
<td>No Growth</td>
</tr>
</tbody>
</table>

The minimum inhibitory and minimal bactericidal (MBC) concentration of honokiol against A. actinomycetemcomitans were both 1000 µg/mL. The cytotoxicity results showed the cell viability of human gingival fibroblast cell line was preserved between 10 to 25 µg/mL of honokiol, whereas higher concentrations resulted in cell death.

Conclusion
Honokiol demonstrated in vitro antibacterial activity against A. actinomycetemcomitans at a MIC of 1000 µg/mL, a concentration not compatible with human gingival fibroblast survival. Future research will evaluate the effects of honokiol on other, less virulent periodontal pathogens.

Acknowledgements
We would like to thank Dr. Sharan M. Gordon, Dr. David W. Paquette, and Dr. Kori L. Brewer for their support in the Summer Scholar Research program. This work was supported by NIH/NIAID (R21AI127640) and the Office of Research and Development School of Dental Medicine. The funders had no role in study design, data collection, and analysis.

References