April 24, 2009

Dear Participants and Guests,

On behalf of the Organizing Committee, Indiana Section of the America Association for Dental Research (INAADR) and Student Research Group (SRG), we welcome you to Indiana University School of Dentistry’s 17th Annual Research Day. Research Day was established in 1993 to represent our local oral health research community. It strives to provide opportunities for IUSD’s researchers to present their work and knowledge for the betterment of oral health research and dentistry.

The Indiana Section is the local link to the national (AADR) and international (IADR) organizations for dental research. The INAADR’s objective is to promote the advancement of research in all sciences pertaining to the oral cavity, its adjacent structures, and their relation to the body as a whole. The Indiana Section seeks to promote better approaches to the prevention and treatment of oral diseases and other diseases of the head and neck, and to improve communication and cooperation among all investigations in order to more efficiently share scientific knowledge that can ultimately benefit all people.

The INAADR sponsors or co-sponsors one scientific seminar per month on average, and is an integral Research Day sponsor. This event showcases advances in IUSD’s basic and clinical dental research, with an emphasis on encouraging our students to present their work and on fostering many opportunities for research collaborations. The SRG’s Student Research Fellowship program provides predoctoral students a stipend and funding for supplies that they use to conduct original research under the guidance of a faculty mentor on any project of interest. The student researcher has opportunities to travel to conferences across the nation and world to present research, such as at the IADR and AADR annual meetings.

The highlight of this morning’s program will be the keynote address given by Dr. Grayson W. Marshall Jr., the current president of the American Association for Dental Research.

We want to offer a special word of thanks to our event and award sponsors, and also to all of the exhibitors for their generous contributions and their commitment to IUSD’s Research Day. The success of this event depends upon their continued support. I encourage you to visit with our exhibitors and acquaint yourself with the latest and greatest in products and services that they have to offer. We look forward to continuing our relationship with every one of our sponsors and vendors, all of whom make this exciting and important event possible.

Last, but not least, we thank you for participating in Research Day 2009. I know that each of you will enjoy what promises to be a most enriching morning.

Sincerely,

Burak Taskonak, DDS, PhD
President, Indiana Section of the AADR

Stephen K. Powell
SRG President
On the Cover

This image of beautiful Latin American fabrics graces this year’s cover because Research Day 2009 highlights a special group presentation of 7 research projects associated with the IU dental school’s Binational/Cross Cultural Health Enhancement Center, which was established in 2007 as one of IUPUI’s premier Signature Centers. Directed by Dr. Angeles Martínez-Mier, the center focuses on research on binational health issues of Latino populations in Indiana and of the communities in Mexico from where many Latinos in the Hoosier state come. The center’s goal is to aid in the understanding of the web of interactions across biological, cultural, behavioral, and demographic domains and to advance knowledge in these areas with real-life, practical applications.

Cover design by Mark Dirlam. Research Day monograph prepared by Katherine Dee LePak.
Research Day Organizing Committee

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IUSD Student Research Group

President: Stephen Powell
Secretary: Marileana Garcia-Corretjer
Faculty Advisers: Richard Gregory, Jeffrey Platt
Thurs., April 23
5:00-8:00 p.m. Judging (Campus Center Meeting Rooms 405, 409)

Fri., April 24
7:30 a.m.-9:00 a.m. Interschool Student Research Competition (CC 405, 409)

9:00 a.m. Opening Remarks (CC Multipurpose Rooms 450B-C) Dr. Lawrence I. Goldblatt Dean

9:05 a.m. Welcome and Introduction of Guests and Keynote Speaker Dr. Domenick T. Zero Associate Dean for Research

9:15 a.m. Keynote Address Dr. Grayson W. Marshall Jr. President, American Association for Dental Research

10:00 a.m. Presentation of Awards Dr. Andréa Ferreira Zandoná Immediate Past President, Indiana Section, AADR

10:25 a.m. Acknowledgment of Special Sponsors and Announcements Dr. Burak Taskonak President, Indiana Section, AADR

10:30 a.m.-Noon Commercial Exhibitions (CC 450A)

Research Presentations (CC 405, 409):
10:30-11:10 a.m.: Posters 1-38
11:20 a.m.-Noon: Posters 39-71; Clinical Case Reports 1-4; Table Clinic 1

Noon Removal of Posters
Keynote Speaker
Grayson W. Marshall Jr., D.D.S., M.P.H., Ph.D.

The IU School of Dentistry and Indiana Section of the American Association for Dental Research welcome Research Day keynote speaker Dr. Grayson Marshall, who was inducted as president of the AADR during the association’s annual session in Miami, Florida, earlier this month.

Dr. Marshall has devoted more than two decades of his distinguished career to the dental faculty of the University of California, San Francisco. He holds several key positions at the UCSF School of Dentistry, including chair of the Division of Biomaterials and Bioengineering and vice-chair of the Department of Preventive and Restorative Dental Sciences.

His Ph.D. and D.D.S. degrees were earned at Northwestern University (1972 and 1986, respectively). After earning his Ph.D. in Materials Science, he undertook a one-year postdoctoral fellowship in Biological Materials at Northwestern and then joined the faculty in that department, teaching there for the next 14 years. He earned a master’s degree in Public Health (Epidemiology) at the University of California, Berkeley, in 1992.

Dr. Marshall’s body of research in recent years has included several projects funded by the NIH’s National Institute of Dental and Craniofacial Research, including a Biomedical Research Program grant that seeks to develop and test new bone-inducing nanocomposites based on nanoapatite and hydrogels. He is currently at the mid-way point on two NIH/NIDCR grants – one for five years in which he is seeking, as principal investigator, to determine relationships of dentin structure and mechanisms of remineralization, and the other for four years in which he is striving, as a co-investigator, to determine the mechanisms of protein-guided mineralization of enamel-like materials.

Dr. Marshall is a past president of the Academy of Dental Materials and a recipient of the IADR’s prestigious Wilmer Souder Distinguished Scientist Award.

Keynote Presentation
Toward Functional Remineralization of Carious Dentin

Current trends in minimally invasive dentistry emphasize the reversal and repair of the active caries process as a first step to restoring the damaged tissue. Dentin remineralization appears to be possible, but due to its complex composite structure, it has not been established if proper mechanical function can be restored by remineralization of affected dentin. New methods now permit quantitative studies of the nature of dentin structure and its demineralization and remineralization. Apatite mineral reinforces the collagen fibrils in dentin, being located either within (intrafibrillar mineral) (Balooch et al., 2008; Jager and Frazier, 2000; Landis et al, 1993) or between them (extrafibrillar mineral) (Katz and Li, 1973; Katz et al., 1989; Landis, 1996). In particular, intrafibrillar mineralization has been shown to be critical for normal mechanical properties of dentin (Kinney et al, 2003) and is much more resistant to demineralization than extrafibrillar mineral (Balooch et al, 2008). We believe that remineralization of dentin is dependent on the attachment of mineral within the collagen fibrils, perhaps initially within the intrafibrillar compartment; a condition we have termed functional remineralization. Further, properties obtained from the dehydrated organic dentin matrix may not reflect the true mechanical behavior of the remineralized tissue under physiological and hydrated conditions. Thus the recovery of mechanical
properties of the hydrated tissue may be a more appropriate endpoint than overall mineral content to evaluate the effectiveness of remineralization in dentin, which should correlate well with its overall functionality (Bertassoni et al, 2009). We have been studying the demineralization and remineralization of dentin from natural and artificial caries lesions using a combination of methods including mineral content by x-ray imaging, demineralization characteristics by atomic force microscopy and Raman microspectroscopy, mechanical properties by AFM-based nanoindentation, and remineralization in solutions using both static and constant composition approaches. So far we have been able to obtain significant, but partial, recovery of the normal hydrated elastic modulus of such lesions. We believe such studies will lead to therapies that will repair the dentin, restore its mechanical properties, and reduce the cycle of surgical-restorative interventions. This work is supported by NIH/NIDCR Grant R01 DE16849.
Presentations
10:30 a.m. to 11:10 a.m.

SCOTTSBURG MIDDLE SCHOOL
(P1, P2, P3, P4, P5)

BINATIONAL/CROSS-CULTURAL HEALTH ENHANCEMENT CENTER
(P6, P7, P8, P9, P10, P11, P12)

BEHAVIORAL SCIENCE
(P13)

BONE CELL BIOLOGY
(P14)

CARIOLOGY
(P15, P16, P17, P18, P19, P20, P21, P22, P23, P24, P25, P26, P27, P28, P29, P30, P31, P32)

DENTAL MATERIALS (ENDODONTICS)
(P33)

DIAGNOSTIC SYSTEMS
(P34)

EDUCATIONAL RESEARCH
(P35)

ENDODONTICS
(P36, P37)

EXPERIMENTAL PATHOLOGY
(P38)

Presentations
11:20 a.m. to Noon

GENOMICS
(P39)

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**CLINICAL CASE REPORTS**

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P1  
**Effects of Tobacco on Oral Health**  
B. WALSH, D. SHEPHERD, P. CLARK  
Scottsburg Middle School  

The objective of our research was to learn about the effects of tobacco use on teeth. We used our 8th grade health book, “Decisions for Health,” and the ADA internet site to research the issue. Chewing tobacco can cause gum tissue to recede and then increase sensitivity to cold and hot foods. Smoking increases the risk of oral cancer by 50% and is the 4th most common cause of cancer. In addition to causing stained teeth and bad breath, smoking increases tartar and plaque on teeth. All kinds of smoking are very dangerous to your oral health. Supported by the Indiana University School of Dentistry.

P2  
**Smokeless Tobacco and Its Impact on Your Mouth**  
K. SCHEMMEL, K. LANE, P. CLARK  
Scottsburg Middle School  

The objective of this research was to identify the effects of smokeless tobacco on oral health. Research was conducted using various government, not-for-profit, and commercial internet sites. Chewing smokeless tobacco can cause tooth loss and gum disease, along with oral cancer of the lip, tongue, mouth, and throat. In 2008, more than 7,000 people died of cancer caused from chewing and 28,900 were diagnosed with cancer. Across the country, 12% of all 8th graders use smokeless tobacco, which can lead to addiction. Smokeless tobacco has the same or worse health risks as cigarettes and is extremely harmful to oral health. Supported by the Indiana University School of Dentistry.
P3
Chewing Gum: Good or Bad for Your Oral Health?
A. CONTRERAS, C. DAVIS, P. CLARK
Scottsburg Middle School

The objective of this investigation was to find out whether gum chewing is good or bad for your oral health. We used the several internet sites including Wikipedia and Ask. We found that gum can be both good and bad. Sometimes chewing gum can help you concentrate and also helps bad breath. Gum can neutralize some of the acid produced by bacteria. However, gum chewing can be harmful when it causes unnecessary wear and tear of cartilage that acts as a shock absorber for the jaws. In conclusion, gum chewing can be a positive, but don’t chew too much. Supported by the Indiana University School of Dentistry.

P4
Dangers of Dental Grills and Oral Piercings
T. BALLARD, K. DANIEL, E. HAWK, C. MASON, P. CLARK
Scottsburg Middle School

We researched the harm that can come from dental grills and oral piercings. Our research information came from internet sites sponsored by the ADA and the Surgeon General. Oral piercings can cause oral health problems by banging against teeth, carrying infectious disease, and crowding the mouth which can misshape the tongue. Dental grills can chip and tear the tooth and may trap bacteria causing tooth decay. Oral piercings are not good for oral health and dental grills are even worse. Supported by the Indiana University School of Dentistry.

P5
How Eating Disorders Affect Your Oral Health
L. COLLINS, V. GEISLER, P. CLARK
Scottsburg Middle School

The objective of this research was to find out how eating disorders affect your oral health. Research was conducted by investigating internet websites which included www.ADA.com. Eating disorders rob the body of nutrients needed for healthy teeth. Teeth can change in color, size, and length. Loss of weight and therefore, bone density, can change jaw structure and facial shape. Bulimia is particularly destructive to teeth, because the acids produced by vomiting attack the tooth enamel. All eating disorders negatively affect oral health. Supported by the Indiana University School of Dentistry.
**BINATIONAL/CROSS-CULTURAL HEALTH ENHANCEMENT CENTER**

(Special Group Presentation of Posters 6,7,8,9,10,11,12)

**P6**

International Service-Learning Program, Mexico. Improving Cultural Competence of Dental Students

A.E. SOTO-ROJAS¹,*, E.A. MARTÍNEZ-MIER², M. MEADOWS¹, S. JONES², J. HATCHER²

¹Indiana University School of Dentistry
²IUPUI Center for Service and Learning

The International Service-learning (ISL) Calnali program aims at connecting meaningful community service experiences with academic learning, personal growth, and civic responsibility. The experience’s objectives were developed to have an impact on health professionals’ competencies by enhancing linguistic and cultural competency through an immersion experience that exposes students to other health care systems. The current study aimed at assessing if the Calnali ISL’s students meet its objectives and improve their cultural knowledge, sensitivity, and awareness. Surveys that assessed participants’ ISL experience and progress towards cultural competency were developed and administered using CoursEval™. 9 dental students completed the surveys before (PRE) and after (POST) their participation in the Calnali ISL experience. A third, similar survey was sent to IUSD alumni (ALUM) who participated in the Calnali ISL experience while they were in dental school. 48 surveys were sent and 23 received (48% response rate). Using a Likert scale in which 0= very low to 5 = very high, PRE, POST and ALUM survey’s results were: 3.9, 3.8 and 3.6, respectively, indicating moderate understanding of barriers faced by Latinos. For how cultural differences will influence their interactions or work with Latino patients, values were 3.2, 3.2 and 3.1 indicating moderate understanding. For students and alumni perceptions of the frequency disparities in health outcomes are observed in Latino patients, values were of 2.5, 2.9 and 2.9 indicating a moderately low understanding. Students and alumni reported feeling moderately confident in their professional ability to provide services to Latino patients (3.4, 3.6 and 3.7). No significant differences were found between the pre and post surveys and with groups; however, values tended to be higher for post and alumni responses. **Barriers, cultural differences, and disparities faced by the Latino population were moderately understood by student and alumni.** Study supported by a Boyer Scholarship and a Service Learning Assistantship from the Center for Service and Learning and from the Binational/Cross-cultural Health Enhancement Center.

**P7**

Latino Participation in a Mobile Sealant Program

C. SCHRINER,*, A.E. SOTO-ROJAS, K.M. YODER

Indiana University School of Dentistry, Predoctoral Program

Seal Indiana (SI) is a state-wide mobile dental program that provides preventive oral health services for children who do not have adequate access to dental care. Of the 17,000 children SI has seen through school visitations, 29% are of Latino decent. This particular group has been found to have higher caries
rates and numbers of untreated disease. Though the SI program seems to be reaching many students, participation rates remain low at some schools. Assessing reasons why people choose not to take part in SI can be useful in developing interventions aimed at increasing participation rates. The objective of this study was to gain a better understanding for the lack of participation in the SI program, to receive general feedback about the program, and to observe cultural differences in the Latino population. A questionnaire was developed utilizing theories in health behavior and promotion and distributed to an Indiana rural school with a high Latino population. A total of 100 questionnaires were given to the school’s nurse to distribute and collect. Analysis was conducted at the group level. Overall, 90 surveys were returned and 39(43%) were of Latino origin. The majority of participants who consented for their children to participate in SI were Latino 18(64%). Among the reasons people gave as to why they chose not to participate in SI, 62% claimed they were already seeing a dentist on a regular basis. The survey was able to detect reasons why parents do not consent for their children to participate in the SI program and show differences among the Latino population compared to other ethnicities. To improve SI services, further assessment from other schools will be incorporated at a later date in order to obtain a more complete evaluation.

P8
International Service Learning and Changes in Cultural Competence in Dental Students
D.B. GALLUP1,* E.A. MARTÍNEZ-MIER1, A.E. SOTO-ROJAS1, S. JONES2, J. HATCHER2
1Indiana University School of Dentistry
2IUPUI Center for Service and Learning

The International Service-Learning (ISL) programs at IUSD connect meaningful community service experiences with academic learning. This study aimed at determining if participation in an ISL experience allowed dental students to progress towards achieving ADA and IUSD established competencies at managing a diverse patient population and having the interpersonal and communication skills to function successfully in a multicultural environment. A mixed methods approach was used for the study. A model that best fitted the research question was identified and a validated questionnaire was used to assess students’ progress towards competencies. 4th year dental students who participated in an ISL experience, a group of students who participated in a state-wide SL program (Seal Indiana – SI) and a third group who had not participated in service experiences (NS) were compared. Before and after participation responses were compared using ANOVA and multiple logistic regression models. Students answered 33 questions on 3 domains: 1) knowledge of the impact of values and beliefs on access to care, 2) culturally appropriate clinical decision making and 3) cross-cultural communication. 83 students answered pre and post experience questionnaires. 27 in the ISL group, 30 in the SI group and 26 in the NS group. Prior to the experience, there was a statistically significant difference (p<0.05) among the groups in cross-cultural communication(with ISL having the score reflecting most competence in the scale - 1.00 vs. 1.13 and 1.24), but not in traditional beliefs knowledge or clinical decision making. Post participation results also showed statistically significant differences (p < 0.05) among and within groups, with ISL and SI reporting increased scores for knowledge of the impact of values and beliefs on access and appropriate clinical decision making. Participation in ISL experiences in this sample of students
increased their knowledge of the impact of values and beliefs on access to care and facilitated culturally appropriate clinical decision making. Supported by a Center for Service and Learning’s Boyer Scholarship and Service Learning Assistantship and Pilot Grant Funds from the Binational/Cross-cultural Health Enhancement Center.

P9
Teeth, Mastication, and Excess Weight in Mexican Elders
G. MAUPOMÉ-CARVANTES

Background: The presence of teeth is associated with the ability to chew and thus related to appropriate diet and nutrition. While tooth loss and mastication problems have been linked to Body Mass Index (BMI), the relationship deserves further characterization. Objective: To assess the association between number of teeth, mastication, and obesity (not excess weight) in elders across three urban-to-rural locales in Mexico. Methods: A cross-sectional study on independently living elders over the age of 59 (122 men, 183 women), residing in either middle socio-economic class (SES)-urban/ low SES-urban/ low SES-rural locales in Central Mexico identified obesity (yes BMI>29, no BMI<30), number of teeth (0-10/11-20/21-32), sex, urban-to-rural locales, masticatory function, living alone (yes/no), self-perception of health (excellent-good/regular/ bad-very bad), depression (yes/no), regular official source of monthly income (yes/no). Oral and anthropometric exams, and oral/general health interviews were carried out at home by standardized dentists and nutritionists. Results: 285 subjects participated (44.6% rural, 33.7% low-urban, 21.7% middle-urban). Overall mean age was 75±8.5 years (low-urban subjects were younger, 73.1±7.2 years). Obesity prevalence was 20% (n=57), and higher in women (23.8%), low-urban locale (29.2%), among persons with >21 teeth (29%), and younger persons (72±7.0). Mean masticatory function was similar between persons with (36.6%± 36.4%) and without obesity (32.2%±33.5%). Binary logistic regression adjusting for age, locale, sex, living alone, depression, self-perception of health, and income, showed that persons with >21 teeth (OR=2.7, 95%CI 1.32-5.59), from the low SES-urban locale (OR= 3.8, 95%CI 1.3-10.9) and female (OR= 2.24, 95%CI 1.1-4.4) were more likely to have obesity. Conclusion: Masticatory function was not associated with obesity. However, the number of teeth present may increase the ability to eat foodstuffs with different nutritional values. Food selection and possibly obesity may be modified through diverse cultural dietary patterns and varying levels of physical activity in rural and urban areas.

P10
Responses of Latino Parents to Seal Indiana Follow-up Phone Calls
A.E. SOTO-ROJAS, K.M. YODER*
Indiana University School of Dentistry

Seal Indiana (SI) is a state-wide mobile dental non-profit program that provides dental screenings, sealants, x-rays and fluoride varnish for children from low-income families, at Title I schools, community health centers, head start and summer migrant programs. A report of services provided is sent to
parents. Previous studies have shown that cultural differences play a role in the patients’ response to follow-up. It is appropriate to assess patient responses to follow-up strategies to modify them according to needs of particular populations. OBJECTIVE: This study compared Latino and non-Latino parents’ responses to telephone calls made by a bilingual dentist regarding the follow-up of children reported with severe dental caries by SI program. METHODOLOGY: A bilingual dentist telephoned parents of children with severe dental caries to ascertain the availability of finding dental services, and to assist if Medicaid insurance is needed. Successful telephone calls, positive or negative responses were recorded. A successful call is reported if the dentist talked to the parent and positive if the parent talks to the dentist. RESULTS: A total of 186 children were reported (January-June 2006) with severe decay 52 (28%) were Latino and 134 (72%) were Non-Latino. Several telephone calls were attempted if needed. For non-Latinos 63 (47%) phone calls were successful, reasons for unsuccessful calls were: 33 didn’t answer, in 27 a message was left, in 11 the number was wrong or disconnected. Nine negative responses to phone calls were found. For Latinos, 26 (50%) phone calls were successful, 19 didn’t answer, in 3 a message was left and in 4 the number was wrong or disconnected. There were no negative responses from Latino parents. Percentages of successful calls and negative responses were significantly different for the two groups (p<0.05). CONCLUSIONS: In this sample of parents of Latino and non-Latino patients reported with severe caries, the Latino parents were more receptive to phone calls than non-Latino parents and this difference may be related to cultural differences. Study supported by the Indiana State Department of Health. This presentation is part of the research outfit Bi-National/Cross-Cultural Health Enhancement Center – an Indiana University Signature Center.

P11
Community-Based Participatory Research: A Tool to Address Oral Health Disparities
L.D. GALVEZ, * E.A. MARTÍNEZ-MIER, A.E. SOTO-ROJAS
Indiana University School of Dentistry

Several publications have pointed out that there is a need to address that untreated caries is higher in Latinos and that the reasons for this disparity need to be understood and addressed. The aim of this study was to gain a better understanding of the dental caries prevalence of a group of Latino children, and the dental knowledge of their parents. A Latino community organization and researchers collaborated to conduct focus groups, key informant interviews, and dental exams. Children ages 6 to 13 were examined for dental caries using the International Caries Detection and Assessment System index. Core guiding questions were developed, tested, and refined with a random sample of participants. Questions inquired about oral health prevention, access to care, beliefs and knowledge of causes of dental problems and reasons preventing the community from improving oral health. The interviews were recorded and transcribed. Codification of answers was performed. Results were analyzed using content analysis methodology in which the frequency of answers was assessed and tabulated. Caries prevalence was calculated for both cavitated and non cavitated lesions. The results were analyzed jointly by community members and researchers. 29 adults ages 18 to 44 participated in the focus groups. 39 of their children received a dental exam. Results showed that 32 of the children had at least one caries lesion. Most participants reported understanding the role of sugared beverages, candy and other
cariogenic foods in caries development. Most participants; however, were not familiar with the role of fluoride in caries prevention. None of the participants were aware of the role of sealants, in spite of 22 of the children examined had sealants placed. Many traditional beliefs were associated to the use of chewing gum and early childhood caries. The information obtained indicated there was great need for information and education; it also guided the development of a community action plan that will include the development of a culturally appropriate oral health educational program. Supported by an RSFG grant and Pilot Grant Funds from the Binational/Cross-cultural Health Enhancement Center.

P12

Treatment Outcomes of Dental Sealants Placed in a Rural Setting

1Indiana University School of Dentistry
2Universidad Autonoma del Estado de Yucatan

The evidence of the effectiveness of sealants as a prevention strategy for caries has been confirmed by systematic reviews conducted by several groups. However, the effectiveness of the use of dental sealants in rural settings under field conditions has not been extensively studied. The overall goal of this investigation was to determine the treatment outcomes of sealants placed in a public health setting as part of a service-learning program in rural Mexico. 478 consented children (mean age: 10.53±5.11), were examined by calibrated investigators using the International Caries Detection and Assessment System (ICDAS) in 2004, 2006 and 2007. After being examined, 3rd and 4th year dental students placed sealants (UltraSeal XT, Ultradent Products Inc. USA) on children’s permanent molar and premolars which were diagnosed as sound or had incipient occlusal caries lesions (ICDAS severity scores ranging from 0-3). In 2008, children were contacted to receive a recall examination by a calibrated examiner (4-, 2-, and 1-year follow up). Children were examined using ICDAS and sealant retention criteria. 232 children returned for a recall examination (mean age: 10.89±3.11). For sound teeth (code 0) after 1, 2, and 4 years, 96.3%, 86.9 and 60.4% of the sealants had survived, respectively. For sealants placed on surfaces diagnosed as early enamel caries lesions (ICDAS 1-3), after 1, 2, and 4 years, 94.3%, 71.4% and 55.7% had survived. Differences among survival rates for sound vs. carious surfaces were not statistically significant. Survival rates for sealants placed as part of a service-learning program are comparable to previously reported survival rates for sealants placed in rural settings. Sealants appear to be an effective treatment to manage dental caries in this type of setting. Supported by an IUPUI Signature Center Grant.

BEHAVIORAL SCIENCE

P13

Are Postmenopausal Women Aware of Their Periodontal Health?
Are postmenopausal women aware of their periodontal health status? Ninety-four postmenopausal women who reported receiving “regular” dental and medical care participated in this IRB approved observational study. Participants responded to a questionnaire and received a periodontal exam from a calibrated examiner. Plaque score percentage (PS) for each participant, periodontal probe depth (PD), and clinical attachment level (CAL) in mm on 6 sites per tooth were measured. Based on clinical attachment levels, participants were classified as having mild (1-2mm CAL), moderate (3-4mmCAL), or severe (>5mmCAL on greater than 30% of sites) periodontitis. A cone beam computed tomography (CBCT) image was also taken of each woman to identify bone loss. Perception of periodontal health status was compared to actual diagnosis from clinical exam outcome. Almost all participants (97.8%) reported having “healthy gums”, 2.1% reported having had “history of gum disease but currently healthy gums”, and 0 reported having gum disease. Based on clinical exam findings, 36.2% had severe, 26.6% had moderate, and 34.0% had mild periodontitis, while 3.2% did not have periodontitis. When asked about frequency of dental visits to maintain current periodontal conditions, 86.2% reported “every 6 months”, 3.2% reported “every 3 months”, and 10.6% did not know. Average Plaque score was 67.5%. When asked if they could be at risk for tooth loss, 98.9% answered “no”; when asked why, the most common answer given was “good dental coverage”. Postmenopausal women who visit dentists and physicians regularly are not aware of their periodontal health. This study suggests that patient education must be a priority to prevent progression of periodontitis and tooth loss. Further research in this area potentially can identify treatments and prophylaxis that may be useful for women at the onset of menopause.

**BONE CELL BIOLOGY**

**P14**

**Pyk2 Phosphorylation and Signaling in Osteoclasts is Decreased by Dynamin**

L. DU¹, * L. NEFF², R. BARON², A. BRUZZANITI¹

¹Indiana University School of Dentistry, Department of Oral Biology
²Harvard School of Dental Medicine, Department of Oral Medicine, Infection and Immunity, Boston, Mass.

The podosome belt is an actin-rich adhesion structure found in osteoclasts (OCs) and other highly migratory cells. In OCs, the podosome belt forms the sealing zone and surrounds the ruffled border membrane where bone resorption occurs. Formation of the podosome belt/sealing zone is critical for the bone resorbing activity of osteoclasts and agents that disrupt this structure significantly alter the ability of OCs to attach to bone, migrate along the bone surface and resorb bone. The tyrosine kinases Pyk2 and Src are important signaling proteins which contribute to podosome belt organization, cell
spreading and the bone resorbing activity of OCs. Moreover, mice lacking either Src or Pyk2 exhibit increased bone mass due to dysfunctional OC activity. Following OC attachment via integrins, Pyk2 is autophosphorylated at tyrosine 402 which forms the binding site for Src and leads to the activation of both kinases. However, the mechanisms leading to the dephosphorylation of Pyk2, complex disassembly and podosome turnover are unknown. The GTPases dynamin, which is known to be phosphorylated by Src, also contributes to podosome organization and OC bone resorbing activity. Therefore, the objective of this study was to identify whether dynamin associates with Pyk2 and/or regulates Pyk2’s activity. We used scanning confocal microscopy to examine the localization of Pyk2 and dynamin in OCs. This approach revealed that Pyk2 and dynamin colocalize with actin in the podosome belt of OCs suggesting that the two proteins may form a complex. Next, we used authentic OCs derived from bone marrow and 293VnR cells transiently-transfected with Pyk2 and dynamin cDNA to examine the interaction of Pyk2 and dynamin in vitro. Cells lysates were subject to co-immunoprecipitation followed by Western blotting using specific antibodies. We found that dynamin associates with Pyk2, decreases Pyk2 Y402 phosphorylation in a dynamin GTPase-dependent manner, and prevents the binding of Src to the Pyk2-Y402 binding site. These results demonstrate that dynamin promotes the dephosphorylation of Pyk2 which may block Pyk2-mediated integrin signaling and regulate podosome belt disassembly in OCs.

**CARIOLOGY**

**P15**

**Enamel Conditioning Effect on Penetration and Microleakage of Glass Ionomer-Based Sealants**

S. AHMED,* C. GONZÁLEZ-CABEZAS, M. COCHRAN, M.R. FONTANA, B. MATIS, T. CHU

Indiana University School of Dentistry

While most sealants available are resin-based, glass ionomer-based cements can also be used as sealants, with the advantage of being more tolerant to moisture during placement and release fluoride. The objective of this study was to evaluate the influence of different fissure conditioning techniques on penetration and microleakage of glass ionomer (GI) and resin-modified glass ionomer cements (RMGI) used as sealants. Clinically sound extracted human molars were distributed into nine experimental groups (n=15 each). Group 1 (control) was sealed with resin-based sealant (Delton) following clinically accepted techniques. Groups 2-6 were sealed with RMGI (Vitremer) after having the fissure conditioned with either Polyacrylic acid (RMGI-control), 35% H₃PO₄, low viscosity 35% H₃PO₄ with a surfactant, self-etch conditioner, or 35% H₃PO₄ followed by self-etch conditioner. Groups 7-9 were sealed with GI sealant (Fuji Triage) after having the fissures conditioned with either Polyacrylic acid (GI-control), 35% H₃PO₄ or low viscosity 35% H₃PO₄ with a surfactant. After aging through thermocycling (2500 cycles), specimens were incubated in methylene blue for four hours and sectioned at multiple locations. Digital images were obtained using a digital stereomicroscope, and microleakage was determined by scoring the dye penetration along the enamel-sealant interface. The penetration of the material was
determined by calculating the percentage of the total length of the fissure penetrated by the material. Results: The use of self etch-conditioner significantly increased RMGI penetration, while surface conditioning with 35% phosphoric acid with surfactant significantly decreased microleakage of GI. The resin-based sealant placed after 35% phosphoric acid surface conditioning showed the best penetration and the least level of microleakage. In conclusion, results from this study suggest that the placement of glass ionomer-based sealants can be enhanced by modifying current conditioning methods.

P16
Comparison of Two-QLF Thresholds for Caries Quantification under Sealants

An ongoing clinical study is assessing the ability of different detection methods to monitor caries lesions under clear sealants. One of the methods under study is Quantitative Light-induced Fluorescence (QLF).

Objective: To compare two QLF thresholds for fluorescence image analysis on caries quantification.

Methods: 77 consented children (mean age: 8.8±1.1), with at least two permanent molars that were either sound or had occlusal caries lesions [International Caries Detection and Assessment System (ICDAS) lesion severity scores ranging from 0-4], had their permanent molars brushed with water, and examined using Quantitative Light-induced Fluorescence (QLF, Inspektor Research Systems B.V., The Netherlands) before and one month after sealant placement (Helioseal Clear Chroma, Ivoclar Vivadent, Liechtenstein). 121 surfaces were selected. QLF images were analyzed for average fluorescence loss (ΔF [%]), size (S [mm²]), and ΔQ (ΔF×S [%×mm²]). Two thresholds [70% (Th70), and 95% (Th95) of fluorescence reduction] were considered to be caries and evaluated further by image analysis. Pearson correlation coefficients between QLF variables and ICDAS scores and comparisons among QLF variables based on baseline ICDAS scores were assessed using ANOVA. Results: For Th70 there was a significant (p<0.05) moderate correlation between the QLF variables and the baseline ICDAS scores (ΔF: r=0.65, S: r=0.47, ΔQ: r=0.51). For Th95 the correlations were not as strong. For the comparisons, for Th70, QLF variables were able to significantly distinguish ICDAS scores (p<0.05) at baseline and after sealant placement (e.g., baseline-ΔQ: ICDAS scores 0&1<3&4; 2<4, 1 month-ΔQ: ICDAS scores 0&1&2<4). However, for Th95, QLF-S at baseline and S and ΔQ after sealant placement were unable to distinguish between ICDAS scores (p>0.05). Conclusion: The use of QLF when set at a threshold of 70% fluorescence reduction allowed for better discrimination of ICDAS scores when examined through clear sealants. This study was supported by NIH grant R21 DE018115-01.

P17
Development of a Standard Fluoride Analytical Method for Dental Plaque
E.A. MARTÍNEZ-MIER, C.B. BUCKLEY,* A.E. SOTO-ROJAS
Indiana University School of Dentistry
Fluoride diffusion analysis (DA) releases and concentrates both free and bound F by acid-facilitated diffusion. It is the preferred method for analyses of samples in which F may be in a covalent or complexed form, such as the determination of fluoride in total dental plaque. Currently available diffusion techniques release fluoride at an approximate pH of 1, which imitates the pH encountered in the stomach environment. These methods may not have biological relevance when analyzing fluoride in dental plaque samples, since the oral environment does not ever reach such low pH. The aim of this study was to assess the analytical precision and trueness of a newly developed DA method to analyze acid-diffused plaque at a pH of 4. Initially, four combinations of reagents were tested for pH. These included different types and concentrations of acids and acid buffers. Once the target pH was obtained, the identified combination of reagents (2.0 ml DIH₂O + 1.0 ml standard + 1.0 ml HMDS saturated 0.00005M SO₄) was used to analyze commercially F standards (0.02 ppm) and plaque samples. Using a goal of the required within laboratory precision of 5%, the estimated standard deviation would need to exceed 0.0048 to conclude that the measurement is not as precise as required. Results did not reach that level (sd = 0.0029). The trueness of the measurement process was assessed based on the confidence interval (0.0191- 0.024), which in this case did contain the true measurement value. Therefore, test results were within ISO acceptable limits for precision and trueness. As expected, significant differences were found among the concentration values obtained using the pH 4 and pH 1 method for plaque samples (65.37 ± 28.24 µg F/g vs. 0.28 ± 0.34 µg F/g). Based on the results obtained from these samples, it is concluded that the current technique, which simulates oral pH conditions of biological relevance, is able to render precise and true values when analyzing samples of known concentration and repeatable values when analyzing samples of unknown concentration.

P18

Preliminary Q-PCR Analysis of Plaque Microflora as Caries Predictor

D. CATT,* G. ECKERT, M.R. FONTANA

Indiana University School of Dentistry

Objective: Subtle differences in plaque microflora may have a role in evaluating caries risk assessment. We used quantitative real-time PCR (Q-PCR) to examine differences in plaque microflora from young children who were caries-free at baseline and either developed caries (n=6, Group A) or remained caries-free (n=6, Group B) after 1yr. Plaque was assayed for specific bacterial species determined previously to be overabundant (Actinomyces naeslundii, Streptococcus mutans) or scant (S. mitis, S. gordonii) in carious lesions. We previously reported no statistical differences between the two groups in the amounts of these bacteria using the baseline plaque samples. This report examines the results for the one-year plaque samples. Methods: Plaque samples or control bacteria in cell lysis solution (1% Triton X-100, 20mM Tris-HCl, 2mM EDTA [pH 8.0]) were incubated with 20U of mutanolysin/ml and 0.2mg of lysozyme/ml at 37°C for 2 hr, then boiled at 100°C for 10 min. 20µl of a mixture containing 1µl of lysed cells, 1X TaqMan Universal PCR Master Mix (Applied Biosystems), 200nM (each) sense and antisense primer and 250nM TaqMan probe (5’FAM and 3’TAMRA labeled) were analyzed using the ABI PRISM 7000 sequence detection system (Applied Biosystems) with the following cycle profile: 50°C,2min; 95°C,10min; then 60 cycles of 95°C,15s; 58°C,1min. Serial dilutions (in duplicate) of each
sample were assayed. **Results:** Group A (caries-active) had a statistically significant (p<0.05) increase over Group B (caries-free) in the amount of *S. mutans*, the combined amount of *S. mutans* and A. *naeslundii*, and the total of all 4 probe species. In Group B, *S. mitis* was present at a significantly higher percent of total than in Group A. **Conclusion:** Preliminary results suggest examination of plaque microflora as a tool for caries risk assessment may be feasible but a larger cohort of species and multiple sampling time points may be necessary.

**P19**

**The Antimicrobial Effect of a Copper-Containing Sealant**

E. COLEMAN,* M.R. FONTANA, C. GONZÁLEZ-CABEZAS, A. HADIR

Sealants protect the pit and fissure areas of teeth surfaces by penetrating into the fissures of the tooth to seal them from additional bacterial colonization, and to isolate existing sealed bacteria from nutrient sources derived from the oral environment, thereby preventing the development of caries and/or arresting existing caries lesions. Copper salts have antimicrobial properties and have been used in the past in dentistry to control microbial growth adjacent to copper releasing materials. **Objective:** to test whether Cl seal has and anticariogenic properties compared to a negative control; Pit and Fissure sealant; Delton, Dentsply **Methods:** In this study, two groups of 12 human tooth specimens were inoculated once at the beginning of the experiment with 20 µl of a mid-log phase culture of *S. mutans* TH16 (serotype c), at an absorbance of 0.5 at 540 nm in trypticase soy broth supplemented with 5% sucrose (TSBS). Following inoculation, specimens were incubated at 37°C for 2 hours to allow the bacteria to adhere to the tooth structure before beginning the cycling of fluids. Specimens were exposed for 4 days, at 37°C, to circulating trypticase soy broth supplemented with 5% sucrose (TSBS; 0.7 ml/min) for 1 h, 3 times a day, and to a mineral washing solution (MW; 0.7 ml/min during the day, and 0.15 ml/min at night) for the rest of the day. The circulating fluids were intended to reproduce nutrient intake 3 times/day, while the MW represented an artificial saliva buffer solution. Three teeth/group were aseptically removed and placed in 5 ml of sterile saline. Then they were vortexed (20 sec) and sonicated (20 sec) to disrupt plaque from the tooth surface. The dislodged bacteria was be diluted 1:10, 1:100, 1:1000 and 1:10,000 and double plated on Mitis Salivarus supplemented with bacitracin and sucrose (MSSB, for *S. mutans*) and Trypticase Soy Agar (TSA) for determination of the total number of bacteria and to ensure that there was no contamination in the system. The fluid remaining in the caries-vessels after the last sucrose cycle, as well as the remaining drainage fluid, TSBS and MW media was monitored for pH. Specimens were analyzed for bacterial colonization, sectioned, and analyzed for lesion depth using confocal laser scanning microscopy. **Results:** Cl seal had significantly higher total area, total gray, and depth than did Delton. This study was supported by a grant from IUSD and the Cooley and Cooley company.

**P20**

**The Influence of ICADS-II E-Learning Programme for Occlusal Caries Detection**

M.B. DINIZ,* L.M. LIMA, L. SANTOS-PINTO, R.C.L. CORDEIRO, G.J. ECKERT, A.G. FERREIRA ZANDONÁ
**P21**

**Correlation of Early Caries Exams and Treatment Plan**  
D. HARTLEY,* A.G. FERREIRA ZANDOMÁ, M.R. FONTANA, J.R. CHIN, G.J. ECKERT  
Indiana University School of Dentistry

**Objective:** Assess correlation between a visual exam using the International Caries Detection and Assessment System (ICDAS-II) and corresponding treatment plan completed by undergraduate students at Indiana University School of Dentistry (IUSD).  
**Methods:** Sample of 187 subjects with charts were selected from participating subjects (N=207) in an 18 month parent study where children 5-14, undergoing treatment at the Pediatric Dental Clinic of the IUSD had been examined with the ICDAS-II criteria by independent examiners. Prediction of subject-level treatment plan information from baseline ICDAS examination results was performed using logistic regression.  
**Results:** There was a significant (p=0.004) positive association between higher numbers of surfaces containing ICDAS scores ≥ 1/3/5, or filled surfaces and presence of a treatment plan and a completed caries risk form. However, although there was an association, only 7 charts had a caries risk form completed. Invasive interventions (amalgams/resins/crowns/extractions) were more likely to be planned and delivered for ICDAS=3/4 and ICDAS=5/6 than ICDAS=1/2 (p=0.0001). Sealants were more likely to be planned and delivered for ICDAS=1/2 than for ICDAS=0 (p=0.002). Subjects with higher ICDAS scores were more likely to receive...
fluoride treatments and dietary counseling and less likely to receive bitewing radiographs (p=0.04).

**Conclusions:** Further guidance is needed to improve the use of customized preventive care based on risk for undergraduate students at IUSD. Supported by Delta Dental Foundation.

**P22**

**Restorative Treatment-Strategies Reported by U.S. Dental School Faculty**

J. WALLER-SMITH¹, M.R. FONTANA¹,*, G. ECKERT², S. DOMÉJEAN-ORLIAGUET³, I. ESPELID⁴, A.B. TVEIT⁴

¹Indiana University School of Dentistry
²Indiana University School of Medicine
³Faculty of Dentistry University of Auvergne, France
⁴Faculty of Dentistry University of Oslo, Norway

Disparities among dental school faculty concerning the teaching and practice of cariology can lead to variations in students’ treatment modalities that can have health and economic consequences for patients and third party providers. Understanding if disparities exist and what they are can help design faculty education and training calibration tools. **Objective:** The purpose of this study was to assess the caries management strategies used by full (FTF)- and part-time (PTF) faculty at one US Dental School employing a modified questionnaire used in previous studies in Europe. **Methods:** The study population consisted of 290 FTF/PTF faculty and 100-4th year students. The survey was posted on surveymonkey.com®. The voluntary participants were asked questions concerning restorative treatment decisions based on selected clinical and radiographic images and patient case-scenarios, including choice of cavity preparations and dental materials. They were also asked how, if at all, caries risk assessment affected their decisions. **Results:** The response rate to date for FTF/PTF/students was: 27%/7%/22%, respectively. There were many differences in diagnoses and treatment decisions. For example, diagnosis of an occlusal/radiographic image of a fissure system ranged from 28% sound to 61% enamel-only lesion, 3% dentin lesion, and 8% uncertain; with varying recommendations: 13% no treatment, 15% fluoride, 51% fissure sealant, and 22% operative intervention. FTF were less likely (p<0.05) than others to require restoration for enamel proximal lesions and non-cavitated occlusal lesions, estimated a longer progression time for proximal outer-enamel lesions to progress to dentin, and were more likely to: recommend topical fluoride and at-home fluoride for non-cavitated lesions in adults, agree with waiting before treating a proximal DEJ lesion in a new lower risk-patient, and believe that it's more important to not fill sound teeth unnecessarily than to risk overtreatment. 66.1% of survey participants stated that they use risk assessment to help in formulating restorative treatment decisions. Those who perform caries risk assessment were less likely (p<0.05) to require restoration for enamel lesions, estimated a longer progression time for proximal outer-enamel lesions to progress to dentin, and were more likely to use topical fluoride and provide a treatment plan for white-spot lesions. **Conclusion:** Disparities exist amongst faculty and students in treatment decisions for non-cavitated caries lesions and use of risk-based caries management. This study was funded by a grant from IUSD.
Comparing ICDAS and Novel Caries Detection Technologies in Secondary Caries


1Indiana University School of Dentistry
2University of Puerto Rico, School of Dentistry Research Center
3Indiana University School of Medicine, Section of Biostatistics

Objective: The International Caries Detection and Assessment System (ICDAS - II) and the Quantitative Light Induced Fluorescence with modified ICDAS criteria (QLF-I) are being used as caries detection methods in a 4 year longitudinal study in schools in the Commonwealth of Puerto Rico. The objective of this study is to assess how clinical ICDAS-II scores compare to QLF-I images as well as the combination of ICDAS-II-QLF-I compared to ICDAS-II and QLF-I individually, as early. Methods: 460 children provided informed consent and were examined with the ICDAS-II and the QLF-I at baseline, 8 months, and 12 months. The enrolled children ranged from 5-13 years old and were mostly Hispanic. The total number of surfaces that were examined was 26,077 including buccal, lingual, occlusal, buccal pits and lingual grooves, with scores 0-6 on ICDAS-II and 0-5 on QLF-I. Results: There was a correlation of 0.77 between ICDAS-II and QLF-I on all surfaces. For scores of 0, QLF-I coincided 86%, score of 1- 55%, score of 2-79.8%, score of 3- 85.7%, score of 4- 95.7%, score 5- 100% and score 6- 98.5%. The correlation between ICDAS/QLF-I combination and QLF-I (all surfaces) is 0.99, and the correlation between ICDAS/QLF-I combination and ICDAS-II (all surfaces) was 0.78. Conclusions: Both ICDAS-II and QLF-I appear to be reliable methods of examining progression of early carious lesions. There was a high correlation between both, comparing individually as well as ICDAS/QLF-I against each one, with a higher correlation of 0.99 when comparing ICDAS/QLF-I with QLF-I. In some instances when evaluating QLF-I alone it gave higher scores to lesions than ICDAS-II alone. The significance of this difference will be determined in a continuation of this longitudinal study to establish if QLF-I or a combination of ICDAS/QLF-I can better assess progression of active carious lesions than ICDAS-II alone. Supported by NIH/NIDCR RO1DE017890-01.

P24

Comparison of Novel Methods Assessing the Erosive Potential of Beverages

J.W. BROUWER, D.T. ZERO, A.T. HARA

1Wabash College, Crawfordsville, Ind.
2Indiana University School of Dentistry, Oral Health Research Institute

Enamel surface softening and surface loss are direct parameters used to determine the erosive potential of acidic beverages. These analyses can be relatively expensive and time-consuming, therefore not adequate for large screening tests. In this study, we hypothesized that two indirect novel methods (pH-stat and ADAF) could adequately reproduce the erosive potential of 10 acidic solutions, determined by percentage of microhardness change (%SMC) and surface loss (SL). Eighty bovine enamel specimens (5x5x2 mm) previously cut and polished were randomly assigned to the 10 experimental groups (n=8) and then immersed in the testing solutions. Each group was exposed to its corresponding testing
solution for 5, 10, and 30 minutes, rinsed with de-ionized water and dried after each immersion. %SMC and SL were determined after each exposure time by optical profilometry and Knoop surface microhardness, respectively. The 10 testing solutions were analyzed by the two novel methods, in triplicate and using standard protocols. Complementary analyses of pH and titratable acidity were performed. Analysis of variance (ANOVA) and Tukey tests (alpha=0.05) showed significant differences among solutions within each exposure time, for both SL and %SMC. Correlation analyses showed that results of pH-STAT and ADAF methods exhibited good correlations with % SMC (>0.81 and >0.81, respectively) and SL (>0.79 and >0.83). Both indirect novel methods tested showed to be promising for the determination of the erosive potential of beverages.

P25
In Vitro Enamel Remineralization Effect of Different Remineralizing Products
H. HIRSCH,* M.R. FONTANA, C. GONZÁLEZ-CABEZAS
Indiana University School of Dentistry

The success of fluoride in preventing and arresting caries is primarily due to its effect in enhancing remineralization of calcium and phosphate into tooth structure at the site of a carious lesion. Some new experimental [e.g., calcium carbonate containing toothpaste tablet by Cooley and Cooley] and already marketed [e.g., MI Paste by GC America] containing Recaldent (casein phosphopeptide amorphous calcium phosphate) products release calcium with the intention to aid in caries remineralization. **Purpose:** Compare the caries remineralization potential of MI Paste, MI Paste Plus (plus fluoride), 1100ppm sodium fluoride dentifrice, and an experimental calcium carbonate tablet. **Methods:** Caries-like lesions (Vickers surface microhardness (SMH) of 25-45) were developed in ninety human enamel specimens. Specimens were then divided in balanced groups (based on SMH) and subjected for 20 days to a cyclic demineralization/remineralization regimen, which consisted daily of a 4-h acid/carbopol demineralization period, four 1-min treatment periods (except for sodium fluoride dentifrice, products were not rinsed off to mimic clinical use), and ~20 h in a saliva mixture (pooled human saliva/artificial saliva). After cycling, specimens were reanalyzed for SMH and the change in hardness (ΔSMH) was calculated (posttreatment-baseline). Specimens were then sectioned, stained, and analyzed using confocal microscopy. **Results:** The re-hardening of the NaF-dentifrice group was significantly (p<0.05) higher ΔSMH (Mean±SD= 70.2±43.7) and the lesion area significantly smaller (7,490±8,356µm²) than the other groups. The experimental tablet (ΔSMH:9.1±10.4; Area:15,259±6,568µm²), MI Paste Plus (ΔSMH:7.0±7.8; Area:17,747±7,835µm²), MI Paste (ΔSMH:2.6±7.0; Area:21,132±5,427µm²), and DI water (ΔSMH:7.2±5.0; Area:18,981±6,200µm²) were not significantly different. **Conclusion:** NaF dentifrice treatment resulted in significantly higher level of remineralization than any of the three tested calcium delivery products in this in vitro remineralization model. Study was supported by an IUSD grant.

P26
Effects of Sealant Thickness on Quantitative Light-Induced Fluorescence Measurements
Sealing incipient caries lesions would be expected to grow in popularity based on recently published evidence-based recommendations. Monitoring the degree of enamel mineralization under a sealant using Quantitative Light-induced Fluorescence could help dental practitioners evaluate the status of demineralization and modify intervention if necessary. **Objective:** To evaluate the effect of sealant thickness on QLF measurements. **Methods:** 224 pre- and post-sealant first molar impressions made with a vinyl polysiloxane material (and poured with Silky Rock die stone. The fabricated models were scanned and analyzed with Proscan 2000A software in order to calculate an average and maximum thickness of the sealant. QLF images were analyzed for average fluorescence loss (ΔF [%]), size (S [mm²]), and ΔQ (ΔF×S [%×mm²]). The data were combined with average and maximum pre- and post-sealant QLF values for each corresponding tooth and analyzed using correlation coefficients. **Results:** 218 out of 224 scanned dies were used for analysis. The mean maximum sealant thickness was 491.6±198.0 µm whereas the mean average thickness was 109.3±50.1 µm. Although a decrease in QLF values occurred after sealant placement, variation in the sealant thickness produced no significant (p>0.05) effect on post-sealant QLF measurements. **Conclusion:** Thickness of a clear sealant does not affect QLF measurements through the material. This study was supported by NIH grant R21 DE018115-01.

**P27**

**Critical Epitopes of Streptococcus mutans in Relation to Dental Caries**


Dental caries is the most prevalent disease in childhood in the US. Antigen I/II is a surface protein of *Streptococcus mutans* important in colonizing dental enamel surfaces and human heart tissue. The specificity of antibody response to antigen I/II, disrupting its function, influences an individual’s susceptibility to dental caries. It is not known which of the epitopes along antigen I/II are most critical in terms of adhesion to the enamel surface. Our goal was to study salivary immune responses to 7 epitopes. We obtained deidentified human saliva samples in accordance with IRB approved protocol #0304-58. Unstimulated whole saliva was used to assess salivary IgA antibody responses to 7 putative critical antigen I/II epitopes. Levels of salivary IgA (S IgA) antibody binding to various peptides were detected using an enzyme-linked immunoabsorbent assay (ELISA) technique. We conducted the experiment at 2 different concentrations of the putative epitope peptides. Total antibody levels were quantified by OD 490nm absorbances of the samples. Two putative critical epitopes (found at positions 834-853 and 1085-1104) of the 7 studied in this study showed promise. Both of them demonstrated more than a 16-fold increase in S IgA binding compared to a control at a concentration of 100 µg/ml. In both experiments one of them had twice the S IgA reactivity (at 100 µg/ml) and 5 times (at 10 µg/ml) the S IgA reactivity than the other 6 putative critical epitopes combined. This epitope was found at positions 1085-1104 along antigen I/II and has the sequence of TLATFNADLTKSATIYPTV. Of the 7 putative critical epitopes examined, the antigen I/II epitopes found comprising positions 834-853 and 1085-1104 may be critical to functionally interfering with the attachment and colonization to the tooth surface of
cariogenic bacteria, which normally leads to dental caries. Supported by a CTSI fellowship and Dr. Katherine Kula of the Department of Orthodontics and Oral Facial Genetics.

P28
Detection of Proximal Lesions: ICDAS II versus Caries Detection Devices
N. MEHTA,* A.G. FERREIRA ZANDONÁ, M. ANDO, G. ECKERT
Indiana University School of Dentistry

Objectives: This study’s aim was to compare the use of visual examination (ICDAS II criteria), fiberoptic transillumination (FOTI, Schott Fibre Optics), digital imaging fiberoptic transillumination (DiFOTI®, Electro-Optical Sciences), Dialux (DL, KaVo), and Midwest Caries Detection (Dentsply) for the detection of proximal caries. Methods: Seventy-two unrestored extracted posterior teeth representing the ICDAS II criteria (0-6) on proximal surfaces were selected. Care was taken to avoid selecting teeth with codes 4-6 on other surfaces. After cleaning, the teeth were mounted on 6 sets of manikins with 6 teeth mounted on each model (1 premolar and 2 molars per quadrant) with proximal surfaces in contact. Training was conducted on all methods prior to study initiation. The manikins were mounted on Phantom heads and three examiners conducted the exams on two occasions at least 24 hours apart following manufacturer’s instructions. The following criteria was used with FOTI and DIALUX: 0-sound, 1-lesions confined to enamel, 2- large shadow visible (inner portion of enamel or at DEJ), 3-shadow in dentin, 4->4 mm in diameter; DiFOTI:0-no shadow, 1-light gray shadow, 2-dark gray shadow, 3-loss of tooth structure or translucent light surrounded by dark shadow; and Midwest: 0-sound, 1- slow signal, 2-medium signal, 3-loud signal. Results: Inter-examiner agreement was high for ICDAS (ICC=0.84), FOTI (ICC=0.83), and DiFOTI (0.80). There was moderate agreement for Dialux (ICC=0.78) and Midwest (ICC=0.68). Intra-examiner agreement varied from 0.69 to 0.97 for FOTI; 0.76 to 0.82 for DiFOTI; 0.89 to 0.98 for Dialux; 0.61 for Midwest; and 0.92 to 0.99 for ICDAS. Conclusion: Agreement (inter and intra) was acceptable for all methods. Midwest agreement was lower likely due to the fact that it emits three sets of sounds which were somewhat difficult to accurately distinguish.

P29
Gel vs. Liquid Etchant for Conditioning Fissures Before Sealant Placement
S. POWELL,* G.J. ECKERT, T. KULA, A.E. SOTO-ROJAS

Use of phosphoric acid for the conditioning of pit and fissure systems prior to sealant placement is recommended. Objective: Assess the efficacy of gel phosphoric acid etching products compared to liquid phosphoric acid products paired with sealants on posterior extracted teeth. Methods: 72 extracted human posterior ICDAS code 0 teeth were visually selected and randomly assigned to 6 groups. Each tooth was cleaned using a toothbrush. 6 (3 gel and 3 liquid) brands of etchants (e) were selected: Acid Etch, Bosworth, US. (e1), Etch 35 Gluma GR. (e2), Etch Zenith Dental US. (e3), Etch, Premier US. (e4), Total Etch Ivoclar Vivadent AG. (e5). Enamel Etch Temrex US (e6). A clear (Helioseal Clear Chroma, Ivoclar Vivadent AG) and opaque sealant (Delton DDS Dentsply 0% filled) were selected
and applied according to manufacturer’s instructions. Teeth were thermocycled 5,000 times and immersed in 1% Methylene Blue for 24 hours. Teeth were sectioned buccal-lingually and 216 sections were obtained. Final results will be analyzed using two-way ANOVA test (5% significance level). **Results:** Sections were analyzed for microleakage, fissure type, sealant penetration and depth of fissure. Preliminary results indicated a low percentage of sealants developed microleakage. Microleakage did not correlate to any variable. Sealant penetration correlated to depth of fissure with increased depth or fissure type leading to incomplete fill or penetration. **Conclusion:** Trends indicate the penetration of sealant is dependent on the type of fissure and not the etchant formulation.

**P30**

**Evaluation of ART Techniques on Extracted Teeth**

M. RASCHE,* A.E. SOTO-ROJAS  
Indiana University School of Dentistry

The Atraumatic/Alternative Restorative Treatment (ART) was developed for use in underserved communities. The objective of this study was to determine effectiveness of removing decay using invasive and non-invasive ART techniques on in-vitro teeth. This preliminary study involved teeth selected with ICDAS scores of 5 and 6. Teeth were divided in three groups, consisting of different caries removal techniques; i) a rotary prophy cone brush, ii) hand instruments, and iii) a ½ round carbide bur. After removing soft carious tissue, teeth were restored with a high-viscosity glass ionomer. Teeth were isolated using a varnish to within 1 mm from the restoration edges and submerged in 1% methylene blue for 24 hours. Teeth were embedded in epoxy resin and sectioned by means of a sawing apparatus occlusally through the mesial, central, and distal pit areas of the restoration/ teeth. The resulting six image sections from the four fragments were then scored using a 20x microscope by two independent observers. Unexcavated caries found in the walls and bases were scored along with dye penetration. For this preliminary study 27 sections per group were assessed. In the rotary prophy brush group, wall and base caries were found in 100% of the sections with 33% having dye penetration. In the hand instrument group wall caries were found in 70%, base caries were found in 20% and dye penetration occurred in 50%. In the bur group wall caries were found in 62.5%, base caries were found in 20% and 0% had dye penetration. Statistical differences were found when comparing the soft brush vs hand and bur groups. The results suggest that removing decay with the aid of a bur featured less unexcavated caries and had better marginal adaptation of restoration than teeth treated with a prophy brush or hand instruments.

**P31**

**Comparing ICDAS on Root Surfaces with Unconventional Caries Detection Tools**

I. ZECKEL,* A.G. FERREIRA ZANDONÁ, G. ECKERT  
Indiana University School of Dentistry, Doctor of Dental Surgery Program
The objective of this study was to compare sensitivity and specificity of five different methods of caries detection: the visual criteria, International Caries Detection and Assessment System (ICDAS), DIAGNODent (DD; Kavo, Germany), Quantitative Light-induced Fluorescence (QLF, Inspектор Pro System, The Netherlands), and the off label use of D-Carie (NEKS Technologies Inc., Laval, QC, Canada), and Midwest Caries I.D. (MCID; Dentsply professional, York, PA, United States) on root surfaces of permanent teeth using histology as the gold standard. One hundred root surfaces on extracted permanent teeth were selected based on the ICDAS criteria for root caries (0-2). Forty samples were sound (20 of which with of abrasion and/or erosion) and 30 samples scores 1-2. Each surface was digitally imaged, 1:1 macro lens, (Nikon SMZ1500, NIKON INC.). The teeth were dried (5sec) imaged with QLF and then analyzed for lesion area (mm²), mean change in fluorescence(df%), and area x df (dQ). DD peak readings were taken on dry teeth (5sec). D-Carie and MCID measurements (off label use) were taken on wet teeth. ICDAS, DD, D-caries, and MCID measurements were repeated. All teeth were hemic-sectioned (Hamco Machines, INC) and wet sections were evaluated (2:1) under a stereomicroscope (Nikon SMZ1500, NIKON INC.) to assess lesion extension into dentin, which was divided into thirds. 

Intra-examiner repeatability (Kappa) ranged from 0.87 (ICDAS and DD) to 0.48 (MCID). QLF df correlation to histology was highest (0.87), followed by QLF area(0.85), DD(0.83), D-carie(0.75), QLF dQ(0.55) and MCID(0.38). The area under the ROC curve was highest for DD(0.96) followed by QLF df(0.95), ICDAS(0.93), D-carie(0.73) and MCID(0.66). Sensitivity and specificity were ICDAS(94%,88%), DD(79%,94%), MCID(56%, 80%), NEKS(41%,92%), dQ and area(9%,100%) and df(0%,100%). The best combination of sensitivity and specificity for root caries detection was determined to be ICDAS.

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P32

Longitudinal Study: Comparison between Clinical ICDAS-II Scores vs. QLF-I Images

A.G. FERREIRA ZANDONÁ1, H. EGGERTSSON1, E. SANTIAGO2, M. GARCIA CORRETJER3,* G.J. ECKERT3, B. KATZ3, M.S. MAU1, J. TRAN1, D.T. ZERO1

1Indiana University School of Dentistry
2University of Puerto Rico School of Dentistry Research Center
3Indiana University School of Medicine, Section of Biostatistics

Objective: The International Caries Detection and Assessment System (ICDAS - II) and the Quantitative Light Induced Fluorescence with modified ICDAS criteria (QLF-I) are being used as caries detection methods in a 4 year longitudinal study in schools in the Commonwealth of Puerto Rico. The objective of this study is to assess how clinical ICDAS-II scores compare to QLF-I images as well as the combination of ICDAS-II-QLF-I compared to ICDAS-II and QLF-I individually, as early. Methods: 460 children provided informed consent and were examined with the ICDAS-II and the QLF-I at baseline, 8 months, and 12 months. The enrolled children ranged from 5-13 years old and were mostly Hispanic. The total number of surfaces that were examined was 26,077 including buccal, lingual, occlusal, buccal pits and lingual grooves, with scores 0-6 on ICDAS-II and 0-5 on QLF-I. Results: There was a correlation of 0.77 between ICDAS-II and QLF-I on all surfaces. For scores of 0, QLF-I coincided 86%, score of 1- 55%, score of 2-79.8%, score of 3- 85.7%, score of 4- 95.7%, score 5- 100% and score 6- 98.5%. The correlation between
ICDAS/QLF-I combination and QLF-I (all surfaces) is 0.99, and the correlation between ICDAS/QLF-I combination and ICDAS-II (all surfaces) was 0.78. Conclusions: Both ICDAS-II and QLF-I appear to be reliable methods of examining progression of early carious lesions. There was a high correlation between both, comparing individually as well as ICDAS/QLF-I against each one, with a higher correlation of 0.99 when comparing ICDAS/QLF-I with QLF-I. In some instances when evaluating QLF-I alone it gave higher scores to lesions than ICDAS-II alone. The significance of this difference will be determined in a continuation of this longitudinal study to establish if QLF-I or a combination of ICDAS/QLF-I can better assess progression of active carious lesions than ICDAS-II alone. Supported by NIH/NIDCR RO1DE017890-01.

DENTAL MATERIALS (ENDODONTICS)

P33
Evaluation of Nanocomposite Incorporation into a Novel Endodontic Retrofill Material
R. REESE,* S. CHOGLE, A. MICKEL, S. SHEIKH, C. DUHAIME, S. POTLURI, J. BOGLE, C. RHIEU
Case Western Reserve University School of Dental Medicine

The goal of endodontic surgery is to excise peri-radicular pathology and seal the apical portion of the root to prevent post-operative infection. Current root-end sealing materials, although effective, may display certain disadvantages such as shrinkage, technique sensitivity, and moisture contamination. Polymer nanocomposites (PNCs) are a new class of polymeric materials composed of nanoparticles such as carbon nanotubes or organoclays dispersed at a nano-scale in a polymer matrix. PNCs offer substantial improvements in mechanical and thermal properties as well as drug elution characteristics and make potentially promising candidates as root-end sealing materials. The aim of this pilot study was to evaluate the apical seal of two polymer/monomer matrix (PMM) combinations containing C18-nanocomposite (NC) with a commonly used retrofilling material, Geristore®. Methods: Root ends of thirty-six teeth were resected, prepared, and then sealed with a PMM material. Group 1(PMM1) consisted of monomers: 2,2-bis[p-(2-hydroxy-3-methacryloxypropoxy)phenyl]propane (Bis-GMA), triethylene-glycol-dimethacrylate (TEGDMA), and hydroxyl-ethyl-methacrylate (HEMA); photoinitiators: camphorquinone (I2), and ethyl-4-N,N-dimethylaminobenzoate (I3); and polymethylmethacrylate as the polymer. Group 2(PMM2) consisted of HEMA, urethane-dimethacrylate (UDMA), I2, I3, and polymer. Group 3(PMM1/NC) consisted of PMM1 and NC. Group 4(PMM2/NC) consisted of PMM2 and NC. Group 5 was Geristore®. Positive and negative controls were also used (3 each). Each root was placed in a leakage apparatus and inoculated with Enterococcus faecalis. Turbidity as a sign of leakage was assessed daily for two weeks. Results were statistically analyzed using ANOVA and Tukey t-tests. All groups displayed varying degrees of leakage except for PMM1/NC which displayed no leakage (P < 0.01). Groups with NC showed significantly less leakage than groups without NC including Geristore®. However, Geristore® showed significantly less leakage than groups without NC (PMM1,PMM2). The addition of NC was suggested as the reason for the significant decrease in leakage. Within the confines
of this study, PMM1/NC should be further investigated for its use as an endodontic root-end sealing material.


diagnostic systems
P34
The Effects of Magnification on Caries Detection
A. STUMP,* M.R. FONTANA, C. GONZÁLEZ-CABEZAS, H. EGGERTSSON, G. ECKERT
Indiana University School of Dentistry

Use of magnification is becoming common in dental practice, yet there is very little understanding how magnification influences the assessment of caries lesion severity. Objectives: It was our objective to compare the effects of magnification use on visual caries lesion detection criteria scores. Methods and Materials: One hundred and forty-four permanent human molars were selected using the International Caries Detection and Assessment System criteria-ICDAS without the use of magnification (selected teeth had severity scores ranging from 0-6). Teeth were randomly numbered and mounted in twelve “dentoform” models. Dental examinations using ICDAS criteria were done in simulated dental conditions by inserting the dentoforms into a phantom head and examined by three trained and calibrated examiners using unaided vision (0x) and three magnifications (2.5x, 3.5x, and 5.5x). Seventy-two randomly selected teeth were re-examined by all examiners. Results: Intra-examiner repeatability was high for all three examiners for all magnifications. For 0x magnification, all three examiners had interclass correlation coefficient (ICC) values of 0.94. For 2.5x magnification, all three examiners had ICC values above 0.88. For 3.5x magnification, all three examiners had ICC values above 0.95. For 5.5x magnification, all three examiners had ICC values above 0.96. Inter-examiner agreement was also high, thus indicating good agreement between examiners (ICC=0.90 for magnification 0x, 0.90 for magnification 2.5x, 0.91 for magnification 3.5x, and 0.89 for magnification 5.5x). ICC values for inter-examiner agreement with the original ICDAS scores were high for all 3 examiners, indicating good agreement (ICC=0.92 for examiner 1, 0.89 for examiner 2, and 0.87 for examiner 3). The comparison between the different magnifications showed no significant differences (ICC values were all above 0.92). The correlation between the outcomes and histology scores was high, ranging from 0.78 to 0.88. There were no statistically significant differences between magnification levels when using data from all examiners for any of the outcomes. The areas under the ROC curves were all over 0.90, specificity was greater than 0.8, and sensitivity was greater than 0.90. It is concluded that magnifications up to 5.5x did not have a significant effect on how caries is visualized versus unaided vision. This study was supported by a grant from IUSD.
EDUCATIONAL RESEARCH

P35
Integration of Curricular Elements to Demonstrate Outcomes of Critical Thinking
L.L. COAN,* J. HUDSON
Indiana University School of Dentistry
Department of Periodontics and Allied Health, Dental Hygiene Program

Faculty recognize and acknowledge it is important to develop critical thinking skills in students. Designing purposeful assignments measuring attainment of effective critical thinking skills can be problematic. The purpose of this project was to assess the critical thinking skill sets learned by dental hygiene students during a course in evidenced-based practice and implemented in a preventive dentistry course. Students were given an assignment in the preventive dentistry course (taught concurrently with the evidence-based course) investigating the validity of manufacturers’ claims of dental products. Using skills learned in the evidence based course, students demonstrated critical thinking by meeting the objectives of the assignment. The project also required students to develop a PowerPoint presentation and poster to present their findings to the class and to display in the clinical reception area for patient use. Using the critical thinking assessment questions found in the National Survey of Student Engagement (NSSE) survey, a student and faculty survey were developed to assess the attainment of the skills described above. After obtaining IRB approval (EX0808-22) and upon completion of the project, students were asked to complete the survey. Faculty reviewed the PowerPoint presentations and posters and completed the survey. Survey results revealed that all faculty believe the assignment showed evidence of critical thinking based on the NSSE criteria. All students and faculty responded similarly with the exception of memorizing and synthesis. 62.5% of students and 20% of the faculty believed the assignment required some or very little memorization. 50% of the students and 20% of the faculty believed the assignment required some or very little synthesis and organization of ideas and information into new interpretations. 68.75% of students compared to 40% of faculty believed making judgments was an important part of the project. Faculty and students were in consensus (selecting ~60% “quite a bit” and ~20% “very much”) that the assignment caused them to apply theory to a practical problem or a new situation. Development of assignments to implement concepts throughout the curriculum is an effective way to demonstrate outcomes in critical thinking. Faculty members should develop assignments that may be integrated throughout the curriculum in order to measure critical thinking purposefully.

ENDODONTICS

P36
Endodontic Treatment of a Patient on Intravenous Bisphosphonate Therapy
S. CHRISTENSEN,* M.M. VAIL
Indiana University School of Dentistry
A condition known as Bisphosphonate-Related Osteonecrosis of the Jaw (BRONJ) adversely affects the quality of life and produces significant morbidity in afflicted patients. The use of intravenous bisphosphonates for treatment of cancer-related conditions and osteoporosis can lead to necrotic bone formation in response to osseous injury. A 74-year-old male presented to the Graduate Endodontic Clinic with a history of IV bisphosphonate (Aredia) treatment from 2002 to 2006 for therapy consistent with the treatment of multiple myeloma. Intraoral exam revealed multiple hopeless, fractured, and carious teeth in need of extraction; however, due to his bisphosphonate treatment and the risk of the development of BRONJ, less invasive non-surgical root canal therapy was preferred. In all, twelve root canals were completed including a perforation repair and second retreatment of a lower first molar. Patients on IV bisphosphonate therapy are at risk of BRONJ and less invasive dental treatment must be considered.

P37

**Regenerative Treatment of a Trauma-Induced Necrotic Tooth**

C. THIESSEN, * M.M. VAIL

Apexification techniques for immature, necrotic teeth offer high levels of success, however an alternative therapy may consist of regeneration in which the necrotic pulp tissue is removed and replaced with vital pulp tissue to promote further physiologic development. This case report describes the treatment of a trauma-induced necrotic, immature, permanent central incisor by a regenerative approach, instead of the conventional apexification technique. After the diagnosis of necrosis with asymptomatic apical periodontitis, the tooth was accessed and purulent drainage noted. The canal was disinfected with copious amounts of sodium hypochlorite; an interim treatment of calcium hydroxide, followed by a mixture of a triple antibiotic paste was placed. After the disinfection protocol was complete, the periapical tissue was mechanically stimulated to induce intracanal bleeding allowing a blood clot to form up to the level of the cemento-enamel junction. Mineral trioxide aggregate was placed coronally on top of the blood clot followed by a double seal of Cavit. After three months, both clinical and radiographic evidence suggested a favorable biological response with this newly developed treatment protocol. This case report confirmed that successful regeneration of previously necrotic-infected canals is possible provided the canal environment can be effectively disinfected.

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**EXPERIMENTAL PATHOLOGY**

P38

**Alendronate as a Contributing Factor to Osteonecrosis of the Jaw**

J. JENKINS, * J. SUN, L.J. WINDSOR

Indiana University-Purdue University Indianapolis, Department of Biology
Bisphosphonates are a class of inorganic pyrophosphates used to inhibit osteoclast activity as a treatment for osteoporosis. Evidence has recently surfaced implicating bisphosphonates as a causative factor in the onset of osteonecrosis of the jaw. Furthermore, it has been hypothesized that matrix metalloproteinase-2 (MMP-2) is a candidate gene for bisphosphonate-induced osteonecrosis of the jaw. The purpose of this study was to determine the effects of alendronate, a common amino-bisphosphonate, on human gingival fibroblast (HGF) proliferation and viability, as well as on HGF-mediated collagen degradation and MMP-2 activity. A water soluble tetrazolium (WST-1) assay kit and a lactate dehydrogenase (LDH) assay kit were used to determine the effects of alendronate on cell proliferation and viability, respectively. Cells were grown for 72 hours for the WST-1 and LDH assays. 6-well plates with collagen were used to determine the effects of alendronate on collagen degradation. 7.5x10⁴ cells were seeded in collagen coated plates and grown for 3, 5 and 7 days in 2 mL Dulbecco’s Modified Eagle’s Media devoid of growth serum. The alendronate concentrations used were 10⁻⁴ up to 10⁻⁸ M. Zymography was used to determine alendronate’s effect on MMP-2. The source of MMP-2 used for zymography was media from the HGF-mediated collagen degradation assays. MMP-2 was separated by zymography and the gels were incubated for 22 hours at 37°C with 10⁻⁵ to 10⁻³ M alendronate. To test the amount of MMP-2 in the collagen plate media, a zymography assay was performed. Media from the collagen plates was used for zymography except that they were not incubated with alendronate. The zymograms were stained with coommassie blue dye to visualize proteolytic activity. The WST-1 assays showed significant (p<0.05) changes in cell proliferation at 10⁻⁵, 10⁻⁴ and 10⁻³ M (80, 32.9 and 2.1%, respectively). LDH assays showed significant cytotoxicity at concentrations of 10⁻⁵, 10⁻⁴ and 10⁻³ M (26.5, 36.5 and 49.4%, respectively). The HGF-mediated collagen degradation assays showed no change in collagen degradation with the addition of alendronate at non-toxic levels. The zymography results showed no significant inhibition of MMP-2 until a concentration of 10⁻³ M, while the enzyme at 10⁻² M was almost completely inhibited by the alendronate. Alendronate was found to be toxic to human gingival fibroblasts within 5 days at concentrations of 10⁻⁴ M and higher. Alendronate was determined to inhibit MMP-2 at levels 100 times higher (10⁻³ and 10⁻² M) than those that were toxic to human gingival fibroblasts. Funding for this study was provided by Life Health Sciences Internships.
Case Western Reserve University School of Dental Medicine

β-defensins are cationic antimicrobial and immunoregulatory peptides that are expressed in epithelia. Their genes have been mapped to chromosome 8p22-p23, which has been shown to be a site of complex genetic variation. DEFB1 (encodes hBD-1) is constitutively expressed and has 2 copies per diploid genome (PDG) whereas DEFB4 (encodes hBD-2) and DEFB103A (encodes hBD-3) are inducible and have multiple copies that range from 2-12 PDG. Ethnic diversity exists in SNP frequency and subsequent haplotypes. We have shown in previous studies that a specific haplotype in DEFB1 is associated with protection against fungi infection, while its peptide, hBD-1 has limited antifungal efficacy when compared to hBD-2 or 3. The objective of this study was to test if the specific haplotype in DEFB1, which is linked to protection, is associated with high copy numbers in both DEFB4 and DEFB103A genes. We genotyped 50 ethnically diverse, healthy individuals and 69 genomic DNA samples from the Coriell ethnic diversity panel. High throughput SNP assays were developed using a multiplex ligase detection reaction assay (MLDR), for DEFB1 haplotype determination. Quantitative real time PCR assays (QPCR) were performed for copy number determination in the DEFB4 and DEFB103A genes. A positive correlation exists with the specific haplotype comprised of three SNPs (-52, -44 and -20) in the 5'UTR of DEFB1 with increased copy number in the DEFB4 and DEFB103A genes. These results suggest the likelihood of linkage between the 2 copy per genome DEFB1 gene haplotype and the multi-copy variants of DEFB4 and DEFB103A. Interpersonal variability in copy number polymorphism may contribute to variability in predisposition to mucosal infections. Supported by NIH/NIDCR 1 K23 DE016110-01A1.

HEALTH CARE SYSTEM

P40
Reading Level of New Patient Information Provided Dental School Websites
R.D. JACKSON
Indiana University School of Dentistry

The average English-speaking American reads at approximately a 5th grade level. The objective of this investigation was to determine the grade level necessary to read information provided to prospective patients at US dental schools using accepted methods for assessing the readability. A list of US dental schools was generated, arranged alphabetically by state and numbered consecutively. A random number generator was used to select a list of 29 dental schools. Each school's website was accessed and the information provided to prospective patients was analyzed. In most cases, the information included: services offered, hours, contact information, fee management and directions. Paragraphs were chosen randomly and analyzed using SMOG (Simple Measure of Gobbledygook) and the Flesch-Kincaid Grade Level (FK) test. SMOG analyzes the number of polysyllabic words from 30 randomly selected sentences in the document to derive a score and the grade level necessary to read the material. SMOG has a 0.985 correlation with the grades of readers who have 100% comprehension of the
materials. The FK rates text on a grade level so that a score of 8.0 indicates that an 8th grader can understand the document. It is usually recommended that informational materials achieve a score of 7.0 to 8.0 with the FK. Analyses of the data indicated the mean grade level to read the materials was 13.2 ±1.9 years (range 10.5-20.2) with SMOG and 12.0s 2.0 with the FK. The conclusion is information provided on the examined websites was written at a reading level exceeding that of most Americans. Dental schools should assess the reading level of information provided to prospective patients to determine whether the words used are appropriate to relay what they wish to convey and attempt to provide this information in a manner that is understandable all prospective patients.

INFECTION CONTROL

P41
Methicillin Resistant Staphylococcus aureus Present on Dental Student Laptop Computers
R. DUNLOP, * C. PALENIK, M.J. KOWOLIK
Indiana University School of Dentistry, Doctor of Dental Surgery Program

Background: Computers have become ubiquitous in healthcare. Studies suggest that keyboards and mice may contribute to cross-transmission of microorganisms. Objectives: This study evaluated the number of multiple drug resistant Staphylococcus aureus (MRSA) isolates present on dental student personal laptops before and after disinfection. Materials and Methods: 52 Second Year (pre-clinical) and 42 Fourth Year (clinical) Dental Students participated. All information collected remained confidential (IRB 07-9-64). There were two microbial samplings - prior to disinfection and then after. Three cotton swabs moistened with PBS (0.85 M, pH 7.2) sampled the entire top surface of each laptop. The swabs went into 2.0 mL of PBS and were then vortexed. Spiral plating of specimens onto an enriched trypticase soy agar (ETSA) plates and a mannitol salt agar (MSA) plate followed. Aerobic incubation was at 37°C for 48 hours. All colony types underwent sub-culturing in trypticase soy broth with 0.25% (w/v) glucose. Aerobic incubation was at 37°C for 48 hours. Spread plating of 0.1 mL specimens then involved five types of media - MSA, cefoxitin screening test (ETSA with antibiotic discs), oxacillin resistance screening agar, BBL CHROMagar and Bio-Rad MRSASelect. Aerobic incubation was at 35°C for 48 hours. After initial sampling, three weekly wipe disinfection processes occurred. Disinfection involved CaviWipes (Metrex, Orange, CA). Sampling of the laptops was as just described. Results: Pre-disinfection specimens from Second Year (Fourth Year) laptops produced 109 (148) isolates of which 74 (41) were S. aureus. 23 (7) laptops yielded 23 (11) MRSA isolates of which 6 (8) were also cefoxitin resistant. Sampling after disinfection produced 90 (114) isolates of which 59 (49) were S. aureus. 35 (6) laptops produced 36 (8) MRSA isolates of which 2 (5) were also cefotamine resistant. Results from CHROMagar and MRSASelect agreed in 96% of cases. 31.7% (14.3%) of all laptops evaluated produced drug resistant S. aureus isolates. Three weekly disinfection procedures did not reduce the number of MRSA isolates cultured. Conclusions: Results of this study indicate that MRSA was present on some laptops sampled and the inability of a weekly cleaning and disinfection to reduce the microbial loads. It
appears there is a need for more frequent disinfection procedures to achieve laptops relatively free of microorganisms.

P42
Going Green at University of Detroit Mercy School of Dentistry
J. AU-YEUNG,* C. KUXHAUS, M. WHEATER
University of Detroit Mercy School of Dentistry

The aim of the study was to measure the compliance of dental faculty, staff, and students with a recycling program and to quantitatively measure paper and plastic waste. A quantitative analysis of compliance with a recycling program at the University of Detroit Mercy School of Dentistry was performed. Clearly labeled recycling bins were placed in the following areas: Junior clinic, Graduate Periodontics, Wet lab, Oral Surgery, AEGD (Advanced Education in General Dentistry), Dispensary, Graduate Endodontics, Emergency clinic, Implant screening, Pediatric Dentistry, Radiology, Orthodontics, Faculty practice, and Senior clinic. Participants were instructed to place only sterilization wrappers (paper and plastic) into the bins. Material was collected daily at the end of each afternoon clinic session, and the paper and plastic was sorted, separated, and weighed. Dispensary provided information as to the amount of sterilization wrappers that were dispensed during the week. The study was done for two weeks. The estimated total weight of sterilization wrappers that were dispensed during each week was 71.05 pounds. During the acclimatization week of September 8-12, 2008, a total of 26.75 pounds of recyclable material was collected. This correlates to a compliance of 37.64%. For the week of September 15-19, 2008, 25.65 pounds of paper and 17.65 pounds of plastic were collected for a combined total of 43.2 pounds of material. This correlates to a compliance of 60.80%. As health care providers we should be the agents of change in reducing our environmental impact by promoting environmental health and thus human health. By gathering data and providing concrete evidence on the impact our school has on the environment, we can analyze the results and create an economically feasible and environmentally friendly way to practice dentistry. The results of this study could then be implemented at other dental schools or health care facilities. Supported by an internal grant from UDMSOD.

MICROBIOLOGY/IMMUNOLOGY

P43
Effect of Nicotine on Streptococcus mutans Hydrophobicity in Sucrose-Free Media
C. RAUCH,* R.L. GREGORY
Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center
Antigen I/II polypeptides on the Streptococcus mutans cell surface are known to interact with immobilized salivary agglutinin, which facilitates bacterial binding to the salivary pellicle. Additionally, antigen I/II plays an important role in S. mutans hydrophobicity. Null mutation of this antigen has been shown to significantly decrease the hydrophobicity of S. mutans, thus decreasing the bacteria’s ability to bind to the salivary pellicle where it can exert its cariogenic effects. It is well documented that smoking causes increased caries rates, and it is thought that this could be at least in part attributed to increased S. mutans hydrophobicity via nicotine-induced upregulation of antigen I/II. Nicotine has been shown to cause upregulation of this antigen, however it has not yet been shown that nicotine exposure leads to a significant increase in S. mutans hydrophobicity. **Objective:** To determine the effect of various nicotine concentrations on S. mutans hydrophobicity. **Methods:** To investigate whether nicotine treatment affects S. mutans UA159 hydrophobicity, serial dilutions of nicotine ranging from 0.0156mg/mL to 2mg/mL were made in sucrose-free TSB media. 100µL of UA159 cell suspension was added to each dilution, and all were incubated for 24 hours. A control sample with no added nicotine was also utilized. Optical density of each sample was measured with a spectrophotometer at 600nm. Hexadecane was added to all samples and vortexed for 1 minute. After separation of the aqueous and organic layers, the optical density of the aqueous layer at 600nm was measured with the spectrophotometer. Adsorption was calculated as the percentage loss in OD600 relative to that of the initial cell suspension according to the following formula: Adsorption = [(initial OD600 – final OD600)/initial OD600] x 100. The adsorption value indicates the hydrophobicity of the S. mutans samples as a result of nicotine treatment. Analysis was completed in duplicate. **Results:** Compared to the control sample which showed 28.58% adsorption from the aqueous phase into the organic phase, a significant increase in percent adsorption was observed in the nicotine treated samples. A general trend of increasing hydrophobicity with increasing nicotine concentrations up to 0.125 mg/mL was observed, with decreasing values seen at higher concentrations. The maximum adsorption of 43.33% was observed at a concentration of 0.125mg/mL, and the minimum of 30.88% was observed at 1mg/mL nicotine. **Conclusion:** This preliminary data indicates that exposure of S. mutans UA159 cells to nicotine treatment leads to a significant increase in hydrophobicity of the cells, as indicated by an increase in percent adsorption of UA159 cells from the aqueous into the organic layer after hexadecane treatment. Additionally, a general trend of increasing hydrophobicity with increasing nicotine concentration was observed up to a concentration of 0.125 mg/mL nicotine, after which point hydrophobicity appeared to decrease. Similar results were observed in additional assays.
Cairo University, Faculty of Oral and Dental Medicine, Cairo, Egypt
National Research Centre, Department of Oral and Dental Surgery, Cairo, Egypt

Periodontitis and osteoporosis are serious public health concerns that are associated with pathological bone remodeling and loss of bone. This study investigated the expression of a key mediator that regulates differentiation of osteoclasts, receptor activator of nuclear factor kappa B ligand (RANKL), in rats with or without osteoporosis and periodontitis to better understand the association between these two common diseases. Forty adult Albino rats were equally divided into four groups: (1) a control group, (2) experimentally induced periodontitis group, (3) experimentally induced osteoporosis group, and (4) experimentally induced osteoporosis and periodontitis group. At the end of the experimental period, blood samples were obtained and animals were sacrificed. Serum alkaline phosphatase activity levels were measured. Histological evaluation and immunohistochemical detection of RANKL in the periodontal ligament and bone tissues were performed. The results demonstrated that there were more RANKL-positive cells in all the experimental groups than in the control group. The percent of RANKL immunoreactive cells in both the periodontal ligament and bone tissues in group 4 (16.8±5.1 and 11.2±5.2, respectively) was significantly higher (P<0.001) than in the other groups. In the periodontal ligament, the percent of RANKL immunoreactive cells in group 2 (10.1±1.9) was significantly higher (P<0.001) than in group 3 (5.3±2.7) and the control group (4.12±1.5). It was concluded that the osteoporotic state significantly increased the bone loss resulting from ligature-induced periodontitis. An additive effect was observed between these diseases and this was seen by the significant increase in RANKL immunoreactivity.

P45
Tβ4 Adjuvant to Chlorhexidine in an Organotypic Human Tissue Model
R. RETI,* M. WHEATER
University of Detroit Mercy School of Dentistry

Chlorhexidine Gluconate (CHX) is used in the management of periodontitis and as an anti-bacterial agent to reduce post operative infection. CHX has however been documented as being cytotoxic to cultured human gingival fibroblasts (HGF). Our lab has been successful in demonstrating a role for thymosin beta4 (Tβ4) in reducing the cytotoxicity of common dental chemotherapeutics including CHX in cultured HGF. To extend our previous studies using HGF, the aim of this study is to examine the efficacy of using Tβ4 as an adjuvant to CHX rinses (in the presence or absence of alcohol) in an organotypic model of human gingival epithelium. Using non-transformed differentiated human-derived epithelial tissues arranged in a multilayered tissue sample that closely parallels native human gingival tissues (EpiGingival model, MatTek), solutions of CHX containing 12% ethanol, CHX without added ethanol, and 12% ethanol only were applied with or without varying concentrations of Tβ4 (0.1, 1.0, 5.0, and 10.0 µg/ml) for 30 seconds. The challenge solutions were then removed and replaced with culture medium. Culture media was sampled at 2, 4, 6, and 8 hours after challenge solution and LDH levels were quantified using a colorimetric assay (BioVision). Tβ4 was able to significantly reduce the known cytotoxicity of CHX without alcohol at all time points. At a concentration of 1.0 µg/ml, Tβ4 appeared to be the most
beneficial. When tested against CHX containing alcohol Tβ4 appeared to be non-effective, and similar results were obtained against the 12% ethanol challenge solution. Tβ4 is an effective adjuvant to alcohol free CHX and has a clinical application in reducing its cytotoxic effects. Supported by an internal grant from UDMSOD and by an AADR Student Research Fellowship to R. Reti.

ORTHODONTICS

P46
The Relationship between Nasopharyngeal Airway Size and Transverse Dentoskeletal Dimensions
A. GHONEIMA,* E. ABDEL-FATTAH, S. IBRAHIM, D. MOHAMED, J. HARTSFIELD JR., K. KULA
Faculty of Dental Medicine Al-Azhar University, Cairo, Egypt
Indiana University School of Dentistry

The form and dimensions of the nasopharynx together with the normal nasorespiratory function has been of interest to orthodontic researchers since it plays a fundamental role in the development of the dentofacial morphology. The objective of this study was to correlate the nasopharyngeal dimensions with the different dentoskeletal patterns in anteroposterior and transverse directions. **Subjects and Methods:** The study was conducted on 80 male subjects were classified into test group and control group. The test group consisted of 60 males who were classified into three equal subgroups (20n each) according to their skeletal anteroposterior relation (ANB) between the maxilla and the mandible into class I, class II and class III. The range of ANB angle was 2 to 4 degrees in class I, 5 to 8 degrees in class II, and -1 to -4 degrees in class III. The control group consisted of 20 subjects with normal dentoskeletal pattern ANB was 2-4 degrees. Lateral and posteroanterior cephalometric radiographs were taken for each subject. From these radiographs; 11 nasopharyngeal, 10 anteroposterior, and 15 transverse measurements were determined and recorded. **Results:** The results from the present study showed: (1) Class II subjects had larger nasopharyngeal airway area and larger sagittal depth of the nasopharynx than class I or class III subjects at (P ≤ 0.01). (2) Class III subjects showed larger bi-maxillomandibulare width and bi-lateronasal width than class II subjects while, class II subjects showed larger bi-gonial width and bi-mastoid width than class I and class III subjects at (P ≤ 0.05). **Conclusions:** On the basis of the results obtained from this study, it was concluded that: (1) Class II subjects showed larger nasopharyngeal airway area and larger sagittal depth of the nasopharynx than class I and class III subjects. (2) Class III subjects showed larger bi-lateronasal width than class II subjects while, class II subjects showed larger bi-gonial width than class I and class III subjects. (3) The assessment of the nasopharyngeal structures should be included with the orthodontic diagnosis and treatment planning as the functional, positional, and structural assessments of the dentofacial pattern are carried out.
PEDIATRIC DENTISTRY

P47

Is Prehypertension Apparent in the Child Population: A Pilot Study of Three Races
M.K. BUSKIRK,* J.E. KOWOLIK

In the adult population there is an accepted relationship between hypertension and the risk of cardiovascular disease which includes myocardial infarction, heart failure, stroke and renal insufficiency. These may be prevented if the hypertension is recognized and treated early. In adults, the risk of hypertension differs between races; it is less clear if this is true for children. **Objective:** The object of this study is to evaluate whether pre-hypertension and hypertension are apparent in the child population and if there are racial differences. The information gathered will help decide whether it is advisable to check the blood pressure of a child patient at each dental visit. If there are differences between the races it will be possible to tailor culturally sensitive education and prevention programs. **Methods:** Parents completed a questionnaire identifying the child’s age, sex, race/ethnicity, activity level, family history of high blood pressure, and medical history. The child’s weight, height, blood pressure and heart rate was measured. The BMI was then calculated, and the NIH blood pressure charts were used to evaluate the child’s blood pressure status. Data was compiled using Microsoft Excel and each child was categorized according to their blood pressure as normal, pre-hypertensive and hypertensive. **Results:** A limited number of children have been enrolled in the study to date. 20% of the children surveyed are categorized as pre-hypertensive, 80% as normal and 0% as hypertensive. Of the pre-hypertensive children 100% of them identified with Hispanic/Latino race/ethnicity. 50% of the pre-hypertensive children were considered overweight and the other 50% were marginally overweight. Findings were not statistically significant due to limited sample size.

P48

Oral Habits in Indianapolis Children: Comparison between 1986-88 and 2006-8
L. HAMILTON,* J.E. KOWOLIK

Indiana University School of Dentistry

It is generally recognized that many children engage in an oral habit, since sucking on an object is believed to provide the child with a sense of security, happiness, and relaxation. Oral habit frequency decreases as the child ages, and many times requires no adult intervention. **Objective:** The purpose of this pilot study was to determine if the prevalence of oral habits which includes digit sucking, fingernail biting, pacifier use, grinding, and tongue thrusting, changed between 1986-88 and 2006-8. Literature from the 1970's and 1980's suggests that approximately twenty to thirty percent of children have an oral habit that persists beyond the age of two to three years. However, there is a paucity of recent studies assessing the current oral habits of children. **Methods:** The protocol for the study was reviewed by the local IRB. Historic paper charts were reviewed for the first time period and axiUm® electronic charts for the second period. The percentages of patients with each habit were calculated. Chi-square tests were used for bivariate comparisons between the cohorts for differences in the prevalence of the
habits. Logistic regression was used to compare the cohorts, adjusting for the patient demographic information. Results: Overall there were not any significant differences in the percentage of kids with at least one habit between 1986-1988 and 2006-2008. From the 1986-1988 charts, 30% of children had a recorded habit, while 33% of the 2006-2008 children had a habit recorded. For specific habits there were significant differences between the two time periods. Thumb-sucking was recorded more often in the earlier time period (50% vs 16%) while nail biting 8% vs 36%) and teeth grinding (9% vs 14%) were recorded more often in the later time period. Conclusion: These results have demonstrated a change in the oral habits of children living in the Indianapolis area. Because this is a retrospective study, the differences observed could be real or could be due to differences in how the habits were recorded in the two time periods. Further work is underway to identify reason for these behavioral changes. This study was supported by funds from an IUSD Student Research Fellowship.

PERIODONTICS

P49
Identification of β4 in Human Gingival Crevicular Fluid
E. KWON,* M. WHEATER, L. CABANILLA
University of Detroit Mercy School of Dentistry

Thymosin beta 4 (β4) is a naturally occurring small peptide with documented anti-inflammatory and wound healing properties. β4 is found in the cytoplasm of most cell types. In addition, β4 has been detected in human bodily fluids including tears, saliva, and wound fluids. The aim of this study was to determine if β4 is a component of human gingival crevicular fluid (GCF). Adult patients of the University of Detroit Mercy School of Dentistry clinic who had given informed consent were used in this study. GCF was obtained by placing a PerioPaper collection strip in the gingival sulcus for 30 seconds. GCF samples were obtained from regions of the gingiva that showed no clinical signs of disease, and from regions with evidence of periodontal disease as determined by probing depth (PD). The volume of GCF collected on each strip was measured using the Periotron 8000. GCF proteins were eluted from the PerioPaper strip with 100 µl sample buffer and centrifugation, and samples were analyzed by ELISA to determine if β4 was present (Alpco Diagnostics). β4 was present in six of six GCF samples taken from gingival regions with no clinical signs of disease. The concentration of β4 ranged from 30 to 100 µg/ml. In a comparison using a single patient, in an area devoid of disease the average GCF β4 level was 34.5 µg/ml. In contrast, the average GCF β4 level in an area with a PD of 5 mm was 123 µg/ml. This is the first report to show that β4 is a protein component of gingival crevicular fluid. GCF β4 levels appear to be higher than those reported for saliva or tears. Supported by an internal grant from UDMSOD.

P50
Phage Therapy and Its Potential Application in Periodontal Therapy
O. PENCE,* D.M. GALLI
Indiana University School of Dentistry, Dental Hygiene Program

Phage therapy, an established method of treating bacterial infections with viruses, has been in use for over 80 years. Almost forgotten by modern western society but practiced in Eastern Europe and Russia until the present day, it claims to possess many advantages over traditional antibiotic therapy. In periodontics, antibiotic therapy is often used to augment non-surgical and surgical treatment plans to achieve healthier clinical attachment levels. However, given the rise of antibiotic resistant bacteria this method of treatment may no longer be effective in the near future. This review of the scientific literature explores the possible advantages and disadvantages of substituting the use of antibiotics with phage therapy in the periodontal treatment plan. A search of the scientific literature from the 1920s to present day was conducted and included the following resources: PubMed to study phage therapy research (primary and review articles), academic microbiology and periodontics textbooks to learn about viral characteristics and the standard of care in periodontics, and Google to identify relevant news articles as well as agencies or companies using phage therapy. The review found that phage therapy possesses many advantages over antibiotics including self-replication of the therapeutic, the ability to degrade protective biofilms, the ability to preserve normal flora, and the ability to treat antibiotic resistant bacteria. Known obstacles to the implementation of phage therapy include the lack of western clinical trials, strict FDA regulations, rapid removal of phages by the immune system, and the lack of phages for all but one of the known periodontal pathogens. In conclusion, phage therapy would appear to be superior to the use of antibiotics in the treatment of periodontitis, at least in theory. However, unless phages can be identified that target the majority of periodontal pathogens phage therapy is not feasible in the near future as a treatment for most, if not all, clinical conditions of the periodontium.

P51
Soluble TLR-2: Putative Adjunct Marker for Chronic Periodontitis
S. PRAKASAM,* V. SWAMINATHAN, B.J. SRIHARI, V. JOHN, S.B. BLANCHARD, M. SRINIVASAN
Indiana University School of Dentistry
Graduate Periodontics and Oral Pathology, Medicine and Radiology

At present the diagnosis of periodontitis, monitoring of disease activity and the efficacy of periodontal treatment is challenging and highly subjective. According to the American Association of Periodontology the current system of diagnosis is a “measure of accumulated past disease at a site rather than current activity.” Thus, there exists a need for an objective measure to diagnose active periodontitis, and it’s response to therapy. Primarily considered as chronic bacterial infection, the periodontal disease pathology is mediated by host response to the local microflora. Toll like receptors area family of germ line encoded receptors that recognize and respond to the local flora. A soluble form of toll like receptor 2 (sTLR2) was recently identified in human plasma, breast milk and saliva. It has been shown that TLR-2 suppresses excessive host response against putative periodontal pathogens such as Porphyromonas Gingivalis, T. Forsythus, or their products. Most molecules and cells from the periodontium and GCF end up in saliva. The purpose of this study is to test the hypothesis that the salivary levels of sTLR-2 may
correlate with the progression of periodontal disease activity. Unstimulated whole saliva (UWS) was collected from 40 subjects based on the ADA classification (10 subjects from each class). sTLR-2 level in clarified UWS was assessed qualitatively and quantitatively by Western blot and ELISA respectively. There was a linear correlation between the sTLR-2 level in the UWS and the degree of periodontal destruction. The highest levels of sTLR2 were found in subjects classified as ADA Class IV followed by Class III, Class II, and Class I in that order. The results suggest sTLR2 may serve as an adjunctive tool in the diagnosis of periodontal disease and in the monitoring of disease activity. Supported by Dr. Mythily Srinivasan, IUSD.

P52  
**Mechanism(s) of Heterogeneity Response of Gingival Fibroblast to Porphyromonas gingivalis**  
T. SMITH,* N. AL-SHIBANI, L.J. WINDSOR  

Periodontal disease is a host-mediated inflammatory response to subgingival microflora, which leads to tissue breakdown and bone loss. Individuals with the same periodontal pathogens may experience different disease processes and severity. *Porphyromonas gingivalis* (*P. gingivalis*) has been implicated as one of the major pathogens involved in periodontal disease. In a recent study comparing the collagen-degrading ability of different human gingival fibroblast (HGF) cell lines when exposed to *P. gingivalis* stimulation, it was discovered that in the presence of *P. gingivalis* supernatant that some cell lines cleaved all the collagen in the wells (aggressive cells lines), while others only cleaved the collagen underneath the cell colonies (non-aggressive cell lines). **Objective:** The aim of this study was to determine if this difference between the aggressive and non-aggressive cell lines is due to lack of matrix metalloproteinase (MMP) activation and not their expression.  
**Methods:** The collagen degrading ability of the HGFs was examined with a cell-mediated Type I collagen assay. HGFs were seeded as single colonies in the center of the collagen-coated six-well plates. After the cells attached, serum-free media containing *P. gingivalis* supernatant, trypsin, or plasmin were added. After specific time periods, the conditioned media from the human gingival fibroblast cells was collected for zymography and Western blot analyses to examine MMP activation. The collagen cleavage was visualized by staining the plates with Coomassie blue after removal of the cells. **Results:** *P. gingivalis* stimulated the cleavage of all the collagen by the aggressive cell line, but not by the non-aggressive cell line. Both trypsin and plasmin served as alternate mechanisms for MMP activation and stimulated the collagen degradation of both the aggressive and non-aggressive cell lines.  
**Conclusion:** It appears that one of the rate limiting steps in the collagen cleavage mediated by the aggressive and non-aggressive cell lines is MMP activation. This study was supported by a grant from Indiana University School of Dentistry Research Fund.

P53  
**A Systems Biology Approach on Oral Epithelial Responses to Periodontal Pathogens**  
S.B. JANARDHANAM,* R.K. KOLLIpara, P.B. NARAYANAN, M. SRINIVASAN  
Indiana University School of Dentistry, Oral Pathology Medicine and Radiology  
Indiana University-Purdue University Indianapolis, School of Informatics
Periodontitis, affects ~20% in the US. The most widely implicated species in periodontitis are Actinobacillus actinomycetemcomitans (Aa), Porphyromonas gingivalis (Pg), and Fusobacterium nucleatum (Fn). We employ a systems biology approach with bioinformatic, genetic and biochemical methods to study differential responses of oral epithelial cells to specific pathogens. The purpose of this study was to compare gene expression profiles of oral epithelial cells infected with 4 different bacteria viz., Aa, Pg, Fn and Streptococcus gordonii (Sg). Public domain microarray data was used for this study. In the dataset various subsets of genes were differentially expressed (two-tailed T test) in response to the above mentioned micro-organisms and clustered into 3 GO classifications: apoptosis, detection of external stimuli and cytokine activity. We also re-confirmed gene expression of some Toll Like Receptor (TLR) genes with real time PCR and cytokines with ELISA. Interestingly, apoptosis related genes were upregulated in cells stimulated with an oral commensal strain (Sg), but downregulated in cells exposed to pathogens (Pg/Aa). Also, many pro-inflammatory cytokines were upregulated in cells stimulated with Pg/Aa as compared to cells stimulated with Sg. In sum, our studies suggest that select periodontal pathogens enhance the survival of infected cells that secrete cytokines and mediate pathology. Supported by Dr. Mythily Srinivasan, IUSD.

P54
Dental Plaque as a Risk Factor for Coronary Heart Disease
V. WAHAIDI, B. ALLEN, S. DOWSETT, G. ECKERT, M.J. KOWOLIK*
Indiana University School of Dentistry
Indiana University School of Medicine
Richard L. Roudebush Veterans Administration Medical Center, Indianapolis, Ind.

Introduction: Systemic inflammation is a central mechanism suggested to causally link periodontal disease and coronary heart disease (CHD). We hypothesized that dental plaque accumulation would elicit systemic inflammatory responses that differ by gender/race. Objectives: To use a classical experimental gingivitis model (EGM) to determine the effect of dental plaque accumulation on systemic markers of inflammation that are associated with CHD risk. Moreover, to address whether a gender/racial disparity in these systemic inflammatory responses to dental plaque accumulation exists.

Methods: We recruited 156 healthy adults, aged 18-31 years. Black and white, and male and female subjects participated in a 21-day EGM. Plaque levels and gingival inflammation were assessed using the plaque and gingival indices, respectively. In addition, peripheral blood samples were collected at each visit to evaluate systemic markers of inflammation. Paired t-tests and Wilcoxon signed rank tests were used to test for changes during the experimental phase. Results: 128 participants completed the study. The correlation between the plaque index and gingival index changes during the experimental phase was 0.79 overall, and was similar across genders/races. During the experimental phase, participants had increases (P<0.05) in the plaque index, gingival index, mean corpuscular volume, mean platelet volume, and cortisol levels. In blacks, increases (P<0.05) were observed in the neutrophil oxidative activity and mean corpuscular hemoglobin levels. In black males, the erythrocyte sedimentation rate increased (P<0.05). Fibrinogen levels increased (P<0.05) in white males. Significant decreases (P<0.05) were
observed in total cholesterol, high density lipoprotein, and erythrocyte counts. Hematocrit and hemoglobin levels decreased (P<0.05) in blacks. In black males, decreases (P<0.05) were observed in the low density lipoprotein levels. Conclusions: In young healthy adults, accumulation of dental plaque elicited systemic inflammatory responses, some of which are with potential atherogenic consequences. These responses differed between individuals of different gender/race. Supported by NIH # R01 DE015145-01.

PREVENTIVE DENTISTRY

P55
Evaluation of Fissure Treatment Before Sealant Placement
S. CHITRE,* G. ECKERT, M.R. FONTANA, T. KULA, A.E. SOTO-ROJAS

Occlusal pits and fissures are high risk sites for development of caries. Placement of dental sealants has been reported to be effective in preventing this process. OBJECTIVE: To evaluate two different preparation techniques by comparison of the penetration and microleakage of dental sealants on different incipient caries levels. METHODS: 23 extracted molars (ICDAS scale 0-2) were collected and ranked by a calibrated examiner into three groups. Further divided into two sub-groups of i) bur and ii) control (6 total). Occlusal surfaces were prepared with: 1) ¾mm round bur, the bur dimensions (0.5mm) were used the standard for maximum depth and width of cutting. 2) No treatment as a control. Teeth were conditioned with 37% phosphoric acid, rinsed, dried, and sealed with an opaque light cured sealant, exposed to thermocycling for 5000 cycles, and tested for microleakage and penetration by cutting the crownbucco-lingually. Sealant depth was measured from depth 200µm width of the fissure opening to the bottom of the fissure. Microleakage was measured using dye penetration and calculating the gap size at the enamel sealant interface. RESULTS: The average fissure depth to sealant penetration ratio in no treatment group of ICDAS 0 was 19% as compared to no treatment of ICDAS 1 and 2 which were 100% and 56% respectively, whereas the average ratio of fissure depth to sealant penetration in the bur group of ICDAS 0 was 100% as compared to 56% and 23% in bur group of ICDAS 1 and ICDAS 2. Microleakage was scored 0 in the no treatment and bur group of ICDAS 0,1,2. CONCLUSIONS: Fissure treatment prior to placement of sealants in code 0-2 ICDAS molars showed no differences in sealant retention.

P56
Total Fluoride Content and Release of Various Fluoride Varnishes
C. GONZÁLEZ-CABEZAS, J. EDER*
Indiana University, School of Dentistry
The number of varnishes available on the U.S. market has significantly increased in recent years. However, there is currently very little regulation of the safety and efficacy of these varnishes. Objective: To analyze total fluoride content (safety) and fluoride release (efficacy potential) of the probably most commonly used commercial varnishes. Methods: Total fluoride content of six varnishes (Duraphat, Cavity Shield, Enamel Pro, DuraShield, Vanish, and Ultradent) was determined in triplicates (0.15–0.20g) by dissolution of the samples in chloroform. After dissolution, water was added to extract the F (3x/sample). Extracted fluoride was quantified using a fluoride specific electrode. Total fluoride release of four varnishes (Duraphat, Cavity Shield, Enamel Pro and Vanish) was determined by placing well-mixed samples in custom-made molds of a standardized volume (n=8) and incubation in deionized water with stirring (100rpm), at room temperature. After 1, 4, 24, and 48h samples were transferred to fresh deionized water. Each water sample was then analyzed for fluoride concentration to determine the amount of fluoride released per sample at each different time-period. Data were analyzed using a one way ANOVA model. Results: Enamel Pro and Ultradent both had the highest amounts of total fluoride (p<0.05; 24,527±1,481 and 24,194±2,001, respectively), which was higher than the amount stated on their label. Vanish had significantly lower concentration of fluoride (16,618±1154ppm) than the other three varnishes. These four varnishes had lower concentration of F than the one stated in their label (22,600ppm); although, Duraphat concentration was very close to it (21,729±80ppm). Fluoride release for Enamel Pro was significantly higher than all other varnishes tested at all time periods. While not statistically different, fluoride release from Cavity Shield was observed to be much lower than the other varnishes after the 24 and 48 hr incubations. Conclusion: Significant variations in total fluoride content and fluoride release of varnishes were found among the studied varnishes suggesting that not all varnishes have similar levels of safety or efficacy.

PULP BIOLOGY

P57
Glutathione Affects Gingival and Pulp Fibroblasts Hydrolases After Tegdma Exposure
K.S. GREGSON

Objective: Triethylene glycol dimethacrylate (TEGDMA), a resin monomer, is known to be toxic to human gingival (HGF) and human pulp fibroblasts (HPF) in a dose dependent manner. The aim of this study was to evaluate the effects of glutathione on the hydrolase activity of HGF and HPF after exposure to TEGDMA. Methods: HGFs or HPF were exposed to 1.25 mM of TEGDMA for 3 hours with or without prior treatment with either N-acetyl cysteine (NAC, 2mM), buthionine sulfoximine (BSO, 100 µM), or diethylmaleate (DEM, 100 nM) for 20 hours. Hydrolase activity was measured using a spectrophotometric substrate, 4-nitrophenol butarate. Cell media were normalized for protein concentration. The assays contained 1 µg protein from the cell media and 20 µL (200 µM) substrate in phosphate buffered saline, pH 7.5, at 25°C in a final volume of 1 mL. Readings at 400 nm, the wavelength at which 4-nitro phenol (pNP) absorbs, were taken every 5 minutes for 1 hour. Results: The
hydrolase activity from the TEGDMA treated cell media was enhanced by both DEM and BSO in both cell types. NAC pretreatment abolished the increase in hydrolase activity seen with TEGDMA in both cell types. Conclusion: These results indicate that glutathione does affect hydrolase activity in human gingival and pulp fibroblasts conditioned media after exposure to TEGDMA.

**TISSUE REGENERATION**

**P58**

**Expression of Matrix Metalloproteinases During Limb Regeneration in *Xenopus laevis***

N. SANTOSH,* B. SARANJAMI, L.J. WINDSOR, D.L. STOCUM, F. SONG

Indiana University School of Dentistry, Department of Oral Biology
Indiana University School of Science, Department of Biology

African clawed frog (*Xenopus laevis*) is a unique anuran vertebrate that can regenerate missing organs such as limbs, tail and lens of the eyes only during the early developmental stages of its lifecycle. As the developmental stage advances its regeneration ability is lost. Matrix metalloproteinases (MMPs) are zinc dependent endopeptidases, that are able to cleave extracellular matrix (ECM) and results in ECM remodeling, as well as various growth factors release and activation. Remodeling of ECM and activation of the various growth factors are crucial in regenerating the exact replica of missing structures in regeneration-competent animals such as early-stage Xenopus tadpoles. The goal of this study is to understand the underlying mechanism of induction of limb regeneration by analyzing the expression patterns of MMPs and the tissue inhibitors of the MMPs (TIMPs) between Xenopus stage-54 (regeneration-competent) and Xenopus stage-60 (regeneration-deficient). Gelatin zymography revealed that proteinases such as 92 kDa, 82 kDa, 72 kDa, 64 kDa and 52 kDa were expressed in the control, day-1, day-4 and day-7 blastema from stage-54 and stage-60. In both stages, 82 kDa proteinase was upregulated in day-1, day-4 and day-7 blastema compared to the control. Its expression was decreased in day-4 blastema of both stages compared to the day-1. While day-7 blastema of stage-54 maintained the expression of 82 kDa proteinase, stage-60 showed a decrease in its expression. In stage-54, 72 kDa proteinase showed decrease in the day-1 blastema compared to control. The expression remained the same through day-4 compared to day-1 and showed an increase by day-7. In stage-60, 72 kDa proteinase showed increase in day-1 blastema compared to the control. The expression decreased by day-4 compared to day-1 and remained the same through day-7. MMP protein arrays (RayBiotech,Inc., Norcross, GA) were able to detect MMP-1, -2, -3, -8, -9, -10, and -13, as well as TIMP-1, -2 and -4 in the control, day-1, day-4 and day-7 blastema from stage-54 and stage-60. Semi-quantification analysis on the density of MMP arrays demonstrated that the expression of MMP-9 and MMP-10 increased from day-1 to day-7 in stage-54 but showed no significant change in expression from day-1 to day-7 in stage-60. MMP-8 expression decreased from day-1 through day-7 blastema of stage-60, whereas there was no significant change in day-1 to day-7 in stage-54. These results suggested that the expression patterns of the MMPs especially 82 kDa and 72 kDa proteinases, were different in stage-54 and stage-60 of
Xenopus. This might play an important role in ECM remodeling and growth factors activation that occurs during the Xenopus stage-54 limb regeneration. This study was supported by an IUSD start-up grant to F. Song and grant from W. M. Keck Foundation to D. L. Stocum.

PS9
Homology of VEGF and Tβ-4 in Xenopus, Axolotl and Short-Toes
Indiana University-Purdue University Indianapolis, School of Science, Department of Biology
Indiana University School of Dentistry, Department of Oral Biology

Vascular Endothelial Growth Factor (VEGF) and Thymosin Beta 4 (Tβ-4) have been suggested to play important roles in angiogenesis, which is a critical process in limb regeneration of amphibians. There is no information on the potential role of VEGF and Tβ-4 in axolotl and the short-toes during amphibian limb regeneration. To begin to study these roles, we compared the mRNA sequence of VEGF and Tβ-4 in African clawed frog (Xenopus laevis), the axolotl (Ambystoma mexicanum), a mutant regeneration-deficient phenotype of the axolotl called short-toes, and humans. Total RNA was extracted from Xenopus, axolotl and the mutant short-toes by RNeasy kit (Qiagen Sciences Inc., Germantown, MD). One step reverse transcriptase polymerase chain reaction (Qiagen Sciences Inc.) was performed with low annealing temperature of 50°C. VEGF primers were designed based on Xenopus cDNA sequence and Tβ-4 primers were designed based on human cDNA sequence. The RT-PCR products for Xenopus, axolotl and short-toes were sent for two direction sequencing analysis (ACGT, Inc., Wheeling, IL). The comparison of sequences between the different species for VEGF showed 75% homology between human and Xenopus, 73% between human and axolotl, and 75% between human and short toes. There was 98% homology between Xenopus and axolotl, 98% between axolotl and short-toes. Tβ-4 studies showed 94% homology between human and Xenopus, 94% between human and axolotl, and 96% between human and short-toes. There was 99% homology between Xenopus and axolotl and 100% between axolotl and short-toes. These results suggest that VEGF and Tβ4 are highly conserved (more than 90%) between Xenopus laevis, axolotl and short-toes. Grants from the W. M. Keck Foundation and the Army Research Office to D.L. Stocum and an Indiana University School of Dentistry start-up grant to F. Song.

TOBACCO CESSATION

P60
The Effects of Cigarette Smoke Condensate on Human Pulp Cells
E. GROW,1,* J. SUN,2 N. SANTOSH,2 L.J. WINDSOR,3 R.L. GREGORY,2 F. SONG2
1Indiana University-Purdue University, Department of Chemistry
2Indiana University School of Dentistry
Cigarette smoke condensate (CSC) is produced when tobacco is burned and it is composed of more than 4,000 chemicals. It is well known that smoking tobacco can cause lung cancer and other health problems such as periodontal disease and oral cancer. However, very little is known about the effects of CSC on cell repair and their regeneration ability. This research project examined the effects of CSC on human pulp cells (HPCs) and is the first step into investigating smoking's effect on HPC repair and their regeneration ability. HPCs (50,000 cells/well) were exposed to various concentrations of CSC (0, 3.125, 6.25, 12.5, 50, 100, 200 and 400 µg/ml) for three days. The cytotoxicity and cell viability effects of the CSC on HPCs were evaluated by performing lactate dehydrogenase (LDH, Roche Applied Science, Mannheim, Germany) and water soluble tetrazolium-1 (WST-1, Roche Applied Science) assays, respectively. To test their collagen degrading ability under the influence of CSC, HPCs (100,000 cells/well) were seeded as a single colony in each well of Type I collagen-coated 6-well plates and supplemented with CSC (0, 12.5, 25, and 400 µg/ml) for 1, 3 and 5 days before staining with Coomassie blue. The conditioned media were also collected to test for proteinase activity utilizing zymography. The CSC was toxic and inhibited HPC proliferation at 400 µg/ml. Concentrations of CSC at 12.5 and 25 µg/ml stimulated the HPC’s ability to degrade collagen. The production of pro- and active MMP-2 was increased in the cultured media. CSC is toxic to HPCs and affects pulp cell growth at 400 µg/ml. CSC at 12.5 and 25 µg/ml concentrations changes the HPC ability to remodel extracellular matrix, in part, by producing more MMP-2. This project was supported by IUSD Start-Up Fund and IUPUI Center for Research and Learning Multidisciplinary Undergraduate Research Institute Grant.

P61

Effect of Nicotine on Streptococcus mutans Binding to Fibrinogen, Collagen and Fibronectin

D. AI-ALFE, R.L. GREGORY*

Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center

Bacterial attachment usually involves an interaction between a bacterial surface adhesin and a host cell receptor. The mechanism as to how this interaction occurs between S. mutans cells and extra-cellular components is not yet clear. Since the bacteria colonize damaged heart tissue, it is believed that subendothelial extracellular matrix (ECM) molecules, such as fibrinogen, collagen and fibronectin, function as cell receptors for the bacteria. Nicotine is a key constituent in tobacco. In vitro, nicotine inhibits the production of fibronectin and collagen, while also promoting collagen breakdown from human gingival fibroblasts. The objective of this study was to characterize the interactions between fibrinogen, collagen, and fibronectin with a human isolate of S. mutans UA159 treated with different concentrations of nicotine. Two different ELISA protocols were used. In the first assay, ELISA plate wells were coated with S. mutans UA159 (untreated and treated with nicotine at 2 mg/ml, 1 mg/ml, 0.5 mg/ml, or 0.25 mg/ml), and probed with fibrinogen, collagen and fibronectin, then primary antibodies to the ECM proteins and secondary antibodies were added. In the second ELISA assay, wells were coated with ECM proteins and then untreated and treated S. mutans cells were added. Adherent cells were stained with crystal violet, and the dye was dissolved by adding 7% acetic acid before measuring the absorbance. The
results suggested that higher binding affinity to both collagen and fibrinogen was with cells treated with 0.5 mg/ml nicotine, followed by 1 mg/ml nicotine treated S. mutans. A statistically significant increase in binding to fibrinogen, collagen and fibronectin was noticed between the control group and 2 mg/ml nicotine treated S. mutans. Dose dependent results reflect the binding efficacy of S. mutans to different ECM proteins (fibrinogen, collagen and fibronectin). Nicotine up-regulates the binding properties of S. mutans to ECM proteins (fibrinogen, collagen and fibronectin). Further studies will identify the specific S. mutans ECM binding proteins up-regulated by nicotine. Supported by the Ministry of Higher Education and State for Scientific Research (MHESR) ParOwn1207, Egypt.

P62
Effect of Nicotine on Glucosyltransferase Expression of Streptococcus mutans
M. FANG,* C. ZHENG, R.L. GREGORY
Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center

Streptococcus mutans is a principal cariogenic bacteria in humans. The glucosyltransferases of S. mutans are recognized as important virulence factors for this cariogenic bacterium. There are three S. mutans glucosyltransferases (GTFs): GTF B, GTF C and GTF D. GTF B and GTF C synthesize primarily water-insoluble glucans, which make a major contribution to plaque formation. Former reports from the National Institutes of Health (NIH) and the Centers for Disease Control and Prevention (CDC) indicated that chewing and smoked tobacco users are more likely to develop dental caries than those who don’t use tobacco. Nicotine is one of the active components of tobacco. The objective of this study was to measure the effects of nicotine on S. mutans glucosyltransferases. Methods: S. mutans UA159 was cultured in Tryptic Soy broth (TSB) supplemented with 1% sucrose and treated with different concentrations of nicotine (0, 0.625 and 1 mg/ml) for 16 hours at 37°C in 5% CO₂ to obtain planktonic cells. The cell surface and intracellular proteins were extracted and the concentration of total protein in each sample was measured by the Bradford Protein Assay. The same amount of protein was loaded into each lane of Sodium Dodecyl Sulfate Polyacrylamide Gels (SDS-PAGE) and then transferred to blotting membranes to measure the amount of GFT by Western blotting after probing with specific primary rat antibody to S. mutans GTF and secondary anti-rat IgG antibody. The chemiluminescent-labeled immunoblots were scanned and analyzed by NIH ImageJ software. Results: 1 mg/ml nicotine up-regulated GTF-B in S. mutans significantly more than the 0.625 mg/ml nicotine and control (p<0.05). 0.625 mg/ml nicotine also up-regulated GTF-B, compared with the control, however, this was not significant. Conclusions: Nicotine altered GTF synthesis of S. mutans grown in sucrose and may play a role in tobacco related dental caries.

P63
Nicotine’s Effect on Hydrophobicity and Adherence of Streptococcus mutans
J.R. MORGAN,* R.L. GREGORY
Streptococcus mutans plays a major role in tooth decay, and thus increasing the rate of dental caries. Streptococcus antigen I/II is a surface protein antigen. The abundance of antigen I/II on the surface of S. mutans can be measured by assessing the hydrophobicity. Previous studies have shown that antigen I/II increases the hydrophobicity of S. mutans, and nicotine up regulates antigen I/II protein expression. The effect of nicotine on the hydrophobicity of S. mutans was measured. Nicotine dilutions from 0.1562 mg/ml-5 mg/ml were made in Tryptic Soy Broth without sucrose. Bacteria were grown in each of these dilutions for 16 hours at 37°C in 5% CO₂. The cells were washed three times in sterile saline and suspended in potassium urea magnesium (PUM) buffer. The initial optical density was measured (OD600). One milliliter of the bacterial suspension was transferred into an Eppendorf tube, and 0.1 ml of hexadecane was added. This was mixed and was allowed to stand until the phases separated. The final optical density of the aqueous bacterial phase was measured (OD600). Hydrophobicity was calculated by (Initial OD – Final OD/Initial OD) x 100%. The results demonstrated that the hydrophobicity of S. mutans increased as the nicotine concentration increased up to 1.25 mg/ml when hydrophobicity leveled off. The increase in hydrophobicity suggests that nicotine users will have increased S. mutans adherence and caries. Biofilm formation was initiated by inoculating 5 μl of suspended bacteria cells just as in the hydrophobicity assay. The same nicotine dilutions, 0.1562 mg/ml-5 mg/ml were placed into the wells of 96 well sterile microtiter plates, and incubated at 37°C with 5% CO₂ for 16 h. After incubation, liquid was removed and wells were rinsed with sterile saline. The wells were stained with crystal violet stain for 10 min. The plates were rinsed with sterile saline and the absorbance was measured at 490 nm with a microplate reader. The data indicates that as the nicotine dilutions increased, the adherence of the bacteria increased in the wells. This data suggests that the increase in hydrophobicity observed with nicotine and the adherence of S. mutans to the tooth surface is directly related.

**P64**

Glucan Effects on *Streptococcus mutans* Hydrophobicity

A.L. WHITE,* R.L. GREGORY

Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center

*Streptococcus mutans* is largely responsible for the majority of human dental caries. The occurrence of dental caries amongst smokers is higher than that of nonsmokers. However, the effects of tobacco and nicotine on oral bacteria are still uncertain. The purpose of this study was to analyze the effect of sucrose in Tryptic Soy Broth (TSB) on the hydrophobicity of S. mutans cells. Previous studies have shown that antigen I/II-defective mutants provided significantly lower hydrophobicity than wildtype cells. In addition, nicotine up-regulates antigen I/II expression and increases hydrophobicity and biofilm formation without sucrose. In the hydrophobicity analysis of sucrose-grown S. mutans cells (UA159), the effect of various concentrations of nicotine (4, 2, 1, 0.5, and 0.25 mg/ml) and Cigarette Smoke
Condensate (tobacco) (1.0, 0.5, 0.25, 0.125, and 0.0625 mg/ml) was the focus of this study. Bacteria were suspended in TSB containing 1% sucrose with various concentrations of either nicotine or tobacco and incubated at 37°C in 5% CO₂ for 24 hours. The nicotine and tobacco had varied effects on sucrose-grown *S. mutans* cells. In general, sucrose-grown cells had relatively lower hydrophobicity than non-sucrose grown cells. Furthermore, nicotine-treated sucrose-grown cells overall had lower hydrophobicity than the no nicotine control cells. In comparison with earlier research, this assay suggested causality between nicotine/tobacco and hydrophobicity in that the glucan produced by sucrose-grown *S. mutans* may be bound to GTF and/or glucan-binding protein possibly masking antigen I/II on the surface. An ELISA assay further supported these findings that suggested that the topography of the *S. mutans* cells was obscured with glucan masking antigen I/II on the surface. This indicates that sucrose-grown *S. mutans* cells may not significantly utilize antigen I/II for attachment. This project is supported by an IUPUI Center for Research and Learning MURI Grant.

**P65**

**Effect of Nicotine and Tobacco on LDH in Streptococcus mutans**

I.A. LEVITT,* R.L. GREGORY

Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center

*Streptococcus mutans* is a bacterium commonly found in the oral cavity and is a significant contributor of dental plaque and tooth decay. Smokers have increased caries. High lactate dehydrogenase (LDH) enzyme activity may be a sign of demineralization of the enamel. **Objective:** To ascertain LDH activity in *S. mutans* nicotine and tobacco condensate- treated cells. **Methods:** In order to determine the effect of nicotine on total *S. mutans* LDH activity, *S. mutans* cells grown in Tryptic Soy broth containing different concentrations of nicotine was assessed after incubation for 16 hours in 5% CO₂ at 37°C. Dilutions ranging from 0.0017 to 2 mg/mL of nicotine or tobacco condensate were assessed. LDH Lysis Solution was added to disrupt the bacterial cells. LDH substrate solution was added and absorbance was measured at 490 nm for LDH activity and 690 nm for cell growth. **Results:** In general, specific LDH activity as a proportion of cell growth (490/690 nm ratio) of nicotine- and tobacco-treated *S. mutans* cells increased compared to the control samples. However, nicotine in the range of 0.0625 to 0.25 mg/mL treated samples had the highest specific LDH activity compared to the other nicotine samples, but still remained higher than the no nicotine control. The results of the tobacco condensate- treated cells were similar to the nicotine data. **Conclusion:** Findings indicated that total LDH activity increased with *S. mutans* cells incubated with nicotine or tobacco condensate until the cell’s growth halts at very high concentrations. Components of tobacco may up-regulate LDH expression, facilitating more lactic acid formation. Alternatively, tobacco components may disrupt the integrity of the *S. mutans* cell wall allowing the diffusion of LDH out of the cell. The data supports the observation that smokers have increased caries due to increased LDH activity in *S. mutans* cells when exposed to tobacco components. This project is supported by an IUPUI Center for Research and Learning MURI Grant.
**P66**

**Effect of Nicotine on the Adherence of *Streptococcus mutans* to Salivary-Coated Hydroxyapatite**

M.E. WILSON,* R.L. GREGORY

Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center

*Streptococcus mutans* plays a major role in the formation of dental caries. Oral bacteria are exposed to a variety of factors that affect adhesion. There are several proteins that play a role in the adhesion of the bacteria. However, there are different environmental conditions under which the adhesion of the bacteria is affected, including exposure to nicotine. Previous work had indicated that nicotine concentrations up to 2 mg/mL enhance the growth of the bacteria, causing them to grow with more cells per chain of bacteria. This would indicate an increased ability for the cells to adhere. The objective was to determine the effect of nicotine on the adhesion of *S. mutans* to salivary-coated hydroxyapatite beads. In order to examine whether the adhesion of *S. mutans* UA159 to saliva-coated hydroxyapatite beads is affected by nicotine, hydroxyapatite beads were coated with diluted saliva and blocked with bovine serum albumin. The beads were incubated with *S. mutans* cells that had grown in varying concentrations of nicotine and whose cell numbers had been made equal by measuring the absorption at 600nm. The cells which did not adhere to the saliva on the beads were rinsed off. The beads were resuspended in saline, vortexed and sonicated for ten seconds to remove the attached bacteria, diluted in a 1:10 dilution and spiral plated. The plates were incubated in a CO₂ incubator for 48 hours and counted using an automated colony counter. Previous work had shown that bacteria incubated in 0.5, 1.0, and 2.0 mg/mL of nicotine demonstrated a significant increase in the chain length of the *S. mutans* cells. Our adhesion assay results indicate an increase in the amount of bacterial adherence to the hydroxyapatite beads in the cells grown in 0.5, 1.0, and 2.0 mg/mL of nicotine when compared to the amount of adherence seen in the control. This data establishes that nicotine has a significant effect of the adherence of *S. mutans* to salivary-coated hydroxyapatite beads, which indicates an increased attachment in the oral cavity, possibly related to the increased expression of antigen I/II reported by our laboratory. The increased adherence by *S. mutans* after exposure to nicotine provides one explanation for increased dental caries in smokers.

**P67**

**Effects of Taboka® Extract on Human Gingival Fibroblast Mediated Collagen Degradation and Expression of Matrix Metalloproteinases**

M. LASZYNSKI,* J. SUN, L.J. WINDSOR

Indiana University School of Dentistry

Tobacco has long been implicated in multiple diseases including cancer and periodontal disease. It has been shown that nicotine, a major component of tobacco, alters cytokine/growth factor expression and increases human gingival fibroblast mediated collagen degradation. Phillip Morris (Richmond, VA) is marketing Taboka®, a relatively new smokeless spitless tobacco product. This product is aimed at providing an alternative to cigarette smoking for individuals who are unable to smoke due to recently
enacted smoke-free ordinances. The effects of this new tobacco product on oral health have not yet been studied. The objective of this study was to determine the effects that Taboka® has on MMP expression and cell mediated collagen degradation to aid in determining Taboka’s® deleterious effects on the consumer. Taboka® was extracted by immersing one pouch in four milliliters of water for sixty minutes at 37° C. Pouches were then removed and the extract was centrifuged and filtered. The nicotine concentration of the extract was determined to be 2136 µg/mL by the Division of Clinical Pharmacology and Experimental Therapeutics at San Francisco General Hospital (San Francisco, CA). Taboka® at a concentration of 50 µg/mL of nicotine were used to assess collagen degradation and MMP expression. RayBio human MMP antibody array detection kits (RayBiotech, Inc., Norcross, GA) were used to detect the expression of MMPs. The membranes were blocked, incubated with samples for 3 hours, washed, incubated with biotin-conjugated antibodies for 2 hours, washed and then incubated with primary antibodies as described by the manufacturer. Subsequently, the membranes were washed and then incubated with secondary antibodies. After mixing the detection agents and applying them to the membranes for 2 min, the membranes were visualized by autoradiography on X-ray film. An assay using 6-well plates precoated with rat-tail tendon Type 1 collagen was used to determine Taboka’s® effect on collagen degradation. HGFs were detached with 0.25% trypsin resuspended in media, and seeded as single colonies (100,000 cells/150µL per well). The cells were allowed to attach and then incubated in serum-free DMEM without or with Taboka® and nicotine. After various experimental periods, the conditioned media was collected and the cells removed with 0.1% Triton and 0.25% trypsin (Invitrogen). The plates were then stained with Coomassie blue to visualize collagen degradation. The results suggest that Taboka® affects the rate of collagen degradation by altering MMP expression in the human gingival fibroblasts. The Taboka® slightly altered the rate of collagen degradation mediated by the gingival fibroblasts. The Taboka® also altered the expression levels of the MMPs.

P68
Effects of Taboka® on Rat Keratinocytes
A. RICHARDSON,* J. SUN, L.J. WINDSOR
Indiana University School of Dentistry

Tobacco companies are presently marketing smokeless spitless tobacco products aimed at smokers who are in environments where they can’t smoke. Taboka® is one of these products. There is little scientific data available about the effects of smokeless spitless tobacco products on consumers. There is a need to evaluate the effects of these smokeless spitless tobacco products on cells and tissues, and to eventually compare them to cigarette smoke condensate to determine whether these products are any less harmful than smoking. The first objective of this study was to determine the effects that Taboka® has on rat keratinocyte cell-mediated collagen degradation. The second objective was to determine the effects that Taboka® has on the expression of matrix metalloproteinases (MMP’s) in rat keratinocytes, which in turn is related to the collagen metabolism. The hypothesis was that Taboka® would increase keratinocyte MMP activation and in turn collagen degradation. Takoka® extract increased the rate of collagen degradation by the rat keratinocytes. The Taboka extract also altered the expression level of the MMPs. The data shows that Takoka® affects cells in the oral cavity. The public should be aware of
The effects of smokeless spitless tobacco and therefore be able to make a more educated decision about using smokeless spitless tobacco products as alternatives to smoking cigarettes.

P69  
**The Effects of Nicotine on Osteoblasts**  
E. SMITH,* J. SUN, F. SONG, L.J. WINDSOR  
Indiana University-Purdue University Indianapolis, Department of Biology  
Indiana University School of Dentistry, Department of Oral Biology

Tobacco use is a significant risk factor for the formation and progression of periodontal disease, as well as multiple types of cancer. Periodontal disease involves the destruction of bone and eventually tooth loss. Nicotine is a major component of tobacco. The effects that nicotine has on bone-forming cells (osteoblasts) have not been well studied. Therefore, the purpose of this study was to examine the effects of nicotine on osteoblast proliferation, viability, expression of the matrix metalloproteinases (MMP), and expression of multiple cytokines/growth factors. Osteoblasts (MG63) (American Type Culture Collection, Manassa, VA) were grown in low glucose Dulbecco’s Modified Eagle’s Medium supplemented with 10% fetal bovine serum at 37°C and in 5% CO₂. Osteoblast proliferation was measured by the water-soluble tetrazolium-1 (WST-1) assays (Roche Diagnostics, Mannheim, Germany) and viability was measured by the lactate dehydrogenase (LDH) assays (Roche Diagnostics, Mannheim, Germany) after the osteoblasts were exposed to different concentrations of nicotine (0-1000 µg/ml). The results were statistically analyzed (ANOVA, Tukey’s, p<0.05). Osteoblast expression of the MMPs was measured utilizing the Human MMP Antibody Array 1 (RayBiotech, Norcross, GA) after the osteoblasts were exposed to 250 µg/ml nicotine. Osteoblast expression of multiple cytokines/growth factors was measured by the Human Cytokine Antibody Array 1 (RayBiotech, Norcross, GA) after the osteoblasts were exposed to 250 µg/ml nicotine and the results were statistically analyzed. The results indicate that osteoblast proliferation and viability significantly decreased after exposure to 1000 µg/ml of nicotine (WST-1: p=0.007; LDH: p=0.000). The osteoblasts significantly upregulated MMP-1, a collagenase. Finally, there were some slight changes in osteoblast expression of certain cytokines/growth factors, but further investigation is needed. These results demonstrate that nicotine does affect characteristics of osteoblasts. This study was sponsored by the Indiana University-Purdue University Indianapolis Multidisciplinary Undergraduate Research Institute and The Tobacco Cessation and Biobehavioral Center.

P70  
**Combined Effects of Tobacco and *Porphyromonas gingivalis* on Gingival Fibroblasts**  
W. ZHANG,* F. SONG, L.J. WINDSOR  
Indiana University School of Dentistry

Cigarette smoke condensate (CSC), the particulate matter of cigarette smoke, is composed of thousands of chemicals (e.g., nicotine). Cigarette smoking is a risk factor for periodontal disease. *Porphyromonas*
P71
Tobacco Smoking Condensate Affects the Sucrose-Dependent Adherence of Oral Streptococci
C. ZHENG,* R.L. GREGORY
Indiana University School of Dentistry

The positive relationship between smoking and dental caries has been reported. However, the underlying mechanisms are unclear, particularly on Streptococcus mutans. Objectives: This study investigated the effect of tobacco smoking condensate (TSC) on the growth of S. mutans and Streptococcus gordonii, sucrose-dependent attachment and related protein expression. Methods: MIC and MBC of TSC were determined for S. mutans and S. gordonii. The growth curves and sucrose-dependent adherence of these strains with different concentrations of TSC were monitored for 11 or 18 h, respectively. Bacteria were also treated with TSC and protein extracts were separated by electrophoresis and subjected to Western blot analysis for GTF and GbpB. Results: The mean MIC and MBC of TSC against S. mutans were 3.0 (± 1.2) and 7.0 (± 2.0) mg/ml, respectively, which were higher than those against S. gordonii. These two species demonstrated different growth patterns. S. mutans recovered relatively quickly from TSC treatment with a longer doubling time, compared to the control group, while S. gordonii took more time to enter log-phase. The percentage of sucrose adherent bacteria was significantly increased among the treated groups for S. mutans, but not for S. gordonii. The expression of GTF and GbpB was also significantly upregulated for the treated S. mutans. Conclusion: The different growth patterns and response to produce GTF for sucrose-dependent adherence may...
switch a non-cariogenic dominant composition to a cariogenic dominant composition. This shift may increase the risk for smokers to develop caries.

CLINICAL CASE REPORTS

ENDODONTICS

CC1
Non-Surgical Endodontic Treatment of an Extraoral Sinus Tract
P. LEY,* M.M. VAIL
Indiana University School of Dentistry, Department of Graduate Endodontics

Cutaneous, or extraoral, sinus tracts are an uncommon finding associated with odontogenic abscesses. Due to the presentation of the extraoral lesions they are often mistaken for pathosis of dermatologic origin. Consequently, patients often see several physicians or even surgeons without resolution. Often it is not until they are referred to a dentist that a diagnosis of odontogenic origin is made. Typically when an odontogenic infection spreads from the intramedullary bone through the cortical bone it will drain into the oral cavity. However, when the muscle attachments are situated in such a way that the apices of a mandibular molar are superior to the attachment the infection has the potential to spread extraorally. The objective of this case report is to describe the successful non-surgical endodontic treatment of tooth #19 with a draining extraoral sinus tract. The initial presentation of the patient to the graduate endodontic clinic is described, as well as the treatment provided and a description of the follow-up appointments. Radiographs and clinical photographs were recorded during the procedure and a 14 month follow-up completed. Extraoral sinus tracts of odontogenic origin, although rare, can be predictably treated with conventional root canal therapy without surgical removal of the sinus tract or the prescription of systemic antibiotics.

PERIODONTICS/ORTHODONTICS

CC2
Periodontally Accelerated Osteogenic Orthodontics
E. CRUZ,* R.M. ORTENZIO, S.B. BLANCHARD, V. JOHN, K.S. KULA, W.E. ROBERTS
Indiana University School of Dentistry, Department of Periodontics and Allied Dental Programs and Department of Orthodontics and Oral Facial Genetics
Conventional orthodontic treatment has benefited from a new surgical technique of Periodontally Accelerated Osteogenic Orthodontics (PAOO), which requires selective corticotomies few days after starting orthodontic treatment. This technique decreases orthodontic treatment time by more than 50% and is reported to reduce relapse and root resorption along with a significant increase in alveolar bone support. The faster orthodontic tooth movement is enhanced by the surgically-induced regional acceleratory phenomenon (RAP) as an outcome of surgery the accelerated bone remodeling response is initiated which accelerates demineralization and remineralization of the bone. A 27 year old female with class I malocclusion and severe lower anterior crowding was treated with this new technique. A complete orthodontic and periodontal evaluation was performed including radiographs, periodontal charting, CBCT (cone beam computed tomography) and a diagnostic wax up. Orthodontic treatment was planned and the patient had orthodontic brackets placed two days prior to surgery. Surgery was performed under IV conscious sedation and included elevation of full thickness flaps on both mandibular and maxillary arches. Corticotomies were performed in selected sites followed by composite bone grafting in the sites. The composite graft was composed of de-mineralized freeze dried allograft and a xenograft material (Bio-Oss). The material was rehydrated in saline solution containing 100mg/10ml of clindamycin prior grafting. Flaps were repositioned and sutured. Orthodontic adjustments were performed every two weeks. Results and conclusions: Treatment was concluded after 17 weeks which reduced treatment time by less than half compared to conventional orthodontics that was estimated for 12 months. This case report represents the first reported use of PAOO in the State of Indiana and promises to be an exciting treatment option for the future.

PROSTHODONTICS

CC3

Rehabilitation of a Fully Edentulous Patient Using Implants and CAD/CAM Technology

N. LABBAN,* C.J. ANDRES

Indiana University School of Dentistry, Division of Prosthodontics

Recently, many improvements have been added to the CAD/CAM technology that has permitted for the enhancement of different treatment strategies related to the rehabilitation of edentulous patients. In the mean time, fixed implant-supported prostheses can be fabricated using either acrylic resin or all ceramic materials. The objective of this clinical report is to describe the fabrication techniques of removable maxillary implant retained acrylic complete overdenture opposing fixed mandibular implant supported ceramic complete denture utilizing a CAD/CAM-generated framework. A 73 year old male patient came to the graduate prosthodontic clinic requesting total dental extraction of his severely decayed lower and upper dentition and insertion of implants for lower fixed and upper removable prosthesis. Three and half years ago, extraction of upper and lower teeth was done followed by delayed implants placement. Since then, he had worn conventional acrylic dentures in the upper and the lower jaws for four months during the healing time of the implants. Later, the upper denture was converted to
a removable implant retained overdenture using locator attachments while the lower denture was converted to a fixed implant supported denture to simulate the final prosthesis. Three months later, a final removable maxillary implant retained acrylic complete overdenture and fixed mandibular implant supported ceramic complete denture were delivered. Moreover, gold occlusal surfaces were casted and cemented on the upper posterior acrylic denture teeth. The patient was very comfortable and satisfied with the esthetic and functional outcomes of the treatment. After a 2 year follow up, none of the implants were lost and no significant bone loss around these implants was found. In addition, no significant wear was noticed on the occlusal surfaces of the upper and lower denture. The use of implants and CAD/CAM technology might be considered a viable treatment modality for edentulous patients. In addition, the use of gold occlusal surfaces might increase the longevity of the upper denture by reducing the wear process due to the opposing ceramic occlusal surfaces.

CC4
Multidisciplinary Full Mouth Rehabilitation for an Ectodermal Dysplasia Patient
G. SHIMIZU OLIVA,* J.A. LEVON
Indiana University School of Dentistry, Graduate Prostodontic Program

Ectodermal Dysplasia (ED) is a genetic disorder in which there are congenital birth defects of two or more ectodermal structures. These structures may include skin, hair, nails, teeth, nerve cells, sweat glands, parts of the eye and ear, and parts of other organs. ED is usually described as being hypohidrotic or hidrotic, depending upon the degree of sweat gland function. Hypohidrotic ectodermal dysplasia (HED) exhibits the most severe dental anomalies. The most remarkable oral features of HED are the absence of most deciduous and permanent teeth. The prosthodontic treatment of patients with ectodermal dysplasia can be complicated due to their oral deficiencies. The purpose of this clinical report is to describe the multidisciplinary treatment for full mouth rehabilitation of a 24 year old male with ectodermal dysplasia. Patient was orthodontically treated to align the permanent existing teeth and maintain the space of the congenitally missing teeth for future dental implant placement and restoration. Dental implants were placed in areas of # 7, 10, 12, 20, 28 and 29. The prosthodontic rehabilitation included increasing the OVD with conventional fixed and implant supported restorations. Effective treatment of patients with genetic anomalies such as ectodermal dysplasia requires excellent communication between the treatment specialists. From the onset of treatment, collaboration among the orthodontist, periodontist and prosthodontist was necessary to achieve the esthetic and functional goals. The patient’s confidence improved after cementation of provisional restorations and he was very satisfied with the final prostheses.

TABLE CLINIC
PROSTHODONTICS

T1
Treatment Planning in Patients with Severely Worn Dentition
K. SCHaub, * J.A. LEVon
Indiana University School of Dentistry, Graduate Prosthodontic Program

In 1984 Dr. Kenneth Turner created a classification system to help the prosthodontist better diagnose, manage, and treat patients with severely worn dentition. The loss of occlusal vertical dimension and the amount of space available to restore the dentition are what separate patients into one of three categories. Diagnosis and treatment of these patients brings one of the greatest challenges to dentists today. The objective of this study was to use this classification system to better treat patients that presented to the Graduate Prosthodontic clinic in the past 3 years. Category 1 includes a patient with Amelogenesis Imperfecta that was treated with posterior quadrant crown lengthening, 10 RCT, cast post and cores, and twenty eight porcelain fused to metal crowns. This patient was treated according to Turner’s Category 1 recommendations. Category 2 includes a patient that had a long history of anterior wear and was treated according to this classification. Twenty eight porcelain fused to metal crowns, along with maxillary anterior crown lengthening were used to restore this patient back to function. Finally, the third patient falls into category 3 which is the most difficult to diagnose and treat. This patient presented with worn maxillary anterior teeth (lingual) and several missing posterior teeth. It was determined that this patient would be best restored with porcelain fused to metal crowns on the maxillary arch with a 3 unit bridge from 29-31. With the use of the Turner Classification, three difficult treatment scenarios were well planned and carried out. In conclusion, dentists treating patients with severely worn dentition should use Turner’s Classification to better manage and successfully treat these patients.
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Undergraduate Students:

Procter & Gamble Undergraduate Student Award. This award is given by Procter & Gamble to the undergraduate (non-DDS) student who presents the best poster or table clinic on dental related research. Dental hygiene students are among the eligible competitors. The winner receives a monetary award, and the recipient’s name is added to a plaque on permanent display in the dental school library.

Predoctoral Dental Students:

Procter & Gamble Dental Student Award for Excellence in Preventive Oral Health Care. This award is given by Procter & Gamble to the dental student who presents the best poster or table clinic emphasizing prevention of oral disease. The winner receives a monetary award, and the recipient’s name is added to a plaque on permanent display in the dental school library.

Johnson & Johnson Listerine Student Research Group Award. Supported by Johnson & Johnson and the IUSD Student Research Group, this award is given to any dental student who presents the best poster or table clinic emphasizing dental research and who has contributed over the years to dental research while at IUSD. The winner receives a monetary award, and the recipient’s name is added to a plaque on permanent display in the dental school library.

American Dental Association/Dentsply International Student Clinician Award. The winner of this award receives an expense-paid trip to the ADA’s annual session in fall 2009. First-, second-, and third-year dental students are eligible for the competition, which is supported by Dentsply International, of York, Pa. The award goes to the best table clinic or poster prepared by a member of the DDS class of 2010, 2011, or 2012. The recipient is presented with a personal plaque, and his or her name is added to a plaque on permanent display in the IU dental school’s Comprehensive Care Clinic. The winner’s presentation will be entered in the national competition (in table clinic format) during the ADA’s scientific session next fall.

Indiana Dental Association Best Clinical Case Report Award. This award was established in 2005 by the Indiana Dental Association to recognize any third- or fourth-year predoctoral student presenting the most outstanding clinical case presentation in a poster or table clinic format. The case report demonstrates proficiency, skill, and expertise in the proper management of dental care. Case reports also allow assessment of proper clinical decisions that are supported by evidence-based published literature or for which valid justification is provided by the author. The winner receives a monetary award.

Cyril S. Carr Dental Student Research Scholarship. This scholarship honors the memory of Cyril S. Carr, a 1916 graduate of the Indiana Dental College who was a dental practitioner in Indianapolis for half a century. All predoctoral dental students who have been engaged in research projects at the dental school are eligible for the Carr scholarship. Presentations and publications will be factors in selection of a winner. The recipient is selected by the IUSD Research Committee.
The Indiana Section of the American Association for Dental Research (INAADR) has established several awards to recognize outstanding research and clinical presentations. These awards are open to undergraduate, graduate, and postdoctoral students, as well as staff members. The awards are designed to encourage innovation, clinical expertise, and academic excellence in the fields of dental research and education. Here is a summary of the awards, including their eligibility criteria and the benefits they offer:

**INAADR Hatton Travel Award for DDS students.** Given by the Indiana Section of the American Association for Dental Research, this award recognizes dental students that have been selected as finalists for the AADR Hatton award. This award provides reimbursement for travel after the student has applied for and exhausted other IUSD and IUPUI travel grants for research. The award recipient will receive a certificate and a monetary award.

**Interschool Dental Student Research Awards.** Supported by the Indiana Section of the American Association for Dental Research, this award is given to any dental student from participating dental schools who presents the best poster or table clinic emphasizing dental research and has contributed over the years to dental research. Three students from each of the invited dental schools will compete for an award against the other traveling schools as well as for a second award against each other and three IUSD dental students identified in the Pre-Research Day judging that occurs the night before. The winner receives a monetary award.

**Graduate Dental Students:**

**Wrigley Student Award.** Supported by Wrigley, this award is available for all M.S.D. and M.S. graduate-level students presenting a poster at Research Day. The award recipient will receive a certificate and a monetary award.

**INAADR Hatton Travel Award for M.S./M.S.D. students.** Given by the Indiana Section of the American Association for Dental Research, the award recognizes master’s degree students who have been selected as finalists for the AADR Hatton award. This award provides reimbursement for travel after the student has applied for and exhausted other IUSD and IUPUI travel grants for research. The award recipient will receive a certificate and a monetary award.

**Trident Award for Innovation in Oral Care Research.** The Trident Award is supported by Cadbury Schweppes Americas Confectionary. All Ph.D. students presenting a poster at Research Day are eligible. The award recipient will receive a certificate and a monetary award.

The Indiana Dental Association Best Clinical Case Report Award for M.S.D. and M.S. students. This award was established in 2009 by the Indiana Dental Association to recognize any M.S.D. and M.S. student presenting the most outstanding clinical case presentation in a poster or table clinic format. The case report demonstrates proficiency, skill, and expertise in the proper management of dental care. Case reports also allow assessment of proper clinical decisions that are supported by evidence-based published literature or for which valid justification is provided by the author. The winner receives a monetary award.

**Postdoctoral Fellows:**

**INAADR Postdoctoral Fellow Award.** This award is given by the Indiana Section of the American Association for Dental Research. All postdoctoral fellows presenting a poster at Research Day are eligible. The research must have been conducted during the postdoctoral fellowship, and the researcher may not hold any faculty position for longer than a year after completing the postdoctoral research. The award recipient will receive a certificate and a monetary award.

**Staff:**
Sunstar Butler’s Staff Award for Research Excellence. This award is given for a poster presentation. The Staff Award for Research Excellence was created in 1994 to honor members of the staff for their invaluable contributions to the dental school’s research program. The recognition, which includes a monetary prize, has been made possible with support from the Sunstar Butler Company. A plaque listing the name of the awardee is on permanent display in the IUSD Library.

Faculty:

Indiana University School of Dentistry Alumni Association Distinguished Faculty Awards for Teaching and Research. The IUSD Alumni Association awards serve as a tribute from the dental school’s alumni to IU faculty members who have demonstrated exceptional talent as researchers and teachers. Each recipient is presented with a plaque and a monetary award.
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POSTERS
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SCOTTSBURG MIDDLE SCHOOL
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P1
Effects of Tobacco on Oral Health
B. WALSH, D. SHEPHERD, P. CLARK
Scottsburg Middle School

The objective of our research was to learn about the effects of tobacco use on teeth. We used our 8th grade health book, “Decisions for Health,” and the ADA internet site to research the issue. Chewing tobacco can cause gum tissue to recede and then increase sensitivity to cold and hot foods. Smoking increases the risk of oral cancer by 50% and is the 4th most common cause of cancer. In addition to causing stained teeth and bad breath, smoking increases tartar and plague on teeth. All kinds of smoking are very dangerous to your oral health. Supported by the Indiana University School of Dentistry.

P2
Smokeless Tobacco and Its Impact on Your Mouth
K. SCHEMMEL, K. LANE, P. CLARK
Scottsburg Middle School

The objective of this research was to identify the effects of smokeless tobacco on oral health. Research was conducted using various government, not-for-profit, and commercial internet sites. Chewing smokeless tobacco can cause tooth loss and gum disease, along with oral cancer of the lip, tongue, mouth, and throat. In 2008, more than 7,000 people died of cancer caused from chewing and 28,900 were diagnosed with cancer. Across the country, 12% of all 8th graders use smokeless tobacco, which can lead to addiction. Smokeless tobacco has the same or worse health risks as cigarettes and is extremely harmful to oral health. Supported by the Indiana University School of Dentistry.
P3  
Chewing Gum: Good or Bad for Your Oral Health?  
A. CONTRERAS, C. DAVIS, P. CLARK  
Scottsburg Middle School

The objective of this investigation was to find out whether gum chewing is good or bad for your oral health. We used the several internet sites including Wikipedia and Ask. We found that gum can be both good and bad. Sometimes chewing gum can help you concentrate and also helps bad breath. Gum can neutralize some of the acid produced by bacteria. However, gum chewing can be harmful when it causes unnecessary wear and tear of cartilage that acts as a shock absorber for the jaws. In conclusion, gum chewing can be a positive, but don’t chew too much. Supported by the Indiana University School of Dentistry.

P4  
Dangers of Dental Grills and Oral Piercings  
T. BALLARD, K. DANIEL, E. HAWK, C. MASON, P. CLARK  
Scottsburg Middle School

We researched the harm that can come from dental grills and oral piercings. Our research information came from internet sites sponsored by the ADA and the Surgeon General. Oral piercings can cause oral health problems by banging against teeth, carrying infectious disease, and crowding the mouth which can misshape the tongue. Dental grills can chip and tear the tooth and may trap bacteria causing tooth decay. Oral piercings are not good for oral health and dental grills are even worse. Supported by the Indiana University School of Dentistry.

P5  
How Eating Disorders Affect Your Oral Health  
L. COLLINS, V. GEISLER, P. CLARK  
Scottsburg Middle School

The objective of this research was to find out how eating disorders affect your oral health. Research was conducted by investigating internet websites which included www.ADA.com. Eating disorders rob the body of nutrients needed for healthy teeth. Teeth can change in color, size, and length. Loss of weight and therefore, bone density, can change jaw structure and facial shape. Bulimia is particularly destructive to teeth, because the acids produced by vomiting attack the tooth enamel. All eating disorders negatively affect oral health. Supported by the Indiana University School of Dentistry.
BINATIONAL/CROSS-CULTURAL HEALTH ENHANCEMENT CENTER
(Special Group Presentation of Posters 6,7,8,9,10,11,12)

P6
International Service-Learning Program, Mexico. Improving Cultural Competence of Dental Students
A.E. SOTO-ROJAS¹,* E.A. MARTÍNEZ-MIER³, M. MEADOWS¹, S. JONES², J. HATCHER²
¹Indiana University School of Dentistry
²IUPUI Center for Service and Learning

The International Service-learning (ISL) Calnali program aims at connecting meaningful community service experiences with academic learning, personal growth, and civic responsibility. The experience's objectives were developed to have an impact on health professionals' competencies by enhancing linguistic and cultural competency through an immersion experience that exposes students to other health care systems. The current study aimed at assessing if the Calnali ISL’s students meet its objectives and improve their cultural knowledge, sensitivity, and awareness. Surveys that assessed participants’ ISL experience and progress towards cultural competency were developed and administered using CoursEval™. 9 dental students completed the surveys before (PRE) and after (POST) their participation in the Calnali ISL experience. A third, similar survey was sent to IUSD alumni (ALUM) who participated in the Calnali ISL experience while they were in dental school. 48 surveys were sent and 23 received (48% response rate). Using a Likert scale in which 0= very low to 5 = very high, PRE, POST and ALUM survey's results were: 3.9, 3.8 and 3.6, respectively, indicating moderate understanding of barriers faced by Latinos. For how cultural differences will influence their interactions or work with Latino patients, values were 3.2, 3.2 and 3.1 indicating moderate understanding. For students and alumni perceptions of the frequency disparities in health outcomes are observed in Latino patients, values were of 2.5, 2.9 and 2.9 indicating a moderately low understanding. Students and alumni reported feeling moderately confident in their professional ability to provide services to Latino patients (3.4, 3.6 and 3.7). No significant differences were found between the pre and post surveys and with groups; however, values tended to be higher for post and alumni responses. Barriers, cultural differences, and disparities faced by the Latino population were moderately understood by student and alumni. Study supported by a Boyer Scholarship and a Service Learning Assistantship from the Center for Service and Learning and from the Binational/Cross-cultural Health Enhancement Center.

P7
Latino Participation in a Mobile Sealant Program
C. SCHRINER,* A.E. SOTO-ROJAS, K.M. YODER
Indiana University School of Dentistry, Predoctoral Program

Seal Indiana (SI) is a state-wide mobile dental program that provides preventive oral health services for children who do not have adequate access to dental care. Of the 17,000 children SI has seen through school visitations, 29% are of Latino decent. This particular group has been found to have higher caries
rates and numbers of untreated disease. Though the SI program seems to be reaching many students, participation rates remain low at some schools. Assessing reasons why people choose not to take part in SI can be useful in developing interventions aimed at increasing participation rates. The objective of this study was to gain a better understanding for the lack of participation in the SI program, to receive general feedback about the program, and to observe cultural differences in the Latino population. A questionnaire was developed utilizing theories in health behavior and promotion and distributed to an Indiana rural school with a high Latino population. A total of 100 questionnaires were given to the school’s nurse to distribute and collect. Analysis was conducted at the group level. Overall, 90 surveys were returned and 39(43%) were of Latino origin. The majority of participants who consented for their children to participate in SI were Latino 18(64%). Among the reasons people gave as to why they chose not to participate in SI, 62% claimed they were already seeing a dentist on a regular basis. The survey was able to detect reasons why parents do not consent for their children to participate in the SI program and show differences among the Latino population compared to other ethnicities. To improve SI services, further assessment from other schools will be incorporated at a later date in order to obtain a more complete evaluation.

P8
International Service Learning and Changes in Cultural Competence in Dental Students
D.B. GALLUP1, * E.A. MARTÍNEZ-MIER1, A.E. SOTO-ROJAS1, S. JONES2, J. HATCHER2
1Indiana University School of Dentistry
2IUPUI Center for Service and Learning

The International Service-Learning (ISL) programs at IUSD connect meaningful community service experiences with academic learning. This study aimed at determining if participation in an ISL experience allowed dental students to progress towards achieving ADA and IUSD established competencies at managing a diverse patient population and having the interpersonal and communication skills to function successfully in a multicultural environment. A mixed methods approach was used for the study. A model that best fitted the research question was identified and a validated questionnaire was used to assess students’ progress towards competencies. 4th year dental students who participated in an ISL experience, a group of students who participated in a state-wide SL program (Seal Indiana – SI) and a third group who had not participated in service experiences (NS) were compared. Before and after participation responses were compared using ANOVA and multiple logistic regression models. Students answered 33 questions on 3 domains: 1) knowledge of the impact of values and beliefs on access to care, 2) culturally appropriate clinical decision making and 3) cross-cultural communication. 83 students answered pre and post experience questionnaires. 27 in the ISL group, 30 in the SI group and 26 in the NS group. Prior to the experience, there was a statistically significant difference (p<0.05) among the groups in cross-cultural communication(with ISL having the score reflecting most competence in the scale - 1.00 vs. 1.13 and 1.24), but not in traditional beliefs knowledge or clinical decision making. Post participation results also showed statistically significant differences (p < 0.05) among and within groups, with ISL and SI reporting increased scores for knowledge of the impact of values and beliefs on access and appropriate clinical decision making. Participation in ISL experiences in this sample of students
increased their knowledge of the impact of values and beliefs on access to care and facilitated culturally appropriate clinical decision making. Supported by a Center for Service and Learning’s Boyer Scholarship and Service Learning Assistantship and Pilot Grant Funds from the Binational/Cross-cultural Health Enhancement Center.

P9
Teeth, Mastication, and Excess Weight in Mexican Elders
G. MAUPOMÉ-CARVANTES

Background: The presence of teeth is associated with the ability to chew and thus related to appropriate diet and nutrition. While tooth loss and mastication problems have been linked to Body Mass Index (BMI), the relationship deserves further characterization. Objective: To assess the association between number of teeth, mastication, and obesity (not excess weight) in elders across three urban-to-rural locales in Mexico. Methods: A cross-sectional study on independently living elders over the age of 59 (122 men, 183 women), residing in either middle socio-economic class (SES)-urban/ low SES-urban/ low SES-rural locales in Central Mexico identified obesity (yes BMI>29, no BMI<30), number of teeth (0-10/11-20/21-32), sex, urban-to-rural locales, masticatory function, living alone (yes/no), self-perception of health (excellent-good/regular/ bad-very bad), depression (yes/no), regular official source of monthly income (yes/no). Oral and anthropometric exams, and oral/general health interviews were carried out at home by standardized dentists and nutritionists. Results: 285 subjects participated (44.6% rural, 33.7% low-urban, 21.7% middle-urban). Overall mean age was 75±8.5 years (low-urban subjects were younger, 73.1±7.2 years). Obesity prevalence was 20% (n=57), and higher in women (23.8%), low-urban locale (29.2%), among persons with >21 teeth (29%), and younger persons (72±7.0). Mean masticatory function was similar between persons with (36.6%± 36.4%) and without obesity (32.2%±33.5%). Binary logistic regression adjusting for age, locale, sex, living alone, depression, self-perception of health, and income, showed that persons with >21 teeth (OR=2.7, 95%CI 1.32-5.59), from the low SES-urban locale (OR= 3.8, 95%CI 1.3-10.9) and female (OR= 2.24, 95%CI 1.1-4.4) were more likely to have obesity. Conclusion: Masticatory function was not associated with obesity. However, the number of teeth present may increase the ability to eat foodstuffs with different nutritional values. Food selection and possibly obesity may be modified through diverse cultural dietary patterns and varying levels of physical activity in rural and urban areas.

P10
Responses of Latino Parents to Seal Indiana Follow-up Phone Calls
A.E. SOTO-ROJAS, K.M. YODER*
Indiana University School of Dentistry

Seal Indiana (SI) is a state-wide mobile dental non-profit program that provides dental screenings, sealants, x-rays and fluoride varnish for children from low-income families, at Title I schools, community health centers, head start and summer migrant programs. A report of services provided is sent to
parents. Previous studies have shown that cultural differences play a role in the patients’ response to follow-up. It is appropriate to assess patient responses to follow-up strategies to modify them according to needs of particular populations. **OBJECTIVE:** This study compared Latino and non-Latino parents’ responses to telephone calls made by a bilingual dentist regarding the follow-up of children reported with severe dental caries by SI program. **METHODOLOGY:** A bilingual dentist telephoned parents of children with severe dental caries to ascertain the availability of finding dental services, and to assist if Medicaid insurance is needed. Successful telephone calls, positive or negative responses were recorded. A successful call is reported if the dentist talked to the parent and positive if the parent talks to the dentist. **RESULTS:** A total of 186 children were reported (January-June 2006) with severe decay 52 (28%) were Latino and 134 (72%) were Non-Latino. Several telephone calls were attempted if needed. For non-Latinos 63 (47%) phone calls were successful, reasons for unsuccessful calls were: 33 didn’t answer, in 27 a message was left, in 11 the number was wrong or disconnected. Nine negative responses to phone calls were found. For Latinos, 26 (50%) phone calls were successful, 19 didn’t answer, in 3 a message was left and in 4 the number was wrong or disconnected. There were no negative responses from Latino parents. Percentages of successful calls and negative responses were significantly different for the two groups (p<0.05). **CONCLUSIONS:** In this sample of parents of Latino and non-Latino patients reported with severe caries, the Latino parents were more receptive to phone calls than non-Latino parents and this difference may be related to cultural differences. Study supported by the Indiana State Department of Health. This presentation is part of the research outfit Bi-National/Cross-Cultural Health Enhancement Center – an Indiana University Signature Center.

**P11**

**Community-Based Participatory Research: A Tool to Address Oral Health Disparities**

L.D. GALVEZ,* E.A. MARTÍNEZ-MIER, A.E. SOTO-ROJAS

Indiana University School of Dentistry

Several publications have pointed out that there is a need to address that untreated caries is higher in Latinos and that the reasons for this disparity need to be understood and addressed. The aim of this study was to gain a better understanding of the dental caries prevalence of a group of Latino children, and the dental knowledge of their parents. A Latino community organization and researchers collaborated to conduct focus groups, key informant interviews, and dental exams. Children ages 6 to 13 were examined for dental caries using the International Caries Detection and Assessment System index. Core guiding questions were developed, tested, and refined with a random sample of participants. Questions inquired about oral health prevention, access to care, beliefs and knowledge of causes of dental problems and reasons preventing the community from improving oral health. The interviews were recorded and transcribed. Codification of answers was performed. Results were analyzed using content analysis methodology in which the frequency of answers was assessed and tabulated. Caries prevalence was calculated for both cavitated and non cavitated lesions. The results were analyzed jointly by community members and researchers. 29 adults ages 18 to 44 participated in the focus groups. 39 of their children received a dental exam. Results showed that 32 of the children had at least one caries lesion. Most participants reported understanding the role of sugared beverages, candy and other
cariogenic foods in caries development. Most participants; however, were not familiar with the role of fluoride in caries prevention. None of the participants were aware of the role of sealants, in spite of 22 of the children examined had sealants placed. Many traditional beliefs were associated to the use of chewing gum and early childhood caries. The information obtained indicated there was great need for information and education; it also guided the development of a community action plan that will include the development of a culturally appropriate oral health educational program. Supported by an RSFG grant and Pilot Grant Funds from the Binational/Cross-cultural Health Enhancement Center.

**P12**

**Treatment Outcomes of Dental Sealants Placed in a Rural Setting**

E.A. MARTÍNEZ-MIER1,* M. ESCOFFIE-RAMIREZ2, S.L. COOK3, J.A. GUIDO1, A.E. SOTO-ROJAS1, H. EGGERTSSON1

1Indiana University School of Dentistry
2Universidad Autonoma del Estado de Yucatan

The evidence of the effectiveness of sealants as a prevention strategy for caries has been confirmed by systematic reviews conducted by several groups. However, the effectiveness of the use of dental sealants in rural settings under field conditions has not been extensively studied. The overall goal of this investigation was to determine the treatment outcomes of sealants placed in a public health setting as part of a service-learning program in rural Mexico. 478 consented children (mean age: 10.53±5.11), were examined by calibrated investigators using the International Caries Detection and Assessment System (ICDAS) in 2004, 2006 and 2007. After being examined, 3rd and 4th year dental students placed sealants (UltraSeal XT, Ultradent Products Inc. USA) on children’s permanent molar and premolars which were diagnosed as sound or had incipient occlusal caries lesions (ICDAS severity scores ranging from 0-3). In 2008, children were contacted to receive a recall examination by a calibrated examiner (4-, 2-, and 1-year follow up). Children were examined using ICDAS and sealant retention criteria. 232 children returned for a recall examination (mean age: 10.89±3.11). For sound teeth (code 0) after 1, 2, and 4 years, 96.3%, 86.9 and 60.4% of the sealants had survived, respectively. For sealants placed on surfaces diagnosed as early enamel caries lesions (ICDAS 1-3), after 1, 2, and 4 years, 94.3%, 71.4% and 55.7% had survived. Differences among survival rates for sound vs. carious surfaces were not statistically significant. Survival rates for sealants placed as part of a service-learning program are comparable to previously reported survival rates for sealants placed in rural settings. Sealants appear to be an effective treatment to manage dental caries in this type of setting. Supported by an IUPUI Signature Center Grant.

**BEHAVIORAL SCIENCE**

**P13**

**Are Postmenopausal Women Aware of Their Periodontal Health?**
D. SANTOS,* B. ATKINS, J. SHAH, N. ALMUDALLAL, L. BAHL-PALOMO
Case Western Reserve University School of Dental Medicine

Are postmenopausal women aware of their periodontal health status? Ninety-four postmenopausal women who reported receiving “regular” dental and medical care participated in this IRB approved observational study. Participants responded to a questionnaire and received a periodontal exam from a calibrated examiner. Plaque score percentage (PS) for each participant, periodontal probe depth (PD), and clinical attachment level (CAL) in mm on 6 sites per tooth were measured. Based on clinical attachment levels, participants were classified as having mild (1-2mm CAL), moderate (3-4mmCAL), or severe (>5mmCAL on greater than 30% of sites) periodontitis. A cone beam computed tomography (CBCT) image was also taken of each woman to identify bone loss. Perception of periodontal health status was compared to actual diagnosis from clinical exam outcome. Almost all participants (97.8%) reported having “healthy gums”, 2.1% reported having had “history of gum disease but currently healthy gums”, and 0 reported having gum disease. Based on clinical exam findings, 36.2% had severe, 26.6% had moderate, and 34.0% had mild periodontitis, while 3.2% did not have periodontitis. When asked about frequency of dental visits to maintain current periodontal conditions, 86.2% reported “every 6 months”, 3.2% reported “every 3 months”, and 10.6% did not know. Average Plaque score was 67.5%. When asked if they could be at risk for tooth loss, 98.9% answered “no”; when asked why, the most common answer given was “good dental coverage”. Postmenopausal women who visit dentists and physicians regularly are not aware of their periodontal health. This study suggests that patient education must be a priority to prevent progression of periodontitis and tooth loss. Further research in this area potentially can identify treatments and prophylaxis that may be useful for women at the onset of menopause.

BONE CELL BIOLOGY

P14
Pyk2 Phosphorylation and Signaling in Osteoclasts is Decreased by Dynamin
L. DU1,* L. NEFF2, R. BARON2, A. BRUZZANITI1
1Indiana University School of Dentistry, Department of Oral Biology
2Harvard School of Dental Medicine, Department of Oral Medicine, Infection and Immunity, Boston, Mass.

The podosome belt is an actin-rich adhesion structure found in osteoclasts (OCs) and other highly migratory cells. In OCs, the podosome belt forms the sealing zone and surrounds the ruffled border membrane where bone resorption occurs. Formation of the podosome belt/sealing zone is critical for the bone resorbing activity of osteoclasts and agents that disrupt this structure significantly alter the ability of OCs to attach to bone, migrate along the bone surface and resorb bone. The tyrosine kinases Pyk2 and Src are important signaling proteins which contribute to podosome belt organization, cell
spreading and the bone resorbing activity of OCs. Moreover, mice lacking either Src or Pyk2 exhibit increased bone mass due to dysfunctional OC activity. Following OC attachment via integrins, Pyk2 is autophosphorylated at tyrosine 402 which forms the binding site for Src and leads to the activation of both kinases. However, the mechanisms leading to the dephosphorylation of Pyk2, complex disassembly and podosome turnover are unknown. The GTPases dynamin, which is known to be phosphorylated by Src, also contributes to podosome organization and OC bone resorbing activity. Therefore, the objective of this study was to identify whether dynamin associates with Pyk2 and/or regulates Pyk2’s activity. We used scanning confocal microscopy to examine the localization of Pyk2 and dynamin in OCs. This approach revealed that Pyk2 and dynamin colocalize with actin in the podosome belt of OCs suggesting that the two proteins may form a complex. Next, we used authentic OCs derived from bone marrow and 293VnR cells transiently-transfected with Pyk2 and dynamin cDNA to examine the interaction of Pyk2 and dynamin in vitro. Cells lysates were subject to co-immunoprecipitation followed by Western blotting using specific antibodies. We found that dynamin associates with Pyk2, decreases Pyk2 Y402 phosphorylation in a dynamin GTPase-dependent manner, and prevents the binding of Src to the Pyk2-Y402 binding site. These results demonstrate that dynamin promotes the dephosphorylation of Pyk2 which may block Pyk2-mediated integrin signaling and regulate podosome belt disassembly in OCs.

CARIOLOGY

P15
Enamel Conditioning Effect on Penetration and Microleakage of Glass Ionomer-Based Sealants
S. AHMED,* C. GONZÁLEZ-CABEZAS, M. COCHRAN, M.R. FONTANA, B. MATIS, T. CHU
Indiana University School of Dentistry

While most sealants available are resin-based, glass ionomer-based cements can also be used as sealants, with the advantage of being more tolerant to moisture during placement and release fluoride. The objective of this study was to evaluate the influence of different fissure conditioning techniques on penetration and microleakage of glass ionomer (GI) and resin-modified glass ionomer cements (RMGI) used as sealants. Clinically sound extracted human molars were distributed into nine experimental groups (n=15 each). Group 1 (control) was sealed with resin-based sealant (Delton) following clinically accepted techniques. Groups 2-6 were sealed with RMGI (Vitremer) after having the fissure conditioned with either Polyacrylic acid (RMGI-control), 35% H₃PO₄, low viscosity 35% H₃PO₄ with a surfactant, self-etch conditioner, or 35% H₃PO₄ followed by self-etch conditioner. Groups 7-9 were sealed with GI sealant (Fuji Triage) after having the fissures conditioned with either Polyacrylic acid (GI-control), 35% H₃PO₄ or low viscosity 35% H₃PO₄ with a surfactant. After aging through thermocycling (2500 cycles), specimens were incubated in methylene blue for four hours and sectioned at multiple locations. Digital images were obtained using a digital stereomicroscope, and microleakage was determined by scoring the dye penetration along the enamel-sealant interface. The penetration of the material was
P16
Comparison of Two-QLF Thresholds for Caries Quantification under Sealants

An ongoing clinical study is assessing the ability of different detection methods to monitor caries lesions under clear sealants. One of the methods under study is Quantitative Light-induced Fluorescence (QLF). **Objective:** To compare two QLF thresholds for fluorescence image analysis on caries quantification. **Methods:** 77 consented children (mean age: 8.8±1.1), with at least two permanent molars that were either sound or had occlusal caries lesions [International Caries Detection and Assessment System (ICDAS) lesion severity scores ranging from 0-4], had their permanent molars brushed with water, and examined using Quantitative Light-induced Fluorescence (QLF, Inspektor Research Systems B.V., The Netherlands) before and one month after sealant placement (Helioseal Clear Chroma, Ivoclar Vivadent, Liechtenstein). 121 surfaces were selected. QLF images were analyzed for average fluorescence loss (ΔF [%]), size (S [mm²]), and ΔQ (ΔF×S [%×mm²]). Two thresholds [70% (Th70), and 95% (Th95) of fluorescence reduction] were considered to be caries and evaluated further by image analysis. Pearson correlation coefficients between QLF variables and ICDAS scores and comparisons among QLF variables based on baseline ICDAS scores were assessed using ANOVA. **Results:** For Th70 there was a significant (p<0.05) moderate correlation between the QLF variables and the baseline ICDAS scores (ΔF: r=0.65, S: r=0.47, ΔQ: r=0.51). For Th95 the correlations were not as strong. For the comparisons, for Th70, QLF variables were able to significantly distinguish ICDAS scores (p<0.05) at baseline and after sealant placement (e.g., baseline-ΔQ: ICDAS scores 0&1<3&4; 2<4, 1 month-ΔQ: ICDAS scores 0&1&2<4). However, for Th95, QLF-S at baseline and S and ΔQ after sealant placement were unable to distinguish between ICDAS scores (p>0.05). **Conclusion:** The use of QLF when set at a threshold of 70% fluorescence reduction allowed for better discrimination of ICDAS scores when examined through clear sealants. This study was supported by NIH grant R21 DE018115-01.

P17
Development of a Standard Fluoride Analytical Method for Dental Plaque
E.A. MARTÍNEZ-MIER, C.B. BUCKLEY,* A.E. SOTO-ROJAS
Indiana University School of Dentistry

determined by calculating the percentage of the total length of the fissure penetrated by the material. **Results:** The use of self etch-conditioner significantly increased RMGI penetration, while surface conditioning with 35% phosphoric acid with surfactant significantly decreased microleakage of GI. The resin-based sealant placed after 35% phosphoric acid surface conditioning showed the best penetration and the least level of microleakage. In conclusion, results from this study suggest that the placement of glass ionomer-based sealants can be enhanced by modifying current conditioning methods.
Fluoride diffusion analysis (DA) releases and concentrates both free and bound F by acid-facilitated diffusion. It is the preferred method for analyses of samples in which F may be in a covalent or complexed form, such as the determination of fluoride in total dental plaque. Currently available diffusion techniques release fluoride at an approximate pH of 1, which imitates the pH encountered in the stomach environment. These methods may not have biological relevance when analyzing fluoride in dental plaque samples, since the oral environment does not ever reach such low pH. The aim of this study was to assess the analytical precision and trueness of a newly developed DA method to analyze acid-diffused plaque at a pH of 4. Initially, four combinations of reagents were tested for pH. These included different types and concentrations of acids and acid buffers. Once the target pH was obtained, the identified combination of reagents (2.0 ml DIH2O + 1.0 ml standard + 1.0 ml HMDS saturated 0.00005M SO4) was used to analyze commercially F standards (0.02 ppm) and plaque samples. Using a goal of the required within laboratory precision of 5%, the estimated standard deviation would need to exceed 0.0048 to conclude that the measurement is not as precise as required. Results did not reach that level (sd = 0.0029). The trueness of the measurement process was assessed based on the confidence interval (0.0191- 0.024), which in this case did contain the true measurement value. Therefore, test results were within IS0 acceptable limits for precision and trueness. As expected, significant differences were found among the concentration values obtained using the pH 4 and pH 1 method for plaque samples (65.37 ± 28.24 µg F/g vs. 0.28 ± 0.34 µg F/g). Based on the results obtained from these samples, it is concluded that the current technique, which simulates oral pH conditions of biological relevance, is able to render precise and true values when analyzing samples of know concentration and repeatable values when analyzing samples of unknown concentration.

P18
Preliminary Q-PCR Analysis of Plaque Microflora as Caries Predictor
D. CATT,* G. ECKERT, M.R. FONTANA
Indiana University School of Dentistry

Objective: Subtle differences in plaque microflora may have a role in evaluating caries risk assessment. We used quantitative real-time PCR (Q-PCR) to examine differences in plaque microflora from young children who were caries-free at baseline and either developed caries (n=6, Group A) or remained caries-free (n=6, Group B) after 1yr. Plaque was assayed for specific bacterial species determined previously to be overabundant (Actinomyces naeslundii, Streptococcus mutans) or scant (S.mitis, S.gordonii) in carious lesions. We previously reported no statistical differences between the two groups in the amounts of these bacteria using the baseline plaque samples. This report examines the results for the one-year plaque samples. Methods: Plaque samples or control bacteria in cell lysis solution (1% Triton X-100, 20mM Tris-HCl, 2mM EDTA [pH 8.0]) were incubated with 20U of mutanolysin/ml and 0.2mg of lysozyme/ml at 37°C for 2 hr, then boiled at 100°C for 10 min. 20µl of a mixture containing 1µl of lysed cells, 1X TaqMan Universal PCR Master Mix (Applied Biosystems), 200nM (each) sense and antisense primer and 250nM TaqMan probe (5’FAM and 3’TAMRA labeled) were analyzed using the ABI PRISM 7000 sequence detection system (Applied Biosystems) with the following cycle profile: 50°C,2min; 95°C,10min; then 60 cycles of 95°C,15s; 58°C,1min. Serial dilutions (in duplicate) of each
sample were assayed. **Results:** Group A (caries-active) had a statistically significant (p<0.05) increase over Group B (caries-free) in the amount of *S. mutans*, the combined amount of *S. mutans* and *A. naeslundii*, and the total of all 4 probe species. In Group B, *S. mitis* was present at a significantly higher percent of total than in Group A. **Conclusion:** Preliminary results suggest examination of plaque microflora as a tool for caries risk assessment may be feasible but a larger cohort of species and multiple sampling time points may be necessary.

**P19**
**The Antimicrobial Effect of a Copper-Containing Sealant**
E. COLEMAN, * M.R. FONTANA, C. GONZÁLEZ-CABEZAS, A. HADIR

Sealants protect the pit and fissure areas of teeth surfaces by penetrating into the fissures of the tooth to seal them from additional bacterial colonization, and to isolate existing sealed bacteria from nutrient sources derived from the oral environment, thereby preventing the development of caries and/or arresting existing caries lesions. Copper salts have antimicrobial properties and have been used in the past in dentistry to control microbial growth adjacent to copper releasing materials. **Objective:** to test whether Cl seal has and anticariogenic properties compared to a negative control; Pit and Fissure sealant; Delton, Dentsply **Methods:** In this study, two groups of 12 human tooth specimens were inoculated once at the beginning of the experiment with 20 µl of a mid-log phase culture of *S. mutans* TH16 (serotype c), at an absorbance of 0.5 at 540 nm in trypticase soy broth supplemented with 5% sucrose (TSBS). Following inoculation, specimens were incubated at 37°C for 2 hours to allow the bacteria to adhere to the tooth structure before beginning the cycling of fluids. Specimens were exposed for 4 days, at 37°C, to circulating trypticase soy broth supplemented with 5% sucrose (TSBS; 0.7 ml/min) for 1 h, 3 times a day, and to a mineral washing solution (MW; 0.7 ml/min during the day, and 0.15 ml/min at night) for the rest of the day. The circulating fluids were intended to reproduce nutrient intake 3 times/day, while the MW represented an artificial saliva buffer solution. Three teeth/group were aseptically removed and placed in 5 ml of sterile saline. Then they were vortexed (20 sec) and sonicated (20 sec) to disrupt plaque from the tooth surface. The dislodged bacteria was be diluted 1:10, 1:100, 1:1000 and 1:10,000 and double plated on Mitis Salivarus supplemented with bacitracin and sucrose (MSSB, for *S. mutans*) and Trypticase Soy Agar (TSA) for determination of the total number of bacteria and to ensure that there was no contamination in the system. The fluid remaining in the caries-vessels after the last sucrose cycle, as well as the remaining drainage fluid, TSBS and MW media was monitored for pH. Specimens were analyzed for bacterial colonization, sectioned, and analyzed for lesion depth using confocal laser scanning microscopy. **Results:** Cl seal had significantly higher total area, total gray, and depth than did Delton. This study was supported by a grant from IUSD and the Cooley and Cooley company.

**P20**
**The Influence of ICDAS-II E-Learning Programme for Occlusal Caries Detection**
Sao Paulo State University, Araraquara Dental School, Brazil
Indiana University School of Dentistry

Objectives: Evaluate the influence of ICDAS-II training in a group of dental students for occlusal caries detection in permanent teeth. Methods: One hundred and four permanent teeth (premolars and molars) with occlusal surfaces varying from ICDAS-II scores 0-6 were cleaned and stored in thymol solution. One occlusal site per tooth was selected and a photograph taken to identify the site. Eight senior dental students examined the teeth twice observing a one-week interval between two phases: before and after the ICDAS-II e-learning programme. Teeth were histologically examined. Reproducibility was assessed using two-way tables and intraclass correlation coefficients (ICCs). Repeated measures ANOVA was used to test for a significant change in the ICDAS scores before and after e-learning. Comparisons between the % correct, specificity, sensitivity, and area under the ROC curve of the ICDAS scores before versus after e-learning were performed using bootstrap analyses. Results: Intraclass correlation coefficients for intra- and inter-examiner repeatability were high, both before (0.75 and 0.72, respectively) and after e-learning (0.82 and 0.78 respectively). The ICDAS-II scores decreased significantly from before to after e-learning (p=0.0001). Correlation between ICDAS-II scores and histology scores was moderate (0.57 before e-learning and 0.61 after). Although the ROC curve shows an improvement in the use of the ICDAS-II scoring after e-learning, the difference was not significant (p=0.10). Although specificity of the ICDAS-II scores significantly improved after e-learning (p=0.0001, 77% vs. 36%), sensitivity was reduced slightly after e-learning (p=0.0061, 87% vs. 92%). Conclusion: The ICDAS-II e-learning programme improved performance of the ICDAS-II visual examination criteria for the detection of occlusal caries lesions.

P21
Correlation of Early Caries Exams and Treatment Plan
D. HARTLEY,* A.G. FERREIRA ZANDONÁ, M.R. FONTANA, J.R. CHIN, G.J. ECKERT
Indiana University School of Dentistry

Objective: Assess correlation between a visual exam using the International Caries Detection and Assessment System (ICDAS-II) and corresponding treatment plan completed by undergraduate students at Indiana University School of Dentistry (IUSD). Methods: sample of 187 subjects with charts were selected from participating subjects (N=207) in an 18 month parent study where children 5-14, undergoing treatment at the Pediatric Dental Clinic of the IUSD had been examined with the ICDAS-II criteria by independent examiners. Prediction of subject-level treatment plan information from baseline ICDAS examination results was performed using logistic regression. Results: There was a significant (p=0.004) positive association between higher numbers of surfaces containing ICDAS scores ≥ 1/3/5, or filled surfaces and presence of a treatment plan and a completed caries risk form. However, although there was an association, only 7 charts had a caries risk form completed. Invasive interventions (amalgams/resins/crowns/extractions) were more likely to be planned and delivered for ICDAS=3/4 and ICDAS=5/6 than ICDAS=1/2 (p=0.0001). Sealants were more likely to be planned and delivered for ICDAS=1/2 than for ICDAS=0 (p=0.002). Subjects with higher ICDAS scores were more likely to receive...
fluoride treatments and dietary counseling and less likely to receive bitewing radiographs (p=0.04).

**Conclusions:** Further guidance is needed to improve the use of customized preventive care based on risk for undergraduate students at IUSD. Supported by Delta Dental Foundation.

**P22**

**Restorative Treatment-Strategies Reported by U.S. Dental School Faculty**

J. WALLER-SMITH¹, M.R. FONTANA³, G. ECKERT², S. DOMÉJEAN-ORLIAGUET³, I. ESPELID⁴, A.B. TVEIT⁴

¹Indiana University School of Dentistry

²Indiana University School of Medicine

³Faculty of Dentistry University of Auvergne, France

⁴Faculty of Dentistry University of Oslo, Norway

Disparities among dental school faculty concerning the teaching and practice of cariology can lead to variations in students’ treatment modalities that can have health and economic consequences for patients and third party providers. Understanding if disparities exist and what they are can help design faculty education and training calibration tools. **Objective:** The purpose of this study was to assess the caries management strategies used by full (FTF)- and part-time (PTF) faculty at one US Dental School employing a modified questionnaire used in previous studies in Europe. **Methods:** The study population consisted of 290 FTF/PTF faculty and 100-4th year students. The survey was posted on surveymonkey.com®. The voluntary participants were asked questions concerning restorative treatment decisions based on selected clinical and radiographic images and patient case-scenarios, including choice of cavity preparations and dental materials. They were also asked how, if at all, caries risk assessment affected their decisions. **Results:** The response rate to date for FTF/PTF/students was: 27%/7%/22%, respectively. There were many differences in diagnoses and treatment decisions. For example, diagnosis of an occlusal/radiographic image of a fissure system ranged from 28% sound to 61% enamel-only lesion, 3% dentin lesion, and 8% uncertain; with varying recommendations: 13% no treatment, 15% fluoride, 51% fissure sealant, and 22% operative intervention. FTF were less likely (p<0.05) than others to require restoration for enamel proximal lesions and non-cavitated occlusal lesions, estimated a longer progression time for proximal outer-enamel lesions to progress to dentin, and were more likely to recommend topical fluoride and at-home fluoride for non-cavitated lesions in adults, agree with waiting before treating a proximal DEJ lesion in a new lower risk-patient, and believe that it’s more important to not fill sound teeth unnecessarily than to risk overtreatment. 66.1% of survey participants stated that they use risk assessment to help in formulating restorative treatment decisions. Those who perform caries risk assessment were less likely (p<0.05) to require restoration for enamel lesions, estimated a longer progression time for proximal outer-enamel lesions to progress to dentin, and were more likely to use topical fluoride and provide a treatment plan for white-spot lesions. **Conclusion:** Disparities exist amongst faculty and students in treatment decisions for non-cavitated caries lesions and use of risk-based caries management. This study was funded by a grant from IUSD.

**P23**
Comparing ICDAS and Novel Caries Detection Technologies in Secondary Caries
1Indiana University School of Dentistry
2University of Puerto Rico, School of Dentistry Research Center
3Indiana University School of Medicine, Section of Biostatistics

Objective: The International Caries Detection and Assessment System (ICDAS - II) and the Quantitative Light Induced Fluorescence with modified ICDAS criteria (QLF-I) are being used as caries detection methods in a 4 year longitudinal study in schools in the Commonwealth of Puerto Rico. The objective of this study is to assess how clinical ICDAS-II scores compare to QLF-I images as well as the combination of ICDAS-II-QLF-I compared to ICDAS-II and QLF-I individually, as early. Methods: 460 children provided informed consent and were examined with the ICDAS-II and the QLF-I at baseline, 8 months, and 12 months. The enrolled children ranged from 5-13 years old and were mostly Hispanic. The total number of surfaces that were examined was 26,077 including buccal, lingual, occlusal, buccal pits and lingual grooves, with scores 0-6 on ICDAS-II and 0-5 on QLF-I. Results: There was a correlation of 0.77 between ICDAS-II and QLF-I on all surfaces. For scores of 0, QLF-I coincided 86%, score of 1- 55%, score of 2-79.8%, score of 3- 85.7%, score of 4- 95.7%, score 5- 100% and score 6- 98.5%. The correlation between ICDAS/QLF-I combination and QLF-I (all surfaces) is 0.99, and the correlation between ICDAS/QLF-I combination and ICDAS-II (all surfaces) was 0.78. Conclusions: Both ICDAS-II and QLF-I appear to be reliable methods of examining progression of early carious lesions. There was a high correlation between both, comparing individually as well as ICDAS/QLF-I against each one, with a higher correlation of 0.99 when comparing ICDAS/QLF-I with QLF-I. In some instances when evaluating QLF-I alone it gave higher scores to lesions than ICDAS-II alone. The significance of this difference will be determined in a continuation of this longitudinal study to establish if QLF-I or a combination of ICDAS/QLF-I can better assess progression of active carious lesions than ICDAS-II alone. Supported by NIH/NIDCR RO1DE017890-01.

P24
Comparison of Novel Methods Assessing the Erosive Potential of Beverages
1Wabash College, Crawfordsville, Ind.
2Indiana University School of Dentistry, Oral Health Research Institute

Enamel surface softening and surface loss are direct parameters used to determine the erosive potential of acidic beverages. These analyses can be relatively expensive and time-consuming, therefore not adequate for large screening tests. In this study, we hypothesized that two indirect novel methods (pH-stat and ADAF) could adequately reproduce the erosive potential of 10 acidic solutions, determined by percentage of microhardness change (%SMC) and surface loss (SL). Eighty bovine enamel specimens (5x5x2 mm) previously cut and polished were randomly assigned to the 10 experimental groups (n=8) and then immersed in the testing solutions. Each group was exposed to its corresponding testing
solution for 5, 10, and 30 minutes, rinsed with de-ionized water and dried after each immersion. %SMC and SL were determined after each exposure time by optical profilometry and Knoop surface microhardness, respectively. The 10 testing solutions were analyzed by the two novel methods, in triplicate and using standard protocols. Complementary analyses of pH and titratable acidity were performed. Analysis of variance (ANOVA) and Tukey tests (alpha=0.05) showed significant differences among solutions within each exposure time, for both SL and %SMC. Correlation analyses showed that results of pH-STAT and ADAF methods exhibited good correlations with % SMC (>0.81 and >0.81, respectively) and SL (>0.79 and >0.83). Both indirect novel methods tested showed to be promising for the determination of the erosive potential of beverages.

P25
In Vitro Enamel Remineralization Effect of Different Remineralizing Products
H. HIRSCH,* M.R. FONTANA, C. GONZÁLEZ-CABEZAS
Indiana University School of Dentistry

The success of fluoride in preventing and arresting caries is primarily due to its effect in enhancing remineralization of calcium and phosphate into tooth structure at the site of a carious lesion. Some new experimental [e.g., calcium carbonate containing toothpaste tablet by Cooley and Cooley] and already marketed [e.g., MI Paste by GC America] containing Recaldent (casein phosphopeptide amorphous calcium phosphate] products release calcium with the intention to aid in caries remineralization. 

Purpose: Compare the caries remineralization potential of MI Paste, MI Paste Plus (plus fluoride), 1100ppm sodium fluoride dentifrice, and an experimental calcium carbonate tablet. Methods: Caries-like lesions (Vickers surface microhardness (SMH) of 25-45) were developed in ninety human enamel specimens. Specimens were then divided in balanced groups (based on SMH) and subjected for 20 days to a cyclic demineralization/remineralization regimen, which consisted daily of a 4-h acid/carbopol demineralization period, four 1-min treatment periods (except for sodium fluoride dentifrice, products were not rinsed off to mimic clinical use), and ~20 h in a saliva mixture (pooled human saliva/artificial saliva). After cycling, specimens were reanalyzed for SMH and the change in hardness (ΔSMH) was calculated (posttreatment - baseline). Specimens were then sectioned, stained, and analyzed using confocal microscopy. Results: The re-hardening of the NaF-dentifrice group was significantly (p<0.05) higher ΔSMH (Mean±SD= 70.2±43.7) and the lesion area significantly smaller (7,490±8,356µm²) than the other groups. The experimental tablet (ΔSMH:9.1±10.4; Area:15,259±6,568µm²), MI Paste Plus (ΔSMH:7.0±7.8; Area:17,747±7,835µm²), MI Paste (ΔSMH:2.6±7.0; Area:21,132±5,427µm²), and DI water (ΔSMH:7.2±5.0; Area:18,981±6,200µm²) were not significantly different. Conclusion: NaF dentifrice treatment resulted in significantly higher level of remineralization than any of the three tested calcium delivery products in this in vitro remineralization model. Study was supported by an IUSD grant.

P26
Effects of Sealant Thickness on Quantitative Light-Induced Fluorescence Measurements
Sealing incipient caries lesions would be expected to grow in popularity based on recently published evidence-based recommendations. Monitoring the degree of enamel mineralization under a sealant using Quantitative Light-induced Fluorescence could help dental practitioners evaluate the status of demineralization and modify intervention if necessary. **Objective:** To evaluate the effect of sealant thickness on QLF measurements. **Methods:** 224 pre- and post-sealant first molar impressions made with a vinyl polysiloxane material (and poured with Silky Rock die stone). The fabricated models were scanned and analyzed with Proscan 2000A software in order to calculate an average and maximum thickness of the sealant. QLF images were analyzed for average fluorescence loss (ΔF [%]), size (S [mm²]), and ΔQ (ΔF×S [%×mm²]). The data were combined with average and maximum pre- and post-sealant QLF values for each corresponding tooth and analyzed using correlation coefficients. **Results:** 218 out of 224 scanned dies were used for analysis. The mean maximum sealant thickness was 491.6±198.0 µm whereas the mean average thickness was 109.3±50.1 µm. Although a decrease in QLF values occurred after sealant placement, variation in the sealant thickness produced no significant (p>0.05) effect on post-sealant QLF measurements. **Conclusion:** Thickness of a clear sealant does not affect QLF measurements through the material. This study was supported by NIH grant R21 DE018115-01.

**P27**

**Critical Epitopes of Streptococcus mutans in Relation to Dental Caries**


Dental caries is the most prevalent disease in childhood in the US. Antigen I/II is a surface protein of *Streptococcus mutans* important in colonizing dental enamel surfaces and human heart tissue. The specificity of antibody response to antigen I/II, disrupting its function, influences an individual’s susceptibility to dental caries. It is not known which of the epitopes along antigen I/II are most critical in terms of adhesion to the enamel surface. Our goal was to study salivary immune responses to 7 epitopes. We obtained deidentified human saliva samples in accordance with IRB approved protocol #0304-58. Unstimulated whole saliva was used to assess salivary IgA antibody responses to 7 putative critical antigen I/II epitopes. Levels of salivary IgA (SlgA) antibody binding to various peptides were detected using an enzyme-linked immunoabsorbent assay (ELISA) technique. We conducted the experiment at 2 different concentrations of the putative epitope peptides. Total antibody levels were quantified by OD 490nm absorbances of the samples. Two putative critical epitopes (found at positions 834-853 and 1085-1104) of the 7 studied in this study showed promise. Both of them demonstrated more than a 16-fold increase in SlgA binding compared to a control at a concentration of 100 µg/ml. In both experiments one of them had twice the SlgA reactivity (at 100 µg/ml) and 5 times (at 10 µg/ml) the SlgA reactivity than the other 6 putative critical epitopes combined. This epitope was found at positions 1085-1104 along antigen I/II and has the sequence of TLATFNADLTKSVATIYPTV. Of the 7 putative critical epitopes examined, the antigen I/II epitopes found comprising positions 834-853 and 1085-1104 may be critical to functionally interfering with the attachment and colonization to the tooth surface of
**P28**

**Detection of Proximal Lesions: ICDAS II versus Caries Detection Devices**

N. MEHTA,* A.G. FERREIRA ZANDONÁ, M. ANDO, G. ECKERT
Indiana University School of Dentistry

Objectives: This study's aim was to compare the use of visual examination (ICDAS II criteria), fiberoptic transillumination (FOTI, Schott Fibre Optics), digital imaging fiberoptic transillumination (DiFOTI®, Electro-Optical Sciences), DIALux (DL, KaVo), and Midwest Caries Detection (Dentsply) for the detection of proximal caries. Methods: Seventy-two unrestored extracted posterior teeth representing the ICDAS II criteria (0-6) on proximal surfaces were selected. Care was taken to avoid selecting teeth with codes 4-6 on other surfaces. After cleaning, the teeth were mounted on 6 sets of manikins with 6 teeth mounted on each model (1 premolar and 2 molars per quadrant) with proximal surfaces in contact. Training was conducted on all methods prior to study initiation. The manikins were mounted on Phantom heads and three examiners conducted the exams on two occasions at least 24 hours apart following manufacturer's instructions. The following criteria was used with FOTI and DIALUX: 0-sound, 1-lesions confined to enamel, 2- large shadow visible (inner portion of enamel or at DEJ), 3-shadow in dentin, 4- > 4 mm in diameter; DiFOTI:0-no shadow, 1-light gray shadow, 2-dark gray shadow, 3-loss of tooth structure or translucent light surrounded by dark shadow; and Midwest: 0-sound, 1- slow signal, 2-medium signal, 3-loud signal. Results: Inter-examiner agreement was high for ICDAS (ICC=0.84), FOTI (ICC=0.83), and DiFOTI (0.80). There was moderate agreement for Dialux (ICC=0.78) and Midwest (ICC=0.68). Intra-examiner agreement varied from 0.69 to 0.97 for FOTI; 0.76 to 0.82 for DiFOTI; 0.89 to 0.98 for Dialux; 0.61 for Midwest; and 0.92 to 0.99 for ICDAS. Conclusion: Agreement (inter and intra) was acceptable for all methods. Midwest agreement was lower likely due to the fact that it emits three sets of sounds which were somewhat difficult to accurately distinguish.

**P29**

**Gel vs. Liquid Etchant for Conditioning Fissures Before Sealant Placement**

S. POWELL,* G.J. ECKERT, T. KULA, A.E. SOTO-ROJAS

Use of phosphoric acid for the conditioning of pit and fissure systems prior to sealant placement is recommended. **Objective:** Assess the efficacy of gel phosphoric acid etching products compared to liquid phosphoric acid products paired with sealants on posterior extracted teeth. **Methods:** 72 extracted human posterior ICDAS code 0 teeth were visually selected and randomly assigned to 6 groups. Each tooth was cleaned using a toothbrush. 6 (3 gel and 3 liquid) brands of etchants (e) were selected: Acid Etch, Bosworth, US. (e1), Etch 35 Gluma GR. (e2), Etch Zenith Dental US. (e3), Etch, Premier US. (e4), Total Etch Ivoclar Vivadent AG. (e5). Enamel Etch Temrex US (e6). A clear (Helioseal Clear Chroma, Ivoclar Vivadent AG) and opaque sealant (Delton DDS Dentsply 0% filled) were selected.
and applied according to manufacturer’s instructions. Teeth were thermocycled 5,000 times and immersed in 1% Methylene Blue for 24 hours. Teeth were sectioned bucco-lingually and 216 sections were obtained. Final results will be analyzed using two-way ANOVA test (5% significance level). **Results:** Sections were analyzed for microleakage, fissure type, sealant penetration and depth of fissure. Preliminary results indicated a low percentage of sealants developed microleakage. Microleakage did not correlate to any variable. Sealant penetration correlated to depth of fissure with increased depth or fissure type leading to incomplete fill or penetration. **Conclusion:** Trends indicate the penetration of sealant is dependent on the type of fissure and not the etchant formulation.

**P30**
**Evaluation of ART Techniques on Extracted Teeth**

M. RASCHE,* A.E. SOTO-ROJAS

Indiana University School of Dentistry

The Atraumatic/Alternative Restorative Treatment (ART) was developed for use in underserved communities. The objective of this study was to determine effectiveness of removing decay using invasive and non-invasive ART techniques on *in-vitro* teeth. This preliminary study involved teeth selected with ICDAS scores of 5 and 6. Teeth were divided in three groups, consisting of different caries removal techniques; i) a rotary prophy cone brush, ii) hand instruments, and iii) a ½ round carbide bur. After removing soft carious tissue, teeth were restored with a high-viscosity glass ionomer. Teeth were isolated using a varnish to within 1 mm from the restoration edges and submerged in 1% methylene blue for 24 hours. Teeth were embedded in epoxy resin and sectioned by means of a sawing apparatus occlusaly through the mesial, central, and distal pit areas of the restoration/teeth. The resulting six image sections from the four fragments were then scored using a 20x microscope by two independent observers. Unexcavated caries found in the walls and bases were scored along with dye penetration. For this preliminary study 27 sections per group were assessed. In the rotary prophy brush group, wall and base caries were found in 100% of the sections with 33% having dye penetration. In the hand instrument group wall caries were found in 70%, base caries were found in 20% and dye penetration occurred in 50%. In the bur group wall caries were found in 62.5%, base caries were found in 20% and 0% had dye penetration. Statistical differences were found when comparing the soft brush vs hand and bur groups. The results suggest that removing decay with the aid of a bur featured less unexcavated caries and had better marginal adaptation of restoration than teeth treated with a prophy brush or hand instruments.

**P31**
**Comparing ICDAS on Root Surfaces with Unconventional Caries Detection Tools**

I. ZECKEL,* A.G. FERREIRA ZANDONÁ, G. ECKERT

Indiana University School of Dentistry, Doctor of Dental Surgery Program
The objective of this study was to compare sensitivity and specificity of five different methods of caries detection: the visual criteria, International Caries Detection and Assessment System (ICDAS), DIAGNOdent (DD; Kavo, Germany), Quantitative Light-induced Fluorescence (QLF, Inspektor Pro System, The Netherlands), and the off label use of D-Carie (NEKS Technologies Inc., Laval, QC, Canada), and Midwest Caries I.D. (MCID; Dentsply professional, York, PA, United States) on root surfaces of permanent teeth using histology as the gold standard. One hundred root surfaces on extracted permanent teeth were selected based on the ICDAS criteria for root caries (0-2). Forty samples were sound (20 of which with of abrasion and/or erosion) and 30 samples scores 1-2. Each surface was digitally imaged, 1:1 macro lens, (Nikon SMZ1500, NIKON INC.). The teeth were dried (5sec) imaged with QLF and then analyzed for lesion area (mm²), mean change in fluorescence(df%), and area x df (dQ). DD peak readings were taken on dry teeth (5sec). D-Carie and MCID measurements (off label use) were taken on wet teeth. ICDAS, DD, D-caries, and MCID measurements were repeated. All teeth were hemi-sectioned (Hamco Machines, INC) and wet sections were evaluated (2:1) under a stereomicroscope (Nikon SMZ1500, NIKON INC.) to assess lesion extension into dentin, which was divided into thirds. Intra-examiner repeatability (Kappa) ranged from 0.87 (ICDAS and DD) to 0.48 (MCID). QLF df correlation to histology was highest (0.87), followed by QLF area(0.85), DD(0.83), D-carie(0.75), QLF dQ(0.55) and MCID(0.38). The area under the ROC curve was highest for DD(0.96) followed by QLF df(0.95), ICDAS(0.93), D-carie(0.73) and MCID(0.66). Sensitivity and specificity were ICDAS(94%,88%), DD(79%,94%), MCID(56%, 80%), NEKS(41%,92%), dQ and area(9%,100%) and df(0%,100%). **The best combination of sensitivity and specificity for root caries detection was determined to be ICDAS.** Supported by 2008 AADR Student Research Fellowships.

**P32**

**Longitudinal Study: Comparison between Clinical ICDAS-II Scores vs. QLF-I Images**

A.G. FERREIRA ZANDONÁ1, H. EGGERTSSON1, E. SANTIAGO2, M. GARCIA CORRETJER3,*, G.J. ECKERT3, B. KATZ2, M.S. MAU1, J. TRAN1, D.T. ZERO1

1Indiana University School of Dentistry  
2University of Puerto Rico School of Dentistry Research Center  
3Indiana University School of Medicine, Section of Biostatistics

Objective: The International Caries Detection and Assessment System (ICDAS - II) and the Quantitative Light Induced Fluorescence with modified ICDAS criteria (QLF-I) are being used as caries detection methods in a 4 year longitudinal study in schools in the Commonwealth of Puerto Rico. The objective of this study is to assess how clinical ICDAS-II scores compare to QLF-I images as well as the combination of ICDAS-II-QLF-I compared to ICDAS-II and QLF-I individually, as early. Methods: 460 children provided informed consent and were examined with the ICDAS-II and the QLF-I at baseline, 8 months, and 12 months. The enrolled children ranged from 5-13 years old and were mostly Hispanic. The total number of surfaces that were examined was 26,077 including buccal, lingual, occlusal, buccal pits and lingual grooves, with scores 0-6 on ICDAS-II and 0-5 on QLF-I. Results: There was a correlation of 0.77 between ICDAS-II and QLF-I on all surfaces. For scores of 0, QLF-I coincided 86%, score of 1- 55%, score of 2-79.8%, score of 3- 85.7%, score of 4- 95.7%, score 5- 100% and score 6- 98.5%. The correlation between
ICDAS/QLF-I combination and QLF-I (all surfaces) is 0.99, and the correlation between ICDAS/QLF-I combination and ICDAS-II (all surfaces) was 0.78. Conclusions: Both ICDAS-II and QLF-I appear to be reliable methods of examining progression of early carious lesions. There was a high correlation between both, comparing individually as well as ICDAS/QLF-I against each one, with a higher correlation of 0.99 when comparing ICDAS/QLF-I with QLF-I. In some instances when evaluating QLF-I alone it gave higher scores to lesions than ICDAS-II alone. The significance of this difference will be determined in a continuation of this longitudinal study to establish if QLF-I or a combination of ICDAS/QLF-I can better assess progression of active carious lesions than ICDAS-II alone. Supported by NIH/NIDCR RO1DE017890-01.

**DENTAL MATERIALS (ENDODONTICS)**

**P33**

**Evaluation of Nanocomposite Incorporation into a Novel Endodontic Retrofill Material**

R. REESE,* S. CHOGLE, A. MICKEL, S. SHEIKH, C. DUHAIME, S. POTLURI, J. BOGLE, C. RHIEU

Case Western Reserve University School of Dental Medicine

The goal of endodontic surgery is to excise peri-radicular pathology and seal the apical portion of the root to prevent post-operative infection. Current root-end sealing materials, although effective, may display certain disadvantages such as shrinkage, technique sensitivity, and moisture contamination. Polymer nanocomposites (PNCs) are a new class of polymeric materials composed of nanoparticles such as carbon nanotubes or organoclays dispersed at a nano-scale in a polymer matrix. PNCs offer substantial improvements in mechanical and thermal properties as well as drug elution characteristics and make potentially promising candidates as root-end sealing materials. The aim of this pilot study was to evaluate the apical seal of two polymer/monomer matrix (PMM) combinations containing C18-nanocomposite (NC) with a commonly used retrofilling material, Geristore®. Methods: Root ends of thirty-six teeth were resected, prepared, and then sealed with a PMM material. Group 1 (PMM1) consisted of monomers: 2,2-bis[p-(2-hydroxy-3-methacryloxypropoxy)phenyl]propane (Bis-GMA), triethylene-glycol-dimethacrylate (TEGDMA), and hydroxyl-ethyl-methacrylate (HEMA); photoinitiators: camphorquinone (I2), and ethyl-4-N,N-dimethylaminobenzoate (I3); and polymethylmethacrylate as the polymer. Group 2 (PMM2) consisted of HEMA, urethane-dimethacrylate (UDMA), I2, I3, and polymer. Group 3 (PMM1/NC) consisted of PMM1 and NC. Group 4 (PMM2/NC) consisted of PMM2 and NC. Group 5 was Geristore®. Positive and negative controls were also used (3 each). Each root was placed in a leakage apparatus and inoculated with *Enterococcus faecalis*. Turbidity as a sign of leakage was assessed daily for two weeks. Results were statistically analyzed using ANOVA and Tukey t-tests. All groups displayed varying degrees of leakage except for PMM1/NC which displayed no leakage (p < 0.01). Groups with NC showed significantly less leakage than groups without NC including Geristore®. However, Geristore® showed significantly less leakage than groups without NC (PMM1, PMM2). The addition of NC was suggested as the reason for the significant decrease in leakage. Within the confines
of this study, PMM1/NC should be further investigated for its use as an endodontic root-end sealing material.

**DIAGNOSTIC SYSTEMS**

P34

**The Effects of Magnification on Caries Detection**

A. STUMP,* M.R. FONTANA, C. GONZÁLEZ-CABEZAS, H. EGGERTSSON, G. ECKERT

Indiana University School of Dentistry

Use of magnification is becoming common in dental practice, yet there is very little understanding how magnification influences the assessment of caries lesion severity. Objectives: It was our objective to compare the effects of magnification use on visual caries lesion detection criteria scores. Methods and Materials: One hundred and forty-four permanent human molars were selected using the International Caries Detection and Assessment System criteria-ICDAS without the use of magnification (selected teeth had severity scores ranging from 0-6). Teeth were randomly numbered and mounted in twelve “dentoform” models. Dental examinations using ICDAS criteria were done in simulated dental conditions by inserting the dentoforms into a phantom head and examined by three trained and calibrated examiners using unaided vision (0x) and three magnifications (2.5x, 3.5x, and 5.5x). Seventy-two randomly selected teeth were re-examined by all examiners. Results: Intra-examiner repeatability was high for all three examiners for all magnifications. For 0x magnification, all three examiners had interclass correlation coefficient (ICC) values of 0.94. For 2.5x magnification, all three examiners had ICC values above 0.88. For 3.5x magnification, all three examiners had ICC values above 0.95. For 5.5x magnification, all three examiners had ICC values above 0.96. Inter-examiner agreement was also high, thus indicating good agreement between examiners (ICC=0.90 for magnification 0x, 0.90 for magnification 2.5x, 0.91 for magnification 3.5x, and 0.89 for magnification 5.5x). ICC values for inter-examiner agreement with the original ICDAS scores were high for all 3 examiners, indicating good agreement (ICC=0.92 for examiner 1, 0.89 for examiner 2, and 0.87 for examiner 3). The comparison between the different magnifications showed no significant differences (ICC values were all above 0.92). The correlation between the outcomes and histology scores was high, ranging from 0.78 to 0.88. There were no statistically significant differences between magnification levels when using data from all examiners for any of the outcomes. The areas under the ROC curves were all over 0.90, specificity was greater than 0.8, and sensitivity was greater than 0.90. It is concluded that magnifications up to 5.5x did not have a significant effect on how caries is visualized versus unaided vision. This study was supported by a grant from IUSD.
EDUCATIONAL RESEARCH

P35
Integration of Curricular Elements to Demonstrate Outcomes of Critical Thinking
L.L. COAN,* J. HUDSON
Indiana University School of Dentistry
Department of Periodontics and Allied Health, Dental Hygiene Program

Faculty recognize and acknowledge it is important to develop critical thinking skills in students. Designing purposeful assignments measuring attainment of effective critical thinking skills can be problematic. The purpose of this project was to assess the critical thinking skill sets learned by dental hygiene students during a course in evidenced-based practice and implemented in a preventive dentistry course. Students were given an assignment in the preventive dentistry course (taught concurrently with the evidence-based course) investigating the validity of manufacturers’ claims of dental products. Using skills learned in the evidence based course, students demonstrated critical thinking by meeting the objectives of the assignment. The project also required students to develop a PowerPoint presentation and poster to present their findings to the class and to display in the clinical reception area for patient use. Using the critical thinking assessment questions found in the National Survey of Student Engagement (NSSE) survey, a student and faculty survey were developed to assess the attainment of the skills described above. After obtaining IRB approval (EX0808-22) and upon completion of the project, students were asked to complete the survey. Faculty reviewed the PowerPoint presentations and posters and completed the survey. Survey results revealed that all faculty believe the assignment showed evidence of critical thinking based on the NSSE criteria. All students and faculty responded similarly with the exception of memorizing and synthesis. 62.5% of students and 20% of the faculty believed the assignment required some or very little memorization. 50% of the students and 20% of the faculty believed the assignment required some or very little synthesis and organization of ideas and information into new interpretations. 68.75% of students compared to 40% of faculty believed making judgments was an important part of the project. Faculty and students were in consensus (selecting “60% ‘quite a bit’” and “20% “very much”) that the assignment caused them to apply theory to a practical problem or a new situation. Development of assignments to implement concepts throughout the curriculum is an effective way to demonstrate outcomes in critical thinking. Faculty members should develop assignments that may be integrated throughout the curriculum in order to measure critical thinking purposefully.

ENDODONTICS

P36
Endodontic Treatment of a Patient on Intravenous Bisphosphonate Therapy
S. CHRISTENSEN,* M.M. VAIL
Indiana University School of Dentistry
A condition known as Bisphosphonate-Related Osteonecrosis of the Jaw (BRONJ) adversely affects the quality of life and produces significant morbidity in afflicted patients. The use of intravenous bisphosphonates for treatment of cancer-related conditions and osteoporosis can lead to necrotic bone formation in response to osseous injury. A 74-year-old male presented to the Graduate Endodontic Clinic with a history of IV bisphosphonate (Aredia) treatment from 2002 to 2006 for therapy consistent with the treatment of multiple myeloma. Intraoral exam revealed multiple hopeless, fractured, and carious teeth in need of extraction; however, due to his bisphosphonate treatment and the risk of the development of BRONJ, less invasive non-surgical root canal therapy was preferred. In all, twelve root canals were completed including a perforation repair and second retreatment of a lower first molar. Patients on IV bisphosphonate therapy are at risk of BRONJ and less invasive dental treatment must be considered.

P37
Regenerative Treatment of a Trauma-Induced Necrotic Tooth
C. THIESSEN, * M.M. VAIL

Apexification techniques for immature, necrotic teeth offer high levels of success, however an alternative therapy may consist of regeneration in which the necrotic pulp tissue is removed and replaced with vital pulp tissue to promote further physiologic development. This case report describes the treatment of a trauma-induced necrotic, immature, permanent central incisor by a regenerative approach, instead of the conventional apexification technique. After the diagnosis of necrosis with asymptomatic apical periodontitis, the tooth was accessed and purulent drainage noted. The canal was disinfected with copious amounts of sodium hypochlorite; an interim treatment of calcium hydroxide, followed by a mixture of a triple antibiotic paste was placed. After the disinfection protocol was complete, the periapical tissue was mechanically stimulated to induce intracanal bleeding allowing a blood clot to form up to the level of the cemento-enamel junction. Mineral trioxide aggregate was placed coronally on top of the blood clot followed by a double seal of Cavit. After three months, both clinical and radiographic evidence suggested a favorable biological response with this newly developed treatment protocol. This case report confirmed that successful regeneration of previously necrotic-infected canals is possible provided the canal environment can be effectively disinfected.

EXPERIMENTAL PATHOLOGY

P38
Alendronate as a Contributing Factor to Osteonecrosis of the Jaw
J. JENKINS, * J. SUN, L.J. WINDSOR
Indiana University-Purdue University Indianapolis, Department of Biology
Bisphosphonates are a class of inorganic pyrophosphates used to inhibit osteoclast activity as a treatment for osteoporosis. Evidence has recently surfaced implicating bisphosphonates as a causative factor in the onset of osteonecrosis of the jaw. Furthermore, it has been hypothesized that matrix metalloproteinase-2 (MMP-2) is a candidate gene for bisphosphonate-induced osteonecrosis of the jaw. The purpose of this study was to determine the effects of alendronate, a common amino-bisphosphonate, on human gingival fibroblast (HGF) proliferation and viability, as well as on HGF-mediated collagen degradation and MMP-2 activity. A water soluble tetrazolium (WST-1) assay kit and a lactate dehydrogenase (LDH) assay kit were used to determine the effects of alendronate on cell proliferation and viability, respectively. Cells were grown for 72 hours for the WST-1 and LDH assays. 6-well plates with collagen were used to determine the effects of alendronate on collagen degradation. 7.5x10^4 cells were seeded in collagen coated plates and grown for 3, 5 and 7 days in 2 mL Dubelco’s Modified Eagle’s Media devoid of growth serum. The alendronate concentrations used were 10^-4 up to 10^-6 M. Zymography was used to determine alendronate’s effect on MMP-2. The source of MMP-2 used for zymography was media from the HGF-mediated collagen degradation assays. MMP-2 was separated by zymography and the gels were incubated for 22 hours at 37° C with 10^-5 to 10^-3 M alendronate. To test the amount of MMP-2 in the collagen plate media, a zymography assay was performed. Media from the collagen plates was used for zymography except that they were not incubated with alendronate. The zymograms were stained with coomassie blue dye to visualize proteolytic activity. The WST-1 assays showed significant (p<0.05) changes in cell proliferation at 10^-5, 10^-4 and 10^-3 M (80, 32.9 and 2.1%, respectively). LDH assays showed significant cytotoxicity at concentrations of 10^-5, 10^-4 and 10^-3 M (26.5, 36.5 and 49.4%, respectively). The HGF-mediated collagen degradation assays showed no change in collagen degradation with the addition of alendronate at non-toxic levels. The zymography results showed no significant inhibition of MMP-2 until a concentration of 10^-3 M, while the enzyme at 10^-2 M was almost completely inhibited by the alendronate. Alendronate was found to be toxic to human gingival fibroblasts within 5 days at concentrations of 10^-4 M and higher. Alendronate was determined to inhibit MMP-2 at levels 100 times higher (10^-3 and 10^-2 M) than those that were toxic to human gingival fibroblasts. Funding for this study was provided by Life Health Sciences Internships.
β-defensins are cationic antimicrobial and immunoregulatory peptides that are expressed in epithelia. Their genes have been mapped to chromosome 8p22-p23, which has been shown to be a site of complex genetic variation. DEFB1 (encodes hBD-1) is constitutively expressed and has 2 copies per diploid genome (PDG) whereas DEFB4 (encodes hBD-2) and DEFB103A (encodes hBD-3) are inducible and have multiple copies that range from 2-12 PDG. Ethnic diversity exists in SNP frequency and subsequent haplotypes. We have shown in previous studies that a specific haplotype in DEFB1 is associated with protection against fungi infection, while its peptide, hBD-1 has limited antifungal efficacy when compared to hBD-2 or 3. The objective of this study was to test if the specific haplotype in DEFB1, which is linked to protection, is associated with high copy numbers in both DEFB4 and DEFB103A genes. We genotyped 50 ethnically diverse, healthy individuals and 69 genomic DNA samples from the Coriell ethnic diversity panel. High throughput SNP assays were developed using a multiplex ligase detection reaction assay (MLDR), for DEFB1 haplotype determination. Quantitative real time PCR assays (QPCR) were performed for copy number determination in the DEFB4 and DEFB103A genes. A positive correlation exists with the specific haplotype comprised of three SNPs (-52, -44 and -20) in the 5’UTR of DEFB1 with increased copy number in the DEFB4 and DEFB103A genes. These results suggest the likelihood of linkage between the 2 copy per genome DEFB1 gene haplotype and the multi-copy variants of DEFB4 and DEFB103A. Interpersonal variability in copy number polymorphism may contribute to variability in predisposition to mucosal infections. Supported by NIH/NIDCR 1 K23 DE016110-01A1.

HEALTH CARE SYSTEM

P40
Reading Level of New Patient Information Provided Dental School Websites
R.D. JACKSON
Indiana University School of Dentistry

The average English-speaking American reads at approximately a 5th grade level. The objective of this investigation was to determine the grade level necessary to read information provided to prospective patients at US dental schools using accepted methods for assessing the readability. A list of US dental schools was generated, arranged alphabetically by state and numbered consecutively. A random number generator was used to select a list of 29 dental schools. Each school’s website was accessed and the information provided to prospective patients was analyzed. In most cases, the information included: services offered, hours, contact information, fee management and directions. Paragraphs were chosen randomly and analyzed using SMOG (Simple Measure of Gobbledygook) and the Flesch-Kincaid Grade Level (FK) test. SMOG analyzes the number of polysyllabic words from 30 randomly selected sentences in the document to derive a score and the grade level necessary to read the material. SMOG has a 0.985 correlation with the grades of readers who have 100% comprehension of the
Background: Computers have become ubiquitous in healthcare. Studies suggest that keyboards and mice may contribute to cross-transmission of microorganisms. Objectives: This study evaluated the number of multiple drug resistant *Staphylococcus aureus* (MRSA) isolates present on dental student personal laptops before and after disinfection. Materials and Methods: 52 Second Year (pre-clinical) and 42 Fourth Year (clinical) Dental Students participated. All information collected remained confidential (IRB 07-9-64). There were two microbial samplings - prior to disinfection and then after. Three cotton swabs moistened with PBS (0.85 M, pH 7.2) sampled the entire top surface of each laptop. The swabs went into 2.0 mL of PBS and were then vortexed. Spiral plating of specimens onto an enriched trypticase soy agar (ETSA) plates and a mannitol salt agar (MSA) plate followed. Aerobic incubation was at 37°C for 48 hours. All colony types underwent sub-culturing in trypticase soy broth with 0.25% (w/v) glucose. Aerobic incubation was at 37°C for 48 hours. Spread plating of 0.1 mL specimens then involved five types of media - MSA, cefoxitin screening test (ETSA with antibiotic discs), oxacillin resistance screening agar, BBL CHROMagar and Bio-Rad MRSASelect. Aerobic incubation was at 35°C for 48 hours. After initial sampling, three weekly wipe disinfection processes occurred. Disinfection involved CaviWipes (Metrex, Orange, CA). Sampling of the laptops was as just described. Results: Pre-disinfection specimens from Second Year (Fourth Year) laptops produced 109 (148) isolates of which 74 (41) were *S. aureus*. 23 (7) laptops yielded 23 (11) MRSA isolates of which 6 (8) were also cefoxitin resistant. Sampling after disinfection produced 90 (114) isolates of which 59 (49) were *S. aureus*. 35 (6) laptops produced 36 (8) MRSA isolates of which 2 (5) were also cefotamine resistant. Results from CHROMagar and MRSASelect agreed in 96% of cases. 31.7% (14.3%) of all laptops evaluated produced drug resistant *S. aureus* isolates. Three weekly disinfection procedures did not reduce the number of MRSA isolates cultured. Conclusions: Results of this study indicate that MRSA was present on some laptops sampled and the inability of a weekly cleaning and disinfection to reduce the microbial loads. It
appears there is a need for more frequent disinfection procedures to achieve laptops relatively free of microorganisms.

P42
Going Green at University of Detroit Mercy School of Dentistry
J. AU-YEUNG,* C. KUXHAUS, M. WHEATER
University of Detroit Mercy School of Dentistry

The aim of the study was to measure the compliance of dental faculty, staff, and students with a recycling program and to quantitatively measure paper and plastic waste. A quantitative analysis of compliance with a recycling program at the University of Detroit Mercy School of Dentistry was performed. Clearly labeled recycling bins were placed in the following areas: Junior clinic, Graduate Periodontics, Wet lab, Oral Surgery, AEGD (Advanced Education in General Dentistry), Dispensary, Graduate Endodotics, Emergency clinic, Implant screening, Pediatric Dentistry, Radiology, Orthodontics, Faculty practice, and Senior clinic. Participants were instructed to place only sterilization wrappers (paper and plastic) into the bins. Material was collected daily at the end of each afternoon clinic session, and the paper and plastic was sorted, separated, and weighed. Dispensary provided information as to the amount of sterilization wrappers that were dispensed during the week. The study was done for two weeks. The estimated total weight of sterilization wrappers that were dispensed during each week was 71.05 pounds. During the acclimatization week of September 8-12, 2008, a total of 26.75 pounds of recyclable material was collected. This correlates to a compliance of 37.64%. For the week of September 15-19, 2008, 25.65 pounds of paper and 17.65 pounds of plastic were collected for a combined total of 43.2 pounds of material. This correlates to a compliance of 60.80%. As health care providers we should be the agents of change in reducing our environmental impact by promoting environmental health and thus human health. By gathering data and providing concrete evidence on the impact our school has on the environment, we can analyze the results and create an economically feasible and environmentally friendly way to practice dentistry. The results of this study could then be implemented at other dental schools or health care facilities. Supported by an internal grant from UDMSOD.

P43
Effect of Nicotine on Streptococcus mutans Hydrophobicity in Sucrose-Free Media
C. RAUCH,* R.L. GREGORY
Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center

MICROBIOLOGY/IMMUNOLOGY
Antigen I/II polypeptides on the *Streptococcus mutans* cell surface are known to interact with immobilized salivary agglutinin, which facilitates bacterial binding to the salivary pellicle. Additionally, antigen I/II plays an important role in *S. mutans* hydrophobicity. Null mutation of this antigen has been shown to significantly decrease the hydrophobicity of *S. mutans*, thus decreasing the bacteria’s ability to bind to the salivary pellicle where it can exert its cariogenic effects. It is well documented that smoking causes increased caries rates, and it is thought that this could be at least in part attributed to increased *S. mutans* hydrophobicity via nicotine-induced upregulation of antigen I/II. Nicotine has been shown to cause upregulation of this antigen, however it has not yet been shown that nicotine exposure leads to a significant increase in *S. mutans* hydrophobicity. **Objective:** To determine the effect of various nicotine concentrations on *S. mutans* hydrophobicity. **Methods:** To investigate whether nicotine treatment affects *S. mutans* UA159 hydrophobicity, serial dilutions of nicotine ranging from 0.0156mg/mL to 2mg/mL were made in sucrose-free TSB media. 100μL of UA159 cell suspension was added to each dilution, and all were incubated for 24 hours. A control sample with no added nicotine was also utilized. Optical density of each sample was measured with a spectrophotometer at 600nm. Hexadecane was added to all samples and vortexed for 1 minute. After separation of the aqueous and organic layers, the optical density of the aqueous layer at 600nm was measured with the spectrophotometer. Adsorption was calculated as the percentage loss in OD<sub>600</sub> relative to that of the initial cell suspension according to the following formula: Adsorption = [(initial OD<sub>600</sub> – final OD<sub>600</sub>) / initial ODD<sub>600</sub>]<sub>x</sub> 100. The adsorption value indicates the hydrophobicity of the *S. mutans* samples as a result of nicotine treatment. Analysis was completed in duplicate. **Results:** Compared to the control sample which showed 28.58% adsorption from the aqueous phase into the organic phase, a significant increase in percent adsorption was observed in the nicotine treated samples. A general trend of increasing hydrophobicity with increasing nicotine concentrations up to 0.125 mg/mL was observed, with decreasing values seen at higher concentrations. The maximum adsorption of 43.33% was observed at a concentration of 0.125mg/mL, and the minimum of 30.88% was observed at 1mg/mL nicotine. **Conclusion:** This preliminary data indicates that exposure of *S. mutans* UA159 cells to nicotine treatment leads to a significant increase in hydrophobicity of the cells, as indicated by an increase in percent adsorption of UA159 cells from the aqueous into the organic layer after hexadecane treatment. Additionally, a general trend of increasing hydrophobicity with increasing nicotine concentration was observed up to a concentration of 0.125 mg/mL nicotine, after which point hydrophobicity appeared to decrease. Similar results were observed in additional assays.

**ORAL BIOLOGY**

P44

RANKL Expression in Ligature-Induced Periodontitis in Osteoporotic and Nonosteoporotic Rats

E. ALLAM,* A. DRAZ, A. HASSAN, A. NEAMAT, M. GALAL, L.J. WINDSOR

Indiana University School of Dentistry, Department of Oral Biology

Cairo University, Department of Oral Pathology, Cairo, Egypt
Cairo University, Faculty of Oral and Dental Medicine, Cairo, Egypt
National Research Centre, Department of Oral and Dental Surgery, Cairo, Egypt

Periodontitis and osteoporosis are serious public health concerns that are associated with pathological bone remodeling and loss of bone. This study investigated the expression of a key mediator that regulates differentiation of osteoclasts, receptor activator of nuclear factor kappa B ligand (RANKL), in rats with or without osteoporosis and periodontitis to better understand the association between these two common diseases. Forty adult Albino rats were equally divided into four groups: (1) a control group, (2) experimentally induced periodontitis group, (3) experimentally induced osteoporosis group, and (4) experimentally induced osteoporosis and periodontitis group. At the end of the experimental period, blood samples were obtained and animals were sacrificed. Serum alkaline phosphatase activity levels were measured. Histological evaluation and immunohistochemical detection of RANKL in the periodontal ligament and bone tissues were performed. The results demonstrated that there were more RANKL-positive cells in all the experimental groups than in the control group. The percent of RANKL immunoreactive cells in both the periodontal ligament and bone tissues in group 4 (16.8±5.1 and 11.2±5.2, respectively) was significantly higher (P< 0.001) than in the other groups. In the periodontal ligament, the percent of RANKL immunoreactive cells in group 2 (10.1±1.9) was significantly higher (P< 0.001) than in group 3 (5.3± 2.7) and the control group (4.12±1.5). It was concluded that the osteoporotic state significantly increased the bone loss resulting from ligature-induced periodontitis. An additive effect was observed between these diseases and this was seen by the significant increase in RANKL immunoreactivity.

P45
Tβ4 Adjuvant to Chlorhexidine in an Organotypic Human Tissue Model
R. RETI,* M. WHEATER
University of Detroit Mercy School of Dentistry

Chlorhexidine Gluconate (CHX) is used in the management of periodontitis and as an anti-bacterial agent to reduce post operative infection. CHX has however been documented as being cytotoxic to cultured human gingival fibroblasts (HGF). Our lab has been successful in demonstrating a role for thymosin beta4 (Tβ4) in reducing the cytotoxicity of common dental chemotherapeutics including CHX in cultured HGF. To extend our previous studies using HGF, the aim of this study is to examine the efficacy of using Tβ4 as an adjuvant to CHX rinses (in the presence or absence of alcohol) in an organotypic model of human gingival epithelium. Using non-transformed differentiated human-derived epithelial tissues arranged in a multilayered tissue sample that closely parallels native human gingival tissues (EpiGingival model, MatTek), solutions of CHX containing 12% ethanol, CHX without added ethanol, and 12% ethanol only were applied with or without varying concentrations of Tβ4 (0.1, 1.0, 5.0, and 10.0 µg/ml) for 30 seconds. The challenge solutions were then removed and replaced with culture medium. Culture media was sampled at 2, 4, 6, and 8 hours after challenge solution and LDH levels were quantified using a colorimetric assay (BioVision). Tβ4 was able to significantly reduce the known cytotoxicity of CHX without alcohol at all time points. At a concentration of 1.0 µg/ml, Tβ4 appeared to be the most
beneficial. When tested against CHX containing alcohol Tß4 appeared to be non-effective, and similar results were obtained against the 12% ethanol challenge solution. Tß4 is an effective adjuvant to alcohol free CHX and has a clinical application in reducing its cytotoxic effects. Supported by an internal grant from UDMSOD and by an AADR Student Research Fellowship to R. Reti.

ORTHODONTICS

P46
The Relationship between Nasopharyngeal Airway Size and Transverse Dento-skeletal Dimensions
A. GHONEIMA,* E. ABDEL-FATTAH, S. IBRAHIM, D. MOHAMED, J. HARTSFIELD JR., K. KULA
Faculty of Dental Medicine Al-Azhar University, Cairo, Egypt
Indiana University School of Dentistry

The form and dimensions of the nasopharynx together with the normal nasorespiratory function has been of interest to orthodontic researchers since it plays a fundamental role in the development of the dentofacial morphology. The objective of this study was to correlate the nasopharyngeal dimensions with the different dento-skeletal patterns in anteroposterior and transverse directions. Subjects and Methods: The study was conducted on 80 male subjects were classified into test group and control group. The test group consisted of 60 males who were classified into three equal subgroups (20n each) according to their skeletal anteroposterior relation (ANB) between the maxilla and the mandible into class I, class II and class III. The range of ANB angle was 2 to 4 degrees in class I, 5 to 8 degrees in class II, and -1 to -4 degrees in class III. The control group consisted of 20 subjects with normal dento-skeletal pattern ANB was 2-4 degrees. Lateral and posteroanterior cephalometric radiographs were taken for each subject. From these radiographs; 11 nasopharyngeal, 10 anteroposterior, and 15 transverse measurements were determined and recorded. Results: The results from the present study showed: (1) Class II subjects had larger nasopharyngeal airway area and larger sagittal depth of the nasopharynx than class I or class III subjects at (P ≤ 0.01). (2) Class III subjects showed larger bi-maxillomandibulare width and bi-lateronasal width than class II subjects while, class II subjects showed larger bi-gonial width and bi-mastoid width than class I and class III subjects at (P ≤ 0.05). Conclusions: On the basis of the results obtained from this study, it was concluded that: (1) Class II subjects showed larger nasopharyngeal airway area and larger sagittal depth of the nasopharynx than class I and class III subjects. (2) Class III subjects showed larger bi-lateronasal width than class II subjects while, class II subjects showed larger bi-gonial width than class I and class III subjects. (3) The assessment of the nasopharyngeal structures should be included with the orthodontic diagnosis and treatment planning as the functional, positional, and structural assessments of the dentofacial pattern are carried out.
PEDIATRIC DENTISTRY

P47
Is Prehypertension Apparent in the Child Population: A Pilot Study of Three Races
M.K. BUSKIRK,* J.E. KOWOLIK

In the adult population there is an accepted relationship between hypertension and the risk of cardiovascular disease which includes myocardial infarction, heart failure, stroke and renal insufficiency. These may be prevented if the hypertension is recognized and treated early. In adults, the risk of hypertension differs between races; it is less clear if this is true for children. Objective: The object of this study is to evaluate whether pre-hypertension and hypertension are apparent in the child population and if there are racial differences. The information gathered will help decide whether it is advisable to check the blood pressure of a child patient at each dental visit. If there are differences between the races it will be possible to tailor culturally sensitive education and prevention programs. Methods: Parents completed a questionnaire identifying the child’s age, sex, race/ethnicity, activity level, family history of high blood pressure, and medical history. The child’s weight, height, blood pressure and heart rate was measured. The BMI was then calculated, and the NIH blood pressure charts were used to evaluate the child’s blood pressure status. Data was compiled using Microsoft Excel and each child was categorized according to their blood pressure as normal, pre-hypertensive and hypertensive. Results: A limited number of children have been enrolled in the study to date. 20% of the children surveyed are categorized as pre-hypertensive, 80% as normal and 0% as hypertensive. Of the pre-hypertensive children 100% of them identified with Hispanic/Latino race/ethnicity. 50% of the pre-hypertensive children were considered overweight and the other 50% were marginally overweight. Findings were not statistically significant due to limited sample size.

P48
Oral Habits in Indianapolis Children: Comparison between 1986-88 and 2006-8
L. HAMILTON,* J.E. KOWOLIK
Indiana University School of Dentistry

It is generally recognized that many children engage in an oral habit, since sucking on an object is believed to provide the child with a sense of security, happiness, and relaxation. Oral habit frequency decreases as the child ages, and many times requires no adult intervention. Objective: The purpose of this pilot study was to determine if the prevalence of oral habits which includes digit sucking, fingernail biting, pacifier use, grinding, and tongue thrusting, changed between 1986-88 and 2006-8. Literature from the 1970’s and 1980’s suggests that approximately twenty to thirty percent of children have an oral habit that persists beyond the age of two to three years. However, there is a paucity of recent studies assessing the current oral habits of children. Methods: The protocol for the study was reviewed by the local IRB. Historic paper charts were reviewed for the first time period and axiUm© electronic charts for the second period. The percentages of patients with each habit were calculated. Chi-square tests were used for bivariate comparisons between the cohorts for differences in the prevalence of the
habits. Logistic regression was used to compare the cohorts, adjusting for the patient demographic information. Results: Overall there were not any significant differences in the percentage of kids with at least one habit between 1986-1988 and 2006-2008. From the 1986-1988 charts, 30% of children had a recorded habit, while 33% of the 2006-2008 children had a habit recorded. For specific habits there were significant differences between the two time periods. Thumb-sucking was recorded more often in the earlier time period (50% vs 16%) while nail biting 8% vs 36%) and teeth grinding (9% vs 14%) were recorded more often in the later time period. Conclusion: These results have demonstrated a change in the oral habits of children living in the Indianapolis area. Because this is a retrospective study, the differences observed could be real or could be due to differences in how the habits were recorded in the two time periods. Further work is underway to identify reason for these behavioral changes. This study was supported by funds from an IUSD Student Research Fellowship.

PERIODONTICS

P49
Identification of Tβ4 in Human Gingival Crevicular Fluid
E. KWON,* M. WHEATER, L. CABANILLA
University of Detroit Mercy School of Dentistry

Thymosin beta 4 (Tβ4) is a naturally occurring small peptide with documented anti-inflammatory and wound healing properties. Tβ4 is found in the cytoplasm of most cell types. In addition, Tβ4 has been detected in human bodily fluids including tears, saliva, and wound fluids. The aim of this study was to determine if Tβ4 is a component of human gingival crevicular fluid (GCF). Adult patients of the University of Detroit Mercy School of Dentistry clinic who had given informed consent were used in this study. GCF was obtained by placing a PerioPaper collection strip in the gingival sulcus for 30 seconds. GCF samples were obtained from regions of the gingiva that showed no clinical signs of disease, and from regions with evidence of periodontal disease as determined by probing depth (PD). The volume of GCF collected on each strip was measured using the Periotron 8000. GCF proteins were eluted from the PerioPaper strip with 100 µl sample buffer and centrifugation, and samples were analyzed by ELISA to determine if Tβ4 was present (Alpco Diagnostics). Tβ4 was present in six of six GCF samples taken from gingival regions with no clinical signs of disease. The concentration of Tβ4 ranged from 30 to 100 µg/ml. In a comparison using a single patient, in an area devoid of disease the average GCF Tβ4 level was 34.5 µg/ml. In contrast, the average GCF Tβ4 level in an area with a PD of 5 mm was 123 µg/ml. This is the first report to show that Tβ4 is a protein component of gingival crevicular fluid. GCF Tβ4 levels appear to be higher than those reported for saliva or tears. Supported by an internal grant from UDMSOD.

P50
Phage Therapy and Its Potential Application in Periodontal Therapy
O. PENCE,* D.M. GALLI
Indiana University School of Dentistry, Dental Hygiene Program

Phage therapy, an established method of treating bacterial infections with viruses, has been in use for over 80 years. Almost forgotten by modern western society but practiced in Eastern Europe and Russia until the present day, it claims to possess many advantages over traditional antibiotic therapy. In periodontics, antibiotic therapy is often used to augment non-surgical and surgical treatment plans to achieve healthier clinical attachment levels. However, given the rise of antibiotic resistant bacteria this method of treatment may no longer be effective in the near future. This review of the scientific literature explores the possible advantages and disadvantages of substituting the use of antibiotics with phage therapy in the periodontal treatment plan. A search of the scientific literature from the 1920s to present day was conducted and included the following resources: PubMed to study phage therapy research (primary and review articles), academic microbiology and periodontics textbooks to learn about viral characteristics and the standard of care in periodontics, and Google to identify relevant news articles as well as agencies or companies using phage therapy. The review found that phage therapy possesses many advantages over antibiotics including self-replication of the therapeutic, the ability to degrade protective biofilms, the ability to preserve normal flora, and the ability to treat antibiotic resistant bacteria. Known obstacles to the implementation of phage therapy include the lack of western clinical trials, strict FDA regulations, rapid removal of phages by the immune system, and the lack of phages for all but one of the known periodontal pathogens. In conclusion, phage therapy would appear to be superior to the use of antibiotics in the treatment of periodontitis, at least in theory. However, unless phages can be identified that target the majority of periodontal pathogens phage therapy is not feasible in the near future as a treatment for most, if not all, clinical conditions of the periodontium.

P51
Soluble TLR-2: Putative Adjunct Marker for Chronic Periodontitis
S. PRAKASAM,* V. SWAMINATHAN, B.J. SRIHARI, V. JOHN, S.B. BLANCHARD, M. SRINIVASAN
Indiana University School of Dentistry
Graduate Periodontics and Oral Pathology, Medicine and Radiology

At present the diagnosis of periodontitis, monitoring of disease activity and the efficacy of periodontal treatment is challenging and highly subjective. According to the American Association of Periodontology the current system of diagnosis is a “measure of accumulated past disease at a site rather than current activity.” Thus, there exists a need for an objective measure to diagnose active periodontitis, and it’s response to therapy. Primarily considered as chronic bacterial infection, the periodontal disease pathology is mediated by host response to the local microflora. Toll like receptors area family of germ line encoded receptors that recognize and respond to the local flora. A soluble form of toll like receptor 2 (sTLR2) was recently identified in human plasma, breast milk and saliva. It has been shown that TLR-2 suppresses excessive host response against putative periodontal pathogens such as Porphyromonas Gingivalis, T. Forsythus, or their products. Most molecules and cells from the periodontium and GCF end up in saliva. The purpose of this study is to test the hypothesis that the salivary levels of sTLR-2 may
correlate with the progression of periodontal disease activity. Unstimulated whole saliva (UWS) was collected from 40 subjects based on the ADA classification (10 subjects from each class). sTLR-2 level in clarified UWS was assessed qualitatively and quantitatively by Western blot and ELISA respectively. There was a linear correlation between the sTLR-2 level in the UWS and the degree of periodontal destruction. The highest levels of sTLR2 were found in subjects classified as ADA Class IV followed by Class III, Class II, and Class I in that order. The results suggest sTLR2 may serve as an adjunctive tool in the diagnosis of periodontal disease and in the monitoring of disease activity. Supported by Dr. Mythily Srinivasan, IUSD.

P52
Mechanism(s) of Heterogeneity Response of Gingival Fibroblast to *Porphyromonas gingivalis*
T. SMITH,* N. AL-SHIBANI, L.J. WINDSOR

Periodontal disease is a host-mediated inflammatory response to subgingival microflora, which leads to tissue breakdown and bone loss. Individuals with the same periodontal pathogens may experience different disease processes and severity. *Porphyromonas gingivalis* (*P. gingivalis*) has been implicated as one of the major pathogens involved in periodontal disease. In a recent study comparing the collagen-degrading ability of different human gingival fibroblast (HGF) cell lines when exposed to *P. gingivalis* stimulation, it was discovered that in the presence of *P. gingivalis* supernatant that some cell lines cleaved all the collagen in the wells (aggressive cells lines), while others only cleaved the collagen underneath the cell colonies (non-aggressive cell lines). **Objective:** The aim of this study was to determine if this difference between the aggressive and non-aggressive cell lines is due to lack of matrix metalloproteinase (MMP) activation and not their expression. **Methods:** The collagen degrading ability of the HGFs was examined with a cell-mediated Type I collagen assay. HGFs were seeded as single colonies in the center of the collagen-coated six-well plates. After the cells attached, serum-free media containing *P. gingivalis* supernatant, trypsin, or plasmin were added. After specific time periods, the conditioned media from the human gingival fibroblast cells was collected for zymography and western blot analyses to examine MMP activation. The collagen cleavage was visualized by staining the plates with Coomassie blue after removal of the cells. **Results:** *P. gingivalis* stimulated the cleavage of all the collagen by the aggressive cell line, but not by the non-aggressive cell line. Both trypsin and plasmin served as alternate mechanisms for MMP activation and stimulated the collagen degradation of both the aggressive and non-aggressive cell lines. **Conclusion:** It appears that one of the rate limiting steps in the collagen cleavage mediated by the aggressive and non-aggressive cell lines is MMP activation. This study was supported by a grant from Indiana University School of Dentistry Research Fund.

P53
A Systems Biology Approach on Oral Epithelial Responses to Periodontal Pathogens
S.B. JANARDHANAM,* R.K. KOLLIpara, P.B. NARAYANAN, M. SRINIVASAN
Indiana University School of Dentistry, Oral Pathology Medicine and Radiology
Indiana University-Purdue University Indianapolis, School of Informatics
Periodontitis, affects ~20% in the US. The most widely implicated species in periodontitis are Actinobacillus actinomycetemcomitans (Aa), Porphyromonas gingivalis (Pg), and Fusobacterium nucleatum (Fn). We employ a systems biology approach with bioinformatic, genetic and biochemical methods to study differential responses of oral epithelial cells to specific pathogens. The purpose of this study was to compare gene expression profiles of oral epithelial cells infected with 4 different bacteria viz., Aa, Pg, Fn and Streptococcus gordonii (Sg). Public domain microarray data was used for this study. In the dataset various subsets of genes were differentially expressed (two-tailed T test) in response to the above mentioned micro-organisms and clustered into 3 GO classifications: apoptosis, detection of external stimuli and cytokine activity. We also re-confirmed gene expression of some Toll Like Receptor (TLR) genes with real time PCR and cytokines with ELISA. Interestingly, apoptosis related genes were upregulated in cells stimulated with an oral commensal strain (Sg), but downregulated in cells exposed to pathogens (Pg/Aa). Also, many pro-inflammatory cytokines were upregulated in cells stimulated with Pg/Aa as compared to cells stimulated with Sg. In sum, our studies suggest that select periodontal pathogens enhance the survival of infected cells that secrete cytokines and mediate pathology. Supported by Dr. Mythily Srinivasan, IUSD.

P54

Dental Plaque as a Risk Factor for Coronary Heart Disease

V. WAHAIDI, B. ALLEN, S. DOWSETT, G. ECKERT, M.J. KOWOLIK*

Indiana University School of Dentistry
Indiana University School of Medicine
Richard L. Roudebush Veterans Administration Medical Center, Indianapolis, Ind.

Introduction: Systemic inflammation is a central mechanism suggested to causally link periodontal disease and coronary heart disease (CHD). We hypothesized that dental plaque accumulation would elicit systemic inflammatory responses that differ by gender/race. Objectives: To use a classical experimental gingivitis model (EGM) to determine the effect of dental plaque accumulation on systemic markers of inflammation that are associated with CHD risk. Moreover, to address whether a gender/racial disparity in these systemic inflammatory responses to dental plaque accumulation exists.

Methods: We recruited 156 healthy adults, aged 18-31 years. Black and white, and male and female subjects participated in a 21-day EGM. Plaque levels and gingival inflammation were assessed using the plaque and gingival indices, respectively. In addition, peripheral blood samples were collected at each visit to evaluate systemic markers of inflammation. Paired t-tests and Wilcoxon signed rank tests were used to test for changes during the experimental phase. Results: 128 participants completed the study. The correlation between the plaque index and gingival index changes during the experimental phase was 0.79 overall, and was similar across genders/races. During the experimental phase, participants had increases (P<0.05) in the plaque index, gingival index, mean corpuscular volume, mean platelet volume, and cortisol levels. In blacks, increases (P<0.05) were observed in the neutrophil oxidative activity and mean corpuscular hemoglobin levels. In black males, the erythrocyte sedimentation rate increased (P<0.05). Fibrinogen levels increased (P<0.05) in white males. Significant decreases (P<0.05) were
observed in total cholesterol, high density lipoprotein, and erythrocyte counts. Hematocrit and hemoglobin levels decreased (P<0.05) in blacks. In black males, decreases (P<0.05) were observed in the low density lipoprotein levels. Conclusions: In young healthy adults, accumulation of dental plaque elicited systemic inflammatory responses, some of which are with potential atherogenic consequences. These responses differed between individuals of different gender/race. Supported by NIH # R01 DE015145-01.

PREVENTIVE DENTISTRY

P55
Evaluation of Fissure Treatment Before Sealant Placement
S. CHITRE,* G. ECKERT, M.R. FONTANA, T. KULA, A.E. SOTO-ROJAS

Occlusal pits and fissures are high risk sites for development of caries. Placement of dental sealants has been reported to be effective in preventing this process. **OBJECTIVE:** To evaluate two different preparation techniques by comparison of the penetration and microleakage of dental sealants on different incipient caries levels. **METHODS:** 23 extracted molars (ICDAS scale 0-2) were collected and ranked by a calibrated examiner into three groups. Further divided into two sub-groups of i) bur and ii) control (6 total). Occlusal surfaces were prepared with: 1) ¼mm round bur, the bur dimensions (0.5mm) were used the standard for maximum depth and width of cutting. 2) No treatment as a control. Teeth were conditioned with 37% phosphoric acid, rinsed, dried, and sealed with an opaque light cured sealant, exposed to thermocycling for 5000 cycles, and tested for microleakage and penetration by cutting the crownbucco-lingually. Sealant depth was measured from depth 200µm width of the fissure opening to the bottom of the fissure. Microleakage was measured using dye penetration and calculating the gap size at the enamel sealant interface. **RESULTS:** The average fissure depth to sealant penetration ratio in no treatment group of ICDAS 0 was 19% as compared to no treatment of ICDAS 1 and 2 which were 100% and 56% respectively, whereas the average ratio of fissure depth to sealant penetration in the bur group of ICDAS 0 was 100% as compared to 56% and 23% in bur group of ICDAS 1 and ICDAS 2. Microleakage was scored 0 in the no treatment and bur group of ICDAS 0,1,2. **CONCLUSIONS:** Fissure treatment prior to placement of sealants in code 0-2 ICDAS molars showed no differences in sealant retention.

P56
Total Fluoride Content and Release of Various Fluoride Varnishes
C. GONZÁLEZ-CABEZAS, J. EDER*
Indiana University, School of Dentistry
The number of varnishes available on the U.S. market has significantly increased in recent years. However, there is currently very little regulation of the safety and efficacy of these varnishes. Objective: To analyze total fluoride content (safety) and fluoride release (efficacy potential) of the probably most commonly used commercial varnishes. Methods: Total fluoride content of six varnishes (Duraphat, Cavity Shield, Enamel Pro, DuraShield, Vanish, and Ultradent) was determined in triplicates (0.15–0.20g) by dissolution of the samples in chloroform. After dissolution, water was added to extract the F (3x/sample). Extracted fluoride was quantified using a fluoride specific electrode. Total fluoride release of four varnishes (Duraphat, Cavity Shield, Enamel Pro and Vanish) was determined by placing well-mixed samples in custom-made molds of a standardized volume (n=8) and incubation in deionized water with stirring (100rpm), at room temperature. After 1, 4, 24, and 48h samples were transferred to fresh deionized water. Each water sample was then analyzed for fluoride concentration to determine the amount of fluoride released per sample at each different time-period. Data were analyzed using a one way ANOVA model. Results: Enamel Pro and Ultradent both had the highest amounts of total fluoride (p<0.05; 24,527±1,481 and 24,194±2,001, respectively), which was higher than the amount stated on their label. Vanish had significantly lower concentration of fluoride (16,618±1154ppm) than the other three varnishes. These four varnishes had lower concentration of F than the one stated in their label (22,600ppm); although, Duraphat concentration was very close to it (21,729±80ppm). Fluoride release for Enamel Pro was significantly higher than all other varnishes tested at all time periods. While not statistically different, fluoride release from Cavity Shield was observed to be much lower than the other varnishes after the 24 and 48 hr incubations. Conclusion: Significant variations in total fluoride content and fluoride release of varnishes were found among the studied varnishes suggesting that not all varnishes have similar levels of safety or efficacy.

PULP BIOLOGY

P57
Glutathione Affects Gingival and Pulp Fibroblasts Hydrolases After TegDMA Exposure
K.S. GREGSON

Objective: Triethylene glycol dimethacrylate (TEGDMA), a resin monomer, is known to be toxic to human gingival (HGF) and human pulp fibroblasts (HPF) in a dose dependent manner. The aim of this study was to evaluate the effects of glutathione on the hydrolase activity of HGF and HPF after exposure to TEGDMA. Methods: HGFs or HPF were exposed to 1.25 mM of TEGDMA for 3 hours with or without prior treatment with either N-acetyl cysteine (NAC, 2mM), buthionine sulfoximine (BSO, 100 µM), or diethylmaleate (DEM, 100 nM) for 20 hours. Hydrolase activity was measured using a spectrophotometric substrate, 4-nitrophenol butarate. Cell media were normalized for protein concentration. The assays contained 1 µg protein from the cell media and 20 µL (200 µM) substrate in phosphate buffered saline, pH 7.5, at 25°C in a final volume of 1 mL. Readings at 400 nm, the wavelength at which 4-nitro phenol (pNP) absorbs, were taken every 5 minutes for 1 hour. Results: The
Tissue regeneration

P58

Expression of Matrix Metalloproteinases During Limb Regeneration in Xenopus laevis

N. SANTOSH,* B. SARANJAMI, L.J. WINDSOR, D.L. STOCUM, F. SONG
Indiana University School of Dentistry, Department of Oral Biology
Indiana University School of Science, Department of Biology

African clawed frog (Xenopus laevis) is a unique anuran vertebrate that can regenerate missing organs such as limbs, tail and lens of the eyes only during the early developmental stages of its lifecycle. As the developmental stage advances its regeneration ability is lost. Matrix metalloproteinases (MMPs) are zinc dependent endopeptidases, that are able to cleave extracellular matrix (ECM) and results in ECM remodeling, as well as various growth factors release and activation. Remodeling of ECM and activation of the various growth factors are crucial in regenerating the exact replica of missing structures in regeneration-competent animals such as early-stage Xenopus tadpoles. The goal of this study is to understand the underlying mechanism of induction of limb regeneration by analyzing the expression patterns of MMPs and the tissue inhibitors of the MMPs (TIMPs) between Xenopus stage-54 (regeneration-competent) and Xenopus stage-60 (regeneration-deficient). Gelatin zymography revealed that proteinases such as 92 kDa, 82 kDa, 72 kDa, 64 kDa and 52 kDa were expressed in the control, day-1, day-4 and day-7 blastema from stage-54 and stage-60. In both stages, 82 kDa proteinase was upregulated in day-1, day-4 and day-7 blastema compared to the control. Its expression was decreased in day-4 blastema of both stages compared to the day-1. While day-7 blastema of stage-54 maintained the expression of 82 kDa proteinase, stage-60 showed a decrease in its expression. In stage-54, 72 kDa proteinase showed decrease in the day-1 blastema compared to control. The expression remained the same through day-4 compared to day-1 and showed an increase by day-7. In stage-60, 72 kDa proteinase showed increase in day-1 blastema compared to the control. The expression decreased by day-4 compared to day-1 and remained the same through day-7. MMP protein arrays (RayBiotech, Inc., Norcross, GA) were able to detect MMP-1, -2, -3, -8, -9, -10, and -13, as well as TIMP-1, -2 and -4 in the control, day-1, day-4 and day-7 blastema from stage-54 and stage-60. Semi-quantification analysis on the density of MMP arrays demonstrated that the expression of MMP-9 and MMP-10 increased from day-1 to day-7 in stage-54 but showed no significant change in expression from day-1 to day-7 in stage-60. MMP-8 expression decreased from day-1 through day-7 blastema of stage-60, whereas there was no significant change in day-1 to day-7 in stage-54. These results suggested that the expression patterns of the MMPs especially 82 kDa and 72 kDa proteinases, were different in stage-54 and stage-60 of TEGDMA treated cell media was enhanced by both DEM and BSO in both cell types. NAC pretreatment abolished the increase in hydrolase activity seen with TEGDMA in both cell types. Conclusion: These results indicate that glutathione does affect hydrolase activity in human gingival and pulp fibroblasts conditioned media after exposure to TEGDMA.
Xenopus. This might play an important role in ECM remodeling and growth factors activation that occurs during the Xenopus stage-54 limb regeneration. This study was supported by an IUSD start-up grant to F. Song and grant from W. M. Keck Foundation to D. L. Stocum.

PS9
Homology of VEGF and Tβ-4 in Xenopus, Axolotl and Short-Toes
Indiana University-Purdue University Indianapolis, School of Science, Department of Biology
Indiana University School of Dentistry, Department of Oral Biology

Vascular Endothelial Growth Factor (VEGF) and Thymosin Beta 4 (Tβ-4) have been suggested to play important roles in angiogenesis, which is a critical process in limb regeneration of amphibians. There is no information on the potential role of VEGF and Tβ-4 in axolotl and the short-toes during amphibian limb regeneration. To begin to study these roles, we compared the mRNA sequence of VEGF and Tβ-4 in African clawed frog (Xenopus laevis), the axolotl (Ambystoma mexicanum), a mutant regeneration-deficient phenotype of the axolotl called short-toes, and humans. Total RNA was extracted from Xenopus, axolotl and the mutant short-toes by RNaseasy kit (Qiagen Sciences Inc., Germantown, MD). One step reverse transcriptase polymerase chain reaction (Qiagen Sciences Inc.) was performed with low annealing temperature of 50°C. VEGF primers were designed based on Xenopus cDNA sequence and Tβ-4 primers were designed based on human cDNA sequence. The RT-PCR products for Xenopus, axolotl and short-toes were sent for two direction sequencing analysis (ACGT, Inc., Wheeling, IL). The comparison of sequences between the different species for VEGF showed 75% homology between human and Xenopus, 73% between human and axolotl, and 75% between human and short toes. There was 98% homology between Xenopus and axolotl, 98% between axolotl and short-toes. Tβ-4 studies showed 94% homology between human and Xenopus, 94% between human and axolotl, and 96% between human and short-toes. There was 99% homology between Xenopus and axolotl and 100% between axolotl and short-toes. These results suggest that VEGF and Tβ4 are highly conserved (more than 90%) between Xenopus laevis, axolotl and short-toes. Grants from the W. M. Keck Foundation and the Army Research Office to D.L. Stocum and an Indiana University School of Dentistry start-up grant to F. Song.

TOBACCO CESSATION

P60
The Effects of Cigarette Smoke Condensate on Human Pulp Cells
E. GROW1,* J. SUN2, N. SANTOSH2, L.J. WINDSOR3, R.L. GREGORY2, F. SONG2
1Indiana University-Purdue University, Department of Chemistry
2Indiana University School of Dentistry
Cigarette smoke condensate (CSC) is produced when tobacco is burned and it is composed of more than 4,000 chemicals. It is well known that smoking tobacco can cause lung cancer and other health problems such as periodontal disease and oral cancer. However, very little is known about the effects of CSC on cell repair and their regeneration ability. This research project examined the effects of CSC on human pulp cells (HPCs) and is the first step into investigating smoking's effect on HPC repair and their regeneration ability. HPCs (50,000 cells/well) were exposed to various concentrations of CSC (0, 3.125, 6.25, 12.5, 50, 100, 200 and 400 µg/ml) for three days. The cytotoxicity and cell viability effects of the CSC on HPCs were evaluated by performing lactate dehydrogenase (LDH, Roche Applied Science, Mannheim, Germany) and water soluble tetrazolium-1 (WST-1, Roche Applied Science) assays, respectively. To test their collagen degrading ability under the influence of CSC, HPCs (100,000 cells/well) were seeded as a single colony in each well of Type I collagen-coated 6-well plates and supplemented with CSC (0, 12.5, 25, and 400 µg/ml) for 1, 3 and 5 days before staining with Coomassie blue. The conditioned media were also collected to test for proteinase activity utilizing zymography. The CSC was toxic and inhibited HPC proliferation at 400 µg/ml. Concentrations of CSC at 12.5 and 25 µg/ml stimulated the HPC’s ability to degrade collagen. The production of pro- and active MMP-2 was increased in the cultured media. CSC is toxic to HPCs and affects pulp cell growth at 400 µg/ml. CSC at 12.5 and 25 µg/ml concentrations changes the HPC ability to remodel extracellular matrix, in part, by producing more MMP-2. This project was supported by IUSD Start-Up Fund and IUPUI Center for Research and Learning Multidisciplinary Undergraduate Research Institute Grant.

P61

Effect of Nicotine on Streptococcus mutans Binding to Fibrinogen, Collagen and Fibronectin

D. AI-ALFE, R.L. GREGORY*

Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center

Bacterial attachment usually involves an interaction between a bacterial surface adhesin and a host cell receptor. The mechanism as to how this interaction occurs between S. mutans cells and extra-cellular components is not yet clear. Since the bacteria colonize damaged heart tissue, it is believed that sub-endothelial extracellular matrix (ECM) molecules, such as fibrinogen, collagen and fibronectin, function as cell receptors for the bacteria. Nicotine is a key constituent in tobacco. In vitro, nicotine inhibits the production of fibronectin and collagen, while also promoting collagen breakdown from human gingival fibroblasts. The objective of this study was to characterize the interactions between fibrinogen, collagen, and fibronectin with a human isolate of S. mutans UA159 treated with different concentrations of nicotine. Two different ELISA protocols were used. In the first assay, ELISA plate wells were coated with S. mutans UA159 (untreated and treated with nicotine at 2 mg/ml, 1 mg/ml, 0.5 mg/ml, or 0.25 mg/ml), and probed with fibrinogen, collagen and fibronectin, then primary antibodies to the ECM proteins and secondary antibodies were added. In the second ELISA assay, wells were coated with ECM proteins and then untreated and treated S. mutans cells were added. Adherent cells were stained with crystal violet, and the dye was dissolved by adding 7% acetic acid before measuring the absorbance. The
results suggested that higher binding affinity to both collagen and fibrinogen was with cells treated with 0.5 mg/ml nicotine, followed by 1 mg/ml nicotine treated S. mutans. A statistically significant increase in binding to fibrinogen, collagen and fibronectin was noticed between the control group and 2 mg/ml nicotine treated S. mutans. Dose dependent results reflect the binding efficacy of S. mutans to different ECM proteins (fibrinogen, collagen and fibronectin). Nicotine up-regulates the binding properties of S. mutans to ECM proteins (fibrinogen, collagen and fibronectin). Further studies will identify the specific S. mutans ECM binding proteins up-regulated by nicotine. Supported by the Ministry of Higher Education and State for Scientific Research (MHESR) ParOwn1207, Egypt.

**P62**

**Effect of Nicotine on Glucosyltransferase Expression of Streptococcus mutans**

M. FANG,* C. ZHENG, R.L. GREGORY

Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center

*Streptococcus mutans* is a principal cariogenic bacterium in humans. The glucosyltransferases of *S. mutans* are recognized as important virulence factors for this cariogenic bacterium. There are three *S. mutans* glucosyltransferases (GTFs): GTF B, GTF C and GTF D. GTF B and GTF C synthesize primarily water-insoluble glucans, which make a major contribution to plaque formation. Former reports from the National Institutes of Health (NIH) and the Centers for Disease Control and Prevention (CDC) indicated that chewing and smoked tobacco users are more likely to develop dental caries than those who don’t use tobacco. Nicotine is one of the active components of tobacco. The objective of this study was to measure the effects of nicotine on *S. mutans* glucosyltransferases. Methods: *S. mutans* UA159 was cultured in Tryptic Soy broth (TSB) supplemented with 1% sucrose and treated with different concentrations of nicotine (0, 0.625 and 1 mg/ml) for 16 hours at 37°C in 5% CO₂ to obtain planktonic cells. The cell surface and intracellular proteins were extracted and the concentration of total protein in each sample was measured by the Bradford Protein Assay. The same amount of protein was loaded into each lane of Sodium Dodecyl Sulfate Polyacrylamide Gels (SDS-PAGE) and then transferred to blotting membranes to measure the amount of GFT by Western blotting after probing with specific primary rat antibody to *S. mutans* GTF and secondary anti-rat IgG antibody. The chemiluminescent-labeled immunoblots were scanned and analyzed by NIH ImageJ software. Results: 1 mg/ml nicotine up-regulated GTF-B in *S. mutans* significantly more than the 0.625 mg/ml nicotine and control (p<0.05). 0.625 mg/ml nicotine also up-regulated GTF-B, compared with the control, however, this was not significant. Conclusions: Nicotine altered GTF synthesis of *S. mutans* grown in sucrose and may play a role in tobacco related dental caries.

**P63**

**Nicotine’s Effect on Hydrophobicity and Adherence of Streptococcus mutans**

J.R. MORGAN,* R.L. GREGORY
Streptococcus mutans plays a major role in tooth decay, and thus increasing the rate of dental caries. Streptococcus antigen I/II is a surface protein antigen. The abundance of antigen I/II on the surface of S. mutans can be measured by assessing the hydrophobicity. Previous studies have shown that antigen I/II increases the hydrophobicity of S. mutans, and nicotine up regulates antigen I/II protein expression. The effect of nicotine on the hydrophobicity of S. mutans was measured. Nicotine dilutions from 0.1562 mg/ml-5 mg/ml were made in Tryptic Soy Broth without sucrose. Bacteria were grown in each of these dilutions for 16 hours at 37°C in 5% CO₂. The cells were washed three times in sterile saline and suspended in potassium urea magnesium (PUM) buffer. The initial optical density was measured (OD600). One milliliter of the bacterial suspension was transferred into an Eppendorf tube, and 0.1 ml of hexadecane was added. This was mixed and was allowed to stand until the phases separated. The final optical density of the aqueous bacterial phase was measured (OD600). Hydrophobicity was calculated by (Initial OD – Final OD/Initial OD) x 100%. The results demonstrated that the hydrophobicity of S. mutans increased as the nicotine concentration increased up to 1.25 mg/ml when hydrophobicity leveled off. The increase in hydrophobicity suggests that nicotine users will have increased S. mutans adherence and caries. Biofilm formation was initiated by inoculating 5 µl of suspended bacteria cells just as in the hydrophobicity assay. The same nicotine dilutions, 0.1562 mg/ml-5 mg/ml were placed into the wells of 96 well sterile microtiter plates, and incubated at 37°C with 5% CO₂ for 16 h. After incubation, liquid was removed and wells were rinsed with sterile saline. The wells were stained with crystal violet stain for 10 min. The plates were rinsed with sterile saline and the absorbance was measured at 490 nm with a microplate reader. The data indicates that as the nicotine dilutions increased, the adherence of the bacteria increased in the wells. This data suggests that the increase in hydrophobicity observed with nicotine and the adherence of S. mutans to the tooth surface is directly related.

P64

Glucan Effects on Streptococcus mutans Hydrophobicity

A.L. WHITE,* R.L. GREGORY

Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center

Streptococcus mutans is largely responsible for the majority of human dental caries. The occurrence of dental caries amongst smokers is higher than that of nonsmokers. However, the effects of tobacco and nicotine on oral bacteria are still uncertain. The purpose of this study was to analyze the effect of sucrose in Tryptic Soy Broth (TSB) on the hydrophobicity of S. mutans cells. Previous studies have shown that antigen I/II-defective mutants provided significantly lower hydrophobicity than wildtype cells. In addition, nicotine up-regulates antigen I/II expression and increases hydrophobicity and biofilm formation without sucrose. In the hydrophobicity analysis of sucrose-grown S. mutans cells (UA159), the effect of various concentrations of nicotine (4, 2, 1, 0.5, and 0.25 mg/ml) and Cigarette Smoke
Condensate (tobacco) (1.0, 0.5, 0.25, 0.125, and 0.0625 mg/ml) was the focus of this study. Bacteria were suspended in TSB containing 1% sucrose with various concentrations of either nicotine or tobacco and incubated at 37°C in 5% CO₂ for 24 hours. The nicotine and tobacco had varied effects on sucrose-grown S. mutans cells. In general, sucrose-grown cells had relatively lower hydrophobicity than non-sucrose grown cells. Furthermore, nicotine-treated sucrose-grown cells overall had lower hydrophobicity than the no nicotine control cells. In comparison with earlier research, this assay suggested causality between nicotine/tobacco and hydrophobicity in that the glucan produced by sucrose-grown S. mutans may be bound to GTF and/or glucan-binding protein possibly masking antigen I/II on the surface. An ELISA assay further supported these findings that suggested that the topography of the S. mutans cells was obscured with glucan masking antigen I/II on the surface. This indicates that sucrose-grown S. mutans cells may not significantly utilize antigen I/II for attachment. This project is supported by an IUPUI Center for Research and Learning MURI Grant.

P65
Effect of Nicotine and Tobacco on LDH in Streptococcus mutans
I.A. LEVITT,* R.L. GREGORY
Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center

Streptococcus mutans is a bacterium commonly found in the oral cavity and is a significant contributor of dental plaque and tooth decay. Smokers have increased caries. High lactate dehydrogenase (LDH) enzyme activity may be a sign of demineralization of the enamel. **Objective:** To ascertain LDH activity in S. mutans nicotine and tobacco condensate- treated cells. **Methods:** In order to determine the effect of nicotine on total S. mutans LDH activity, S. mutans cells grown in Tryptic Soy broth containing different concentrations of nicotine was assessed after incubation for 16 hours in 5% CO₂ at 37°C. Dilutions ranging from 0.0017 to 2 mg/mL of nicotine or tobacco condensate were assessed. LDH Lysis Solution was added to disrupt the bacterial cells. LDH substrate solution was added and absorbance was measured at 490 nm for LDH activity and 690 nm for cell growth. **Results:** In general, specific LDH activity as a proportion of cell growth (490/690 nm ratio) of nicotine- and tobacco-treated S. mutans cells increased compared to the control samples. However, nicotine in the range of 0.0625 to 0.25 mg/mL treated samples had the highest specific LDH activity compared to the other nicotine samples, but still remained higher than the no nicotine control. The results of the tobacco condensate- treated cells were similar to the nicotine data. **Conclusion:** Findings indicated that total LDH activity increased with S. mutans cells incubated with nicotine or tobacco condensate until the cell’s growth halts at very high concentrations. Components of tobacco may up-regulate LDH expression, facilitating more lactic acid formation. Alternatively, tobacco components may disrupt the integrity of the S. mutans cell wall allowing the diffusion of LDH out of the cell. The data supports the observation that smokers have increased caries due to increased LDH activity in S. mutans cells when exposed to tobacco components. This project is supported by an IUPUI Center for Research and Learning MURI Grant.
P66
Effect of Nicotine on the Adherence of Streptococcus mutans to Salivary-Coated Hydroxyapatite
M.E. WILSON,* R.L. GREGORY
Indiana University School of Dentistry, Department of Oral Biology and Tobacco Cessation and Biobehavioral Center

Streptococcus mutans plays a major role in the formation of dental caries. Oral bacteria are exposed to a variety of factors that affect adhesion. There are several proteins that play a role in the adhesion of the bacteria. However, there are different environmental conditions under which the adhesion of the bacteria is affected, including exposure to nicotine. Previous work had indicated that nicotine concentrations up to 2 mg/mL enhance the growth of the bacteria, causing them to grow with more cells per chain of bacteria. This would indicate an increased ability for the cells to adhere. The objective was to determine the effect of nicotine on the adhesion of S. mutans to salivary-coated hydroxyapatite beads. In order to examine whether the adhesion of S. mutans UA159 to saliva-coated hydroxyapatite beads is affected by nicotine, hydroxyapatite beads were coated with diluted saliva and blocked with bovine serum albumin. The beads were incubated with S. mutans cells that had grown in varying concentrations of nicotine and whose cell numbers had been made equal by measuring the absorption at 600nm. The cells which did not adhere to the saliva on the beads were rinsed off. The beads were resuspended in saline, vortexted and sonicated for ten seconds to remove the attached bacteria, diluted in a 1:10 dilution and spiral plated. The plates were incubated in a CO₂ incubator for 48 hours and counted using an automated colony counter. Previous work had shown that bacteria incubated in 0.5, 1.0, and 2.0 mg/mL of nicotine demonstrated a significant increase in the chain length of the S. mutans cells. Our adhesion assay results indicate an increase in the amount of bacterial adherence to the hydroxyapatite beads in the cells grown in 0.5, 1.0, and 2.0 mg/mL of nicotine when compared to the amount of adherence seen in the control. This data establishes that nicotine has a significant effect of the adherence of S. mutans to salivary-coated hydroxyapatite beads, which indicates an increased attachment in the oral cavity, possibly related to the increased expression of antigen I/II reported by our laboratory. The increased adherence by S. mutans after exposure to nicotine provides one explanation for increased dental caries in smokers.

P67
Effects of Taboka® Extract on Human Gingival Fibroblast Mediated Collagen Degradation and Expression of Matrix Metalloproteinases
M. LASZYNSKI,* J. SUN, L.J. WINDSOR
Indiana University School of Dentistry

Tobacco has long been implicated in multiple diseases including cancer and periodontal disease. It has been shown that nicotine, a major component of tobacco, alters cytokine/growth factor expression and increases human gingival fibroblast mediated collagen degradation. Phillip Morris (Richmond, VA) is marketing Taboka®, a relatively new smokeless spitless tobacco product. This product is aimed at providing an alternative to cigarette smoking for individuals who are unable to smoke due to recently
enacted smoke-free ordinances. The effects of this new tobacco product on oral health have not yet been studied. The objective of this study was to determine the effects that Taboka® has on MMP expression and cell mediated collagen degradation to aid in determining Taboka’s® deleterious effects on the consumer. Taboka® was extracted by immersing one pouch in four milliliters of water for sixty minutes at 37° C. Pouches were then removed and the extract was centrifuged and filtered. The nicotine concentration of the extract was determined to be 2136 µg/mL by the Division of Clinical Pharmacology and Experimental Therapeutics at San Francisco General Hospital (San Francisco, CA). Taboka® at a concentration of 50 µg/mL of nicotine were used to assess collagen degradation and MMP expression. RayBio human MMP antibody array detection kits (RayBiotech, Inc., Norcross, GA) were used to detect the expression of MMPs. The membranes were blocked, incubated with samples for 3 hours, washed, incubated with biotin-conjugated antibodies for 2 hours, washed and then incubated with primary antibodies as described by the manufacturer. Subsequently, the membranes were washed and then incubated with secondary antibodies. After mixing the detection agents and applying them to the membranes for 2 min, the membranes were visualized by autoradiography on X-ray film. An assay using 6-well plates precoated with rat-tail tendon Type 1 collagen was used to determine Taboka’s® effect on collagen degradation. HGFs were detached with 0.25% trypsin resuspended in media, and seeded as single colonies (100,000 cells/150µL per well). The cells were allowed to attach and then incubated in serum-free DMEM without or with Taboka® and nicotine. After various experimental periods, the conditioned media was collected and the cells removed with 0.1% Triton and 0.25% trypsin (Invitrogen). The plates were then stained with Coomassie blue to visualize collagen degradation. The results suggest that Taboka® affects the rate of collagen degradation by altering MMP expression in the human gingival fibroblasts. The Taboka® slightly altered the rate of collagen degradation mediated by the gingival fibroblasts. The Taboka® also altered the expression levels of the MMPs.

**P68**

**Effects of Taboka® on Rat Keratinocytes**

A. RICHARDSON,* J. SUN, L.J. WINDSOR  
Indiana University School of Dentistry

Tobacco companies are presently marketing smokeless spitless tobacco products aimed at smokers who are in environments where they can’t smoke. Taboka® is one of these products. There is little scientific data available about the effects of smokeless spitless tobacco products on consumers. There is a need to evaluate the effects of these smokeless spitless tobacco products on cells and tissues, and to eventually compare them to cigarette smoke condensate to determine whether these products are any less harmful than smoking. The first objective of this study was to determine the effects that Taboka® has on rat keratinocyte cell-mediated collagen degradation. The second objective was to determine the effects that Taboka® has on the expression of matrix metalloproteinases (MMP’s) in rat keratinocytes, which in turn is related to the collagen metabolism. The hypothesis was that Taboka® would increase keratinocyte MMP activation and in turn collagen degradation. Takoka® extract increased the rate of collagen degradation by the rat keratinocytes. The Taboka extract also altered the expression level of the MMPs. The data shows that Takoka® affects cells in the oral cavity. The public should be aware of
the effects of smokeless spitless tobacco and therefore be able to make a more educated decision about using smokeless spitless tobacco products as alternatives to smoking cigarettes.

P69
The Effects of Nicotine on Osteoblasts
E. SMITH,* J. SUN, F. SONG, L.J. WINDSOR
Indiana University-Purdue University Indianapolis, Department of Biology
Indiana University School of Dentistry, Department of Oral Biology

Tobacco use is a significant risk factor for the formation and progression of periodontal disease, as well as multiple types of cancer. Periodontal disease involves the destruction of bone and eventually tooth loss. Nicotine is a major component of tobacco. The effects that nicotine has on bone-forming cells (osteoblasts) have not been well studied. Therefore, the purpose of this study was to examine the effects of nicotine on osteoblast proliferation, viability, expression of the matrix metalloproteinases (MMP), and expression of multiple cytokines/growth factors. Osteoblasts (MG63) (American Type Culture Collection, Manassa, VA) were grown in low glucose Dulbecco's Modified Eagle's Medium supplemented with 10% fetal bovine serum at 37°C and in 5% CO₂. Osteoblast proliferation was measured by the water-soluble tetrazolium-1 (WST-1) assays (Roche Diagnostics, Mannheim, Germany) and viability was measured by the lactate dehydrogenase (LDH) assays (Roche Diagnostics, Mannheim, Germany) after the osteoblasts were exposed to different concentrations of nicotine (0-1000 µg/ml). The results were statistically analyzed (ANOVA, Tukey's, p<0.05). Osteoblast expression of the MMPs was measured utilizing the Human MMP Antibody Array 1 (RayBiotech, Norcross, GA) after the osteoblasts were exposed to 250 µg/ml nicotine. Osteoblast expression of multiple cytokines/growth factors was measured by the Human Cytokine Antibody Array 1 (RayBiotech, Norcross, GA) after the osteoblasts were exposed to 250 µg/ml nicotine and the results were statistically analyzed. The results indicate that osteoblast proliferation and viability significantly decreased after exposure to 1000 µg/ml of nicotine (WST-1: p=0.007; LDH: p=0.000). The osteoblasts significantly upregulated MMP-1, a collagenase. Finally, there were some slight changes in osteoblast expression of certain cytokines/growth factors, but further investigation is needed. These results demonstrate that nicotine does affect characteristics of osteoblasts. This study was sponsored by the Indiana University-Purdue University Indianapolis Multidisciplinary Undergraduate Research Institute and The Tobacco Cessation and Biobehavioral Center.

P70
Combined Effects of Tobacco and Porphyromonas gingivalis on Gingival Fibroblasts
W. ZHANG,* F. SONG, L.J. WINDSOR
Indiana University School of Dentistry

Cigarette smoke condensate (CSC), the particulate matter of cigarette smoke, is composed of thousands of chemicals (e.g., nicotine). Cigarette smoking is a risk factor for periodontal disease. Porphyromonas
gingivalis (P. gingivalis) is an opportunistic pathogen linked to periodontal disease. Objective: This study investigated the combined effects of P. gingivalis and CSC on the collagen-degrading ability of human gingival fibroblasts (HGFs) and its mechanisms. Methods: HGFs were exposed for 1, 3, 5, and 7 days to 50 µg/ml CSC, 10% (v/v) P. gingivalis supernatant, and 50 µg/ml of CSC plus 10% (v/v) P. gingivalis supernatant. Cell proliferation and cytotoxicity were evaluated by water-soluble tetrazolium-1 (WST-1) and lactate dehydrogenase (LDH), respectively. The collagen-degrading ability of HGFs was evaluated in collagen-coated six-well plates. Conditioned media and membrane extracts were utilized for zymography and western blot analyses of matrix metalloproteinases (MMPs) and tissue inhibitors of metalloproteinases (TIMPs). The mRNA levels of multiple MMPs/TIMPs were also examined by reverse transcription-polymerase chain reaction. Results: The treatment conditions did not affect cell proliferation and was no toxic to the HGFs. These three treatments, especially the combination of CSC and P. gingivalis supernatant, increased the collagen degradation when compared to the untreated control. The combined treatment increased the production of active forms of MMP-1, MMP-2, MMP-3, and MMP-14, as well as decreased the production of TIMP-2 in conditioned media. Furthermore compared to control group, the combined treatment increased MMP-14 production in the membrane extracts. The combined treatment also increased the mRNA levels of MMP-1, MMP-2, and MMP-14. Conclusion: CSC can increase P. gingivalis-mediated collagen degradation of HGFs by destroying the balance between the MMPs and TIMPs at multiple levels. This project was supported by the IUPUI Tobacco Cessation and Biobehavioral Center.

P71
Tobacco Smoking Condensate Affects the Sucrose-Dependent Adherence of Oral Streptococci
C. ZHENG,* R.L. GREGORY
Indiana University School of Dentistry

The positive relationship between smoking and dental caries has been reported. However, the underlying mechanisms are unclear, particularly on Streptococcus mutans. Objectives: This study investigated the effect of tobacco smoking condensate (TSC) on the growth of S. mutans and Streptococcus gordonii, sucrose-dependent attachment and related protein expression. Methods: MIC and MBC of TSC were determined for S. mutans and S. gordonii. The growth curves and sucrose-dependent adherence of these strains with different concentrations of TSC were monitored for 11 or 18 h, respectively. Bacteria were also treated with TSC and protein extracts were separated by electrophoresis and subjected to Western blot analysis for GTF and GbpB. Results: The mean MIC and MBC of TSC against S. mutans were 3.0 (± 1.2) and 7.0 (± 2.0) mg/ml, respectively, which were higher than those against S. gordonii. These two species demonstrated different growth patterns. S. mutans recovered relatively quickly from TSC treatment with a longer doubling time, compared to the control group, while S. gordonii took more time to enter log-phase. The percentage of sucrose adherent bacteria was significantly increased among the treated groups for S. mutans, but not for S. gordonii. The expression of GTF and GbpB was also significantly upregulated for the treated S. mutans. Conclusion: The different growth patterns and response to produce GTF for sucrose-dependent adherence may
switch a non-cariogenic dominant composition to a cariogenic dominant composition. This shift may increase the risk for smokers to develop caries.

**CLINICAL CASE REPORTS**

**ENDODONTICS**

**CC1**

Non-Surgical Endodontic Treatment of an Extraoral Sinus Tract

P. LEY, * M.M. VAIL
Indiana University School of Dentistry, Department of Graduate Endodontics

Cutaneous, or extraoral, sinus tracts are an uncommon finding associated with odontogenic abscesses. Due to the presentation of the extraoral lesions they are often mistaken for pathosis of dermatologic origin. Consequently, patients often see several physicians or even surgeons without resolution. Often it is not until they are referred to a dentist that a diagnosis of odontogenic origin is made. Typically when an odontogenic infection spreads from the intramedullary bone through the cortical bone it will drain into the oral cavity. However, when the muscle attachments are situated in such a way that the apices of a mandibular molar are superior to the attachment the infection has the potential to spread extraorally. The objective of this case report is to describe the successful non-surgical endodontic treatment of tooth #19 with a draining extraoral sinus tract. The initial presentation of the patient to the graduate endodontic clinic is described, as well as the treatment provided and a description of the follow-up appointments. Radiographs and clinical photographs were recorded during the procedure and a 14 month follow-up completed. Extraoral sinus tracts of odontogenic origin, although rare, can be predictably treated with conventional root canal therapy without surgical removal of the sinus tract or the prescription of systemic antibiotics.

**PERIODONTICS/ORTHODONTICS**

**CC2**

Periodontally Accelerated Osteogenic Orthodontics

Indiana University School of Dentistry, Department of Periodontics and Allied Dental Programs and Department of Orthodontics and Oral Facial Genetics
Conventional orthodontic treatment has benefited from a new surgical technique of Periodontally Accelerated Osteogenic Orthodontics (PAOO), which requires selective corticotomies few days after starting orthodontic treatment. This technique decreases orthodontic treatment time by more than 50% and is reported to reduce relapse and root resorption along with a significant increase in alveolar bone support. The faster orthodontic tooth movement is enhanced by the surgically-induced regional acceleratory phenomenon (RAP) as an outcome of surgery the accelerated bone remodeling response is initiated which accelerates demineralization and remineralization of the bone. A 27 year old female with class I malocclusion and severe lower anterior crowding was treated with this new technique. A complete orthodontic and periodontal evaluation was performed including radiographs, periodontal charting, CBCT (cone beam computed tomography) and a diagnostic wax up. Orthodontic treatment was planned and the patient had orthodontic brackets placed two days prior to surgery. Surgery was performed under IV conscious sedation and included elevation of full thickness flaps on both mandibular and maxillary arches. Corticotomies were performed in selected sites followed by composite bone grafting in the sites. The composite graft was composed of de-mineralized freeze dried allograft and a xenograft material (Bio-Oss). The material was rehydrated in saline solution containing 100mg/10ml of clindamycin prior grafting. Flaps were repositioned and sutured. Orthodontic adjustments were performed every two weeks. Results and conclusions: Treatment was concluded after 17 weeks which reduced treatment time by less than half compared to conventional orthodontics that was estimated for 12 months. This case report represents the first reported use of PAOO in the State of Indiana and promises to be an exciting treatment option for the future.

PROSTHODONTICS

CC3
Rehabilitation of a Fully Edentulous Patient Using Implants and CAD/CAM Technology
N. LABBAN,* C.J. ANDRES
Indiana University School of Dentistry, Division of Prosthodontics

Recently, many improvements have been added to the CAD/CAM technology that has permitted for the enhancement of different treatment strategies related to the rehabilitation of edentulous patients. In the mean time, fixed implant-supported prostheses can be fabricated using either acrylic resin or all ceramic materials. The objective of this clinical report is to describe the fabrication techniques of removable maxillary implant retained acrylic complete overdenture opposing fixed mandibular implant supported ceramic complete denture utilizing a CAD/CAM-generated framework. A 73 year old male patient came to the graduate prosthodontic clinic requesting total dental extraction of his severely decayed lower and upper dentition and insertion of implants for lower fixed and upper removable prosthesis. Three and half years ago, extraction of upper and lower teeth was done followed by delayed implants placement. Since then, he had worn conventional acrylic dentures in the upper and the lower jaws for four months during the healing time of the implants. Later, the upper denture was converted to
a removable implant retained overdenture using locator attachments while the lower denture was converted to a fixed implant supported denture to simulate the final prosthesis. Three months later, a final removable maxillary implant retained acrylic complete overdenture and fixed mandibular implant supported ceramic complete denture were delivered. Moreover, gold occlusal surfaces were casted and cemented on the upper posterior acrylic denture teeth. The patient was very comfortable and satisfied with the esthetic and functional outcomes of the treatment. After a 2 year follow up, none of the implants were lost and no significant bone loss around these implants was found. In addition, no significant wear was noticed on the occlusal surfaces of the upper and lower denture. The use of implants and CAD/CAM technology might be considered a viable treatment modality for edentulous patients. In addition, the use of gold occlusal surfaces might increase the longevity of the upper denture by reducing the wear process due to the opposing ceramic occlusal surfaces.

CC4
Multidisciplinary Full Mouth Rehabilitation for an Ectodermal Dysplasia Patient
G. SHIMIZU OLIVA,* J.A. LEVON
Indiana University School of Dentistry, Graduate Prosthodontic Program

Ectodermal Dysplasia (ED) is a genetic disorder in which there are congenital birth defects of two or more ectodermal structures. These structures may include skin, hair, nails, teeth, nerve cells, sweat glands, parts of the eye and ear, and parts of other organs. ED is usually described as being hypohidrotic or hidrotic, depending upon the degree of sweat gland function. Hypohidrotic ectodermal dysplasia (HED) exhibits the most severe dental anomalies. The most remarkable oral features of HED are the absence of most deciduous and permanent teeth. The prosthodontic treatment of patients with ectodermal dysplasia can be complicated due to their oral deficiencies. The purpose of this clinical report is to describe the multidisciplinary treatment for full mouth rehabilitation of a 24 year old male with ectodermal dysplasia. Patient was orthodontically treated to align the permanent existing teeth and maintain the space of the congenitally missing teeth for future dental implant placement and restoration. Dental implants were placed in areas of # 7, 10, 12, 20, 28 and 29. The prosthodontic rehabilitation included increasing the OVD with conventional fixed and implant supported restorations. Effective treatment of patients with genetic anomalies such as ectodermal dysplasia requires excellent communication between the treatment specialists. From the onset of treatment, collaboration among the orthodontist, periodontist and prosthodontist was necessary to achieve the esthetic and functional goals. The patient’s confidence improved after cementation of provisional restorations and he was very satisfied with the final prostheses.

TABLE CLINIC
PROSTHODONTICS

T1
Treatment Planning in Patients with Severely Worn Dentition
K. SCHAUB,* J.A. LEVON
Indiana University School of Dentistry, Graduate Prosthodontic Program

In 1984 Dr. Kenneth Turner created a classification system to help the prosthodontist better diagnose, manage, and treat patients with severely worn dentition. The loss of occlusal vertical dimension and the amount of space available to restore the dentition are what separate patients into one of three categories. Diagnosis and treatment of these patients brings one of the greatest challenges to dentists today. The objective of this study was to use this classification system to better treat patients that presented to the Graduate Prosthodontic clinic in the past 3 years. Category 1 includes a patient with Amelogenesis Imperfecta that was treated with posterior quadrant crown lengthening, 10 RCT, cast post and cores, and twenty eight porcelain fused to metal crowns. This patient was treated according to Turner’s Category 1 recommendations. Category 2 includes a patient that had a long history of anterior wear and was treated according to this classification. Twenty eight porcelain fused to metal crowns, along with maxillary anterior crown lengthening were used to restore this patient back to function. Finally, the third patient falls into category 3 which is the most difficult to diagnose and treat. This patient presented with worn maxillary anterior teeth (lingual) and several missing posterior teeth. It was determined that this patient would be best restored with porcelain fused to metal crowns on the maxillary arch with a 3 unit bridge from 29-31. With the use of the Turner Classification, three difficult treatment scenarios were well planned and carried out. In conclusion, dentists treating patients with severely worn dentition should use Turner’s Classification to better manage and successfully treat these patients.