There’s no time like the present to be a part of the student research community at the Indiana University School of Dentistry. At IUSD, we have PhD candidates, graduate students in five specialty programs, awardees of the IUSD DDS student research fellowship and our dedicated mentors producing innovative knowledge in areas such as dental biomaterials, bone physiology, preventive dentistry, oral biology, and much more.

This past year, the IUSD Student Research Group has worked hard to give students opportunities to learn and excel. Through our meetings and with the help of our faculty mentors, we have provided an avenue of networking between student researchers, potential student researchers, and faculty mentors to help students identify and explore a wide variety of research experiences.

The students have really taken advantage of and become involved in projects that have made big contributions to the field of dentistry. Through our bi-monthly meeting and the IUSD annual Research Day, we have provided students with opportunities to practice their presentation skills and share their research with the rest of the IUSD scientific community. The 2018 IUSD Research Day celebrated some truly impressive research successes.

I want to congratulate all student researchers on their achievements this past year and encourage you to continue in your hard work. For the casual reader, thank you for taking some time to learn about our group! I hope that in the coming year, you will join us at our meetings and learn more about dental research! Last but not least, I would especially like to thank Taylor Dietl for doing a great job of producing this year’s newsletter!

Robert Holland, DSRG President, DDS Class of 2019

IUSD Research Day 2018
See testimonials from award winners and presenters from this past spring’s Research Day.
The IUSD Student Research Group is a member of the AADR National Student Group. Dr. Angela Bruzzaniti, director of dental student research, is the faculty advisor and helps organize the schedule for bi-weekly meetings where students present the findings of their ongoing research studies to other students and faculty.

Research Day 2018

By Taylor Dietl, D2

Explore a new side of dentistry!
Research is an exciting and fulfilling endeavor that is open to all programs within the dental school. Opportunities include biofilm studies, dental materials testing, cariology investigation, bone research, craniofacial imaging, pediatric surveys, smoking cessation, and much more!

STUDENT RESEARCH FAST FACTS:

10
Number of research fellows selected for the 2018-2019 school year.

$3,500
Stipend awarded to each research fellow for the successful completion of a research proposal and experimental studies.

For the Indiana University School of Dentistry, research has always been something well-respected and sought after. On April 9th, the 26th annual Research Day was held at the IUPUI Campus Center to celebrate the hard work done throughout the academic year. The event included a ceremony to award 25 distinguished faculty and students, with keynote speaker Dr. Raul Garcia from Boston University Henry M. Goodman School of Dental Medicine. Following the ceremony, there were 53 poster presentations and 23 clinical case reports available for attendees to learn more about current research in the field of dentistry.

The faculty awards presented by Dean Dr. John Williams included the IUSD Distinguished Faculty Award for Teaching, awarded to Dr. Neil Pinney. The IUSD Distinguished Faculty Award for Research was awarded to Dr. Richard Jackson. Finally, the King Saud University Distinguished Research Faculty Travel Award was presented to Dr. Richard Gregory.

The awards given to dental hygiene, undergraduate, predoctoral, and graduate dental students were presented by Dr. Frank Lippert, president of the Indiana section of the AADR. Students were awarded for their outstanding contribution to IUSD’s research mission.

• Jennifer Wu and Patrick McIntyre received the prestigious Cyril S. Carr Research Scholarship, our highest research award. Jennifer and Patrick both worked under the advisory of Dr. Angela Bruzzaniti for their projects.
• The American Dental Association/Dentsply International Student Clinician Award was presented to Alec Willard, mentored by Dr. Tien-Min Gabriel Chu.
• Ashley Kaaraczewski received the King Saud University Travel Award for Excellence in Preventive Oral Health Care under the guidance of mentor Dr. Jeffrey Platt.
• The ASDA IUSD Student Research Group Award sponsored by IN-AADR was awarded to Reed McKinney with Dr. Richard Gregory as his mentor.
• Ella Hicks was awarded the IN-AADR Undergraduate Student Award for her project, “Osteoclast Differentiation is Inhibited by Neutrophin-4,” with her mentor Dr. Angela Bruzzaniti.
• The King Saud University PhD Student Travel Award was presented to Dawn Wagenknecht for her project "Nicotine Increases Streptococcus mutans Biofilm and Arginine Negates the Effect." Dawn worked with Dr. Gregory as her mentor.
• King Saud University also sponsored an award for Best Clinical Case Report, given to Dr. Apoorv Goel, an MSD Periodontics resident.
• Marisa Cornwell and Eryn Johnson were awarded the Elizabeth A. Hughes Dental Hygiene Award.
The Maynard K. Hine Award for Excellence in Dental Research was awarded to Grace Gomez, mentored by Dr. Gregory.

The Delta Dental Award for innovation in Oral Care Research was presented to Dr. Jennifer Chang, an MSD Periodontics resident, mentored by Dr. Yusuke Hamada.

Upon completion of the awards ceremony, students had the opportunity to listen to poster presentations in the many rooms designated for presentations.

Additionally, students had the chance to meet with sponsors and interact with vendors, including: Delta Dental Foundation, Johnson & Johnson, Procter & Gamble, Crest, Indiana Dental Association, Colgate, Dentsply International, and many more!

Research Day 2018 at IUSD was a huge success and it has, as always, shown the true spirit of our Dental community's involvement in research. We hope to continue this rich tradition throughout the years and thank you for making this event as impactful as possible.

Jennifer Wu and Patrick McIntyre (center) receiving the Cyril S. Carr Research Scholarship from Dean John Williams (left) and Dr. Frank Lippert (right).

Some students, like Dr. Apoorv Goel above, presented their research orally when given their awards.

Students presenting their posters on Research Day!
Research Title: "The Effect of High Bone Mass on Orthodontic Tooth Movement"
Faculty Mentor: Dr. Achint Utreja, Department of Orthodontics

Research Title: "Effect of Titanium Dioxide-Containing Toothbrush on Streptococcus mutans Biofilm"
Faculty Mentor: Dr. Richard Gregory, Department of Biomedical and Applied Sciences

Research Title: "Effects of Etching on Sub-micron Features of eMax CAD"
Faculty Mentor: Dr. Gabriel Chu, Department of Biomedical and Applied Sciences

Research Title: "Expression, Secretion, and Function of Nerve Growth Factor in Osteoblasts and Osteocytes"
Faculty Mentor: Dr. Angela Bruzzaniti, Department of Biomedical and Applied Sciences

Research Title: "PTEN Inhibition and Neural Regeneration Following Facial Nerve Transection and Repair in Rats"
Faculty Mentor: Dr. Chandler Walker, Department of Biomedical and Applied Sciences
Poster Presentations by Student Researchers on Research Day!
by Taylor Dietl, D2

Over 75 students worked hard all year with various mentors, all culminating in the presentation of their work in this year’s event. Here are some of their stories. Enjoy!

DDS Class of 2021

Research Title: “The Effect of Alliin on Initial Biofilm formation of Streptococcus mutans”
Faculty Mentor: Dr. Richard Gregory, Department of Biomedical and Applied Sciences

D3 student Reed McKinney presented his work, “Effects of N-demethylation Nicotine Metabolites on Streptococcus mutans Biofilm Formation.” He worked in collaboration with Dr. Richard Gregory on this research.

His project, in his own words: “For this project, I selected bioactive metabolites of nicotine produced by the N-demethylation metabolic pathway -- all of which have been found in the blood, saliva, and urine of smokers. I exposed a growing culture of S. mutans to various biologically relevant concentrations of these compounds, both with and without nicotine, to analyze how they would influence the biofilm's ability to grow, the rate of its growth, and quantify how much biofilm actually grew.

My results found that norcotinine, the final compound of this specific metabolic pathway, completely inhibited biofilm formation at a concentration of 0.5 mg/mL, suggesting that this compound could be used to reverse nicotine's up-regulating effect on S. mutans biofilm formation.”

Reed McKinney (pictured above) “Each experience has been so rewarding to put my results on display. It's encouraging to see how much Research Day has grown over the years.”

Reed commented on his participation in research: "By conducting research, I've been able to explore areas of dental science that aren't necessarily comprehensively taught to us in dental school. I've really enjoyed exploring the field of dental microbiology over the last six years and can't wait to see where the rest of my research career takes me."
When asked about being selected for the AADR Student Research Day Award, Reed said, "Being selected for an award at Research Day was an amazing experience. As a D2, competing against upperclassmen whose projects have been in progress for many years, I didn't expect it. It was an awesome and humbling honor to be able to give an oral presentation to the entire group of student and faculty present that day." The AADR Student Research Day Award includes a travel stipend and the opportunity to present and network with other researchers at the International Association for Dental Research (IADR) annual meeting in Vancouver, BC, Canada in June of 2019.

Sung-Kyung JoAn Kim, a current D4, received the 2018 AADR National Research Grant at the AADR/CADR conference in Fort Lauderdale, Florida. Her project was "Expression, Secretion, and Function of Nerve Growth Factor in Osteoblasts and Osteocytes," where she found that NGF may regulate osteoblast function and may be involved in paracrine signaling to osteocytes to regulate cellular function, resulting in increased mineral deposition. When asked about her research experience, she said: "Actually, conducting research experiments during dental school has provided me a way of forgetting and relieving the burden of stress and competition that naturally follow us as professional students. As a consequence, I concentrated more efficiently on studying and clinics, and have contributed to the research of signaling pathways among bone cells that can positively impact clinical dentistry in the future."

Pre-dental student and soon to be a DDS candidate in the Class of 2023, Courtney McGrew presented her poster "Effect of Nicotine on Streptococcus mutans Binding to Collagen." Coming in as an undergraduate in the IUPUI Life-Health Sciences Internship Program, she worked on her project with Dr. Richard Gregory.

I asked about Courtney's perspective as a pre-dental student, and here's what she said: "From the eyes of a pre-dental undergraduate, IUSD is an impressive and innovative school, full of promising research findings, compassionate faculty mentors, and dedicated healthcare professionals."

Courtney was new to research, but her mentor helped her see it through: "If you have ever been to Dr. Gregory's lab, you know there are many students who are working on their own projects. I have met intelligent students in masters, PhD, and DDS programs, blown away by the depth and careful thought put into their procedures. I have seen by their example that research academia takes a lot of effort and dedication, but yields great rewards that reflect their magnitude of diligence and time put into it."

When commenting on her project, she said, "The big picture of this study connects smoking with atherosclerosis through oral microbiological mechanisms." Her efforts did bring success, too: "The most exciting and reassuring part about my project is that we have recently determined that a specific gene is statistically significant in S. mutans binding to a protein!"
Dr. Gregory has been very active in the research community, receiving grants from organizations such as the National Institute of Dental and Craniofacial Research, National Institute of Heart and Lung, Smokeless Tobacco Research Council, and many others. Recently, his projects have focused on mucosal biofilm biology in regard to oral bacteria like: Streptococcus mutans, Porphyromonas gingivalis, Prevotella intermedia, Fusobacterium nucleatum, Enterococcus faecalis, Candida albicans and Aggregatibacter actinomycetemcomitans. He is also majorly focused on the effect of tobacco on S. mutans virulence, the role of bacterial cell surface proteins in colonization and bacterial atherosclerosis/ endocarditis, and mechanisms to diminish colonization of S. mutans to enamel surfaces and cardiac tissue.

Dr. Gregory was awarded the King Saud University Distinguished Research Faculty Travel Award in spring 2018. He was also named the IDA Outstanding Faculty of the Year two times (2003, 2016), and received the Indiana Branch of the American Society for Microbiology Excellence in Teaching Award.

Although his efforts have been majorly focused on teaching and service work, that has not stopped Dr. Gregory from participating in research projects. He is currently the co-principal investigator for a IUCRG grant at IU, researching the effects of nicotine and other cigarette smoke chemicals on bacterial biofilm dispersal. In 2018 he was also the co-investigator for the Morita Company, studying the effectiveness of electromagnetic wave irradiation on an endodontic biofilm in root canal treated teeth in vitro. IUSD s lucky to have faculty members like Dr. Gregory who are dedicated to student success and the progression of research. He has graciously taken the time for an interview with me, and here’s what I found.

Q: What is your educational background?

A: I enrolled in a microbiology class as a sophomore in high school, which is unusual even today. But that really excited me. Basically I was studying what a single cell organism could do -- that it could do basically what we humans do with trillions of cells. For the next two years I cleaned glassware and made media, those types of things. I loved it. I always had in my mind that I wanted to help people in the medical field. I decided to enroll in Eastern Illinois University and major in medical technology and minor in chemistry. Medial technology fulfilled my desire to help people because I could work in a medical laboratory in a hospital. That program required a 12-month internship at a hospital laboratory at Decatur Memorial Hospital in Illinois. I worked there for a couple of years and decided I wanted to pursue the opportunity to be a supervisor in a hospital laboratory, which required a masters degree. I returned to my love of microbiology, and got accepted at Southern Illinois University in Carbondale. I was assigned to be a teaching assistant and my mentor, Isaac Shechmeister, offered me the opportunity to pursue a PhD after just one semester. At that time I was studying Streptococcus mutans which I finished in 1982, focusing on the biochemical and immunological characterization of ribosomal preparations from S. mutans to develop a caries vaccine. I decided to do a post-doctoral fellowship in mucosal immunology. I was accepted to one of the two top programs in the world: UAB in Birmingham, Alabama. I continued my research in the mucosal response to S. mutans. One of my papers that I published as author was one of the first studies to prove the success of a caries vaccine in humans, quantifying the numbers of S. mutans in the oral cavity of individuals receiving the vaccine."
Q: As the director of the PhD, Dental Sciences Program, where do you think the future of dental research lies at IUSD?
A: (Jokingly) My answer of course would be researching S. mutans! But I can speculate that the immediate future of dental research at IUSD has several focus areas. The top one would be bone research, regenerative endodontics, dental informatics, and of course cariology, which includes S. mutans research.

Q: What made you interested in research?
A: It was a combination of things, but my high school microbiology class is really what started my interest. Isaac Shechmeister was a fantastic person and was very much involved in research. He and I both had an interest in how things work. And I still have that interest today -- how do things work?

Q: What are some of the greatest difficulties you face today having such an expansive background in research?
A: I may only be involved as a faculty member for another five or six years. For people like me, who direct PhD projects, I have to very carefully weigh whether to accept another student or not. They can take four or five years to finish their PhD. The greatest difficulty is and always will be the funding aspect. The ability to obtain enough funding to do the research you want to do. The federal funding environment is very difficult: only 10% of NIH projects that are deemed possibly fundable are funded. So many worthwhile projects are not funded. It is a tough environment at the federal level. I have been fortunate enough to be part of several federally funded projects, but recently I have accepted industrial contracts and use those funds to support some of the student research that happens in my lab.

Q: What drives you to continue to be involved with research so extensively?
A: The first thing is the curiosity. I am a firm believer in the fact that the best researchers are those that have a lot of curiosity about how things work. The second most important thing is perseverance. As you know, it takes a lot of effort and time to do research properly. It just doesn't click all the time; you will not always be 100% successful with all your projects. What makes me so interested in working with students in my lab is that I just love working with students. I love to see that "AHA!" moment that I have or my students have. That's exciting! I love to see that big grin on their face. That drives me. Working with students is my favorite part of my day. I do so many things as part of my faculty life with many being administrative, but my favorite part is working with students in the research lab. I like to think it keeps me youthful and that's another reason I do this.

Q: What advice would you give to aspiring student researchers?
A: First and foremost: only pursue research if you have the curiosity and an appropriate amount of patience and perseverance to do the research. Otherwise, it becomes a chore. If research becomes more a chore than a pleasurable activity, then I think that it would not be for that particular student. I think the student needs to have a love for their research project. That love can come from an emotional or intellectual attachment. Most of my research recently has been on the effects of smoking of oral bacterium, and I don't have an emotional attachment to that. But I have a lot of intellectual attachment to the curiosity of the effects of smoking on oral bacteria. Research can be frustrating, but it can be so rewarding at times, and that's what I love to see for my students.

Dr. Richard Gregory (center) receiving the King Saud University Distinguished Research Faculty Travel Award in 2018 from Dean John Williams (left) and Dr. Frank Lippert (right).
Thank you for your interest in the latest edition of the Student Research Initiative! We would like to extend our most sincere gratitude to Indiana University School of Dentistry and its faculty and staff for their ongoing support of student research. We aspire to continue production of this newsletter to help keep the campus informed of all of the exciting student research efforts going on in the dental community. The Student Research Initiative team would like to extend a special thank you to our faculty mentor, Dr. Richard Gregory, for his photographs, inspiration, and guidance in producing this fifth edition of the newsletter.

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Vice President: Alec Willard, D3, Secretary,
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