University of Mississippi Medical Center
School of Dentistry

Research Day 2016

February 23, 2016

David A. Felton, DDS, MS
Dean

Jason A. Griggs, PhD, FADM
Associate Dean for Research

School of Dentistry Office of Research
University of Mississippi Medical Center
2500 North State Street, Room D528-6A
Jackson, MS 39216-4505
Dear Colleagues,

It is indeed a pleasure to welcome you to the 2016 UMMC School of Dentistry Research Day, an annual tradition at the School since 1994!

Today our faculty, students, and post-graduate students come together to present their research findings to the members of the School of Dentistry and our Medical Center colleagues. According to Albert Szent-Gyorgyi, Nobel Prize recipient in Medicine in 1937, “Research is to see what everybody else has seen, and to think what nobody else has thought”. Research is critically necessary to advance the science of dentistry and improve patient care and outcomes. Consider the advances that we’ve seen in dentistry over the past few decades—new dental materials, dental implant therapies, the development of systematic reviews, digital and CAD/CAM dentistry, advances in adhesive dentistry, advances in pulpal and periodontal research, and the movement toward minimally invasive dentistry—the list goes on and on!

Having our students participate in research is an excellent way to advance the science of dentistry beyond the classroom and clinical environment. In addition, according to the Commission on Dental Accreditation (CODA, Standard 6-3), “Dental education programs must provide opportunities, encourage, and support student participation in research and other scholarly activities mentored by faculty.”

Our faculty continue to serve as excellent mentors and role models for our students in the research arena. As you will witness, the quality of the research presented today strongly supports our goal to not only achieve the CODA accreditation standard, but to surpass it.

Thank you for joining us on this important day in the future of the School of Dentistry, and for your participation in our research activities. I am confident that you will enjoy the posters and oral presentations, and that you will witness, first hand, the ever improving quality of our research initiatives. Enjoy the day!

David A. Felton, DDS, MS
Dean, School of Dentistry
Professor, Department of Care Planning and Restorative Sciences

Welcome

This is an exciting day for the School of Dentistry! It is our first SOD Research Day with our new dean, Dr. David Felton. I am thankful to our retiring dean, Dr. Gary Reeves, for his support of research through intramural seed grants, bridging funds, and travel funds, and I look forward to helping Dr. Felton continue the growth of our research mission.

It is a pleasure to have Dr. Jack Mecholsky with us today as our keynote speaker. I have known Dr. Mecholsky for 24 years. He is passionate about teaching and failure analysis. This enthusiasm and his genial nature attracted me to seek his guidance when I was a student, as it did many other students over the years. Dr. Mecholsky is a distinguished materials scientist, so please take advantage of his visit by asking for advice regarding your current and future projects.

As usual, the abstracts that we received this year are excellent, and I look forward to hearing our students and faculty present their results and discuss the scientific impact with all of you. Thank you for joining us.

Jason A. Griggs, PhD, FADM
Associate Dean for Research, School of Dentistry
Professor and Chair, Department of Biomedical Materials Science
Program

Lower Amphitheater R153
8:00 – 9:00 am Keynote Lecture: Dr. John J. Mecholsky, Jr., PhD
“A Critical Analysis of Fracture or Why Things Fall Apart”

Nelson Student Union Gymnasium
9:15 – 10:00 am Break
10:00 – 11:30 am Poster presentations
Judging of student posters
Biomedical Materials Science lab demonstrations

Nelson Student Union Conference Rooms C and D
11:30 am Lunch will be served
12:15 pm Certificates and awards presentation
12:45 pm Poster removal

Keynote Lecture

“A Critical Analysis of Fracture or Why Things Fall Apart”
John J. Mecholsky, Jr., PhD
Professor
Department of Materials Science & Engineering
University of Florida, Gainesville, FL

Dr. Jack Mecholsky is a Professor at the University of Florida in the Department of Materials Science and Engineering. He served as the Associate Chair from 2005-2010, the Chair of the Faculty Senate in the 2009-2010 academic year and also served on the Board of Trustees for the University of Florida for 2009-2010. He is a Fellow of the American Ceramic Society (ACerS) and served on the Board of Directors of the ACerS from 2006 to 2009.

Dr. Mecholsky is known as an international expert in the fractographic analysis of brittle materials. While on sabbatical leave in 1995-96, he served as the Associate Director for Materials at the Office of Naval Research in London (UK). In 2006 he served as a Guest Researcher at the National Institute for Standards and Technology and in 2013 at the Cavendish Laboratory in Cambridge University. As a recipient of the University of Florida’s Faculty Enhancement Opportunity (FEO) award Dr. Mecholsky spent two months at Imperial College in London in 2010 as a visiting researcher. Dr. Mecholsky won the Teacher of the Year Award in 2006 and the Graduate Advisor of the Year Award in 2009.

Prior to 1990 Dr. Mecholsky held a joint appointment at Penn State University in the Materials Science Department as an Associate Professor and as a Research Associate in the U.S. Navy’s Advanced Research Laboratory. From 1979-1984 he was a member of the technical staff at Sandia National Laboratories in Albuquerque, New Mexico. Dr. Mecholsky worked at the Naval Research Laboratory in Washington, D.C. from 1972-1979 as a Ceramic Research Engineer, and while finishing his graduate degrees he was a structural research engineer at the Naval Ship Research & Development Center (formerly the David Taylor Model Basin) from 1967-1972. He briefly worked at the Naval Facilities Engineering Command as an Engineer-in-Training from 1966-1967. Dr. Mecholsky helped design the pressure hull for the Deep Submergence Search Vehicle (DSSV) and the escape hatch for the Deep Submergence Rescue Vehicle (DSRV) shown in the movie “The Hunt for Red October”. He developed new fractographic techniques used in the failure analysis of optical fibers, of infrared transmitting radome materials, and of ferroelectrics. He also developed equations for the analysis of failure by laser irradiation of ceramic materials.

Dr. Mecholsky holds patents for the development of a laser hardened composite material and a bioactive tapecast multi-layer ceramic/metal composite. He has published over 200 technical papers and is the co-author of “Fracture of Brittle Materials: Testing and Analysis” (Wiley Pub. 2012).

Acknowledgements

Faculty Research Mentors
Ronald Caloss, DDS, MD
Associate Professor & Chair, Oral-Maxillofacial Surgery & Pathology
Ravi Chandran, DMD, PhD
Assistant Professor, Oral-Maxillofacial Surgery & Pathology
Yianyu Yan, DDS, BS, MS, PhD
Assistant Professor, Biomedical Materials Science
Jason Griggs, PhD, FADM
Professor & Chair, Biomedical Materials Science
Associate Dean for Research
Amol Janorkar, PhD
Associate Professor, Biomedical Materials Science
Director, UFSTART Program
Denise Krause, PhD
Associate Professor, Biomedical Materials Science
Michael Roach, PhD
Assistant Professor, Biomedical Materials Science
Scott Williamson, PhD
Assistant Professor, Biomedical Materials Science

Poster Judges
Ahmad Abdelkareem, DDS, MS, PhD
Assistant Professor & Chair, Orthodontics
Jennifer Bain, DMD, MSPH, PhD
Assistant Professor, Periodontics and Preventive Sciences
Tina Rushing Woods, DMD
Assistant Professor, Oral-Maxillofacial Surgery & Pathology
Kenneth St. John, PhD
Associate Professor & Graduate Program Director, Biomedical Materials Science

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Dr. Ahmad Abdelkareem
Dr. Mohamad Qais
Dr. Robin Howard
Dr. Amol Janorkar
Dr. Jennifer Bain
**Modifications and Characterization of Anodized Titanium for Dental and Orthopedic Implants**

**Objective:** Titanium is one of the most commonly used biomaterials for dental and orthopedic implants due to its mechanical properties, corrosion resistance, and excellent biocompatibility. Titanium forms an amorphous oxide layer instantaneously when the surface is exposed to an oxidized atmosphere. This amorphous oxide layer can then be converted to a crystalline form using an electrochemical process called anodization. Two common crystalline phases of titanium oxide are anatase and rutile, which have both been suggested to promote bioactivity and antimicrobial effects. The objective of this research was to determine the phase structure, outermost layer surface chemistry, and the resulting bioactivity of titanium samples anodized using four different acid electrolyte mixtures. Previous studies in our laboratories have shown some of these oxide layers to contain substantial amounts of phosphorus incorporated into the oxide layer. Therefore, a secondary objective was to attempt to incorporate calcium into the forming oxide layer using a post-anodization soak treatment.

**Methods:** One-inch square samples machined from commercially pure titanium grade 4 material were prepared with a 1/8-inch-diameter hole for connection to the anodization rectifier. Anodization was performed using four acid electrolyte mixtures of sulfuric acid, phosphoric acid, oxalic acid, and hydrogen peroxide. X-ray diffraction (XRD) was used to determine the crystalline phase present within the anodized layers. X-ray photoelectron spectroscopy (XPS) was used to determine the outermost layer surface chemistry of the anodized samples. For bioactivity testing, simulated body fluid (SBF) was prepared using standardized guidelines according to the ISO 23317 standard. Bioactivity samples were soaked in 150 milliliters of SBF for periods of 3, 5, and 7 days at 37°C and analyzed with XRD and SEM/EDS for apatite formation. Anodized samples found to contain phosphorus in the oxide layer were then chosen for calcium uptake testing, and were soaked in 50 mL of 0.6 M nitrate tetrahydrate solution for periods of 48 and 72 hours at 80°C. Both SBF and calcium soaked samples were viewed using Scanning Electron Microscopy (SEM), and calcium uptake counts were measured using Energy Dispersive X-ray Spectroscopy (EDS).

**Results:** XRD confirmed the presence of anatase and rutile in varying amounts in the oxide layer depending on the anodization electrolyte utilized. XRD and SEM/EDS showed apatite formation on all anodized samples after 7 days of soaking in SBF. XPS confirmed substantial amounts of phosphorus present in the outermost oxide layer of some of the anodized samples. SEM confirmed the presence of apatite on all of the bioactivity samples after 7 days. EDS showed an increased calcium uptake on phosphorus containing samples with increasing soak time as well as with increasing anodization voltage.

**Conclusions:** XRD showed the presence of anatase and/or rutile formation for three of the groups with one group having an amorphous oxide layer. The surface oxide layer contained carbon, oxygen, titanium, phosphorous, and traces of sulfur in varying amounts. Lastly, a relationship was found of greater calcium uptake on the phosphorus containing samples with increased anodization voltage and with increased soak time. Future work needs to be performed to increase the calcium and phosphorus ratios to be closer to the 1:6.7 ratio shown in hydroxyapatite.

**Modification and Characterization of Anodized Titanium for Dental and Orthopedic Implants**

**Objective:** Titanium is a desirable dental and orthopedic implant material due to its outstanding mechanical properties and excellent biocompatibility. In an ambient environment in the presence of oxygen, titanium naturally forms a thin amorphous oxide layer. The amorphous layer may be converted to a crystalline oxide form using an electrochemical process such as anodization. Additionally, anodization may be able to incorporate desirable chemical species from the electrolyte into the formed oxide layer. Both anatase (A) and rutile (R) crystalline phases of titanium oxide are known to promote bioactivity and antimicrobial effects. However, it is not currently understood which A/R ratio phase ratio promotes the best results in either or both of these areas. A previous study in our laboratory showed the specific A/R phase ratios within the anodized layers could be controlled using acid electrolyte mixtures. This study resulted in the selection of four acid electrolyte mixtures that were shown to produce specific A/R ratios within the anodized layers. The primary objective of this research was to evaluate the surface morphology, surface chemistry, surface roughness and bioactivity of the oxide layers formed through anodization in sulfuric acid based electrolytes. A secondary objective was to additively incorporate calcium (Ca) into anodized oxide layers that already contained phosphorus (P) in an attempt to obtain a Ca/P ratio similar to apatite.

**Methods:** The material used for this study was 2-mm-thick commercially pure titanium grade 4 (CP-1-4). An anodization process was completed on all samples with a DC rectifier using potentiostat-ic 12-V, 10-s steps to a final forming voltage of 180 V. The anodization electrolytes were mixtures of sulfuric acid, phosphoric acid, oxalic acid, and hydrogen peroxide in different molarities. Thin film X-ray diffraction (XRD) was used to determine if anatase and rutile oxide phases were present. Scanning electron microscopy (SEM) was used to examine the oxide layer surface morphology. Image analysis was utilized to identify the total number of pores, individual pore surface area distributions, pore density, mean pore area, and maximum pore area. Surface roughness was measured using atomic force microscopy (AFM) with ScanAsyst mode. Surface chemistry was determined for each of the samples using energy disperse X-ray spectroscopy (EDS). Bioactivity testing in simulated body fluid (SBF), prepared using ISO Standard 23317 guidelines, was performed by submerging samples for periods of 3, 5, and 7 days at 37°C. Samples were then rinsed and dried overnight to be analyzed the following day. XRD and SEM/EDS were used to detect the presence of apatite on the surface for each condition. Samples shown to contain phosphorus in the EDS analysis of the formed oxide were then soaked in 50 mL of 0.6 M calcium nitrate tetrahydrate solution at 80°C for periods of 48 or 72 hours, dried overnight, and analyzed the next day. The weight percent P present and the amount of Ca uptake was measured using EDS.

**Results:** XRD results showed that anatase and rutile formation was electrode dependent. Surface morphology results showed that the surface pore size and distribution were also functions of the anodization electrolyte used. Three electrolyte groups showed mainly round pores at higher forming voltages, while the fourth group showed elongated pores. AFM scans showed significant differences in the surface roughness (Ra) values between the anodized groups, but all samples exhibited an Ra value less than 1 μm. EDS results revealed the presence of P within the oxide layers of the samples anodized with an electrolyte mixtures that contained phosphoric acid. The amount of P was found to increase with the increase of phosphoric acid molarity within the electrolyte solution. XRD and SEM/EDS revealed successful apatite formation at 7 days for all anodized samples from each electrolyte mixture. Ca was also successfully incorporated into the surface of samples shown to contain P using a soaking time of 72 hours. The anodized samples with the higher initial P content also showed the highest Ca uptake.

**Conclusions:** The surface oxide crystallinity and morphology were found to be dependent on the anodization electrolyte mixture utilized at a forming voltage of 180 V. The surface roughness values were found to be sub-micron for all groups. Samples with P in the surface oxide were also able to incorporate Ca, however only at a Ca/P ratio less than the desired ratio of 1.67 found within apatite. The detailed understanding of the surface porosity and Ca uptake of...
Results: The examiners’ accuracy and precision fell within a 95% confidence interval of the actual phantom airway volumes. Interestingly, precision did not improve over time. Significant inter-observer variability was noted for each data set and each time point (p < 0.001). Significant intra-observer variability occurred for three of the four examiners (p < 0.012). Variability did not decrease with time.

Conclusions: DI software was accurate and precise in assessing airway volume in the simulated phantom airways used in this study. Significant inter- and intra-observer variability was present. DI seems to be a suitable tool to perform volumetric airway analysis clinically. Future studies might test accuracy of other commercially available software products as well as more anatomically complex phantom airways.

Arteriovenous Malformation of the Mandible Treated with Endovascular Embolization with Platinum Coils and ONXY 18

H Price1, R Chandran2

1Department of Oral-Maxillofacial Surgery & Pathology, University of Mississippi Medical Center

Objectives: Arteriovenous malformations (AVM) of the mandible are rare, and also can be potentially life-threatening due to massive hemorrhage. These lesions have been treated by multiple modalities including endovascular embolization, direct intralesional embolization, or surgical resection. The objective of this case presentation is to document the efficacy of endovascular embolization with platinum coils and ONXY 18 for the treatment of an AVM of the mandible.

Methods: This was the case of an 18-year-old female with an AVM of the right mandible who presented with massive hemorrhage following dental extractions. She successfully underwent endovascular embolization with platinum coils and ONXY 18 for the treatment of the AVM. This was the case of an 18 year-old female with an AVM of the right mandible who presented with massive hemorrhage following dental extractions. She successfully underwent endovascular embolization with platinum coils and ONXY 18 for the treatment of the AVM.

Results: Complete occlusion of the AVM via endovascular embolization with platinum coils and ONXY 18. Repeat diagnostic angiogram was obtained 27 months after the initial embolization procedure.

Conclusions: Endovascular embolization with platinum coils and ONXY 18 was used to completely occlude the AVM of the mandible. No obvious recurrence of the lesion was noted at 27 months, however some residual blushing was noted in the right mandibular body region. Continued follow up with a repeat angiogram is recommended to evaluate for any changes versus stability of the lesion.

Spheroid Model for Functional Osteogenic Evaluation of Human Adipose Derived Stem Cells

B Garroworthy1, B P vierdeman1, AV Janarjan1

1Department of Biomedical Materials Science, University of Mississippi Medical Center

Objectives: Three dimensional (3D) spheroids of bone cells allow better cellular interactions contributing to cell differentiation towards osteogenic lineage than the current two dimensional (2D) monolayer cell culture. The main objective of this study was to form an in vitro 3D osteogenic cell culture model from human adipose derived stem cells (hASCs) using a conjugate of a recombinant protein, elastin-like polypeptide (ELP), with a charged polyelectrolyte, polylysine (PEI). With our previous studies showing successful spheroid evaluations of proliferation and differentiation in 3T3-L1 adipocytes and H35 rat hepatoma, we hypothesized that hASCs cultured as 3D spheroids would differentiate more toward osteoblastic lineage when compared to the traditional 2D monolayer culture.

Methods: ELP expression, purification and chemical modification with PEI and its coating atop tissue culture polystyrene (TCP) surfaces were performed. hASCs isolated and washing aspirates under an IRB-approved protocol were seeded onto uncoated and ELP-PEI coated TCP surfaces of 24-well cell culture plates and cultured for 3 days of acclimation followed by supplement with osteogenic cocktail for 3 weeks. Live/Dead assay, BCA total protein assay, alkaline phosphatase activity (ALP), osteocalcin, and Alizarin red staining were performed using manufacturer protocols. Statistical evaluation was performed with ANOVA and Games-Howell post hoc test.

Results: hASCs displayed monolayer features during acclimation on uncoated TCP surfaces while ELP-PEI surface showed cell aggregates during the first 24 h and formed spheroids later. Live/Dead assay showed a high number of live cells on coated and uncoated TCP surfaces (> 90%) on day 23. The total protein content had an increasing trend in 2D monolayer indicating cells were metabolic- ly active and proliferating. However, the 3D spheroids showed early plateau in total protein content values, which was due to contact inhibited growth arrest. The ALP activity and osteocalcin normalized to total protein content were greater on days 8, 15 and 22 for 3D spheroids than 2D monolayer indicating higher differentiation of hASCs into osteoblastic lineage. Alizarin red staining on day 23 showed a negligible amount of mineralization in 2D monolayer while the 3D spheroids had greater staining indicating higher mineralization activity. Significant statistical differences were seen
### Poster Abstracts

**Biocompatibility of Osteogenic Cells on ELP-PEI Coated Surfaces.**

*Department of Biomedical Materials Science, University of Mississippi Medical Center*

**Objectives:** The objective of this study was to evaluate the capacity of osteogenic cells to adhere and form colonies on ELP-PEI coated surfaces. The study included an in vitro study with human adipose-derived stem cells (hASCs) cultured in a 3D micro environment on ELP-PEI coated surfaces for 14 days. In addition, an in vivo study on ELP-PEI coated titanium discs was performed on SCID mice for 14 days. The results showed that hASCs cultured on ELP-PEI coated surfaces demonstrated higher levels of viability and proliferation compared to uncoated surfaces. The in vivo study showed that the ELP-PEI coated titanium discs were well tolerated, with no signs of inflammation or foreign body reaction.

**Results:** The results of the in vitro study showed that the hASCs on ELP-PEI coated surfaces had higher levels of viability and proliferation compared to uncoated surfaces. The in vivo study showed that the ELP-PEI coated titanium discs were well tolerated, with no signs of inflammation or foreign body reaction.

**Conclusions:** ELP-PEI coated surfaces are a promising material for biocompatible applications in tissue engineering.

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**Bioactivity and Shear Strength of Anodized Titanium.**

*Department of Biomedical Materials Science, University of Mississippi Medical Center*

**Objectives:** The objective of this study was to evaluate the bioactivity and shear strength of anodized titanium surfaces. The study included an in vitro study with human osteoblasts cultured on anodized titanium discs for 28 days. The results showed that the anodized surfaces had increased bioactivity compared to the uncoated surfaces. The in vivo study on anodized titanium discs was performed on SCID mice for 14 days. The results showed that the anodized titanium discs were well tolerated, with no signs of inflammation or foreign body reaction.

**Results:** The results of the in vitro study showed that the anodized surfaces had increased bioactivity compared to the uncoated surfaces. The in vivo study on anodized titanium discs showed that the anodized titanium discs were well tolerated, with no signs of inflammation or foreign body reaction.

**Conclusions:** Anodized titanium surfaces are a promising material for biocompatible applications in tissue engineering.
Poster Abstracts

**Bold print** signifies student researcher

*signifies presenter if not first author

to create filled map visualizations, graphs, and charts. We obtained dental claims utilization data from the Mississippi Division of Medicaid for years 2007-2014. There were 64,981 claim records broken down by type of procedure with no identifiers about the provider except zip code of practice location. We further aggregated the claims data to the county level for some analyses. Dental licensure data were obtained from the Mississippi State Board of Dental Examiners. Using the Medicaid claims data and urban/rural data from the United States Census Bureau American FactFinder, we mapped the total number of Medicaid dental claims for all zip codes, classifying zip code areas as either rural, urban area, or urban cluster. Finally, the blended datasets were used to create data visualizations and dynamic dashboards representing Medicaid dental utilization data for Mississippi.

**Results:** The data visualizations that were created revealed that most Medicaid reimbursements were made in urban areas, the most heavily populated of the three classifications. In contrast, the least amounts of Medicaid reimbursements were made in rural areas, the least populated area of the three classifications. Based on the Medicaid claims data, more Medicaid claims were made by children 3 to 18 than were made by adults 19 and older. Nearly $500,000,000 in Medicaid reimbursements were made for children’s dental procedures, and only around $70,000,000 in Medicaid reimbursements were made for adults’ dental procedures. More dental patients covered by Medicaid received restorative treatment than received preventive treatment. Nearly 84% of reimbursements were made for restorative care for both children and adults; whereas, only 16% of reimbursements were made for preventive care. Of that 16%, children received nearly 99% of all preventive care, while adults only received 1% of preventive care.

**Conclusions:** The next steps are to use the socioeconomic data obtained from the U.S. Census Bureau American FactFinder and Medicaid dental claims data to determine whether disparities exist in patient utilization based on ethnicity and gender. We also plan to find which dental practices in Mississippi accept Medicaid and which ones do not to determine where geographic disparities in access to care based may exist.

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**Research Opportunities and Awards at the University of Mississippi School of Dentistry**

**Honors in Research Program**

The Honors in Research Program (HRP) provides an opportunity for eligible dental students to choose advanced study in dental research or basic health science and receive recognition for their accomplishments on their transcripts and at graduation. Honors work consists of hypothesis driven research in some aspect of dental or basic health science. Students conduct laboratory research, clinical research, or population research (e.g., improving current clinical practices, exploring controversies in dentistry, engaging in basic and biomedical materials research) with the guidance and supervision of a UMMC faculty member.

**Honors in Research Graduates 2009-2015**

- Krissin Balas, Curtis Caskey, Larry Harris, Stacey Ritter, Camille Sandifer, Corey Shook, Phube Winters

**School of Dentistry Intramural Research Support Program (IRSP)**

The goal of the Intramural Research Support Program is to enhance research activities in the School of Dentistry. In addition to faculty, pre-doctoral students and residents who develop a faculty-mentored research project are eligible to apply for small grants to cover materials and supplies. Priority will be given to those research projects which involve School of Dentistry students.

**Student Research Group (SRG)**

The School of Dentistry Student Research Group is a branch of the American Association for Dental Research (AADR) National Student Research Group (NSRG) and is composed of dental students committed to research and the advancement of further education. Goals of the organization are to expose dental students to various student research projects, aid in the application process for residencies to dental specialties, and to encourage student participation in dental research. Meetings allow students to share and evaluate ongoing research projects within the School of Dentistry including, but not limited to, the following departments: Biomedical Materials Science, Oral-Maxillofacial Surgery and Pathology, and Periodontics and Preventive Sciences.

**Student Research Group Officers for 2015-2016**

- President – Joe Collins
- Vice-President – Alisha Li
- Treasurer – Anna Nix
- Secretary – Bryant Salmon
- Faculty Advisor – Dr. Jennifer Bain

**Awards and Honors**

- 2015 ADA/Dentsply Student Clinician Award – Niketa Thompson was the ADA/Dentsply Student Clinician Award winner and was presented the award at Student Awards Day 2015.
- 2015 Hinman Student Research Award – Co-authors, Bryant Salmons and Will Fontaine, received this award and represented UMMC at the Hinman Student Research Symposium in Memphis, TN, October 30 - November 1, 2015 at the historic Peabody Hotel.

**51st Annual Colgate Dental Students’ Conference on Research**

Jim Nelson was selected as UMMC’s representative to attend this conference, which introduces outstanding dental students to scientists from the ADA Foundation’s Dr. Anthony Volpe Research Center on the NIST campus in Gaithersburg, MD. The conference was held on October 25-27, 2015.

- 2015 Quintessence Award for Research Achievement – Suzanna Ellery Nida received this honor for her many combined achievements during her time in the DMD program, including: (1) Representing UMMC at the Annual Colgate Dental Students’ Conference on Research in 2013, (2) Making an oral presentation at the Mississippi Academy of Sciences in 2013 and (3) Serving as Treasurer of the Student Research Group for 2014-15.
- 2015 Paffenbarger Research Award – Sakshi Jain, a Biomedical Materials Science Master’s degree student competed as a finalist for the Paffenbarger Research Award at the Academy of Dental Materials Conference. She gave an oral presentation of her research and was selected fourth place. Sakshi’s abstract was entitled, “Growth of Crystalline Titanium Oxide Films in Different Acid Electrolytes.”
## Faculty Excellence in Research (as of December 31, 2015)

### Cumulative Publications

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### Cumulative Hirsch-Index

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### Annual Publications

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### UPSTART Student Mentoring

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Previous Research Days...