RESEARCHSPOTLIGHT

TRANSLATING SCIENCE TO PRACTICE

Translating New Knowledge Across Disciplines

COLLECTIVELY, THE PENN DENTAL MEDICINE research enterprise spans scientific disciplines to translate new knowledge into clinical therapies that are expanding our understanding of disease and advancing patient care. In 2016, faculty and laboratory staff throughout our basic science and clinical departments continued to advance research and scholarship across their respective fields and beyond. Their commitment and passion for discovery are building on the School's reputation as a leader in research and innovation.

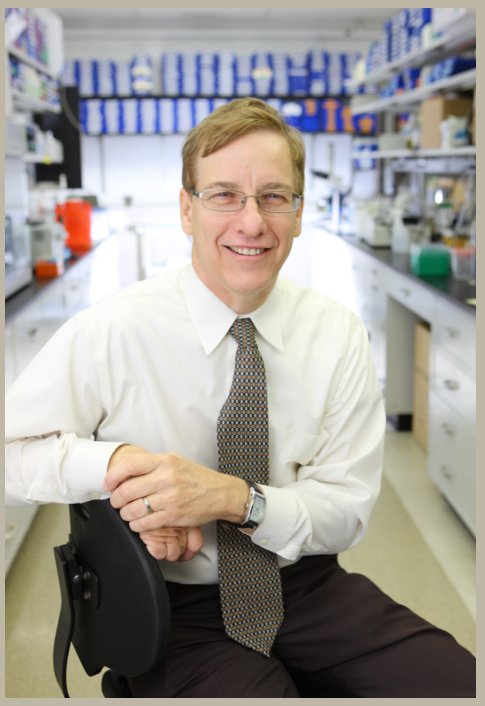
Within FY16, the School was awarded approximately $12.5 million in new sponsored grants. The breadth of these grants is striking as they were funded by five different branches of NIH. Moreover, the faculty within our basic science and clinical departments published a total of 160 articles, more than a 50% increase over the number published in 2010. This represents an impressive increase and reflects well on the productivity of the faculty. On the pages that follow, we are pleased to highlight some of these research and scholarly activities for 2016, including:

- top grant awards within the basic science and clinical departments in 2016 (page 15);
- top five principal investigators for FY16 based on dollars spent (page 15);
- high impact articles on original research in 2016 within both the basic science and clinical departments (page 16) and high impact review articles in 2016 (page 17)

Also in 2016, our Department of Preventive & Restorative Sciences hosted a consensus conference on prosthetic protocols in implant-based rehabilitation (page 17). A consensus conference brings together eminent scientists and clinicians to focus on an important subject to describe current knowledge and provide state-of-the-art guidelines. As a leader in research, Penn Dental Medicine is ideally situated to provide an appropriate setting for these conferences and plans to hold several more in areas critical to basic and clinical oral sciences.

Indeed, Penn Dental Medicine researchers published papers and conducted studies with high impact in the scientific community as reflected in the quality of journals in which their work appeared, and together, through this work and the other wide range of scholarly activities among our faculty, they continue to move dental medicine and oral health sciences forward.

Dana Graves, DDS, DMSc
Vice Dean for Research and Scholarship
Professor and Interim Chair, Department of Periodontics
Director, Doctor of Science in Dentistry Program



In 2016, faculty and laboratory staff throughout our basic science and clinical departments continued to advance research and scholarship across their respective fields and beyond.

Top 2016 New Grant Awards in the Basic Science Departments

In 2016, the top five grant awards for new projects within the Penn Dental Medicine basic science departments, included:

Role of PERK Haplotypes in HIV-Associated Neurocognitive Disorders
Principal Investigator: Dr. Kelly Jordan Sciutto, Dept. of Pathology
(National Institute of Mental Health/NIH/DHHS, $2,753,238)

Affordable Oral Delivery of Human Blood Protein Drugs Encapsulated in Plant Cells
Principal Investigator: Dr. Henry Daniell, Dept. of Biochemistry
(National Heart, Lung, and Blood Institute/NIH/DHHS, $2,717,483)

Approaches to Enhance Lysosomal Function in RPE Cells
Principal Investigator: Dr. Claire Mitchell, Dept. of Anatomy & Cell Biology
(National Eye Institute/NIH/DHH, $2,012,500)

Local Endogenous Regulators of Functional Immune Plasticity in the Periodontium
Principal Investigator: Dr. George Hajishengallis, Dept. of Microbiology
(National Institute of Dental and Craniofacial Research/NIH/DHHS, $1,762,750)

Role of a Novel Human Mast Cell G Protein Coupled Receptor in Allergy and Inflammation
Principal Investigator: Dr. Hydar Ali, Dept. of Pathology
(National Institute of Allergy and Infectious Diseases/NIH/DHHS, $1,610,000)

Top 2016 New Grant Awards in the Clinical Science Departments

In 2016, the top five grant awards for new projects within the Penn Dental Medicine clinical science departments, included:

Mechanisms for Impaired Diabetic Oral Wound Healing
Principal Investigator: Dr. Dana Graves, Dept. of Periodontics
(National Institute of Dental and Craniofacial Research/NIH/DHHS, $2,311,470)

A Novel Anti-Caries Approach to Modulate Virulence of Cariogenic Biofilms
Principal Investigator: Dr. Hyun (Michel) Koo, Dept. of Orthodontics and Divs. of Pediatric Dentistry and Community Oral Health
(National Institute of Dental and Craniofacial Research/NIH/DHHS, $1,922,703)

Biofilm Elimination and Caries Prevention using Multifunctional Nanocatalysts
Principal Investigator: Dr. Hyun (Michel) Koo, Dept. of Orthodontics and Divs. of Pediatric Dentistry and Community Oral Health
(National Institute of Dental and Craniofacial Research/NIH/DHHS, $1,881,793)

A Double-Blind, Partial Cross-Over, Incomplete Factorial Study to Assess the Local Anesthetic Efficacy and Safety of CTY-5339 Anesthetic Spray (CTY-5339-A) when applied to the Cheek Mucosal Tissue in Normal Volunteers
Principal Investigator: Dr. Elliot Hersh, Dept. of Oral Surgery/Pharmacology
(Cetylite, Inc., $249,170)

Defining Mechanical Injury, Hypoxia and Disease Progression in TMJ OA and Pain
Principal Investigator: Dr. Qunzhou Zhang, Dept. of Oral Surgery/Pharmacology
(Osteo Science Foundation, $100,000)

Top FY16 Principal Investigators

The top five principal investigators for Penn Dental Medicine in FY16 based on dollars spent, included:

FACULTY/DEPARTMENT	FY16 TOTAL
Dr. Kelly Jordan-Sciutto Pathology	$1,674,259
Dr. George Hajishengallis Microbiology	$1,669,110
Dr. Henry Daniell Biochemistry	$1,214,455
Dr. Dana Graves Periodontics	$1,135,575
Dr. Kathleen Boesze-Battaglia Biochemistry	$945,368

2016 High Impact Articles: Basic Science Departments

Among the original research articles published in 2016 by faculty in the School's basic science departments, following is a selection of key articles with high impact among those by first or senior authors (indicated in bold).

AUTHORS	ARTICLES	JOURNAL	DEPARTMENT
Yuan, X., Cao, J., He, X., Serra, R., Qu, J., Cao, X. **Yang, S.**	Ciliary IFT80 balances canonical versus non-canonical hedgehog signalling for osteoblast differentiation	*Nature Communications*	Anatomy and Cell Biology
Xiao, Y., Kwon, K.-C., Hoffman, B.E., Kamesh, A., Jones, N.T., Herzog, R.W., **Daniell, H.**	Low cost delivery of proteins bioencapsulated in plant cells to human non-immune or immune modulatory cells	*Biomaterials*	Biochemistry
Kwon, K.-C., Chan, H.-T., León, I.R., Williams-Carrier, R., Barkan, A., **Daniell, H.**	Codon optimization to enhance expression yields insights into chloroplast translation	*Plant Physiology*	Biochemistry
Scuron, M.D., Boesze-Battaglia, K., Dlakic, M., **Shenker, B.J.**	The cytolethal distending toxin contributes to microbial virulence and disease pathogenesis by acting as a tri-perditious toxin	*Frontiers in Cellular and Infection Microbiology*	Pathology
Lim, J.C., Lu, W., Beckel, J.M., **Mitchell, C.H.**	Neuronal release of cytokine IL-3 triggered by mechanosensitive autostimulation of the P2X7 receptor is neuroprotective	*Frontiers in Cellular Neuroscience*	Anatomy and Cell Biology

2016 High Impact Articles: Clinical Departments

Among the original research articles published in 2016 by faculty in the School's clinical departments, following is a selection of key articles with high impact among those by first or senior authors (indicated in bold).

AUTHORS	ARTICLES	JOURNAL	DEPARTMENT
Gao, L., Liu, Y., Kim, D., Li, Y., Hwang, G., Naha, P.C., Cormode, D.P., **Koo, H.**	Nanocatalysts promote Streptococcus mutans biofilm matrix degradation and enhance bacterial killing to suppress dental caries in vivo	*Biomaterials*	Orthodontics/Divisions of Pediatric Dentistry and Community Oral Health
Liu, Y., Kamesh, A.C., Xiao, Y., Sun, V., Hayes, M., **Daniell, H., Koo, H.** *(Koo, H. and Daniell, H. are co-senior authors)*	Topical delivery of low-cost protein drug candidates made in chloroplasts for biofilm disruption and uptake by oral epithelial cells	*Biomaterials*	Orthodontics/Divisions of Pediatric Dentistry and Community Oral Health and Biochemistry
Tarapore, R.S., Lim, J., Tian, C., Pacios, S., Xiao, W., Reid, D., Guan, H., Mattos, M., Yu, B., Wang, C.-Y., **Graves, D.T.**	NF-κB Has a Direct Role in Inhibiting Bmp- and Wnt-Induced Matrix Protein Expression	*Journal of Bone and Mineral Research*	Periodontics
Benakanakere, M.R., Finoti, L.S., Tanaka, U., Grant, G.R., Scarel-Caminaga, R.M., **Kinane, D.F.**	Investigation of the functional role of human Interleukin-8 gene haplotypes by CRISPR/Cas9 mediated genome editing	*Scientific Reports*	Periodontics
Lee, S., Zhang, Q.Z., Karabucak, B., **Le, A.D.***	DPSCs from inflamed pulp modulate macrophage function via the TNF-α/IDO axis	*Journal of Dental Research*	Oral Surgery/ Pharmacology
Wu, Y., Dong, G., Xiao, W., Xiao, E., Miao, F., Syverson, A., Missaghian, N., Vafa, R., Cabrera-Ortega, A.A., Rossa, C., **Graves, D.T.***	Effect of aging on periodontal inflammation, microbial colonization, and disease susceptibility	*Journal of Dental Research*	Periodontics

* *Both published in JDR*

2016 High Impact Review Articles

Among the review articles published in 2016 by the School's faculty, following is a selection of key articles with high impact among those by first or senior authors (indicated in bold).

AUTHORS	ARTICLES	JOURNAL	DEPARTMENT
Subramanian, H., Gupta, K., **Ali, H.**	Roles of Mas-related G protein–coupled receptor X2 on mast cell–mediated host defense, pseudoallergic drug reactions, and chronic inflammatory diseases	*Journal of Allergy and Clinical Immunology*	Pathology
Daniell, H., Chan, H.-T., Pasoreck, E.K.	Vaccination via Chloroplast Genetics: Affordable Protein Drugs for the Prevention and Treatment of Inherited or Infectious Human Diseases	*Annual Review of Genetics*	Biochemistry
Daniell, H., Lin, C.-S., Yu, M., Chang, W.-J.	Chloroplast genomes: Diversity, evolution, and applications in genetic engineering	*Genome Biology*	Biochemistry
Hajishengallis, G., Lambris, J.D.	More than complementing Tolls: complement–Toll-like receptor synergy and crosstalk in innate immunity and inflammation	*Immunological Reviews*	Microbiology
Hajishengallis, G., Lamont, R.J.	Dancing with the Stars: How Choreographed Bacterial Interactions Dictate Nososymbiocity and Give Rise to Keystone Pathogens, Accessory Pathogens, and Pathobionts	*Trends in Microbiology*	Microbiology

Penn Dental Hosts Prosthetic Protocols Consensus Conference

Penn Dental Medicine joined with the Foundation for Oral Rehabilitation (FOR) to host the FOR 2016 Consensus Conference, Nov. 30 – Dec. 1, on the topic of prosthetic protocols in implant-based rehabilitation. Dr. Markus Blatz, Professor and Chair of Preventive & Restorative Sciences at Penn Dental Medicine served as Co-Chair of the meeting, bringing together an international panel of experts in the field of prosthodontics.

Select participants conducted systematic literature reviews on different aspects of implant-based rehabilitation prior to the meeting for discussion by the group assembled. Those literature review topics and presentations included: removable versus fixed implant-supported dentures; clinical outcomes of full arch implant-supported zirconia prostheses; influence of abutment material on biologic/clinical outcomes; immediate-load zygoma implants; full-contour monolithic implant restorations; digital versus conventional implant impressions; fit of prosthetic components and clinical outcomes; material selection and clinical outcomes; and clinical performance of CAD/CAM monolithic ceramic implant-supported restorations bonded to titanium.

"We were honored and proud of the opportunity to host and chair this exceptional conference with global leaders and authorities in the field of prosthodontics, who compiled an extraordinary wealth of significant and relevant information," says Dr. Blatz. "High-quality systematic reviews and consensus conferences have become increasingly important in recent years as the backbone of evidence-based dentistry."

The outcomes of the conference will be published as a special issue of the *European Journal of Oral Implantology* (publication is anticipated in mid-2017) and will also be shared via *www.FOR.org.*

This was FOR's third consensus conference. Established in 2013, FOR is an independent, international initiative that unites professionals from various disciplines to improve oral health care and support humanitarian leadership.

ABOVE: Participants in the 2016 consensus conference of the Foundation for Oral Rehabilitation, held at Penn Dental Medicine Nov. 30 – Dec. 1.