

UNIVERSITY OF PENNSYLVANIA – SCHOOL OF DENTAL MEDICINE
Curriculum Vitae

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Geelsu Hwang, Ph.D.

Home Address:

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Office Address:

240 40th St. Levy 422
School of Dental Medicine, University of Pennsylvania
Philadelphia, PA 19104

Education:

2004-10 Ph.D. Yonsei University, Seoul, South Korea
(Chemical and Biomolecular Engineering)
1997-2004 B.S. Yonsei University, Seoul, South Korea (Chemical
Engineering)

Postgraduate Training and Fellowship Appointments:

2013-15 Postdoc, Department of Orthodontics, School of Dental
Medicine, University of Pennsylvania, Philadelphia, PA
2012-13 Postdoc, Center for Oral Biology, University of
Rochester, Rochester, NY
2010-12 Postdoc, Department of Civil & Environmental
Engineering, University of Alberta, Edmonton, Canada
2010 Postdoc, Nano Medical National Core Research
Center, Yonsei University, Seoul, South Korea

Faculty Appointments:

2019- Assistant Professor, Department of Preventive and
Restorative Sciences, School of Dental Medicine,
University of Pennsylvania, Philadelphia, PA
2017-19 Research Assistant Professor, Department of
Orthodontics, School of Dental Medicine, University of
Pennsylvania, Philadelphia, PA
2015-17 Research Associate, Department of Orthodontics,
School of Dental Medicine, University of Pennsylvania,
Philadelphia, PA

2010 Lecturer, Department of Chemical Engineering, Seoul National University of Science and Technology, Seoul, South Korea

Awards and Fellowships:

Individual:

2024 IADR Innovation in Oral Care Awards
2023 Finalist, Discovering the Future Grant Program, University of Pennsylvania, Philadelphia, PA
2023-25 Visiting Professor, Department of Chemical and Biomolecular Engineering, College of Engineering, Yonsei University, Seoul, South Korea
2022 Schoenleber pilot grant, University of Pennsylvania, School of Dental Medicine, Philadelphia, PA
2021 Finalist, the Science Center's QED Proof-of-Concept Program (commercialization and business assistance for early-stage life science technologies from participating institutions), Philadelphia, PA
2021 Penn Faculty Pathways Program, University of Pennsylvania, Philadelphia, PA
2018 The Joseph and Josephine Rabinowitz Award for Excellence in Research, University of Pennsylvania, School of Dental Medicine, Philadelphia, PA
2016 AADR Travel Award, Penn Dental Research Day, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA
2014 AADR Travel Award, Penn Dental Research Retreat, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA
2008-09 BK21 fellowship from NRF, Yonsei University, Seoul, South Korea
2004, 2006 Doctoral scholarship, Yonsei University, Seoul, South Korea
2002-03 Undergraduate scholarship, Yonsei University, Seoul, South Korea

By students/fellows (as mentor/supervisor):

2021 Finalist, AADR Hatton Competition at the 2021 IADR/AADR/CADR General Session (Postdoc; Dr. Atul Dhall)

- 2021 Postdoctoral Fellowship Program (Nurturing Next-generation Researchers) granted by the National Research Foundation of Korea (Postdoc; Dr. Minjun Oh)
- 2021 AADR Travel Award, Penn Dental Research Day, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA (Postdoc; Dr. Hye-Eun Kim)
- 2021 AADR Travel Award, Penn Dental Research Day, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA (Postdoc; Dr. Atul Dhall)
- 2019 AADR Travel Award, Penn Dental Research Day, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA (Postdoc; Dr. Hye-Eun Kim)
- 2018 AADR Travel Award, Penn Dental Research Day, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA (DMD student; Sherry X. Wan)

Memberships in Professional and Scientific Societies:

National Societies:

- Surfaces In Biomaterials Foundation (2023-)
- Biomedical Engineering Society (2019-)
- American Chemical Society (2019-)
- American Society for Microbiology (2015-)
- American Association for Dental Research/International Association for Dental Research (2014-)

International Societies:

- Society for Applied Microbiology (2022-)
- Korea Technology Advisory Group (2021-)
- Korean-American Scientists and Engineers Association (2018-)
- Canadian Society for Civil Engineering (2012)
- Korean Society of Environmental Engineers (2009)
- The Korean Society of Industrial and Engineering Chemistry (2008-09)
- The Korean Institute of Chemical Engineers (2006-09)
- The Korean Society for Biotechnology and Bioengineering (2005-09)

National Scientific Committees:

- Panel reviewer for National Institutes of Health “special emphasis panel (SEP) ZDE1 JC (11) Review of NIDCR's R03 and DSR Member-Conflict Applications” (2024)
- Panel reviewer for National Science Foundation (2024)

Panel reviewer for National Institutes of Health “special emphasis panel (SEP) ZDE1 YM (09) Review of NIDCR's R03 and DSR Member-Conflict Applications” (2023)

Panel reviewer for National Institutes of Health “R15: Academic Research Enhancement Awards (ZRG1 BBT-M (80))” (2022)

Panel reviewer for Marsden Fund, New Zealand (2022)

Panel reviewer for the National Science Center “NZ6; Human and animal immunology and infection”, Poland (2022)

Panel reviewer for National Institutes of Health “Small Business: Innovative Immunology Research (AIDC-10)” (2021)

Panel reviewer for National Institutes of Health Fellowship F, Career Development K, New Investigator R03, and Scientific Meeting R13 applications (2018)

Editorial Positions:

2023- Editorial Board (Academic Editor), PLOS ONE

2022- Editorial Board (Associate Editor), Frontiers in Microbiology

2022- Editorial Board (Review Editor), Frontiers in Oral Health

2021- Editorial Board (Section Editor), Membranes

2021- Editorial Board (Review Editor), Frontiers in Chemistry

Journal Reviews:

Biomaterials Science (2024-)

Journal of the American Chemical Society (2023-)

Advanced Healthcare Materials (2023-)

Acta Biomaterialia (2023-)

ACS Biomaterials Science & Engineering (2023-)

Materials Today Sustainability (2023-)

Digital Discovery (2023-)

Biofilm (2023-)

Computer Methods in Biomechanics and Biomedical Engineering (2023-)

Journal of Material Chemistry B (2022-)

npj Biofilms and Microbiomes (2022-)

Applied and Environmental Microbiology (2022-)

Chemical Engineering Journal (2022-)

Water Research (2022-)

Advanced Nanobiomed Research (2022-)

Enzyme and Microbial Technology (2022-)

Letters in Applied Microbiology (2022-)

Membranes (2022-)

ACS Applied Nano Materials (2021-)

Bioactive Materials (2021-)
Computational and Structural Biotechnology Journal (2021-)
Virulence (2021-)
iScience (2021-)
International Journal of Nanomedicine (2021-)
Journal of Fungi (2021-)
International Journal of Oral Science (2021-)
Advances in Colloid and Interface Science (2020-)
Nanoscale Advances (2020-)
Trends in Microbiology (2020-)
Frontiers in Nanotechnology (2020-)
Journal of Material Research & Technology (2020-)
Advanced Biosystems (2020-)
Oral Diseases (2020-)
Journal of Esthetic and Restorative Dentistry (2020-)
PLoS One (2020-)
ACS Applied Materials & Interfaces (2019-)
mBio (2019-)
ACS Infectious Diseases (2019-)
Frontiers in Microbiology (2019-)
Frontiers in Chemistry (2019-)
Future Microbiology (2019-)
International Journal of Biological Macromolecules (2019-)
Photochemistry and Photobiology (2019-)
Biomedicine & Pharmacotherapy (2019-)
Chemical Biology & Drug Design (2019-)
Thin Solid Films (2019-)
Chemical Science (2018-)
Environmental Microbiology (2018-)
Molecular Oral Microbiology (2018-)
Scientific Reports (2018-)
Journal of Membrane Science (2018-)
Materials Chemistry and Physics (2018-)
Materials Letters (2018-)
International Journal of Mining Science and Technology (2018-)
Biofouling (2017-)
Journal of Oral Microbiology (2017-)
Journal of Industrial and Engineering Chemistry (2017-)
Journal of Dental Research (2016-)
Archives of Oral Biology (2016-)

International Biodeterioration & Biodegradation (2016-)
Head & Face Medicine (2016-)
Microbiology (2013-)

Academic Committees at the University of Pennsylvania and Affiliated Hospitals:

2023- Module director, Foundation Science II
2022- Member, Lecture Attendance Policy Committee
2022-2024 Constituency Alternates, Faculty Senate Executive Committee (SEC)
2020-2022 Constituency Representatives, Faculty Senate Executive Committee (SEC)
2020-2022 Member, University Council
2020- Member, Advisory Panel for the Master of Science in Oral Biology Program
2020-2021 Master thesis committee chair for a Perio-proth resident (Shaked Navat Pelli)
2020-2020 Co-chair of Imaging, artificial intelligence, and new technology focus group

Major Teaching and Training Responsibilities at the University of Pennsylvania:

Teaching Activities:

DENT 5011, GOHS 5020 Module I director (2023-)
GOHS Capstone Mentor (2023-24)
DENT 5011 Foundation Sciences II (Fall 2020, 2021, 2022, 2023)
DENT 5032 Foundation Sciences IV (Spring 2023, 2024)
DENT 6801 Fixed Prosthodontics II (Spring, Fall 2021, 2022, 2023)
DENT 7821 Restorative Dentistry (Fall 2020, 2021, 2022, 2023)
DScD Bootcamp (Fall 2021, 2022, 2023)
D4 clinical seminar lecture (2020)
DADE wound healing lecture (Spring 2020, 2021, 2022, 2023)
DScD seminar lecture (2020)

Training Activities:

Post-Doctoral Trainees and Fellows:

Junjira Tanum, Ph.D. Post-Doctoral Fellow (2023-)
Beibei Gao, Ph.D. Post-Doctoral Fellow (2023-)
Min Jun Oh, Ph.D. Post-Doctoral Fellow (2020-23)
Atul Dhall, Ph.D. Post-Doctoral Fellow (2019-21)
Hye-Eun Kim, Ph.D. Post-Doctoral Fellow (2018-22)

Graduate/DMD Students:

Adam Bouhamdan, Class of 2027 DMD Program, School of Dental Medicine, University of Pennsylvania (2024-)

Fahad Thwayeb Almutairi, Doctor of Science in Dentistry (DScD) program, School of Dental Medicine, University of Pennsylvania (2023-)

Felicity Zhang, Class of 2025 Master's program, Department of Bioengineering, School of Engineering and Applied Science, University of Pennsylvania

Frank (Fu-Yu) Tsai, Class of 2024 Graduate Oral Health Sciences program, School of Dental Medicine, University of Pennsylvania

Manuel Acuna, Class of 2026 DMD Program, School of Dental Medicine, University of Pennsylvania (2023 summer)

Michelle Joung, Class of 2026 DMD Program, School of Dental Medicine, University of Pennsylvania (2023 summer)

Tiffany Min, Class of 2026 DMD Program, School of Dental Medicine, University of Pennsylvania (2023 summer)

Kevin Tao, Class of 2026 DMD Program, School of Dental Medicine, University of Pennsylvania (2023 summer)

Madeline Stein, Class of 2024 DMD Program, School of Dental Medicine, University of Pennsylvania (2023-)

Amanda Reisman, Class of 2024 DMD Program, School of Dental Medicine, University of Pennsylvania (2023-)

Stephanie Dominguez, Class of 2025 DMD Program, School of Dental Medicine, University of Pennsylvania (2022 summer)

Teny Odaimi, Class of 2025 DMD Program, School of Dental Medicine, University of Pennsylvania (2022 summer)

Monika Lamas Ferreira, Visiting PhD student, Faculty of Dentistry, Universidade Federal de Pelotas, Brazil (2021-22)

Cerjay Lugtu, Class of 2024 DMD Program, School of Dental Medicine, University of Pennsylvania (2021-22)

Brett Kim, Class of 2024 DMD Program, School of Dental Medicine, University of Pennsylvania (2021 summer)

Marwa Bawazir, Doctor of Science in Dentistry (DScD) program, School of Dental Medicine, University of Pennsylvania (2019-21)

Sherry X. Wan, dual-degree D.M.D./M.S. in Bioengineering, School of Dental Medicine and School of Engineering and Applied Science, University of Pennsylvania (Co-mentor; 2017-18)

Jia Tian, dual-degree D.M.D./M.S. in Bioengineering, School of Dental Medicine and School of Engineering and Applied Science, University of Pennsylvania (Co-mentor; 2014-17)

Undergraduate Students:

Ryan Ong, School of Engineering & Applied Science, University of Pennsylvania (2023-)

Kevin Tao, School of Arts & Sciences, University of Pennsylvania (2021-22)

Ravikiran Ramjee, School of Engineering & Applied Science, University of Pennsylvania (2021 PURM)

Tiffany Lee, School of Arts & Sciences, University of Pennsylvania (2021 PURM)

Le He, School of Arts & Sciences, University of Pennsylvania (2020 PURM)

Joseph Heo, School of Arts & Sciences, University of Pennsylvania (2020 PURM)

High School Students:

Claudia Kim, The Baldwin School (2023 Summer)

Anna Ye, Brooklyn Technical High School (2023 Summer)

Lectures by Invitation:

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|------|---|
| 2023 | Invited speaker at Fall Seminar Series, Department of Medical Engineering, University of South Florida, Tampa, FL |
| 2023 | Cross Talk Lectures, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA |
| 2023 | Invited Speaker at 2023 AADOCR Annual Meeting Satellite Symposium, Portland, OR |
| 2022 | Invited Speaker at the graduate lecture, Department of Chemical and Biomolecular Engineering, College of Engineering, Yonsei University, Seoul, South Korea |
| 2022 | Keynote Lecture Speaker at the 2022 KICHe Fall Meeting and International Symposium (60th Anniversary Conference), Busan, South Korea |
| 2022 | Invited Speaker at the 124 th Creative Dentistry Convergence Seminar, College of Dentistry, Yonsei University, Seoul, South Korea |
| 2022 | Invited speaker at Research Seminar Series, College of Dentistry, The University of Oklahoma, Oklahoma City, OK |
| 2021 | Invited speaker at Fall Seminar Series, College of Engineering, Temple University, Philadelphia, PA |
| 2021 | Invited speaker at the 30th Northeast Regional Conference, Fort Lee, NJ |

- 2020 Invited speaker at the Penn Dental Virtual Research Day, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA
- 2019 Invited Speaker at the 15th Research Day, School of Dentistry, Chonnam National University, Gwangju, South Korea
- 2019 Invited Speaker at the 2nd New Investigator Network Construction Seminar, Department of Chemical and Biomolecular Engineering, College of Engineering, Yonsei University, Seoul, South Korea
- 2019 Invited Speaker at the 81st Oral Biology Seminar, College of Dentistry, Yonsei University, Seoul, South Korea
- 2019 Cross Talk Lectures, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA
- 2019 Forsyth Institute, Cambridge, MA
- 2019 Levy Research Seminar Series, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA
- 2018 Invited speaker, PKSA symposium, Philadelphia, PA
- 2018 Department of Biological Sciences, University of Delaware, Newark, DE
- 2018 Invited speaker at the IADR/PER Symposium, 2018 IADR/PER General Session & Exhibition, London, England
- 2017 Invited speaker at the Penn Dental Research Day, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA
- 2016 Levy Research Seminar Series, School of Dental Medicine, University of Pennsylvania, Philadelphia, PA
- 2016 Invited Speaker at the Biofilm Forum, Dentsply Sirona Global Headquarters, York, PA
- 2014 Seoul National University of Science and Technology, Seoul, South Korea

Organizing Roles in Scientific Meetings:

- 2024 Symposium Organizer for “Smart Functional Biomaterials for Biofilm Control” at the International Association for Dental Research
- 2023-24 President for Clinical and Translational Science Network at International Association for Dental Research
- 2022-23 President-elect for Clinical and Translational Science Network at International Association for Dental Research
- 2021 Facilitator for American Chemical Society Postdoc to Faculty Workshop
- 2021-22 Vice President for Clinical and Translational Science Network at International Association for Dental Research

- 2021 Proposal Coordinator for Clinical and Translational Science Network for the 2021 IADR/AADR/CADR General Session in Boston, MA, USA
- 2020-22 American Association for Dental Research Edward H. Hatton Awards Committee
- 2020 Proposal Coordinator for Clinical and Translational Science Network for the 2020 IADR/AADR/CADR General Session in Washington, D.C., USA
- 2019 Abstract reviewer for Cariology Research Group; Poster session chair for the 2019 IADR/AADR/CADR General Session in Vancouver, BC, Canada

Bibliography:

Research Publications, peer-reviewed:

- Liu Y, Daniel SG, Kim H-E, Koo H, Korostoff J, Teles F, Bittinger K, **Hwang G**. Addition of cariogenic pathogens to complex oral microflora drives significant changes in biofilm compositions and functionalities. **Microbiome** 2023; 11: 123.
- Jin J, Mangal U, Seo J-Y, Kim J-Y, Lee Y-H, Lugtu C, **Hwang G**, Cha J-Y, Lee K-J, Yu H-S, Kim K-M, Jang S, Kwon J-S, Choi S-H. Cerium Oxide Nanozymes Confer a Cytoprotective and Bio-Friendly Surface Micro-Environment to Methacrylate Based Oro-Facial Prostheses. **Biomaterials** 2023; 296: 122063.
- Bawazir M, Dhall A, Lee J, Kim B, **Hwang G**. Effect of surface stiffness in initial adhesion of oral microorganisms under various environmental conditions. **Colloids Surf. B Biointerfaces** 2023; 221: 112952.
- Dhall A, Tan JY, Oh M, Kim J, Kim A, **Hwang G**. A dental implant-on-a-chip for investigating host-material-pathogen interactions and photobiomodulation therapy. **Lab Chip** 2022; 2: 4905-4916.
- Dhall A, Ramjee R, Oh M, Tao K, **Hwang G**. A 3D-Printed Customizable Platform for Multiplex Dynamic Biofilm Studies. **Adv. Mater. Technol.** 2022; 2200138.
- Dhall A, Islam S, Park M, Zhang Y, Kim A, **Hwang G**. Bimodal Nanocomposite Platform with Antibiofilm and Self-Powering Functionalities for Biomedical Applications. **ACS Appl. Mater. Interfaces** 2021; 13:40379-40391.
-Highlighted in *Bioelectricity* December 2021;3(4)
- Kim H-E, Dhall A, Liu Y, Bawazir M, Koo H, **Hwang G**. Intervening in symbiotic cross-kingdom biofilm interactions: A binding

mechanism-based non-microbicidal approach. **mBio** 2021; 12:e00651-21.

-Highlighted in *Dimensions of Dental Hygiene* July 2021;11

-Highlighted in *Decisions in Dentistry* July 2021;7(7)6.

-Highlighted in *Chemistry & Industry* Issue 6, 2021

-Highlighted in *MedicalResearch.com* May 2021

Kim H-E, Liu Y, Dhall A, Bawazir M, Koo H, **Hwang G**. Synergism of *Streptococcus mutans* and *Candida albicans* reinforces biofilm maturation and acidogenicity in saliva: an in vitro study. **Front. Cell. Infect. Microbiol.** 2021; 10:623980.

Wan SX, Tian J, Liu Y, Dhall A, Koo H, **Hwang G**. Cross-kingdom cell-to-cell interactions in cariogenic biofilm initiation. **J. Dent. Res.** 2021; 100: 74-81.

Park MC, Islam S, Kim H-E, Korostoff J, Blatz MB, **Hwang G***, Kim A*. Human oral motion-powered smart dental implant (SDI) for *in situ* ambulatory photobiomodulation therapy. **Adv. Healthc. Mater.** 2020; 2000658. *Co-senior authors

Cocco AR, Suarez CEC, Liu Y, Lund RG, Piva E, **Hwang G**. Antibiofilm activity of a novel pit and fissure self-adhesive sealant modified with metallic containing monomers. **Biofouling** 2020; 36: 245-55.

Paula AJ*, **Hwang G***, Koo H*. Dynamics of bacterial population growth during biofilm development resemble spatial and structural aspects of urbanization. **Nat. Commun.** 2020; 11: 1354. *Co-senior authors

Kim HE, Islam S, Park M, Kim A, **Hwang G**. A comprehensive analysis of near-contact photobiomodulation therapy in the host-bacteria interaction model using 3D-printed modular LED platform. **Adv. Biosys.** 2020; 1900227.

Hwang G, Paula AJ, Hunter EE, Yuan Liu, Stebe K, Kumar V, Steager E, Koo H. Catalytic antimicrobial robots for biofilm eradication. **Sci. Robot.** 2019; 4(29): eaaw2388.

Naha PC, Liu Y, **Hwang G**, Huang Y, Gubara S, Jonnakuti V, Simon-Soro A, Kim D, Gao L, Koo H, Cormode DP. Dextran-coated iron oxide nanoparticles as biomimetic catalysts for localized and pH-activated biofilm disruption. **ACS Nano** 2019; 13: 4960-71.

Ren Z, Kim D, Paula AJ, **Hwang G**, Liu Y, Li J, Daniell H, Koo H. Dual-targeting approach degrades biofilm matrix and enhances bacterial killing. **J. Dent. Res.** 2019; 98(3):322-30.

- Sims KR Jr., Liu Y, **Hwang G**, Jung HI, Koo H, Benoit DSW. Enhanced Design and Formulation of Nanoparticles for Anti-Biofilm Drug Delivery. **Nanoscale** 2019; 11(1):219-36.
- Palmer SR, Ren Z, **Hwang G**, Liu Y, Combs A, Söderström B, Vasquez PL, Khosravi Y, Brady LJ, Koo H, Stoodley P. *Streptococcus mutans* yidC1 and yidC2 impact cell-envelope biogenesis, biofilm matrix and biophysical properties. **J. Bact.** 2018; 12(6):1427-1442.
- Liu Y, Naha PC, **Hwang G**, Kim D, Huang Y, Simon-Soro A, Jung HI, Ren Z, Li Y, Gubara S, Alawi F, Zero D, Hara AT, Cormode DP, Koo H. Topical ferumoxytol nanoparticles disrupt biofilms and prevent tooth decay *in vivo* via intrinsic catalytic activity. **Nat. Commun.** 2018; 9(1):2920.
- Kim D, Liu Y, Benhamou RI, Sanchez H, Simón-Soro Á, Li Y, **Hwang G**, Fridman M, Andes DR, Koo H. Bacterial-derived exopolysaccharides enhance antifungal drug tolerance in a cross-kingdom oral biofilm, **ISME J.** 2018; 12(6): 1427-42.
- Hwang G**, Koltisko B, Jin X, Koo H. Non-leachable imidazolium-incorporated composite for disruption of bacterial clustering, exopolysaccharide matrix assembly and enhanced biofilm removal, **ACS Appl. Mater. Interfaces** 2017; 9(44): 38270-80.
- Hwang G**, Liu Y, Kim D, Li Y, Krysan DJ, Koo H. *Candida albicans* mannans mediate *Streptococcus mutans* exoenzyme GtfB binding to modulate cross-kingdom biofilm development *in vivo*, **PLoS Pathog.** 2017; 13(6): e1006407.
-Top 10% of cited papers in PLOS Pathogens in 2022
- Xiao J, Hara AT, Koo H, Zero DT, **Hwang G**. Biofilm 3D architecture influences *in situ* pH distribution pattern on the enamel surface, **Int. J. Oral Sci.** 2017; 9(2): 74-9.
- Hwang G***, Liu Y, Kim D, Sun V, Aviles-Reyes A, Kajfasz JK, Lemos JA, Koo H*. Simultaneous spatiotemporal mapping of *in situ* pH and bacterial activity within an intact 3D microcolony structure, **Sci. Rep.** 2016; 6: 32841. *Co-senior authors
- He J, **Hwang G**, Liu Y, Gao L, Kilpatrick-Liverman LT, Santarpia P, Zhou X, Koo H. L-arginine modifies the exopolysaccharides matrix and thwarts *Streptococcus mutans* outgrowth within mixed-species oral biofilms. **J. Bact.** 2016; JB-00021.
- Gao L, Liu Y, Kim D, Li Y, **Hwang G**, Naha PC, Cormode D, Koo H. Nanocatalysts simultaneously disrupt biofilm matrix and kill

- bacteria to suppress biofilm-associated oral disease in vivo. **Biomaterials** 2016; 101:272-84.
- Zhou J, Horev B, **Hwang G**, Klein MI, Koo H, Benoit DSW. Characterization and optimization of pH-responsive polymer nanoparticles for drug delivery to oral biofilms. **J. Mater. Chem. B** 2016; 4:3075-85.
- Kim D, **Hwang G**, Liu Y, Wang Y, Singh AP, Vorsa N, Koo H. Cranberry flavonoids modulate cariogenic properties of mixed-species biofilm through exopolysaccharides-matrix disruption. **PLoS One** 2015; 1-133.
- Hwang G***, Marsh G, Gao L, Waugh R, Koo H*. Binding Force Dynamics of *Streptococcus mutans*-glucosyltransferase B to *Candida albicans*. **J. Dent. Res.** 2015; 94(9):1310-7. ***Co-senior authors**
- Reginah N, Yoo M, Kwon HS, Kim YJ, **Hwang G**, Lee CH, Ahn IS. Application of the extended DLVO approach to mechanistically study the algal flocculation. **J. Ind. Eng. Chem.** 2015; 30: 289-94.
- Horev B, Klein MI, **Hwang G**, Li Y, Kim D, Koo H, and Benoit DSW. pH-activated nanoparticles for controlled topical delivery of farnesol to disrupt oral biofilm virulence. **ACS Nano** 2015; 9(3):2390-404.
-Highlighted in Science; 'doi:10.1126/science.aab2471'.
- Klein MI, **Hwang G**, Santos P, Campanella O, Koo H. *Streptococcus mutans*-derived extracellular matrix in cariogenic oral biofilms. **Front. Cell. Infect. Microbiol.** 2015; 5:10.
- Hwang G***, Klein MI, Koo H*. Analysis of the mechanical stability and surface detachment of mature *Streptococcus mutans* biofilms by applying a range of external shear forces. **Biofouling** 2014; 30(9):1079-91. ***Co-senior authors**
- Nguyen PT, Falsetta ML, **Hwang G**, Gonzalez-Begne M, Koo H. α -Mangostin disrupts the development of *Streptococcus mutans* biofilms and facilitates its mechanical removal. **PLoS One** 2014; 9(10):e111312.
- Choi J*, **Hwang G***, Gamal El-Din M, Liu Y. Effect of reactor configuration and microbial characteristics on biofilm reactors for oil sands process-affected water treatment. **Int. Biodeterior. Biodegrad.** 2014; 89:74-81. ***Co-first authors**
- Alpatova A, Kim ES, Sun X, **Hwang G**, Liu Y, El-Din MG. Fabrication of porous polymer nanocomposite membranes with enhanced

- anti-fouling properties: Effect of casting composition. **J. Membr. Sci.** 2013; 444: 449-60.
- Hwang G**, Liang J, Kang S, Liu Y. The role of conditioning film formation in *Pseudomonas aeruginosa* PAO1 adhesion to inert surfaces in aquatic environments. **Biochem. Eng. J.** 2013; 76:90-98.
- Hwang G**, Dong T, Islam MS, Sheng Z, Pérez-Estrada LA, et al. The impacts of ozonation on oil sands process-affected water biodegradability and biofilm formation characteristics in bioreactors. **Bioresour. Technol.** 2013; 130:269-77.
- Hwang G**, Ahn IS, Mhin BJ, Kim JY. Adhesion of nano-sized particles to the surface of bacteria: mechanistic study with the extended DLVO theory. **Colloids Surf. B Biointerfaces** 2012; 97:138-44.
- Hwang G**, Kang S, El-Din MG, Liu Y. Impact of an extracellular polymeric substance (EPS) precoating on the initial adhesion of *Burkholderia cepacia* and *Pseudomonas aeruginosa*. **Biofouling** 2012; 28(6):525-38.
- Hwang G**, Kang S, El-Din MG, Liu Y. Impact of conditioning films on the initial adhesion of *Burkholderia cepacia*. **Colloids Surf. B Biointerfaces** 2012; 91:181-8.
- Kim ES, **Hwang G**, El-Din MG, Liu Y. Development of nanosilver and multiwalled carbon nanotube thin-film nanocomposite membrane for enhanced water treatment, **J. Membr. Sci.** 2012; 394-395:37-48.
- Hwang G**, Yang JH, Lee CH, Ahn IS, Mhin BJ. New selection criterion of a base polar liquid in LW-AB approach. **J. Phys. Chem. C** 2011; 115(25):12458-12463.
- Hwang G**, Lee CH, Ahn IS, Mhin BJ. Determination of reliable Lewis acid-base surface tension components of a solid in LW-AB approach. **J. Ind. Eng. Chem.** 2011; 17(1):125-9.
- Hwang G**, Lee CH, Ahn IS, Mhin BJ. Analysis of the adhesion of *Pseudomonas putida* NCIB 9816-4 to a silica gel as a model soil using extended DLVO theory. **J. Hazard. Mater.** 2010; 179(1-3):983-8.
- Hwang G**, Park SR, Lee CH, Ahn IS, Yoon YJ, et al. Influence of naphthalene biodegradation on the adhesion of *Pseudomonas putida* NCIB 9816-4 to a naphthalene-contaminated soil. **J. Hazard. Mater.** 2009; 172(1):491-3.

Park B, **Hwang G**, Haam S, Lee C, Ahn IS, et al. Absorption of a volatile organic compound by a jet loop reactor with circulation of a surfactant solution: performance evaluation. **J. Hazard. Mater.** 2008; 153(1-2):735-41.

Hwang G, Ban YM, Lee CH, Chung CH, Ahn IS. Adhesion of *Pseudomonas putida* NCIB 9816-4 to a naphthalene-contaminated soil. **Colloids Surf. B Biointerfaces** 2008; 62(1):91-6.

Reviews, peer-reviewed:

Hwang G. In it together: Candida-bacterial oral biofilms and therapeutic strategies. **Environ. Microbiol. Rep.** 2022; 14: 183-196.

Hwang G, Blatz MB, Wolff MS, Steier L. Diagnosis of biofilm-associated peri-implant disease using a fluorescence-based approach. **Dent. J.** 2021; 9(3):24.

Zheng S, Bawazir M, Dhall A, Kim H-E, He L, Heo J, **Hwang G**. Implication of surface properties, bacterial motility, and hydrodynamic conditions on bacterial surface sensing and their initial adhesion. **Front. Bioeng. Biotechnol.** 2021; 9:643722.

Liu Y, Ren Z, **Hwang G**, Koo H. Therapeutic strategies targeting cariogenic biofilm microenvironment, **Adv. Dent. Res.** 2018; 29(1):86-92.

Islam MS, **Hwang G**, Yang Liu. Biological Fixed Film, **Water Environ. Res.** 2012; 84(10):1081-113.

Chelme-Ayala P, Afzal A, Ding N, Moustafa A, Pourrezaei P, Alpatova A, Drzewicz P, **Hwang G**, Kim ES, Liu Y, El-Din MG. Physico-Chemical Processes, **Water Environ. Res.** 2012; 84(10):971-1028.

Afzal A, Pourrezaei P, Ding N, Moustafa A, **Hwang G**, Drzewicz P, Kim ES, Perez-Estrada LA, Chelme-Ayala P, Liu Y, El-Din MG. Physico-Chemical Processes, **Water Environ. Res.** 2011; 83(10): 994-1091.

Conference papers, peer-reviewed:

Islam S, **Hwang G**, Song SH, Kim A. Smart Tooth System for In-Situ Wireless PH Monitoring. **2021 21st International Conference on Solid-State Sensors, Actuators and Microsystems (Transducers)**, 2021, pp. 755-758.

Book chapters:

Petry R, Oliveira NC, Alves AC, Filho AGS, Martinez DST, **Hwang G**, Sousa FA, Paula AJ. Nanomaterials properties of environmental interest and how to assess them. Nanomaterials Applications for Environmental Matrices: Water, Soil and Air, Ed. Nascimento R; Ferreira OP; Paula AJ; Oliveira V; Neto S. 2019, 45-105.

Patents:

Hwang G, Kim A, Korostoff J, Kim H-E. Smart Dental Implant System for Ambulatory Dental Care. Dec 12, 2022; National phase in US, EP, CN, JP and CA. Application Serial No. 18/064,747

Hwang G, Kim H-E, Dhall A. Enzymatic Targeting Cariogenic Bacterial-Fungal Biofilm Interactions. Utility Patent Application 2022 No. 17/718,922

Hwang G, Kim A, Korostoff J, Kim H-E. Smart Dental Implant System for Ambulatory Dental Care. Jun 14, 2021; International Application Serial No. PCT/US2021/037223

Hwang G, Kim H-E, Dhall A. Enzymatic Targeting Cariogenic Bacterial-Fungal Biofilm Interactions. Apr 14, 2021; Provisional Application No. 63/174,707

Hwang G, Kim A, Korostoff J, Kim H-E. Smart Dental Implant for Ambulatory Dental Care. Jun 12, 2020; Provisional Application No. 63/038,494

Grant Support:

Current:

Grant Title: Translational Multimodal Strategy for Peri-Implant Disease Prevention

Grant Number: R01 DE032343

Funding Source: NIH/NIDCR

PI: Hwang G (MPI: Kim A, Schaer T)

Period of Award: 08/01/23-04/30/28

Total Funding Amount: \$ 2,611,802

Grant Title: Collaborative Research: Novel Hybrid Metal-Piezoelectric Biomaterials for Anti-infectious Implantable Medical Devices

Grant Number: BMAT 2321384

Funding Source: NSF

PI: Hwang G

Period of Award: 09/01/23-08/31/26

Total Funding Amount: \$ 400,000

Grant Title: Bacterial Adhesion Inhibition and Biofilm Disruption by Adaptive Piezoelectric Biomaterial

Grant Number: R21 DE032162

Funding Source: NIH/NIDCR

PI: Hwang G

Period of Award: 04/01/23-03/31/25

Total Funding Amount: \$ 440,311

Grant Title: Collaborative Research: Smart Dental Implant for Ambulatory Dental Care

Grant Number: ECCS 2225697

Funding Source: NSF

PI: Hwang G

Period of Award: 09/01/22-08/31/25

Total Funding Amount: \$ 249,999

Grant Title: Enzymatic approach for targeting mannans/EPS to disrupt cross-kingdom cariogenic biofilms

Grant Number: R01 DE027970

Funding Source: NIH/NIDCR

PI: Hwang G

Period of Award: 07/01/18-06/30/24 (NCE)

Total Funding Amount: \$ 1,720,689

Past:

Grant Title: Role of GtfB on S.mutans-C.albicans interactions and cariogenic biofilm formation

Grant Number: R03 DE025728

Funding Source: NIH/NIDCR

PI: Hwang G

Period of Award: 01/01/16-12/31/17

Total Funding Amount: \$ 160,000

Grant Title: Influence of composite material on the development, 3D architecture and mechanical stability of Streptococcus mutans biofilms

Funding Source: Dentsply

PI: Koo H

Role in Grant: Co-Investigator

Period of Award: 07/01/15-06/30/16

Total Funding Amount: \$ 32,400