

YOUR HEALTH & THE ENVIRONMENT



NEWS FROM THE UNIVERSITY OF ROCHESTER ENVIRONMENTAL HEALTH SCIENCES CENTER

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MERCURY AND THE MICROBIOME

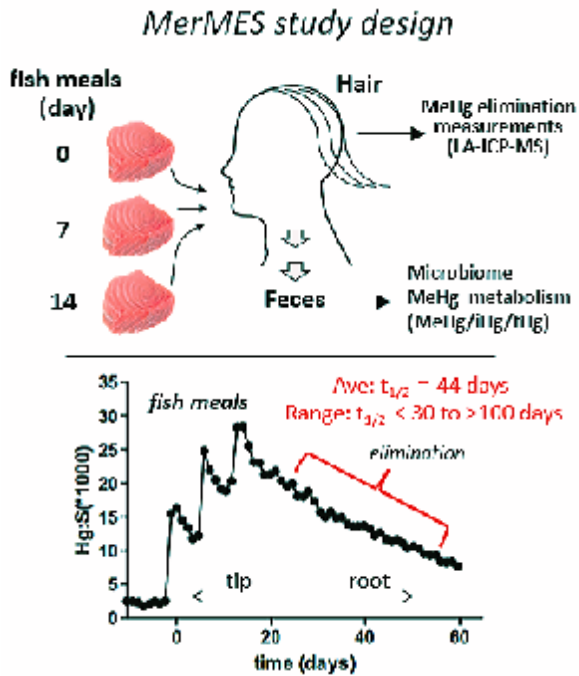
Associate Professor of Environmental Medicine Matthew Rand, PhD is building on the long legacy of mercury toxicology research at the University of Rochester with support from a recent NIH R01 award entitled "Microbial Mechanisms of Methylmercury Metabolism in Humans."

Human mercury exposure predominantly occurs from eating fish, where mercury is almost completely in an organic form known as methylmercury. The greatest concern for methylmercury exposure focuses on women of child-bearing age, pregnant women, and young children. Despite decades of research on the topic, considerable uncertainty remains over the potential risks of toxicity from methylmercury versus the benefits of essential nutrients in fish that support brain development.

This uncertainty, to a large extent, stems from the wide variation in how fast individuals metabolize and clear methylmercury from the body. This natural variation may identify who is more susceptible versus resistant to methylmercury exposures.

Novel methods developed in the Rand lab enable a measure of methylmercury metabolism and elimination status, or "MerMES," in an individual after their consuming just three fish meals.

Using a single strand of hair and high-resolution laser-ablation ICP mass spectrometry, Rand can acquire time-resolved data that permits calculation of a person's methylmercury elimination rate.



Mercury and the Microbiome

Analysis of mercury isoforms in a stool sample from the same individual gives a proxy for how efficiently the methylmercury is metabolized, or broken down (i.e. de-methylated).

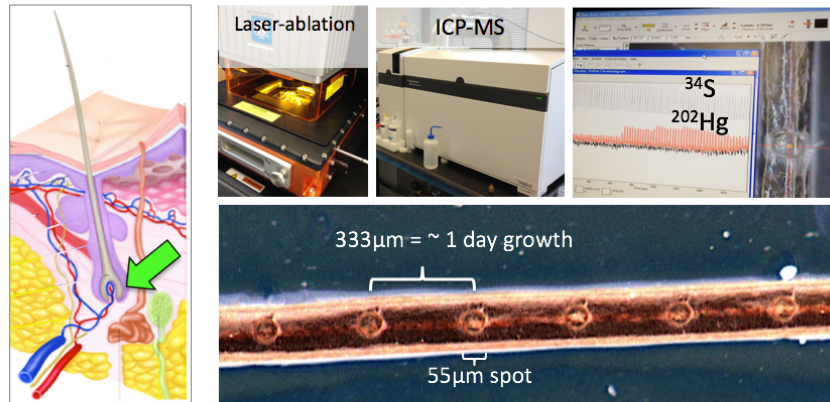
Rand plans to elaborate upon the hypothesis that microbes in the gut are ultimately responsible for how fast methylmercury is de-methylated and excreted. His prior studies show evidence for this, whereby individuals on antibiotics show a reduced rate of methylmercury elimination.

This latest study is funded via a NIEHS Virtual Consortium for Translational/Transdisciplinary Environmental Research (ViCTER) award to Rand and co-investigators Seth Walk and Eric Boyd of the Department of Microbiology and Immunology at Montana State University. Rand is currently recruiting human volunteers for the study, who will eat fish meals and provide hair and stool samples for MerMES determinations.

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Mercury and the Microbiome

Time-resolved Hg analysis by laser ablation ICP-MS



*Hg deposition in hair is preferentially MeHg from blood.
Human hair growth rate: ~ 1.1cm/month.*

Drs. Walk and Boyd will conduct analyses of microbial activity and identity of species within the participants' gut microbiomes using a germ-free mouse model and metagenomic sequence methodologies, respectively. An additional aspect of the study will examine the effects of a prebiotic fiber supplement on the overall methylmercury metabolism rate and the corresponding gut microbiome composition in each participant. Ultimately, Rand and his team anticipate identifying taxa of gut bacteria that contribute to efficient metabolism and excretion of methylmercury that may inform approaches to further protect susceptible populations from methylmercury toxicity.

¹Caito SW, Jackson BP, Punshon T, Scrimale T, Grier A, Gill SR, Love TM, Watson GE, van Wijngaarden E, Rand MD. Variation in Methylmercury Metabolism and Elimination Status in Humans Following Fish Consumption. *Toxicol Sci.* 161:443-453, 2018

McGraw and Croft Publish Lancet Paper on Lung Disease Associated with Vaping

EHSC members Matthew D. McGraw, MD, Assistant Professor of Pediatrics, Division of Pulmonology and Daniel Croft, MD, MPH, Assistant Professor of Medicine, Pulmonary Diseases, and Critical Care, published a paper in *The Lancet: Respiratory Medicine* titled “E-cigarette, or vaping, product use associated lung injury (EVALI): Case series and diagnostic approach” in December 2019.

The study looked at patients admitted to the University of Rochester Medical Center for respiratory complaints who had used vaping devices within the past month and followed 12 cases in which patients were treated for what was suspected to be EVALI between June 2019 and September 2019.



"We expect the guide will help minimize missed [EVALI] diagnoses as cold and flu season ramps up."

- Daniel Croft, MD, MPH

EurekaAlert!, AAAS, Nov. 8, 2019

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McGraw and Croft Publish Lancet Paper on Lung Disease Associated with Vaping

One key finding was that 92% of patients reported using tetrahydrocannabinol (THC) oil in their vaping devices. The study helped with creating an algorithm developed by Croft, McGraw, and their teams to help diagnose EVALI.

Kalininskiy, MD, A., Bach, MD, C., Nacca, MD, N., Ginsberg, MD, G., Marraffa, PharmD, J., Navarette, MD, K., . . . Croft, MD, D. (2019). E-cigarette, or vaping, product use associated lung injury (EVALI): case series and diagnostic approach. *The Lancet Respiratory Medicine*, 7(12), 1017-1026.

[doi.org/10.1016/S2213-2600\(19\)30415-1](https://doi.org/10.1016/S2213-2600(19)30415-1)

[www.thelancet.com/journals/lanres/article/PIIS2213-2600\(19\)30415-1/fulltext](http://www.thelancet.com/journals/lanres/article/PIIS2213-2600(19)30415-1/fulltext)

Irfan Rahman Awarded Lifetime Achievement Award at National Conference on Solid State Chemistry and Allied Areas (NCSCA) 2019



Dean's Professor of Environmental Medicine, Irfan Rahman, PhD, was awarded the prestigious Lifetime Achievement Award by the executive committee of the NCSCA-2019 at the 11th National Conference on Solid State Chemistry And Allied Areas (NCSCA-2019) on December 20, 2019.

To read the article visit:

www.urmc.rochester.edu/labs/rahman/news



Seychelles Child Development Study (SCDS) Team Visits Seychelles

The University of Rochester Seychelles Child Development Study (SCDS) team traveled to the Republic of Seychelles in November 2019 to attend a conference on ocean and health and to meet with local stakeholders and research partners.

The SCDS began in the mid 1980's and has continued to track factors associated with organic and inorganic, pre- and postnatal mercury exposure and its impact on child development.

In an article published in the Seychelles NATION, Seychelles Vice-President Vincent Meriton stated that “we must also take responsibility for our actions that contribute to our problems. We must act globally and locally and find solutions to problems that confront us.

The conference also alerts us to the culture shift that has, and will continue to have, significant impact on the health of our nation,” noting that the younger generation no longer consume fish and lack knowledge about different fish and marine species.

“We must also take responsibility for our actions that contribute to our problems.”

– VINCENT MERITON

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Seychelles Child Development Study (SCDS) Team Visits Seychelles



The University of Rochester Team that traveled to the Republic of Seychelles included: Sally Thurston, PhD, Tanzy Love, PhD, Matt Rand, PhD, Dan Mruzek, PhD, Gene Watson, DDS, PhD, and Edwin van Wijngaarden, PhD.

According to the article, Vice-President Meriton emphasized the importance of scientific research to inform policy and highlighted the contributions of the Seychelles Child Development Study (SCDS) in this regard.

You can read the full Seychelles NATION article here:

<http://www.nation.sc//articles/2345/seychelles-hosts-major-scientific-conference-on-ocean-and-health>

Marissa Sobolewski Presents to EHSC Community Advisory Board

Assistant Professor Marissa Sobolewski, PhD shared her research with the Environmental Health Sciences Center Community Advisory Board at its December 2019 meeting. Her presentation on “Male Vulnerability to Chemicals During Development” reported on pilot research in which her lab exposed pregnant mice to a mixture of chemicals (including BPA and PFOA) known to be measurable in children at birth in New York. She compared the behavior of the offspring in a range of situations. She found that the behavior of the mice was affected by the mixture of chemicals, but that the same concentration of each chemical alone did not cause effects. She also noted that the males’ behavior changed in ways that are similar to autism spectrum diseases and to attention deficit and hyperactivity disorder. Sobolewski looks forward to continuing her research exploring the disparate impacts of low-dose chemical mixtures on males versus females.





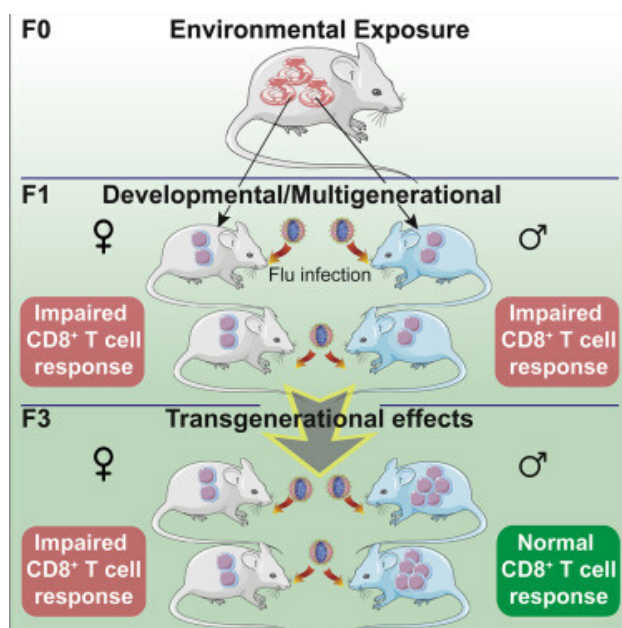
Lawrence Lab Publishes Article on Intergenerational Immune System Effects of Environmental Chemicals in iScience

New research shows that maternal exposure to dioxin can harm the immune system of offspring and that this injury is passed along to subsequent generations, weakening the body's defenses against infections such as the influenza virus. While other studies have shown that environmental exposure to pollutants can have effects on the reproductive, respiratory, and nervous system across multiple generations, the new research shows for the first time that the immune system is impacted as well.

The study was led by Christina Post, who is a graduate student in the laboratory of our Center Director, Paige Lawrence, Ph.D., and appears in the Cell Press journal iScience. "The old adage 'you are what you eat' is a touchstone for many aspects of human health," said Lawrence. "But in terms of the body's ability to fight off infections, this study suggests that, to a certain extent, you may also be what your great-grandmother ate."

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Lawrence Lab Publishes Article on Intergenerational Immune System Effects of Environmental Chemicals in iScience



The Lawrence lab observed the production and function of cytotoxic T cells - white blood cells that defend the body against pathogens, particularly viruses, and seek out and destroy cells with mutations that could lead to cancer - were impaired when the mice were infected with influenza A virus. This weakened immune response was observed not only in the offspring of mice whose mothers were exposed to dioxin, but in the subsequent generations, including as far out as the rodent equivalent of great-grandchildren.

For more information on this publication:

<https://www.urmc.rochester.edu/news/story/5577/environmental-toxins-impair-immune-system-over-multiple-generations.aspx>

Post, C. M., Boule, L. A., Burke, C. G., O'Dell, C. T., Winans, B., & Lawrence, B. P. (2019). The Ancestral Environment Shapes Antiviral CD8⁺ T cell Responses across Generations. *iScience*, 20, 168-183. <https://doi.org/10.1016/j.isci.2019.09.014>

GRAPHICAL ABSTRACT:

[https://www.cell.com/iscience/fulltext/S2589-0042\(19\)30352-9](https://www.cell.com/iscience/fulltext/S2589-0042(19)30352-9)



Progress in Developing Interactive Science Kits on E-Cigarettes and Environmental Health

The Community Engagement Core (CEC) has teamed up with University of Rochester start-up company, Science Take-Out, to develop, pilot test, and evaluate the use of hands-on science kits that focus on topics related to e-cigarettes and vaping.

Dina Markowitz, PhD, Professor of Environmental Medicine and Director of the UR Life Sciences Learning Center was awarded a Small Business Technology Transfer (STTR) grant from the National Institute of Environmental Health Sciences (NIEHS) to develop educational materials about vaping.

Markowitz is also the owner of Science Take-Out (STO), a small business that creates and manufactures preassembled “lab-in-a-bag” science kits to make it easier for diverse users to engage in hands-on science activities.

The kit topics range from exploring the harmful chemicals used in e-cigarette flavorings, chemicals found in e-cigarette devices, and of the potential contribution of vaping to severe lung diseases. Each kit follows a real-life scenario related to teens and vaping.

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Progress in Developing Interactive Science Kits on E-Cigarettes and Environmental Health

The kit activities include hands-on simulations of published research studies done by researchers in the EHSC project and elsewhere.

Markowitz and EHSC CEC program manager, Cait Fallone, MA, conducted focus groups with local organizations including the School Assistant Board (SAB) and the Smoking and Health Action Coalition (SHAC). SAB members include social workers and substance abuse counselors that work for school districts in Monroe County and help support educational resources for school districts. The SAB focus group provided feedback on the potential for the vaping kits to be used with elementary school through high school students, particularly for at-risk youth. The SHAC is composed of public health professionals and community educators who work with youth to decrease the use of tobacco products and e-cigarettes. Feedback from the SHAC focus group included discussions of how to insure the kits share pertinent information from current research and policy. A third focus group was conducted by Markowitz and her STO colleagues with Rochester and Buffalo area science and health teachers.

Later this Spring, the CEC-STO team will pilot test the vaping kits in formal (school-based) and informal (community-based) education settings. The kits will be used with a wide variety of audiences including 5th-12th grade students, parents, and community groups. Through this project and interactions with researchers in the EHSC, the team has identified formal and informal educators' urgent need for materials to educate the general public (and teens in particular) about the health risks of vaping. Markowitz expects that the final kits will be available by Fall 2020.

Welcome to the EHSC

Three new researchers join the Environmental Health Sciences Center



Deborah Ossip, PhD

The Environmental Health Sciences Center (EHSC) welcomes new member Deborah Ossip, PhD, Professor of Public Health Sciences and in the Center for Community Health and Prevention. Ossip directs the Smoking Research Program, which focuses on community-based interventions and underserved populations. Her tobacco control research has spanned basic, clinical, and policy domains, with concurrent foci on translating science to practice and policy, health disparities, and global health.

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Welcome to the EHSC

Three new researchers join the Environmental Health Sciences Center

Her basic research includes early studies demonstrating no reduced exposure for "low tar low nicotine" cigarettes through current collaboration with EHSC Center Member Irfan Rahman, PhD and investigators in biology examining toxicology of emerging products. Her clinical and policy research includes a systematic series of quitline studies, from one of the original two trials demonstrating quitline effectiveness, through co-founding of the North American Quitline Consortium, and recent work introducing a "reach ratio" metric for underserved populations.

She currently Co-directs a NYS-funded tobacco policy change initiative in health systems serving low income and psychiatric populations and is a Site PI and Career Enhancement Core Co-Director for the Center for Research on Flavored Tobacco (CRoFT), an NIH-funded Tobacco Center of Regulatory Science (TCORS) partnership between Roswell Park Cancer Center and the University of Rochester Medical Center.

Ossip currently collaborates with center members, Irfan Rahman, PhD on studies of e-cigarette and other tobacco exposures. She also has acted as an advisor in the early stages of Science Take-Out vaping education kits currently in development. She looks forward to further collaboration with center members to understand and reduce the reducing the public health impacts of vaping.

Welcome to the EHSC

Three new researchers join the Environmental Health Sciences Center

Jim McGrath, PhD

Professor of Biomedical Engineering Jim McGrath, PhD, recently joined the Environmental Health Sciences Center. McGrath holds degrees in Mechanical Engineering from Arizona State (BS) and MIT (MS) and earned a PhD in Biological Engineering from Harvard/MIT's Division of Health Sciences and Technology in 1998. He then trained as a Distinguished Post-doctoral Fellow in the Department of Biomedical Engineering at the Johns Hopkins University.



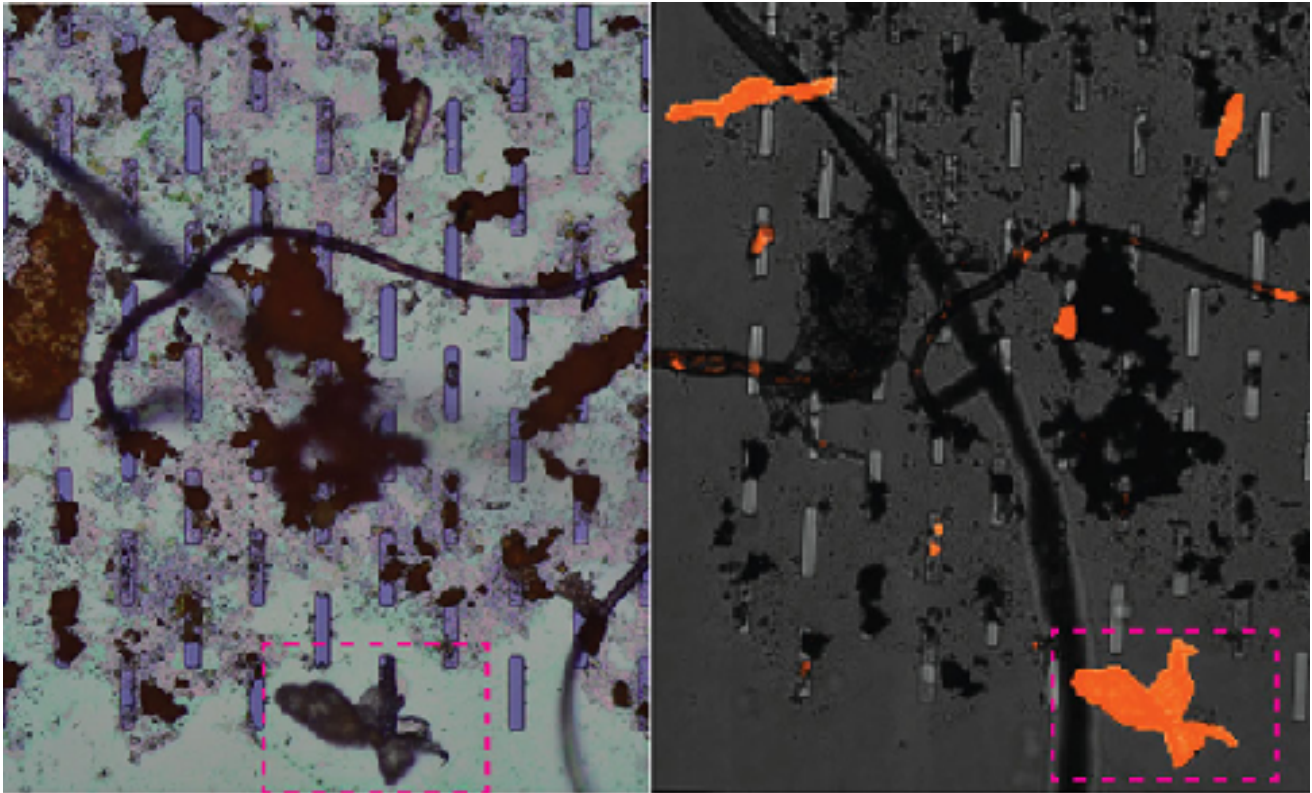
Since 2001, Professor McGrath has been on the Biomedical Engineering faculty at the University of Rochester where he directed the graduate program for a decade, and now serves as the Associate Director of the Microfabrication and Metrology Core (URNano).¹ He is a member of UR's Material Science Program and the Biophysics, Structural and Computational Biology Program.

McGrath leads a highlight interdisciplinary, multi-institutional team that develops and applies ultrathin silicon-based, porous membrane technologies to applications ranging from biological 'tissues-chips' to medically and environmental diagnostics. In 2015, McGrath was elected as a fellow of the American Institute for Medical and Biological Engineering (AIMBE), and he currently serves as the Chairman of the NIH's Instrumentation, Environmental, and Occupational Safety small business study section. He has co-authored 11 issued and pending patents and published more than 80 scientific publications. Professor McGrath is a co-founder, current director, and past president of SiMPore Inc., a company founded in 2007 to commercially manufacture silicon nanomembranes. In 2020 he co-founded Parverio, a start-up company that seeks to apply silicon membrane technologies to the problem of environmental assessment, including microplastic detection and identification.

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Welcome to the EHSC

Three new researchers join the Environmental Health Sciences Center



Debris captured on a silicon nanomembrane (greenish background, with bluish slots, 8 microns wide) by Greg Madejski

In 2019 McGrath received an EHSC pilot to establish the feasibility of using silicon nanomembranes for the assessment of environmental microplastic pollution. He then received an NIEHS STTR grant to create low-cost kits and methods to allow others the same surveys. Through this project, McGrath's lab has partnered with EHSC members Jacques Robert, PhD and Lisa DeLouise, PhD to explore the biological effects of microplastic particles. McGrath is also working with the Community Engagement Core around communication of research results to local residents and the potential future use of these systems in citizen science.

¹<https://www.rochester.edu/urnano/>

Welcome to the EHSC

Three new researchers join the Environmental Health Sciences Center



Patrick Murphy, PhD

The Environmental Health Sciences Center welcomed Patrick Murphy, PhD as a new center member in January 2020. Murphy joined the University of Rochester as an Assistant Professor of Biomedical Genetics in November 2018. His research involves understanding how epigenetic marks control embryonic development, and determining how environmental factors impact developmental gene expression patterns. His laboratory is currently testing whether distinct epigenetic marks (DNA methylation and the histone variant H2A.Z) contribute to the toxic effect of a common

flame retardant, TDCIPP, and whether these same epigenetic marks allow for therapeutic benefits from specific cancer chemotherapy agents, Vidaza and Adriamycin. Murphy has been investigating how the environment impacts epigenetic marks since his time as a postdoctoral researcher at the Huntsman Cancer Institute in Salt Lake City, Utah. He previously studied how epigenetic marks are passed from fathers to sons using the zebrafish model system and how cigarette smoking impacts human sperm DNA methylation patterns. He recently demonstrated that the DNA methylation changes resulting from cigarette smoke exposure in mice are the consequence of oxidative stress.¹ He plans to follow-up on this study by investigating the epigenetic and heritable impacts of oxidative stress in zebrafish. He hypothesizes that the biological impacts of several environmental insults might be the consequence of oxidative stress responses, including epigenetic changes, and these changes allow environmental insults to have long term impacts on health.

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Welcome to the EHSC

Three new researchers join the Environmental Health Sciences Center

Murphy was born and raised in western New York and received his Ph.D. from Cornell University. He and his family are thrilled to be back amongst their extended family and to be contributing members of the University of Rochester community. Patrick is a huge Buffalo Bills fan and is excited for the future of the football team and by their recent successes. He says moving to Pittsford and having the ability to ride his bicycle to training camp was a small but significant aspect of his recruitment to Rochester.

¹<https://doi.org/10.1101/750638>

Toxicology Trainees Enhance Their Presence on Social Media

By Ashley Peppriell, Jakob Gunderson, Emly Quarato, Alyssa Merrill, and Candace Wong



A quick Google Search of “URMC toxicology” brings up the Toxicology Training Program homepage. Thanks to the efforts of the newly formed Social Committee, the content of that page has become more engaging, informative, and attractive to those interested in learning more about our program. While the target audience naturally includes prospective new students, the webpage and new affiliated social media content are now also more easily accessible to members of our Rochester community, researchers from outside universities, and alumni.

The social committee members (authors) have made great strides for the Toxicology program by updating the program website, reviving the affiliated Facebook account, and expanding to encompass an Instagram account. The program website now includes a “Student Perspectives” section, which provides a more holistic account of individual students’ experiences. An example of the webpage for Social Committee co-chair, Candace Wong can be seen below:

Candace Wong

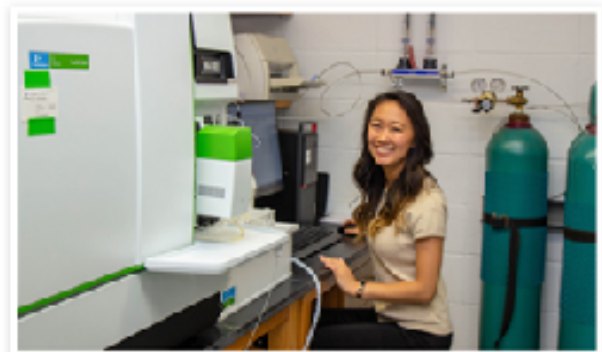
Hometown: Chicago, IL

Education Background:

- B.S. in Molecular and Cellular Biology with a Minor in Chemistry from the University of Illinois at Urbana-Champaign
- M.S. in Toxicology from the University of Rochester School of Medicine and Dentistry

Research Group: [Elder Lab](#)

What have you enjoyed the most about your training thus far?

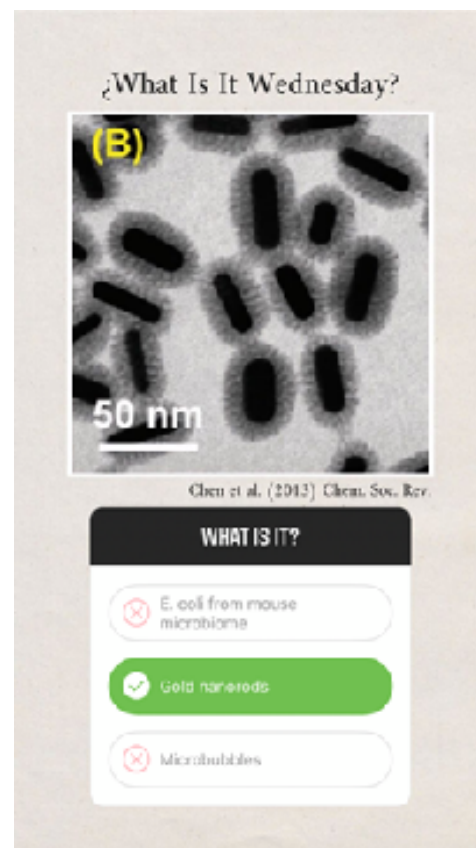


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Toxicology Trainees Enhance Their Presence on Social Media

Student highlights will be shared on the Facebook and Instagram page. The Facebook page features regular posts about exciting news from individual labs here at URM, upcoming events, current topics in Toxicology, and volunteer endeavors of our students and faculty. The new Instagram page posts similar types of content, but allows followers an opportunity to engage with the Toxicology Program and field. Weekly Instagram polls such as “What Is It Wednesday?” exemplify an interactive activity that the program and local community members (e.g. environmental health related groups, K-12 teachers and students) can engage in. An example of a “What Is It Wednesday” post is located to the right. Additionally, the Social Committee is beginning to work with the EHSC Community Engagement Core to share information about these resources and connect with interested community members and groups.

Through new social media content, the Social Committee hopes to accomplish several things. First is setting a precedent for the Toxicology program that will allow us to highlight toxicology graduate students, which can be beneficial for job searches. The second goal is to attract and matriculate prospective students to the program to further the longstanding legacy of the program. Third, through these social media channels, the student community can now more easily engage with the larger community. Social media facilitates these crucial and informative interactions between our toxicologists-in-training and the community.



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Toxicology” and on
Instagram at
“URMCToxicology”!

For Questions or Comments, Please Contact:

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