

YOUR HEALTH & THE ENVIRONMENT



NEWS FROM THE UNIVERSITY OF ROCHESTER ENVIRONMENTAL HEALTH SCIENCES CENTER

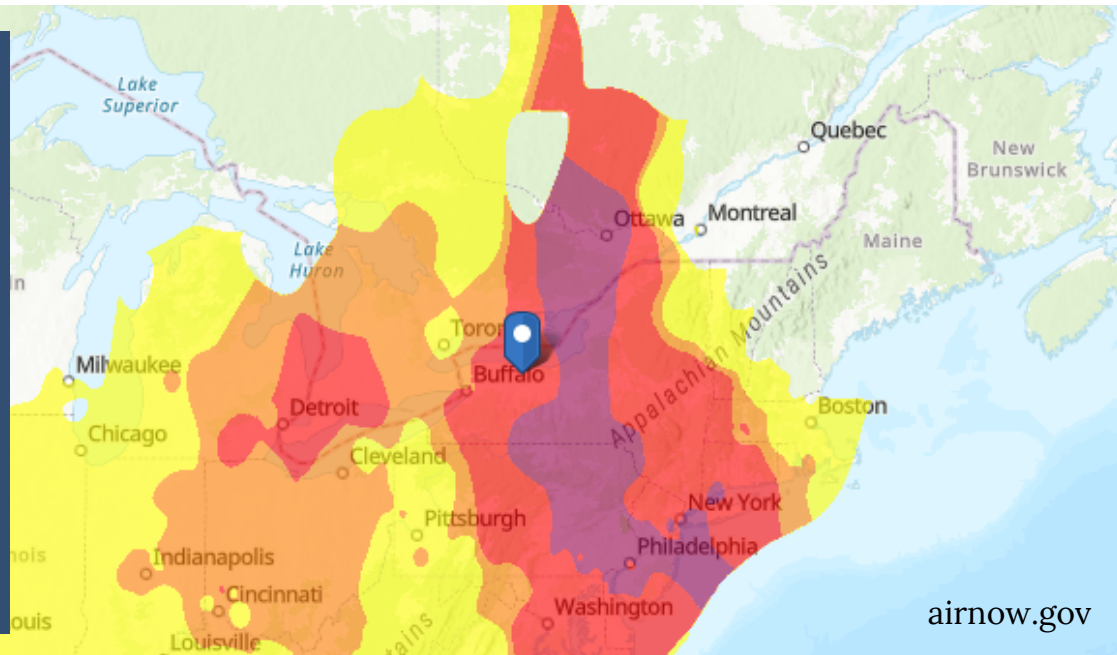
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FACULTY RECOGNIZED FOR EXCELLENCE IN TEACHING AND MENTORING

50 YEARS OF THE TOXICOLOGY TRAINING PROGRAM



EHSC Responds to Summer Air Pollution Events

In early June 2023, Rochesterians woke up to hazy orange skies and the smell of campfires. Wind patterns had carried smoke from wildfires in Canada to blanket Rochester, along with much of the eastern US. Over the next few days, Air Quality Index (AQI) values rose to levels labeled as “unhealthy,” and left people wondering what they should do to protect their family’s health.

The AQI is a scale reflecting the concentrations of several pollutants in the air, including particulate matter. There are many sources of particulate matter in the air, including traffic, industrial activity, and – as experienced by Rochesterians for one of the first times in recent memory – fires. In regions that regularly experience poor air quality events, the public is more familiar with how to check and interpret the AQI than in Rochester. As well, particulate matter from wildfires may have different health effects than particulate matter from other sources.



An American flag in front of Rochester's skyline on a hazy day in Summer 2023; photo by Chris Widmaier

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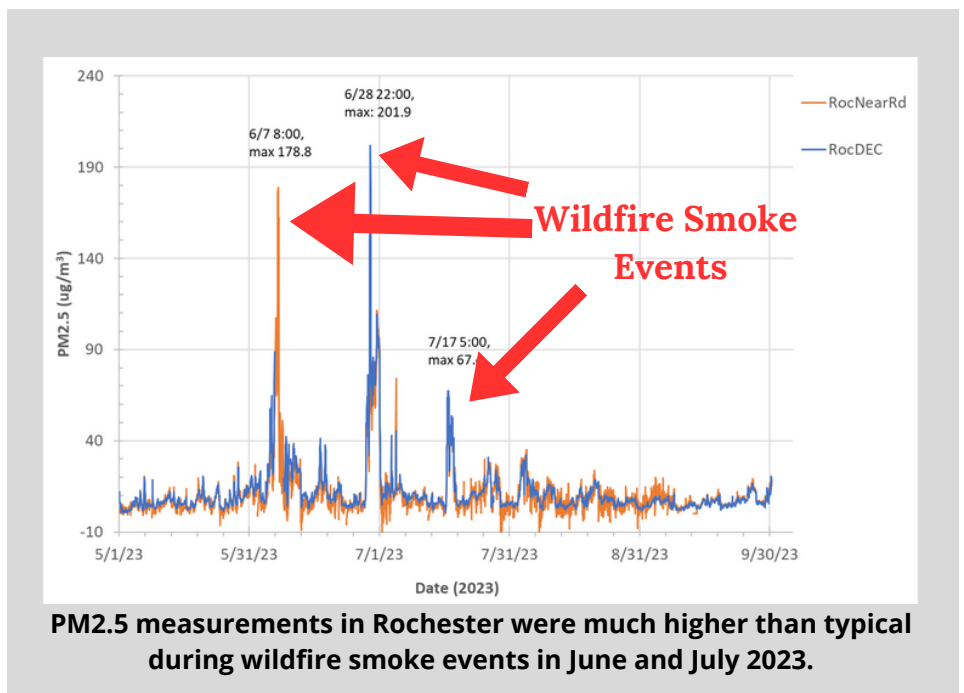
Air Pollution Response (continued)

Center member and pulmonologist Dan Croft, MD, MPH, researches the effects of air pollution on lung health. Individuals with asthma, COPD, or cardiovascular disease, as well as individuals who smoke, are most at risk from exposure to poor air quality. The CDC reported that asthma-associated emergency department visits were 17% higher than expected on days during late spring and summer 2023 when the US was experiencing wildfire smoke.¹ During this summer's air pollution events, Croft spoke to local and national reporters about how people can protect their health when the air quality is poor. He recommended limiting physical exercise outdoors and wearing a respirator when outside to filter some of the particles.

While wildfire season has not historically been of great concern for the northeastern US, wildfires are becoming larger, burning longer, and starting earlier in the year. These wildfire smoke events are expected to become more common. Rochester saw air quality advisories related to wildfire smoke several more times this past summer. During and after the events, our Center's Community Engagement Core (CEC) staff worked to gather and distribute relevant resources from environmental health outreach partners in other parts of the country where wildfires are more common.

Because wildfire-associated smoke events are relatively new to our region and expected to increase, local governments and community groups have been thinking about how to streamline and coordinate their messaging and responses in the future. The CEC coordinated a special meeting of the Rochester Healthy Home Partnership in July 2023 to address this topic.

Representatives from over 20 local organizations gathered to discuss what they did to respond to the air pollution events, needs for information and resources, and how to be better prepared for the next event.



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Air Pollution Response (continued)

This conversation is ongoing, continued most recently at the December 2023 EHSC Community Advisory Board meeting, where Steve Georas, MD, presented about “Environmental exposures and asthma: lessons from the 2023 Canadian wildfires.” He sought feedback from community members on their questions and concerns about how air quality impacts lung health, specifically in vulnerable individuals. In addition, the CEC is working to respond to community partners’ requests for informational materials, guidelines, and model policies specific to our region’s needs by sharing resources collected from other regions and developing several new materials.



Steve Georas, MD, presented at the December 2023 Community Advisory Board Meeting

Air Pollution and Health Research at the EHSC Support Wildfire Smoke Event Responses

Particulate matter comes in many different sizes. The high AQI values during the summer’s wildfire smoke events were based on high concentrations of PM_{2.5} (particles less than 2.5 micrometers in diameter). Air pollution can also contain very small, “ultrafine” particles (less than 100 nanometers). When inhaled, these ultrafine particles can travel far into the lungs and enter the bloodstream, and they can also enter the brain.

The health effects of ultrafine particles is a longstanding area of research by EHSC members. For example, Center Member Deborah Cory-Slechta, PhD, recently discussed her research on how air pollution affects brain development with NIEHS Director Rick Woychik, PhD, in the [August 2023 Environmental Factor newsletter’s “Director’s Corner”](#).



The EHSC supports the University of Rochester’s state-of-the-art Inhalation Exposure Facility, directed by Alison Elder, PhD. The Facility, which was launched during the 1940s, has grown and evolved over the past three decades to support basic and translational inhalation toxicology research. There are very few inhalation exposure facilities in the world, each with a unique focus: at Rochester, the specialty area is the toxicology of airborne ultrafine and nanoparticles. The facility also contains a Harvard Ultrafine Concentrated Ambient Particle System (HUCAPS), which draws air in from a nearby

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Air Pollution Response (continued)

roadway and allows researchers to study exposures to real-world mixtures of particles.

The research conducted in the Inhalation Exposure Facility complements ongoing studies based on ambient air quality monitoring. EHSC members have partnered with the New York State Department of Environmental Conservation (NYS DEC) to monitor air quality in Rochester since 2001, resulting in one of the world's longest running records of size-distributed air particle concentrations, including ultrafine particles. Center members Phil Hopke, PhD, and Dave Rich, ScD, MPH, have deployed a network of low-cost sensors examining spatial and temporal patterns of PM_{2.5} and ozone around Monroe County to develop models that have provided insight about the effects of air pollution from different sources on health in Rochester. This long-running monitoring record, partnership with NYS DEC, and research expertise enabled EHSC researchers and staff to assist in informing public messaging and responses during the 2023 wildfire events.

1 McArdle CE, Dowling TC, Carey K, et al. Asthma-Associated Emergency Department Visits During the Canadian Wildfire Smoke Episodes – United States, April– August 2023. *MMWR Morb Mortal Wkly Rep* 2023;72:926–932. DOI: <http://dx.doi.org/10.15585/mmwr.mm7234a5>

Trainees Participate in Hispanic Heritage Month Event

PhD candidates Darline Castro-Meléndez (right) and Janiret Narvaez-Miranda (left), both advised by Center member Kristin Scheible, MD, participated in “Science Encounters” at the Rochester Museum and Science Center (RMSC) for a Hispanic Heritage Month event on September 30th. The two trainees interacted with the public by conducting hands-on activities on air quality and health and the properties of viruses. The RMSC was the recipient of the EHSC’s 2023 Capacity Building Project for their Climate Action Days event. Darline and Janiret’s outreach complemented the CEC’s partnership with RMSC to incorporate environmental health into their public programming, with a particular focus around air quality, climate change and health.



Welcome to New EHSC Member

The EHSC welcomes new member John Onukwufor, PhD



John Onukwufor, PhD

John O. Onukwufor, PhD, is a Research Associate Professor of Pharmacology and Physiology with a secondary appointment in Environmental Medicine. Dr. Onukwufor received his undergraduate degree in Animal Science and Master's degree in Reproductive Physiology from the University of Nigeria, Nsukka. He then received a PhD in Toxicology from Atlantic Veterinary College at the University of Prince Edward Island. In his PhD research, Dr. Onukwufor studied the effects of multiple environmental stressors (including metals, temperature, and hypoxia) on mitochondrial bioenergetic function in fish. He completed his initial post-doctoral fellowship training in comparative physiology at the University of British Columbia studying stress adaptation in fish. Dr. Onukwufor moved to the

University of Rochester to obtain training in the molecular mechanisms of stress signaling and reactive oxygen species production in invertebrate *C. elegans* during his second post-doctoral fellowship.

In 2021, Dr. Onukwufor was promoted to Research Assistant Professor of Pharmacology and Physiology and awarded the first University of Rochester internal K99/00 award. The UR-K99/00 award enabled Dr. Onukwufor to develop an independent research program focused on metal toxicity and Alzheimer's disease pathogenesis. Dr. Onukwufor subsequently secured a 2-year NIH-NIEHS Diversity Supplement to study the mechanisms of environmental metal neurotoxicity in the pathogenesis of Alzheimer's disease and facilitate his transition to environmental health research. As an EHSC member, he is excited to apply the tools and approaches from his previous work to new problems and questions related to human health.

Dr. Onukwufor's research program focuses on understanding the molecular mechanisms underlying divalent metal neurotoxicity and mitochondrial dysfunction in Alzheimer's disease development. His lab employs multiple complementary approaches including transgenic overexpression and knockout in *C. elegans* and murine models of Alzheimer's disease. Dr. Onukwufor's research program aims to identify specific disease pathomechanisms and novel therapeutic targets for Alzheimer's disease and other neurodegenerative disorders.

Dr. Onukwufor is passionate about fostering research collaborations with EHSC members and is committed to mentoring and training the next generation of environmental health advocates from historically underrepresented communities.

Celebrating Children’s Environmental Health Day

October 12, 2023 was Children’s Environmental Health Day!

Several centers within the University of Rochester partnered with the Children’s Environmental Health Network to increase the visibility of children’s environmental health issues and empower people and organizations to take action. Events included webinars and seminars hosted by EHSC and the Finger Lakes Children’s Environmental Health Center about the effects of PFAS on maternal and child health, a “Got Health?” public talk on tips for reducing kids’ exposures to environmental hazards, an in-person outreach event at Rochester’s Public Market on asthma and respiratory health, and a proclamation by Rochester Mayor Malik Evans. Rochester City Councilmember Mitch

Gruber read Mayor Evans’ proclamation during a Finger Lakes Children’s Environmental Health Center webinar by Tracey Woodruff, PhD, MPH (University of California, San Francisco).



University of Rochester Preventive Care Program for Children with Asthma staff partnered with the CEC to provide education and resources about asthma and environmental health at the Rochester Public Market.

EHSC Faculty Recognized for Excellence in Teaching and Mentoring



James McGrath, PhD, is one of this year's recipients of the University of Rochester [Goergen Award for Excellence in Undergraduate Teaching](#).

Graduate Education and Postdoctoral Affairs Awards

Marissa Sobolewski-Terry, PhD, received the Outstanding Graduate Student Teacher Award.

Kirsi Järvinen-Seppo, MD, PhD, received the Excellence in Postdoctoral Mentoring Award.

Jacques Robert, PhD, received the Outstanding T32 Program Director Award.

Ania Majewska, PhD, received the Graduate Student Society Mentoring Award.

Pictured: Marissa Sobolewski-Terry and Jacques Robert at the Graduate Education and Postdoctoral Affairs Awards Ceremony

[Read more about this year's Graduate Education and Postdoctoral Affairs awards](#)



EHSC Pilot Project Grant Funds Research and Outreach on Microplastics and Human Health

Microplastics are tiny pieces of plastic that are manufactured directly or are created from the breakdown of larger pieces of plastic.

Microplastics have been found in water, plants, animals, and even human bodies, giving rise to public concern. However, their effects on human health remain uncertain.

Lisa DeLouise, PhD, MPD, was awarded an EHSC pilot project grant to investigate microplastic bioactivity. In the environment, microplastics can interact with and adsorb other environmental pollutants, which may alter their toxicity. This pilot project particularly focused on characterizing microplastics found in real-world lake environments and using them to create similar particles (mimetics) that can be used in replicable lab experiments.



Lisa DeLouise, PhD, MPD

In this pilot project, doctoral candidate Sarah Morgan exposed cells to debris collected from Lake Ontario and laboratory-produced environmental plastic particle mimetics. Debris isolated from Lake Ontario was found to contain plastic particles that were not toxic to cells but, in some cases, activated the aryl hydrocarbon receptor and regulated interleukin-6 production. The aryl hydrocarbon receptor and interleukin-6 are both involved in immune system regulation. This suggests that exposure to these plastic particles may impair cellular homeostasis. Exposure to the mimetics, created using various combinations of polystyrene, TCDD, and BPA, led to changes in receptor activity and polystyrene morphology that varied with time and mixture composition. Overall, this work highlights the complex interactions between microplastics and adsorbed chemicals. Additional studies to quantify the human health impacts of microplastics exposure will need to account for these interactions. To learn more about ongoing research on microplastics and human health in Rochester, see the “Rochester Research on Microplastics and Human Health” article in the Summer 2023 newsletter.

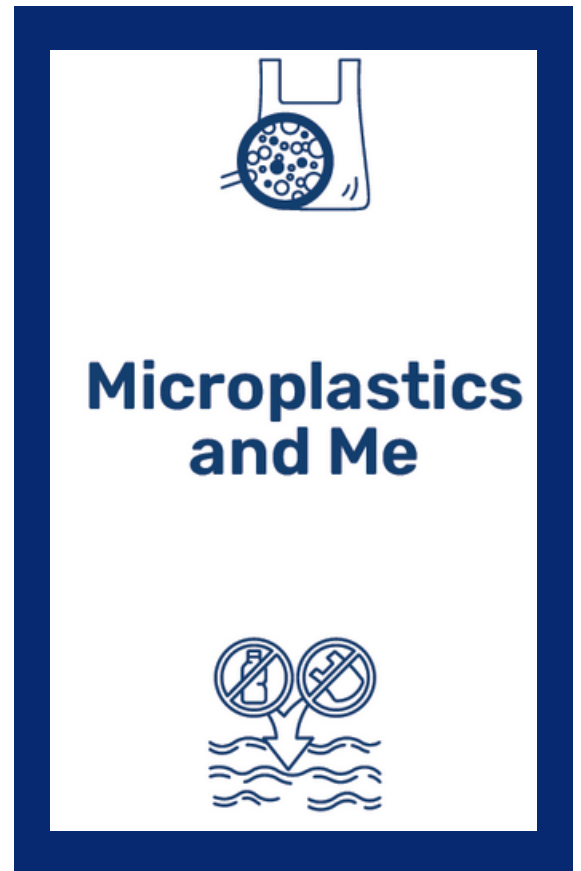
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Microplastics Human Health (continued)

Dr. DeLouise's pilot project grant also funded public outreach on microplastics and human health. University of Rochester undergraduate student Carole Wilay created a brochure to present an overview of current knowledge and ongoing research.

Titled "Microplastics and Me," the brochure was created with feedback from microplastics researchers, water education experts, and the general public. Carole piloted the brochure at events including the Seneca Park Zoo's park cleanups and the Brighton Farmer's Market. She found that people are interested and concerned about the issue of microplastics, their impact on the environment, and potential health risks.

[The brochure is available online.](#)



Center Member Highlights

In November 2023, Center Member Jill Halterman, MD, MPH, was named chair of the Department of Pediatrics and Physician-in-Chief of Golisano Children's Hospital. [Read more about Dr. Halterman from the URMC Newsroom.](#)



Center Member **Irfan Rahman**, PhD, was featured in the NIEHS website series, Stories of Success. This series tells the stories of the scientists behind NIEHS-supported research. Learn more about Dr. Rahman and his research on how smoking affects our circadian rhythms in the [August 2023 Stories of Success.](#)



Dr. Rahman was recently awarded an \$800,000 contract from the US Food and Drug Administration titled "Synthetic Coolant Aerosols – Chemical Constituents and In Vitro Respiratory Toxicity" for a new center that examines the respiratory toxicity of synthetic cooling agents in e-cigarettes.

Vulnerable Beginnings: Unraveling the Effects of Fetal PFAS Exposure on Infants

Insights from the Scheible Lab by Darline Castro-Meléndez, Immunology T32 trainee



Darline Castro-Meléndez

As a doctoral candidate in the lab of Kristin Scheible, MD, my work is driven by a desire to understand the intricate relationship between environmental exposures and human health outcomes, particularly during early life stages. I have dedicated my graduate research to investigating the impact of exposure to Per- and Polyfluoroalkyl substances (PFAS) during pregnancy on the immune system development of infants. My research project is part of a collaboration with the Rochester cohort of the National Institutes of Health (NIH)-sponsored national consortium, Environmental Influences of Child Health Outcomes (ECHO), led by Thomas O'Connor,

PhD. (For more about ECHO, see the Winter 2023 EHSC newsletter article "ECHO in Rochester".)

PFAS are a family of human-made chemicals originating from the 1930s, and they continue to be used in consumer products including food packaging, non-stick cooking surfaces, and water-resistant materials. This ubiquitous use is noteworthy because their durable carbon-fluorine bonds make the family of PFAS chemicals persistent for years without natural degradation, causing accumulation in the human body. This is why PFAS are known as “forever chemicals”.

Studies have measured these substances in newborns' placenta and cord blood, and declining maternal PFAS levels postpartum indicate that these chemicals are transferred to the fetus. This poses risks to growth and the proper development of vital fetal organs, including the liver, kidneys, and immune system. Specifically, PFAS exposure has been consistently associated with compromised vaccine responsiveness, suggesting that individuals exposed to PFAS may be more susceptible to infections.

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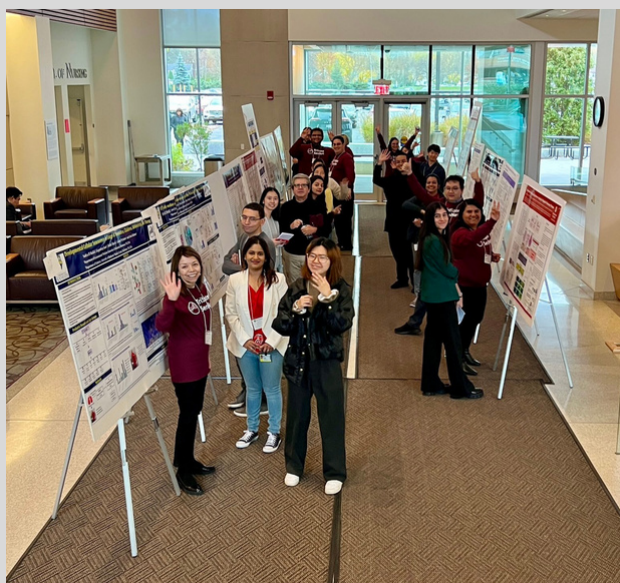
Vulnerable Beginnings (continued)

Early life is a crucial time for immune development, which starts during gestation and continues through childhood. T cells, a specific type of immune cell, begin to develop around week seven after conception and continue to mature through childhood, with different T cell subtypes established throughout time to meet the infants' needs. These cells orchestrate and regulate other arms of the immune system and contribute to creating long-lasting antibodies and memory cells essential for protection against vaccine-preventable diseases.

As part of my dissertation research, I have made significant progress in identifying specific T cell subtypes involved in antibody production that are negatively impacted by prenatal exposure to PFAS. My work provides insight into the changes in cellular composition that occur with exposure to PFAS. Our findings point to a potential molecular mechanism by which PFAS alters the immune response to vaccinations.

These findings emphasize the importance of understanding how early life exposures may disrupt the precise script of fetal development, potentially influencing long-term health outcomes for infants. I have presented my findings on PFAS exposure and infant immunity at national conferences and am currently preparing my first-author manuscript. By continuing to work on elucidating the connections between PFAS exposure and altered immune responses, I hope to safeguard the well-being of future generations.

URMC hosts Tristate SenNet Consortium



University of Rochester Medical Center hosted the TriState SenNet Consortium meeting on November 9 and 10, 2023. The Consortium, which includes the University of Pittsburgh, Ohio State University, Carnegie Mellon and the University of Rochester, studies cellular senescence in human tissues, seeking to understand the intricacies of aging at a cellular level. EHSC Center Member Michael O'Reilly, PhD, gave the Keynote Seminar, "Oxygen: More than a Gas to Breathe." Sadiya Shaikh, PhD, a postdoctoral scholar in Irfan Rahman's lab, won 3rd place for her poster presentation.

Celebrating 50 Years of Toxicology Training

In August, our Toxicology Training program's T32 training grant was renewed for another five years, bringing the program to 50 consecutive years of training the next generation of toxicologists. Alumni of the program have made important contributions to toxicological science, environmental health, regulatory guidelines and public policy.

The Toxicology Training Program is co-directed by Drs. Alison Elder and Matt Rand. They credit the emphasis on interdisciplinary training and a strong sense of community for the program's success. Students are exposed to a wide range of disciplines, including biochemistry, pharmacology, neuroscience, and epidemiology, which prepares them to address the complex challenges of the field. This integrated transdisciplinary approach has been the program's backbone for five decades.

The field of toxicology has evolved significantly over the years, from evaluating consequences of exposure to toxic substances via broad endpoints like birth defects or mortality to interrogating more sensitive, mechanisms-driven, and widely applicable endpoints like neuro-behavioral deficits, epigenetic changes, genetic and metabolic dysregulation, inflammation, and delayed onset of disease. Such endpoints better enable translation to risk assessment for human health.



Trainees dressed up like program co-director Matt Rand for the Environmental Medicine Department's Halloween party.

Toxicology Training Program alumni regularly return to campus to give lectures and to serve as outside mentors for trainees. Alumni are an invaluable bridge for trainees to real-world cutting-edge research trends, ultimately creating the rich and unique experience that the Toxicology Training Program is highly regarded for, both on campus and nationally.

Adapted from:

<https://www.urmc.rochester.edu/education/graduate/phd/toxicology/news/?start=01-01-2023&end=12-31-2023#newsItem6663>

Toxicology Trainee Fall 2023 News and Awards

- **Dr. Thomas Lamb Jr.**, mentored by Dr. Irfan Rahman, successfully defended his dissertation.
- **Ryan Owens**, mentored by Dr. Regina Rowe, received a Master's degree and advanced to PhD candidacy.
- **Nashae Prout**, mentored by Dr. Tom O'Connor, received a Master's degree and advanced to PhD candidacy.
- **Elizabeth Plunk**, mentored by Dr. Ania Majewska, received a Ruth L. Kirschstein Predoctoral Individual National Research Service Award (F31) from the NIEHS.
- **Emily Quarato**, mentored by Dr. Laura Calvi, received the Graduate Student Award for Excellence in Equity and Inclusion at the University of Rochester 2023 Graduate Education and Postdoctoral Affairs Awards.
- **Catherine Caballero**, a first-year graduate student, received a UR School of Medicine and Dentistry Meliora Scholarship at the 2023 Graduate Education and Postdoctoral Affairs awards.
- **Alex Strohm**, mentored by Dr. Ania Majewska, received the 2023-2024 Wright Goodman Dissertation Fellowship.



Celebrating the Toxicology Trainees recognized at the 2023 Graduate Education and Postdoctoral Affairs awards ceremony.

Introducing the Newest Toxicology Trainees

The Toxicology Training Program welcomed six new doctoral program trainees in August 2023.

Aiden Straut

Education Background: BS in Biochemistry and Molecular Biology and in Chemistry from Stockton University



Catherine (Cat) Caballero

Education Background: BS in Chemistry with a minor in Biology from San Houston State University



Ethan Lewis

Education Background: BS in Biochemistry with minor in French and Francophone studies from Hobart and Williams Smith Colleges



Jackie Agyemang

Education Background: BS in Biology and BA in Public Policy with a minor in Environmental Studies from St. Mary's College of Maryland



Jessica Enos

Education Background: BS in Forensic Science with a minor in Physics from University of New Haven; MS in Forensic Science from Arcadia University



Marissa Skulsky

Education Background: BS in Forensic Chemistry with minors in Biological Science and Intelligence and Security Studies from University of Mississippi



For Questions or Comments, Please Contact:

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