

Summer 2017



Your Health & The Environment



News from the University of Rochester Environmental Health Sciences Center

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Connecting chemical exposures and the human immune system

EHSC center member Todd Jusko, PhD, is an environmental epidemiologist with a primary appointment in the Epidemiology Division of the Department of Public Health Sciences. Jusko's research focuses on how environmental chemicals contribute to adverse immunological development over the entire lifespan. Since coming to Rochester in 2013, Jusko has built on existing research partnerships and developed new ones to better understand the relationship between common chemical exposures and immune system function.

Jusko is part of a long-standing partnership with researchers in Slovakia, where, as a result of historic industrial contamination, people continue to be exposed to certain persistent organic chemicals at higher rates than in the U.S. As a graduate student, Jusko was awarded a Fulbright scholarship to complete his dissertation work on PCBs and immune system function while living in Bratislava, Slovakia. This provided an opportunity to work closely with his colleagues at Slovak Medical University. Recently, this group has been studying the relationship between persistent organic chemicals in children's blood and their immune response following vaccination. Jusko and colleagues, including Paige Lawrence, PhD, recently published a paper in *Environmental Health Perspectives* that reported an association between high levels of exposure to DDE (the main breakdown product of the insecticide DDT) and polychlorinated biphenyls (PCBs) and poor immune response to tuberculosis vaccination (*Mycobacterium bovis* bacille Calmette–Guérin [BCG]). This reduced immune response may indicate reduced effectiveness of the vaccine, and suggests that environmental exposures may explain some of the variation in the effectiveness of vaccines. As Jusko said, “Our work provides a foundation for how these types of chemicals affect the developing immune system in infants around the world.” Jusko and Lawrence recently submitted a multi-PI R01 grant proposal to NIH, with the goal of continuing to follow the Slovak cohort through adolescence. This project would examine the durability of the BCG vaccine received during infancy, which is designed to provide lifelong resistance to tuberculosis.



Jusko TA, et al. 2016. A birth cohort study of maternal and infant serum PCB-153 and DDE concentrations and responses to infant tuberculosis vaccination. *Environ Health Perspect* 124:813–821; <http://dx.doi.org/10.1289/ehp.1510101>

Connecting chemical exposures and the human immune system continued...

Enough PCBs remain in Lake Ontario fish that women of childbearing age and children under age 15 are advised not to eat fish. Nonetheless, community surveys done by the EHSC COEC, as well as ongoing angler surveys by NYSDOH, suggest that certain subsistence fishing communities do not heed this advice. The NYSDOH fish consumption guidelines are based on developmental effects of PCB. Jusko's research suggests that depressed immune responses may also be a concern if children are exposed to elevated levels of these chemicals from fish consumption or other sources. Jusko notes that although PCB concentrations in the Slovak population are about 15-20 times higher than U.S. levels in pregnant women, the range of exposure in Slovakia is considerable and thus allows for analyses of health effects at lower levels of exposure that may be relevant to U.S. populations.

In addition to Jusko's long-standing work on persistent organic chemicals in Slovakian cohorts, he has begun to explore poly- and perfluorinated chemical exposures and their mixtures in relation to immune function in U.S. populations through a partnership with URM's Mary Caserta, MD, and EHSC member Gloria Pryhuber MD. Pryhuber and Caserta have been examining the development of the infant immune system in term and preterm infants. Leveraging this existing cohort, Jusko and Lawrence have been able to collaborate with Pryhuber, a neonatologist, and Caserta, a pediatric infectious disease specialist. "We're extremely fortunate to have existing, local cohorts with innovative and high-quality immune endpoints," says Jusko. This collaborative effort was motivated by EHSC pilot grants that Jusko and Lawrence received.

In addition to persistent organic pollutants, Jusko has an interest in the health effects of heavy metal exposure, stemming from his participation in the Rochester Lead Study. He recently received a small grant from the Centers for Disease Control and Prevention to examine the potential immune effects of lead exposure among a cohort of children living in Mexico City. This is a collaborative project with Mt. Sinai EHSC Director Robert Wright, MD.

Current Approaches to Exposure Assessment in Environmental Health Sciences Symposium

On May 4th, the University of Rochester hosted environmental scientists from seven national and international academic institutions at the “Current Approaches to Exposure Assessment in Environmental Health Sciences Symposium.” The event was supported by the University’s Center for Energy & the Environment (CEE) and Environmental Health Sciences Center (EHSC). The event was organized by EHSC members Edwin van Wijngaarden, PhD and David Rich, ScD (who is also co-director of the CEE), with support from CEE’s Jennifer Steward, MS. Earlier this year, the UR-CEE issued a call for proposals for a symposium that would “establish new collaborations or enhance current ones in research areas of particular interest to Rochester faculty.” Rich and van Wijngaarden noted that this call for proposals coincided with efforts within EHSC to establish a new exposure core (see article below on the “EXPAND core”). They also noted that an event focusing on exposure assessment science would be of interest to both CEE and EHSC members. The symposium

aimed to educate and update attendees on state-of-the-art approaches and recent developments in exposure biomarker development and exposure assessment methodologies for use in toxicological, epidemiologic, and related environmental health studies. Approximately 60 people from across the University of Rochester and multiple New York State and regional academic and governmental institutions attended the symposium, which included presentations from the visiting researchers, an introduction to the EXPAND core, and a poster session.



EXPAND Core

During the “Current Approaches to Exposure Assessment in Environmental Health Sciences Symposium,” Environmental Health Sciences Center (EHSC) and Environmental Medicine Faculty member Matt Rand, PhD presented the EHSC’s new EXPAND (EXposure, ANalytical and Dose) Core. The EXPAND Core’s primary objective is to “support the needs of center investigators to improve current analyses and develop new approaches to characterize the composition and fate of toxic agents in various models.”

Rand will direct the Center, along with Alison Elder, PhD, and Gene Watson DDS, PhD, who will act as the consultation team for center members who need to access exposure assessment resources. The EXPAND Core will also have two technical staff members, Tom Scrimale and Bob Gelein. The technical team will be responsible for performing the analyses, overseeing instrument operations and interfacing with investigators.

Rand envisions that this core will “build on existing strengths in elemental and metals analyses and exposure facilities currently in place in our Center and the Environmental Medicine Department.” The Core will also incorporate new analytical capabilities including Perkin Elmer ICP-MS NexION 2000 and the ICP-OES Avio 200 instruments. In addition, Rand noted that the “EXPAND Core will create relationships with other specialty analytical cores at other NIEHS Centers as well as hopefully consolidating and preserving analytical and exposure capabilities we currently have across various facilities.”



Toxicology Training Program Annual Retreat Keynote Lecture

The keynote speaker for the June 2017 Toxicology Training Program Annual Retreat was Andrea Baccarelli, M.D., Ph.D., Chair and Leon Hess Professor, Department of Environmental Health Science at Columbia University Mailman School of Public Health.



Dr. Baccarelli explained how environmental signals modify gene expression and cell functions, and thereby change health trajectories. He discussed the role of environmental hazards on aging populations, using examples of molecular effects of air pollution exposure. The presentation focused on different possible ways to mitigate the effects of environmental exposures, highlighting nutrition, B vitamin supplementation more specifically, as a potential approach.

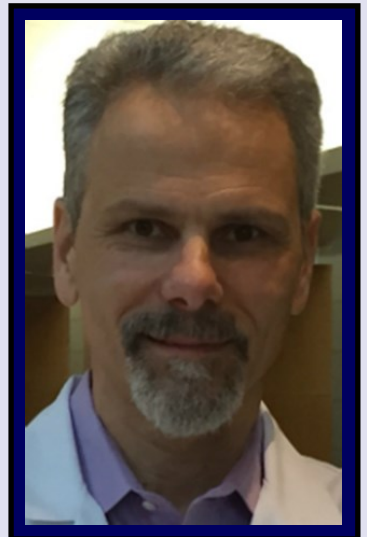
Steve N. Georas Named to New Parkes Professorship

Physician-scientist Steve N. Georas, M.D., professor of Medicine, Environmental Medicine, Microbiology and Immunology, was installed as the inaugural Parkes Family Professor June 5.

Georas is part of the collaborative teams caring for patients in the Medical Intensive Care Units at UR Medicine's Strong Memorial and Highland hospitals, as well at Mary M. Parkes Center for Asthma, Allergy and Pulmonary Care.

"Steve Georas' clinical and scientific contributions are integral to the advancement of our programs and benefit our patients on a daily basis," said Patricia Sime, M.D., Chief of Pulmonary Diseases and Critical Care and the C. Jane Davis and C. Robert Davis Distinguished Professor in Pulmonary Medicine. "Dr. Georas is an internationally recognized physician-scientist who has focused his career on advancing our understanding of the fundamental causes of asthma and translating his research to improve the care of patients with asthma."

Georas is studying how the lung's immune system responds to inhaled particles, allergens and viruses, and how this process breaks down in asthma leading to potentially dangerous immune responses that can cause allergic airway inflammation and difficulty breathing. He is also working to develop techniques to identify people who are at greater risk of developing life-threatening asthma and need intensive therapies.



Steve N. Georas Named to New Parkes Professorship Continued...

“The support we’ve received from the Parkes family for our asthma research is invaluable and has allowed us to make steady progress toward new pathways for asthma treatment,” Georas said. He is an internationally recognized thought leader in asthma research, and has served on advisory committees to the U.S. Food and Drug Administration, National Institutes of Health and numerous professional societies. Later this year he will chair the NIH panel review for the PreclSE Asthma Network, which will establish the next generation of asthma centers developing personalized treatments for severe asthmatics.

Jeff Wyatt: Sturgeon as Bio-Indicators of Environmental Health in the Genesee River



Jeffrey Wyatt, DVM, MPH, Director and Professor of Comparative Medicine, has been working on a decade-long study to monitor toxicants in sturgeon that have been re-introduced to the Genesee River to monitor the toxicants in the Genesee and Lake Ontario.

Lake sturgeon are the largest – and the oldest – freshwater fish species in Upstate New York’s waters. The species dates back to the time when dinosaurs roamed the earth. Sturgeon were eliminated from the Genesee River as a result of overfishing and habitat degradation by the 1980s and are considered a threatened species. An annual program of hatchery-reared sturgeon reintroduction was begun in the Genesee River in 2003. For the last six years, Wyatt has worked with collaborators from the US Geologic Survey to net and take blood samples from the sturgeon and test them for heavy metals, PCBs and other contaminants. In addition to helping to monitor the population of reintroduced sturgeon, this work has developed the potential to use the fish as long-term biomonitors of water quality in the lower Genesee River and Lake Ontario. Although it is illegal to possess sturgeon, their successful reintroduction raises the potential for subsistence fish consumption of chemically contaminated fish. The COEC is working with Wyatt to explore outreach approaches focused on refugee and immigrant populations about the ecological and human health risks of consuming these fish.

Wyatt was invited to give a presentation, “**Sturgeon as Bio-Indicators of and Ambassadors for the Genesee River and Watershed Environmental Health**”, to the bi-annual EHSC Community Advisory Board meeting held May 12th, 2017 at the Monroe County Department of Health. Wyatt also presented his work at the “Current Approaches to Exposure Assessment in Environmental Health Sciences Symposium” Poster Session on May 4th.

Margaret Murphy: Human Health Implications of Microplastics in the Aquatic Environment

The Environmental Health Sciences Center welcomed Margaret Murphy, PhD, to Rochester on May 3-4. Murphy is an AAAS Science & Technology Policy Fellow hosted by the United States Environmental Protection Agency (USEPA) Office of Water, Marine Pollution Control Branch.

Murphy gave two presentations during her time at the University of Rochester, both on her fellowship work with the USEPA on microplastics in the environment. Faculty and students participated in a research workshop titled, "Microplastics and human health: Ubiquity, uncertainty, and future research needs." Later in the day she gave a public presentation on "Microplastics in the environment: A 'small' problem that needs big thinking." Community members, students, staff, and faculty from the Rochester region learned about this issue of growing global concern and its implications in Lake Ontario. Murphy also presented a poster as part of the "Current Approaches to Exposure Assessment in Environmental Health Sciences Symposium" on May 4.



Grant Helps Build Understanding of Environmental Health with Hands-on Science Kits

EHSC faculty members Katrina Korfmacher, PhD and Dina Markowitz, PhD and COEC Program Manager Cait Fallon are partnering with Science Take-Out, LLC on a nearly \$1 million, two-year grant from the National Institute of Environmental Health Sciences (NIEHS) to further develop a line of hands-on environmental health science kits for use in community settings. The Phase II Small Business Technology Transfer (STTR) grant will support modification of Science Take-Out's current line of environmental health education kits for broader use. The kits will help teachers and community educators increase the public's understanding of how the environment can affect human health.

Educating students and the general public about the link between the environment and their health allows them to make informed decisions and change their behavior to protect themselves from environmental exposures. Korfmacher and Markowitz previously partnered with Science Take-Out on a Phase I STTR grant to develop and test the eight current environmental health kits, which range from lessons on breast cancer to lead poisoning prevention. The kits provide a convenient and cost-effective way for teachers to incorporate engaging environmental health science activities into their classrooms.

The University of Rochester COEC will collaborate on this Phase II project with environmental health community engagement staff from the University of North Carolina at Chapel Hill COEC, the University of Texas Medical Branch

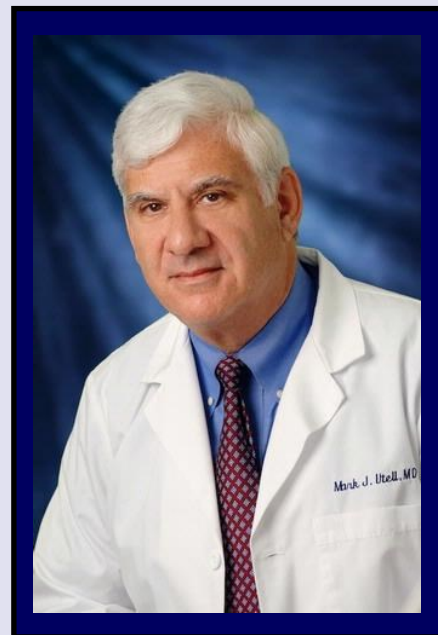


COEC, and West Harlem Environmental Action to adapt the kits for use outside of the classroom. The kits will then undergo extensive field testing to ensure they are relevant and accessible to diverse community audiences. The new 'community kits' will support environmental health engagement activities throughout the country. The team hopes the new grant will help them develop a cost-effective way to promote hands-on environmental health education for the general public.

Utell Chairs NAS Committee on Review of EPA's Science to Achieve Results (STAR) Program

Center member Mark Utell, MD, served as Chair of a National Academies of Sciences committee charged with reviewing Science to Achieve Results (STAR), the U.S. Environmental Protection Agency's (EPA) primary extramural grants program. STAR has played an integral role in addressing environmental and human health research priorities that help improve air and drinking water quality and protect children's health, among other outcomes. The committee released its report in June 2017, recommending that the agency should continue to use the program to respond to the nation's emerging environmental challenges.

Established in 1995, the STAR program provides research grants to support individual investigators, multidisciplinary centers, and graduate fellows. According to the committee's report, the results of research funded by STAR grants have enabled improvements in public health, and some have also had the potential to lead to a reduction in the cost of regulatory compliance for industries, states, and localities by providing improved environmental testing and modeling methods, says the report. Reflecting on the committee's work, Utell noted: "We are faced with complex old and new environmental challenges that require strategic investigation and STAR has fostered collaborative research that has impacted the public health. Programs such as the Children's Health Centers, Particulate Matter Centers (including one at Rochester some years ago), and student fellowships have had origins in STAR. It has been a major mechanism for bringing new people into environmental research careers and hopefully will continue to thrive despite remarkable political pressures."



The full report may be ordered or downloaded free of charge at: <https://www.nap.edu/catalog/24757/a-review-of-the-environmental-protection-agencys-science-to-achieve-results-research-program>

Toxicology Trainee News

Elissa Wong: Won the Kenneth Warren Merit Award from the FASDSG (fetal alcohol spectrum disorder study group). She will be presented her research in Denver, June 24th, 2017. This is a travel award given to one recipient each year for 'outstanding research in the field of FASD.'

Claire McCarthy: Gave a talk on "Studying Biologic Mechanisms of Household Air Pollution-Inducing Diseases" during the symposium, "Catching Fire: The Global Health Issue of Household Air Pollution," at the 2017 American Thoracic Society (ATS) International Conference. McCarthy was also the recipient of a Trainee Abstract Award from the ATS Environmental, Occupational, and Population Health Assembly for her poster presentation.

Lisa Prince: Received the SOT Graduate Student Travel Award to present a poster at the 2017 Annual Society of Toxicology meeting in Baltimore.