

Your Health & The Environment

News from the
University of Rochester
Environmental Health
Sciences Center

Summer 2011



Collaboration can enhance research by introducing a wide variety of expertise, experience and resources. Researchers have long recognized the importance of collaboration to advancing science. However, traditional funding mechanisms, disciplinary specialization, and academic institutions frequently pose barriers to working together. So how can collaboration be supported and increased? Promoting collaboration requires an understanding of how research partnerships begin, and what makes them successful. The University of Rochester Environmental Health Sciences Center (EHSC) has a long history of supporting collaborative research, both among University of Rochester faculty, and with colleagues at other institutions. In this issue, we highlight a collaborative project between two center researchers, explore how it has evolved, and illustrate additional collaborative efforts that these scientists have developed with others.

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A Tale of Two Labs: Part One

Identifying the effects of environmental exposures on lung development

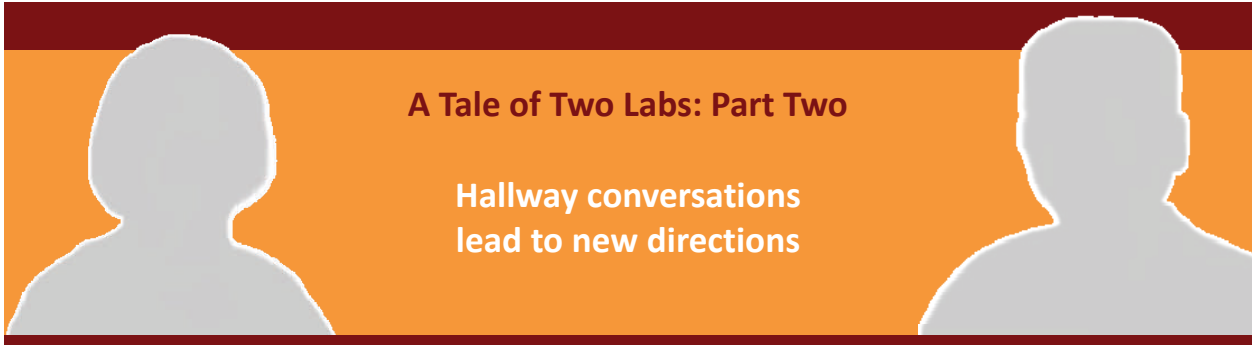


B. Paige Lawrence, PhD, is an immunologist with faculty appointments in Environmental Medicine and Microbiology and Immunology. Two of her current projects, funded by the National Institute of Environmental Health Sciences (NIEHS), focus on how maternal exposure to chemicals from our environment affects the development and function of the immune system. One study focuses on the chemical bisphenol A (BPA), with research on how developmental exposure to BPA affects the onset and severity of several immune-mediated diseases, including asthma and inflammatory bowel disease. The other study researches how signals sent through the aryl hydrocarbon receptor (AhR) cause long-lasting effects on the immune system's response to infection. The AhR binds dioxins and other environmental pollutants, and Dr. Lawrence's research has shown that early life exposure to dioxin reprograms T cells to respond more poorly to infection. Dr. Lawrence suspects that inappropriate activation of AhR by dioxin during immune system development changes how genes are expressed and ultimately changes the immune system's response to infection. This research addresses the growing concern about how environmental factors, such as pollutants, contribute to disease.

Michael O'Reilly, PhD, is a molecular biologist with faculty appointments in Pediatrics, Environmental Medicine, and Oncology. Two grants from the National Heart, Lung, and Blood Institute (NHLBI) and the March of Dimes Foundation currently fund Dr. O'Reilly to study how lung development in premature infants is disrupted by neonatal oxygen treatments. Because lungs of children born prematurely are often underdeveloped, they often require treatment with oxygen and mild ventilation. While this is essential for survival of these fragile babies, the prolonged use of excess oxygen can cause bronchopulmonary dysplasia (BPD), a chronic form of lung disease attributed to oxygen inhibiting normal lung development. Children born prematurely often have reduced lung function, increased asthmatic-like symptoms, increased sensitivity to viral infections, vulnerability to secondhand smoke, high blood pressure, and neurodevelopmental delay. Dr. O'Reilly's research explores possible mechanisms for these effects including the hypothesis that oxygen-induced damage to mitochondria activates signals that reprogram lung development. His research also investigates how altered lung development increases sensitivity to viral infections by reducing the number of anti-viral cells important for defense against respiratory viral infections. Discovering how neonatal oxygen influences normal growth of the lung and other organs, such as the brain, may lead to new treatments and better care for premature infants. Such findings could also save a significant amount of money – in 2005, almost \$27 billion was spent treating premature infants; \$2.5 billion alone was spent treating BPD.



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A Tale of Two Labs: Part Two

Hallway conversations
lead to new directions

Working in adjacent labs, Drs. Lawrence and O’Reilly often see each other in the hallway and stop for brief conversations. Through these interactions, they began to see similarities and potential connections between Dr. Lawrence’s work on developmental changes to the body’s immune system response and Dr. O’Reilly’s work on neonatal oxygen exposure. Together, they applied for and received pilot project funding from the EHSC, and co-developed a mouse model to study how short-term oxygen exposure for premature infants impairs the response to influenza A infections later in life. Working together, Drs. Lawrence and O’Reilly found that neonatal oxygen supplementation alters the lung’s response to influenza A infection. Mice that were exposed to neonatal oxygen exhibited persistent inflammation, scarring of lung tissues, and increased mortality. Using the data from the EHSC pilot project, Lawrence and O’Reilly obtained a 5-year R01 grant from the National Institutes of Health (NIH) that tests the hypothesis that high oxygen supplementation increases sensitivity to respiratory viral infections by reducing ability of the lung to effectively clear the virus. Their current study looks at three possible ways in which this change is made, using both mouse models and human subjects. The researchers hope this work will help identify new therapeutic opportunities for premature infants.

New Building Designed to Encourage Collaborative Thinking

In April 2011, the University of Rochester Medical Center opened the Saunders Building, the new home of the Clinical and Translational Science Institute (CTSI) as well as a number of other academic programs, including EHSC researchers in the Seychelles project, Biostatistics, and Community and Preventive Medicine. The Saunders Building is the University’s first Leadership in Energy and Environmental Design (LEED)-certified building on campus. In addition to its “green” design features, the workspaces in the Saunders building were designed to facilitate teamwork and interaction between researchers to more effectively translate basic research into health solutions. EHSC has been promoting interdisciplinary cooperation between faculty for decades, including the partnership between Dr. O’Reilly and Dr. Lawrence featured in this newsletter. Drs. O’Reilly and Lawrence attribute the initial idea for this collaboration to their hallway conversations in the Kornberg Medical Research Building. The University hopes that interactions between researchers in the new Saunders building will yield many more such collaborations in the future.



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A Tale of Two Labs: Part Three

Branching out

In addition to their work together, Drs. Lawrence and O'Reilly have branched out in other collaborative efforts as well. Below are two examples of collaborations established through their labs.

Studies have shown that in addition to reduced lung function, premature birth may also affect nervous system development. Undergraduate student Ysabella Esteban, a Strong Children's Summer Scholar studying neonatal oxygen exposure in the O'Reilly lab, expressed interest in working on neurodevelopment. Dr. O'Reilly saw an opportunity to connect Esteban with EHSC researcher Dr. Deborah Cory-Slechta, who studies the contribution of environmental chemical exposures to nervous system diseases and disorders.

Previous studies of school-age children have demonstrated an increased risk of poor school achievement for children exposed to neonatal oxygen, but other factors such as home environment and socioeconomic status could also influence the results. A mouse model allows researchers to eliminate confounding factors to look for a specific mechanism for the effects. O'Reilly and Cory-Slechta collaborated to help Esteban develop a three-step mouse model to investigate whether adult male mice exposed to neonatal oxygen have altered motor functions.

Preliminary results from Esteban's findings indicate that neonatal oxygen exposure affects locomotor activity in adult male mice. More research is required to confirm Esteban's initial finding, and to determine the mechanisms by which oxygen causes these changes. Meanwhile, Esteban's work with the O'Reilly and Cory-Slechta labs has already initiated new collaboration between the two researchers, who have applied for funding to continue the research. Speaking positively about her experience, Esteban notes that she found the collaborative approach to be beneficial in many ways. Having access to researchers with varied expertise helped "move the project more quickly" by increasing the available knowledge base.

Ysabella Esteban



Undergraduate Student
Class of 2012
Seton Hall University, Orange, NJ

Tyler Beach



Biology Teacher
Athena High School
Greece, NY

Dr. Lawrence's collaborations have extended to work with a local high school science teacher. The standard high school science curriculum provides a broad overview of basic scientific concepts. Beyond the basic courses, however, it can be difficult for high school students interested in science to find ways of expanding their interests. To respond to these students' interests, a local biology teacher from Greece Athena High School, Tyler Beach, offers a three-year elective introducing students to various types of research. In an effort to make the class more valuable for his students, Mr. Beach frequently pursues new experiences and materials in research education, and has been a participant in professional development programs offered through the Life Sciences Learning Center. This summer, he was able to gain research experience for himself at the EHSC that will enrich his students' experience in the coming years.

With funding by an NIEHS administrative supplement grant, Beach was able to partner with Dr. Lawrence to further his understanding of modern DNA and genomic research techniques. He first learned about Dr. Lawrence's lab when one of his students worked there for a year gaining hands-on experience. This summer, Beach conducted laboratory experiments, working closely with researchers in the Lawrence lab to learn more about current techniques used in toxicology research. With each new test, Beach was introduced to the basic immunological, biochemical or toxicological concept and how it applied to immunotoxicology research overall. Reflecting on this experience, Beach emphasized that it "has provided insight into the procedures that [my] students are doing, and created an opportunity to provide higher quality experiences for students interested in science." Not only has this experience helped him discover ways to help students understand the processes and real-life applications for research, but it has also been an "eye opener for all of the different careers" that a student interested in science can choose from. Dr. Lawrence and Mr. Beach plan to continue their interactions throughout the school year through additional lab opportunities for students or visits by Dr. Lawrence to the classroom.

EHSC Faculty Reaches Out

Many of our Center's researchers have been involved in various forms of community outreach this year. For example, Dr. Deborah Cory-Slechta participated in a Collaborative on Health and Environment (CHE) partnership conference call in May where participants discussed the many barriers to risk assessment for policy makers and how to address them. In 2009, the National Academy published "Science and Decisions: Advancing Risk Assessment," a guide to addressing risk assessment concerns. Dr. Cory-Slechta, along with two other panelists, provided an overview of these guidelines and participated in discussion.

Dr. Irfan Rahman has been involved in responding to community questions regarding lung health. His response to a reader concerned about the residual effects of past cigarette smoke inhalation is in the May 2011 edition of Men's Health Magazine. Dr. Rahman's response suggested consuming at least one serving of foods rich in antioxidants at each meal to help clear the body of free radicals. Dr. Rahman also participated in an NIH/NHLBI workshop on genomic medicine and lung diseases, and co-chaired a study session for NIH/NHLBI in July.

A number of EHSC faculty have also been highlighted by University of Rochester media. To view an archive of these articles to date, please visit:

http://www2.envmed.rochester.edu/envmed/ehscx/live/urmc_news_archive.html

EHSC-Hosted Events

The Toxicology program hosted its annual retreat on June 3rd. The day was packed with faculty workshops, student presentations, and a keynote lecture by James D. Yager, PhD, Senior Associate Dean for Academic Affairs and Professor of Preventive Medicine at Johns Hopkins University. Dr. Yager identified opportunities and challenges for preventing breast cancer, considering both endogenous (within the body) and environmental causes of the disease. The EHSC's Community Outreach and Engagement Core (COEC) invited community members from the Breast Cancer Coalition of Rochester (BCCR) to attend Dr. Yager's talk, followed by a post-lecture discussion and question and answer session led by COEC members. BCCR members were particularly interested in Dr. Yager's observations about uncertainty and the scientific process.

The EHSC also hosted a public talk at URMCC on July 20th by Bernard Goldstein, PhD, Professor of Environmental and Occupational Health and Interim Director of the Center for Healthy Environments and Communities at the University of Pittsburgh. Over 200 people came to hear Dr. Goldstein discuss the potential health impacts of natural gas development through horizontal hydraulic hydrofracturing ("hydrofracking") of the Marcellus Shale. Dr. Goldstein discussed the wide array of potential environmental health risks of natural gas development in this region, including the potential for increased air pollution, worker health and safety issues, noise pollution, chemical contamination of drinking water resources, and psychosocial disruption. In response to the strong public interest in this topic, Dr. Goldstein's talk has been posted on the EHSC web site (www2.envmed.rochester.edu/envmed/EHSC/outreach/coec/ShaleGasDevelopment.html).

Welcome, New Students!



The Toxicology Training program welcomed five new students this fall:

Christiaan King (Smith College)

Ashley Lopez (University of Texas El Paso)

Melissa Louis-Juste (Dominican College)

Claire McCarthy (Hiram College)

Michael Rudy (University of Colorado, Colorado Springs)

Congrats, Grads!

Three Toxicology Training students received their PhDs this year:

Fanny Casado

Mike Madejczyk

Jon Holz

Four Toxicology Training students passed their qualifying exams and received an MS this year:

Brad Buczynski

Danny Dever

Brittany Baisch

Marta Ekstrom



If you have questions or comments about this newsletter, please contact Valerie_George@urmc.rochester.edu