National Institute of Environmental Health Sciences

Superfund Research Program

e-Posted Notes

SRP Annual Meeting Special Edition

E-POSTED NOTES SPECIAL EDITION: 2019 SRP ANNUAL MEETING

SRP Annual Meeting a Success

The NIEHS Superfund Research Program (SRP) 2019 Annual Meeting, held November 18-20 in Seattle, brought together more than 400 researchers, administrators, trainees, and partners from across the country to share findings and discuss their experiences.

This special edition of e-Posted Notes provides a recap of sessions, photos, and other moments throughout the week. Thanks to everyone involved and a special note of thanks to the organizers from the University of Washington (UW) and the University of Louisville (UofL) for making the meeting such a success!

For more information about the meeting and the accompanying Duwamish River tour, see the NIEHS Environmental Factor article.

Welcoming Grantees

SRP-funded researchers came from around the country to the annual meeting, where they shared innovative research to promote environmental health.

Talks and events featured innovative SRP-funded projects that promote environmental health, particularly research driven by early-stage investigators and trainees. The meeting centered on “Data to Knowledge to Action” and emphasized how fundamental research has stimulated knowledge translation, training, and prevention and intervention activities. Presenters discussed novel techniques to evaluate the effects of hazardous substances, new exposure science and detection technologies, and remediation strategies. The meeting also highlighted the importance of engaging with local communities and included perspectives from members of the Duwamish River Cleanup Coalition, a UW SRP Center community partner.

The meeting kicked off with UW Center Director **Evan Gallagher**, who introduced **Ken Workman** of the Duwamish Tribe. Workman began the event with a land acknowledgement and tribal blessing. Workman discussed the importance of living sustainably and cleaning up lands.

Workman is a Duwamish Tribal Council member and great-great-great-great-great grandson of Chief Si'ahl, a Duwamish chief and namesake of the city of Seattle.

Hilary Godwin, dean of the UW School of Public Health, thanked everyone for attending and discussed the value of the Centers in providing resources for transdisciplinary research and community engagement. NIEHS Acting Director **Rick Woychik** provided remarks via video, emphasizing the data science strategic priorities of the institute and how the SRP has remained at the forefront of achieving those priorities.

The second day began with remarks by SRP Director **Bill Suk**, who emphasized the importance of training the next generation of environmental health scientists and described data sharing, integration, and reuse initiatives being implemented to enhance the SRP. This included awarding administrative supplements to accelerate translation of data to knowledge to action.

KEYNOTE SPEAKERS DESCRIBE IMPORTANT RESEARCH ADVANCES

Julia Cui: Environmental Chemical Exposures and the Gut Microbiome

Julia Cui, a UW professor, described the gut microbiome as the "second genome" for precision medicine, indicating that it may explain many of the differences in why people break down chemicals and pharmaceuticals differently. She explained how the gut microbiome can contribute to the breakdown of chemicals directly in the gut and indirectly through microbial metabolites that get into the blood and can affect chemicals in other organs. She described findings from her work to understand how the gut microbiome can modify the effects of polybrominated diphenyl ethers (PBDEs) on the liver.

Andrew Whitehead: The Genomic Basis of Adaptation to Pollution

Through his research, Whitehead seeks to understand how genomes integrate cues from, respond to, and are shaped by the external environment.

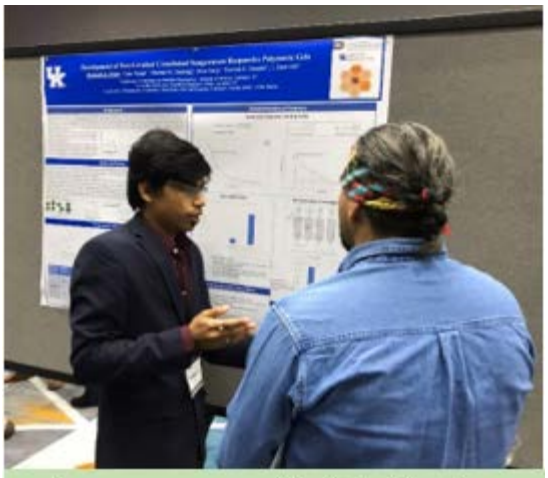
University of California, Davis (UC Davis) professor **Andrew Whitehead** explained his work to understand how killifish have rapidly adapted to pollutants. By looking for signatures of natural selection in the whole genome, he found that most selection footprints are not shared among killifish populations in different areas except at a few key regions, including regions of the aryl hydrocarbon receptor (AhR) pathway, which is involved in the regulation of various biological responses and cell maintenance in the body. He has found that different variants are important in different populations. He also found that rapid adaptation of killifish in a polluted region in the Houston Ship Channel actually came from the introduction of a pollutant-resistant Atlantic Coast species.

MAIN MEETING SESSIONS: SCIENTIFIC INNOVATIONS

Session 1: Highlighting KC Donnelly Awardees

In the first scientific session, KC Donnelly Externship Award winners, including seven of the 2018 Winners, described the interesting and innovative research they performed during their experience at another SRP Center or at a government agency.

- Northeastern University postdoc **Stephanie Eick** worked with Craig Steinmaus and other University of California, Berkeley (UC Berkeley) researchers to identify links between socioeconomic status, arsenic exposure, and type 2 diabetes.
- **Anne Nigra**, a Ph.D. student at Columbia University, is assessing exposure to mercury in a Northern Great Plains tribal region, a project she is conducting with Carlyle Ducheneaux at the Cheyenne River Sioux Tribe's Department of Environmental and Natural Resources in Eagle Butte, South Dakota.
- University of Arizona (UA) postdoc **Priyanka Kushwaha** traveled to the University of California, San Diego (UC San Diego) Center to work with Julian Schroeder to explore how compost amendments can influence the relationships between plant gene expression and microbial community diversity when plants are being used for remediation of mine waste.
- **Rishabh Shah**, a Ph.D. student at the University of Kentucky (UK), worked with Upal Ghosh at the University of Maryland, Baltimore County (UMBC) to develop innovative polymers to be used in passive samplers to capture polychlorinated biphenyls (PCBs) in the environment.



At the poster session, Shah, left, delved into his experimental setup to develop passive samplers.

Session 2: Human Health Research

The second session highlighted work by SRP-funded scientists to advance detection, assessment, and evaluation of the effect of hazardous substances on human health.

- **Amanda Armijo**, a postdoc at the Massachusetts Institute of Technology (MIT), explained her findings linking the Superfund chemical N-nitrosodimethylamine to mutations in the livers of mice.
- **Margaret Grace Mills**, a UW postdoc, is using CRISPR-generated zebrafish mutants to explore how chemical toxicants can lead to oxidative stress in zebrafish.
- **Jacopo Baglieri**, a postdoc at UC San Diego, described how degradation of a protein known as collagen type I is needed for carbon tetrachloride exposure to induce liver cancer development in mice.
- Duke University Ph.D. student **Tess Leuthner** described her work using next-generation sequencing approaches to investigate the effect of Superfund chemicals on mitochondrial function.

Leuthner explained why studying mitochondrial DNA can be complicated and what needs to be considered when designing experiments.

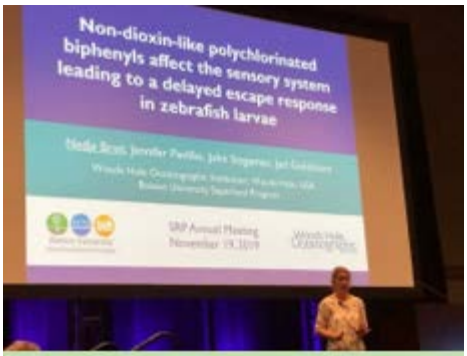
Session 3: Susceptibility and Risk Factors

In the third session, SRP-funded researchers described methods to assess the risks to human health presented by hazardous substances.

- **Arce Domingo**, a master's student at Columbia, described her work linking arsenic exposure,

changes to DNA methylation, and cancer deaths in the Strong Heart Study.

- Dartmouth College Ph.D. student **Brett Doherty** is exploring how exposure to metal mixtures around conception and before birth can affect behavioral development, including sex-specific differences, in the New Hampshire Birth Cohort Study.
- Boston University (BU) postdoc **Nadja Brun** showed how PCBs affect the sensory system, leading to a delayed escape response in zebrafish larvae.



Brun described the effects of PCBs on the sensory system of zebrafish.

- **Jessica Alesio**, a Ph.D. student at the University of Rhode Island (URI), described analytical techniques she is using to better understand what happens to per-and polyfluoroalkyl substances (PFAS) once they enter the body.

Session 4: Exposure Science and Detection Technologies

The fourth session featured ways SRP-funded researchers are developing methods and technologies to detect hazardous substances in the environment.

- **Krisa Camargo**, a Ph.D. student at Texas A&M University (TAMU), is applying biosensor technologies to analyze soils and sediments in Galveston Bay and the Houston Ship Channel.
- UK postdoc **Elham Shirazi** is developing modeling tools that consider wind, temperature, and building characteristics to predict time-varying volatile organic compound indoor air concentrations.
- **Prasadanie Adhihetty**, a UofL Ph.D. student, is developing a gold nanoparticle system to detect benzene in the environment.
- **Christine Ghetu**, a Ph.D. student at Oregon State University (OSU), is assessing how wildfires have influenced indoor and outdoor polycyclic aromatic hydrocarbon (PAH) concentrations and the movement of PAHs between soils and air in the western United States.


Shujun He, left, and Camargo during a break in the meeting.

Session 5: Prevention, Intervention, Remediation

In the fifth session, SRP-funded researchers described basic biological, chemical, and physical methods to reduce the amount and toxicity of hazardous substances.

- **Savannah Volkoff**, a Ph.D. student at Duke, described her work to develop a bioamendment to deliver PAH-degrading biofilms to sediments in the field.
- University of Iowa (UI) Ph.D. student **Christian Bako** is working on a bioremediation project to degrade PCBs in sediment from Altavista, a contaminated wastewater lagoon.
- **Maria Isabel Meza**, a University of New Mexico

(UNM) Ph.D. student, is synthesizing pure uranyl arsenate, a complex formed by arsenic and uranium, to learn more about its properties.

Bako explained the prevalence of PCB contamination in sediments and the importance of cleaning it up.

- **Shujun He**, a TAMU Ph.D. student, is investigating properties to improve sorption of toxic compounds by montmorillonite clay, with the long-term goal of using the sorbent materials to reduce exposures to potentially toxic compounds in the environment.

Session 6: Emerging Research

The sixth session highlighted SRP-funded researchers who are working on new and emerging topics in environmental health.

Maggie Williams is identifying ways by which dioxins can affect the microbiome, which, in turn, may affect gene expression immune response.

- **Maggie Williams**, a postdoc at Michigan State University (MSU), is characterizing the interactions between the gut microbiome and human health following exposure to dioxins.
- Brown University Ph.D. student **Shannon Martin** described her work showing that PFAS exacerbates brain injury in exposed zebrafish.
- **Sara Gushgari-Doyle**, a UC Berkeley Ph.D. student, explained how microorganisms use networks to interact with their community and how trichloroethylene (TCE) and arsenic can affect those microorganism networks.
- **Chase Williams**, a UW postdoc, has found that elevated carbon dioxide impairs olfactory-mediated neural and behavioral responses in coho salmon.

SUCCESSES OF TRANSDISCIPLINARY TRAINING

Wetterhahn Award: Elana Elkin

The SRP selected **Elana Elkin** as the 22nd recipient of the annual Karen Wetterhahn Memorial Award. Elkin, who is a postdoc at the University of Michigan, part of Northeastern University's Puerto Rico Testsite for Exploring Contamination Threats (PROTECT) SRP Center, is exploring how exposure to harmful contaminants affects placental cells and may lead to pregnancy complications. Read more about Elkin and her research in the NIEHS Environmental Factor.

Graduate Student Poster Winners

The graduate student poster competition provided an

Acting Deputy Director of NIEHS, Gwen Collman, right, presented the Wetterhahn Award to Elkin.

opportunity for participants to explain their research and showcase innovative findings. Congratulations to the four students who received awards!

In the environmental sciences and engineering category, the winners were:

- **Jessica Ewald**, University of Iowa: Growth of *Dehalococcoides* and Increased Abundance of Reductive Dehalogenase Genes in PCB-Contaminated Sediment Microcosms
- **Shuai Xie**, Brown University: Sorption Process of Trichloroethylene at Low Concentration on Various Building Materials

Suk, left, presented the poster winners, Shankar, Chen, and Xie, with their awards. (Not pictured: Ewald)

In the health sciences category, the winners were:

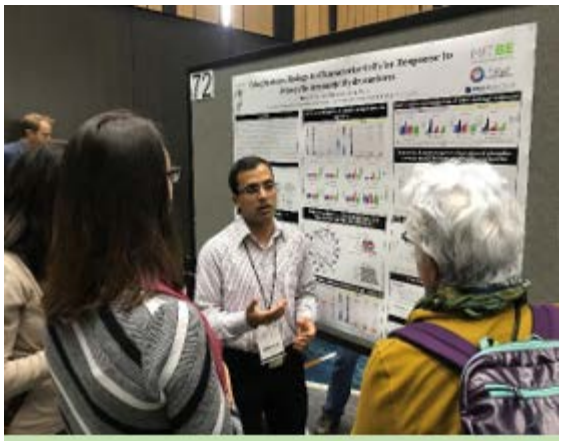
- **Zunwei Chen**, Texas A&M University: A Compendium of Human Cell Lines from Different Organs as an in vitro Model for Rapid Grouping of Superfund Chemicals into Classes
- **Prarthana Shankar**, Oregon State University: Identification and Functional Characterization of the AHR2-Dependent Gene, wfikkn1, in Zebrafish

TIME FOR SCIENTIFIC AND PROGRAMMATIC DISCUSSION

Poster Sessions Facilitate Collaboration

During two poster sessions, more than 90 SRP graduate students, postdocs, and principal investigators presented innovative SRP-funded research. As part of the student poster competition, trainees shared their research and its significance for SRP stakeholders and the public. These sessions provided an opportunity for researchers and trainees to learn about others who are doing related work.

Technology Demonstrations Offer Hands-

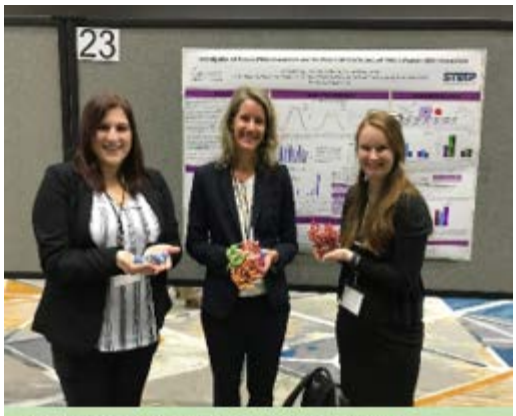


At the poster session, Ishwar Kohale, a Ph.D. candidate from MIT, explains his work using a systems biology approach to characterize cell responses to PAHs.

on Exchanges

The meeting featured an “SRP in 3-D” fair with demonstrations of SRP-funded products. On the first day, Research Translation Core (RTC) and Community Engagement Core (CEC) members from 18 Centers displayed tools and materials they developed as part of their efforts.

The second day featured devices, demos, and displays from throughout the program:



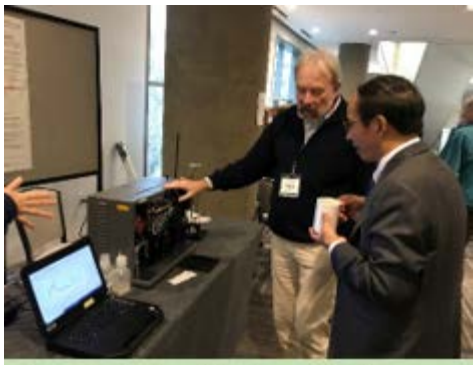
SRP Health Scientist Administrator Michelle Heacock, center, shows off 3-D protein models with SRP trainees from URI.

- **Lindsay Boehme** of PowerTech Water, LLC described their INCION technology to selectively remove lead from drinking water.
- **Chett Boxley** of GlycoSurf developed novel rhamnolipid surfactants for recovery of critical elements and cleaning up metal-contaminated waste streams.
- **Shawn Campagna** of Microbial Insights, Inc. is using environmental metabolomics to improve decision making and management of contaminated sites.
- **Frank Cassou** of CycloPure displayed their novel high-affinity polymer adsorbents for cleaning up perfluorinated chemicals in water.
- **Long Chen** of Northeastern demonstrated tools they are using at PROTECT for water testing, treatment, and report-back.
- **Franziska Landes** of Columbia displayed a new field kit to screen soil for hazardous lead.
- **Laurel Schaider** of Silent Spring Institute showed participants the Digital Exposure Report-Back Interface (DERBI), an interactive Web-based tool for personalized exposure and biomonitoring results.
- UI’s **Scott Spak** showed how they are using interactive Web-based data sharing and visualization to promote research translation.
- **Michael Unger** of the Virginia Institute of Marine Science (VIMS) described their monoclonal antibody-based biosensor for rapid assessment of PAH distribution, fate, and toxicity at contaminated sites.
- **Kathleen Vandiver** of MIT displayed her models that are used to teach essential exposure biology concepts.

Spak, left, shares an interactive data sharing and visualization tool with a meeting participant.

Data Science Breakfast

Meeting participants who were awarded data science supplements from the SRP to promote data sharing, integration, and reuse were invited to participate in a breakfast meeting with **Stephanie Holmgren** from the NIEHS Office of Data Science. Holmgren provided an overview of current NIEHS data science initiatives and how the data supplement grantees may be able to fit into those initiatives. **Christie Drew** also spoke to participants about the role of the NIEHS Program Analysis Branch in documenting the breadth of what data supplement awardees are accomplishing.



Unger, left, describes how his biosensor is deployed in the field to detect PAHs.

Administrators Meeting

A breakout meeting for SRP Center administrators enabled them to get to know one another and NIEHS staff and to learn about NIEHS policy updates. Administrators heard more about the NIEHS CareerTrac System, the Human Subjects System, the grant-related scientific review process and tools, and the annual update process.

HIGHLIGHTING RESEARCH TRANSLATION AND COMMUNITY ENGAGEMENT

Translational Research Story Workshop

As part of the RTC and CEC satellite meeting, attendees heard from NIEHS Program Analysis Branch Chief **Christie Drew**, who discussed the Translational Research Framework and how it could be applied to their Centers and cores. The tool was created by NIEHS to help grantees track their environmental health research. Drew explained how the framework could be used as a storytelling tool. Using examples from UW, UC Berkeley, and Duke, Drew showed how different research advances could be mapped on the Translational Research Framework to clearly document movement of grantees' work from basic research to public impact and provide a path for scientists to see where their research might go. During breakout sessions, participants discussed how they could actively incorporate the Translational Research Framework into their Centers' activities and engage researchers in the process.

EPA Community Involvement Plans

Participants learned how the U.S. Environmental Protection Agency (EPA) involves communities in their cleanup and how SRP Centers and other community groups can be involved in this process.

- **Larry Zaragoza** of the EPA's Office of Superfund Remediation and Technology Innovation described Superfund community involvement from a national perspective. He mentioned different tools and processes the EPA uses to promote community involvement.
- **Julie Congdon**, the EPA's community involvement manager for the Lower Duwamish Waterway Superfund site, outlined the Community Involvement Plan and how they are engaging with diverse groups along the Duwamish River.
- **Paulina Lopez**, executive director of the

A discussion panel allowed participants to ask presenters questions and to provide examples of their experience with Community Involvement Plans.

Duwamish River Cleanup Coalition and a member of the EPA's Community Advisory Group for the Lower Duwamish Waterway Superfund site, explained the role of community groups and the importance of building trust. She emphasized the importance of understanding the historical context of communities living near the site and promoting community-led solutions.

- **Thomas Burbacher** and **BJ Cummings** from the UW SRP Center focused on a specific study along the Duwamish River that focused on learning more about seafood consumption of nearby residents and promoting safe fishing practices to reduce exposure to environmental contaminants.

Integrating Citizen Scientists into Community Engagement Cores

Attendees also heard about how SRP grantees are working with community members to promote data collection by citizens and to design community-focused research.

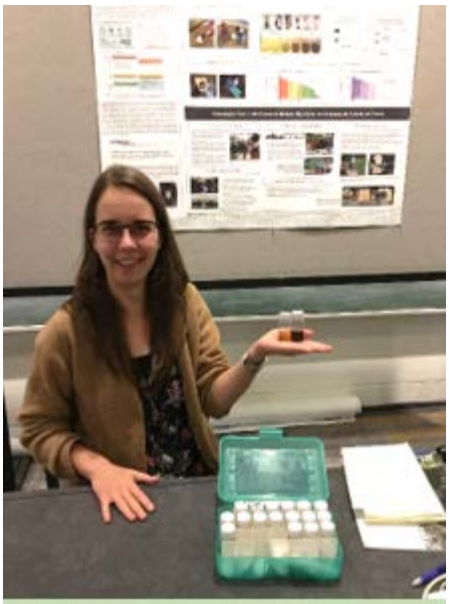
- **Galen Newman** and **Jen Horney** of the TAMU SRP Center are integrating data from samples collected by citizen scientists with spatial data to understand the potential of exposure to various contaminants.
- **Ted Smith** of the UofL SRP Center described the development of a data portal that aggregates citizen-generated data so it can be used by the community.
- **Mónica Ramírez-Andreotta** of the UA SRP Center explained her work to design citizen science projects for systems-level change and how that process can contribute to reducing communities' environmental health risk.

TRAINING FUTURE SCIENTIFIC LEADERS

Trainee Satellite Meeting

A special trainee program introduced graduate students and postdocs to diverse professional career tracks and provided networking opportunities with former SRP trainees. In the first session, panelists **John Wise, Sr.** from UofL, **Marguerite Pappaioanou** and **Peter Rabinowitz** from UW, and **James Rice** from Gradient discussed how their careers fit into the growing concept of One Health, which recognizes that the health of people is connected to the health of animals and the environment.

Another trainee session focused on the importance of considering population health disparities and environmental justice (EJ) when conducting research.



Trainees also participated in the technology fair and other meeting activities. Shown here, Landes described Columbia's new field kit to screen soil for lead.

Attendees learned about EJ issues residents are facing along the Duwamish River. The session included talks by **Millie Piazza** from the Washington State Department of Ecology; **Linn Gould**, executive director of Just Health Action; and **James Rasmussen**, Superfund Manager for the Duwamish River Cleanup Coalition.

Trainees also heard from **Erik Lee Snapp**, director of graduate and postdoctoral programs at the Howard Hughes Medical Institute, who provided tips for successful job applications. **H. Adam Steinberg** from the University of Wisconsin focused on ways to effectively communicate data.

SPOTLIGHTING LOCAL PERSPECTIVES

Boat Tour Highlights Duwamish River and Surrounding Community

On the last day of the meeting, participants were offered a boat tour of the Duwamish River. Organized by meeting hosts from UW, the tour spotlighted the history of the Lower Duwamish Waterway Superfund site and the community groups that have worked to protect the river as a cultural resource. The tour was hosted by James Rasmussen, a member of the Duwamish Tribe and Superfund manager of the Duwamish River Cleanup Coalition, along with Shawn Blocker of EPA Region 10.

Blocker described the vast cleanup efforts carried out since 2001, when the area was designated a Superfund site. Cleanup continues, with the help of community groups like the Duwamish River Cleanup Coalition. Rasmussen discussed how the river's history of contamination affects Native Americans and other residents who rely on it. People living near the river use it for fishing and recreation, giving rise to concerns about chemical exposures. For more about the tour, see the Environmental Factor.

The Duwamish River tour offered an important local perspective on challenges surrounding active Superfund sites and the importance of community involvement.