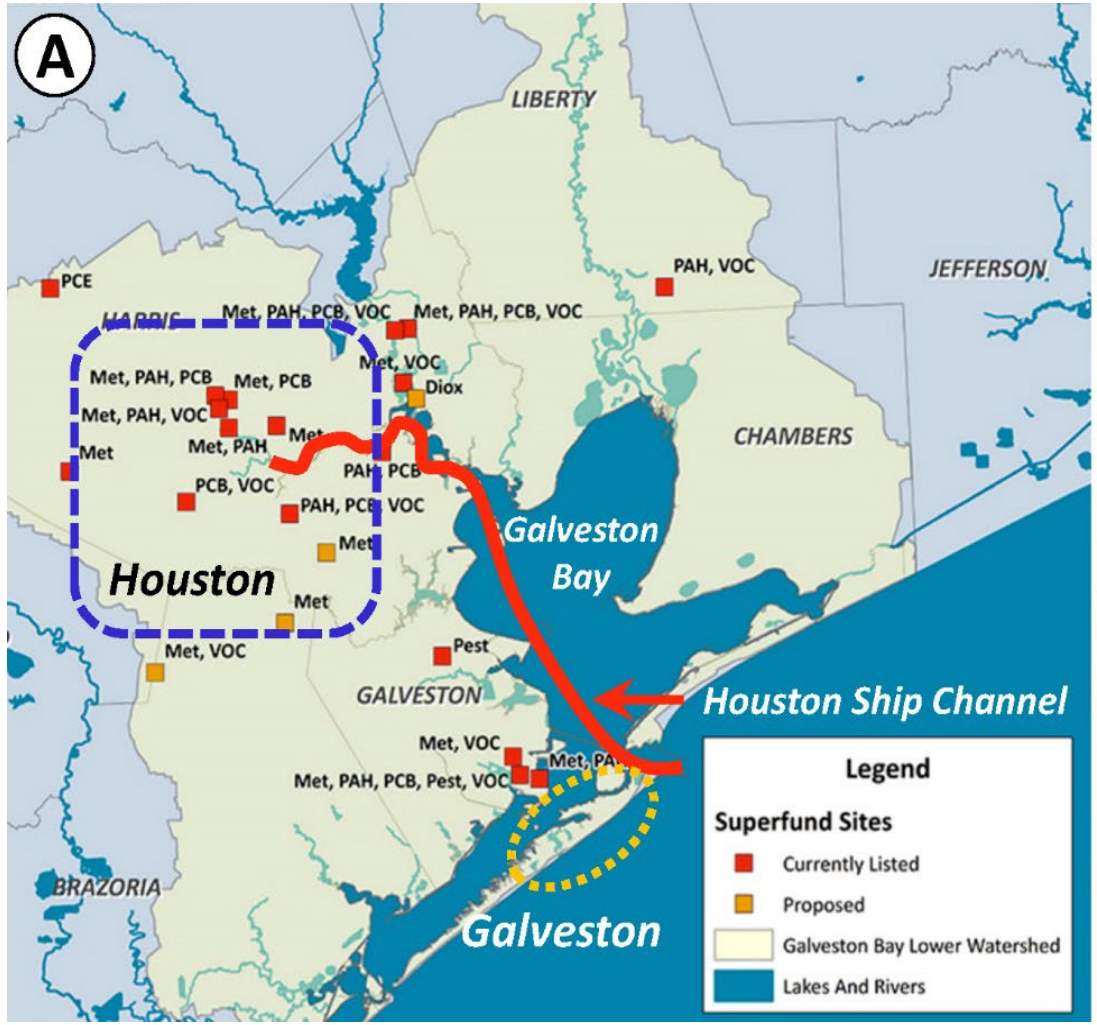
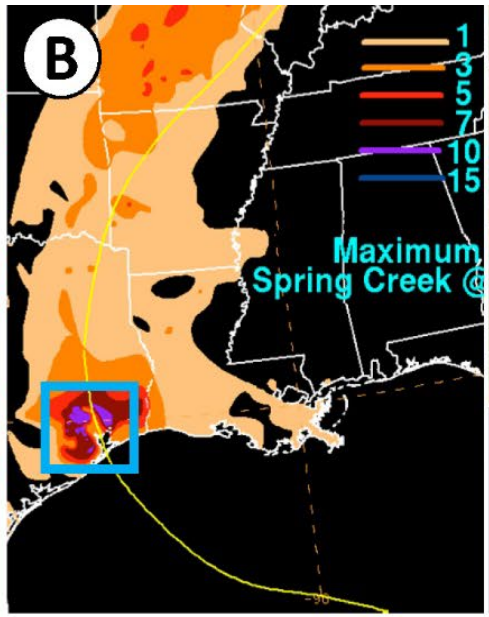
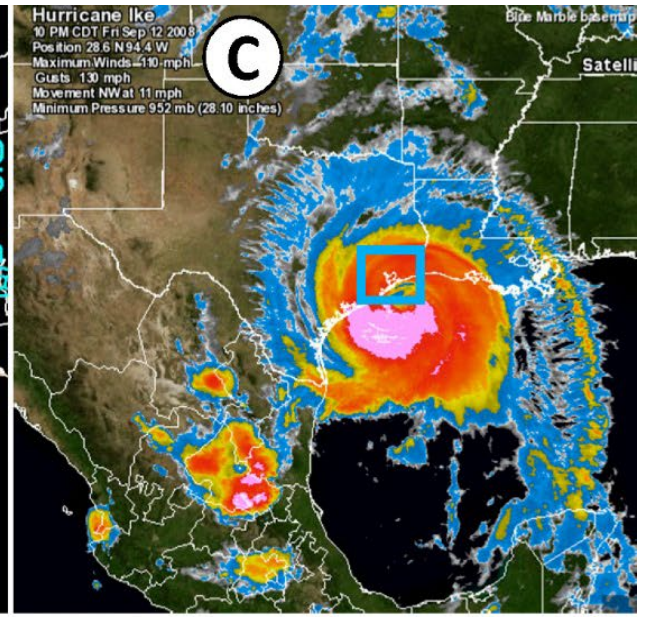
Texas A&M University Superfund Research Center (2017-2022)

Comprehensive tools and models for addressing exposure to mixtures during environmental emergency-related contamination events

Case scenario: Hurricane Ike (2008) impact on Galveston Bay-Houston Ship Channel







Texas A&M University Superfund Research Center (2017-2022)

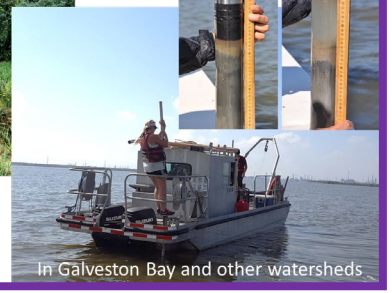
Comprehensive tools and models for addressing exposure to mixtures during environmental emergency-related contamination events

2017

Post-Harvey sampling:

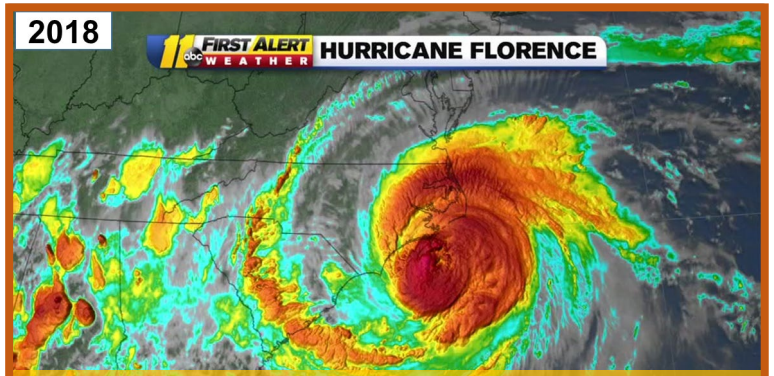
In the homes

In the communities

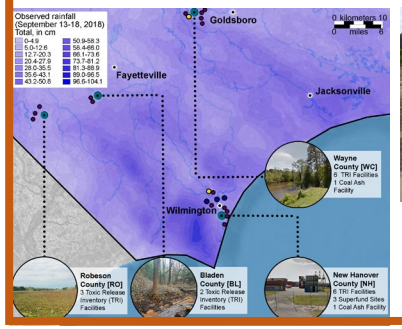


In Galveston Bay and other watersheds

2018



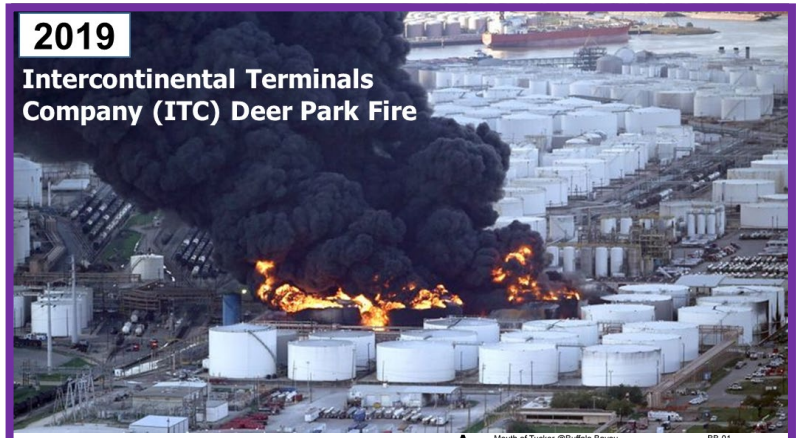
Sampling: Sep 23 2018; Jan 30 2019; May 10 2019

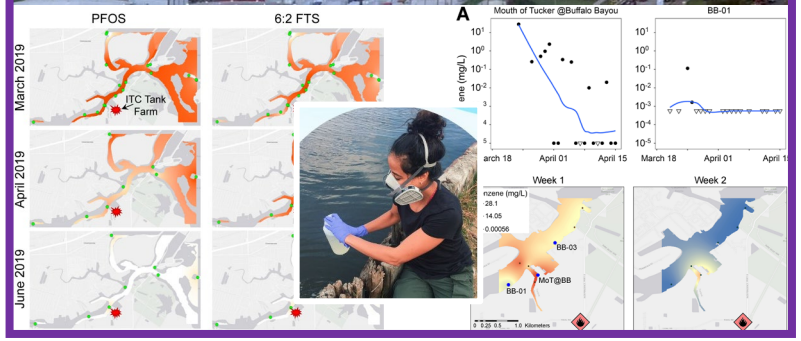


Soil sampling

Air sampling

2019





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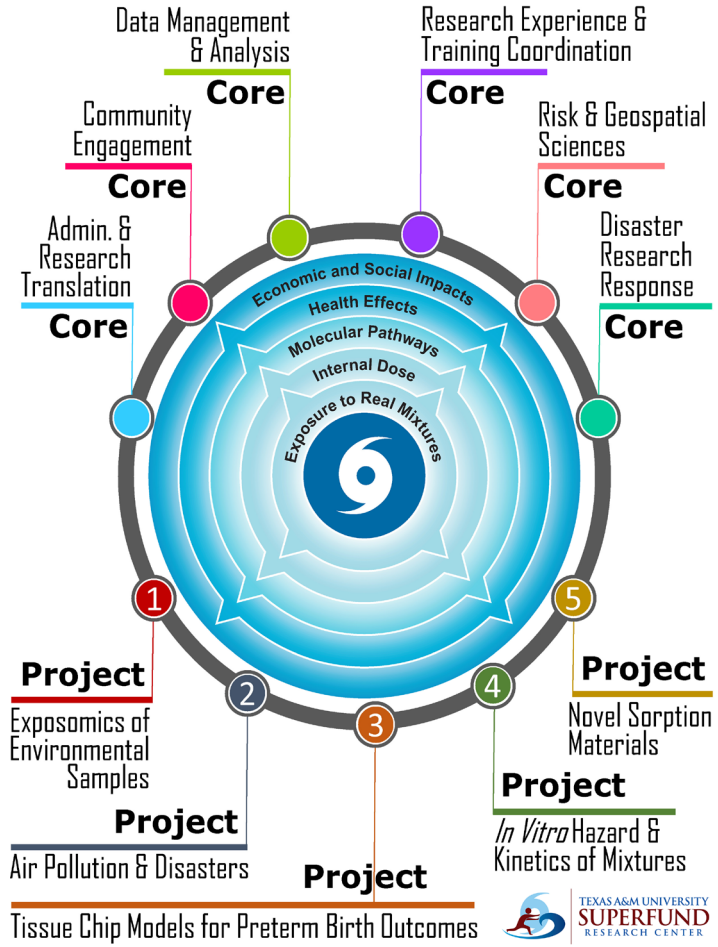
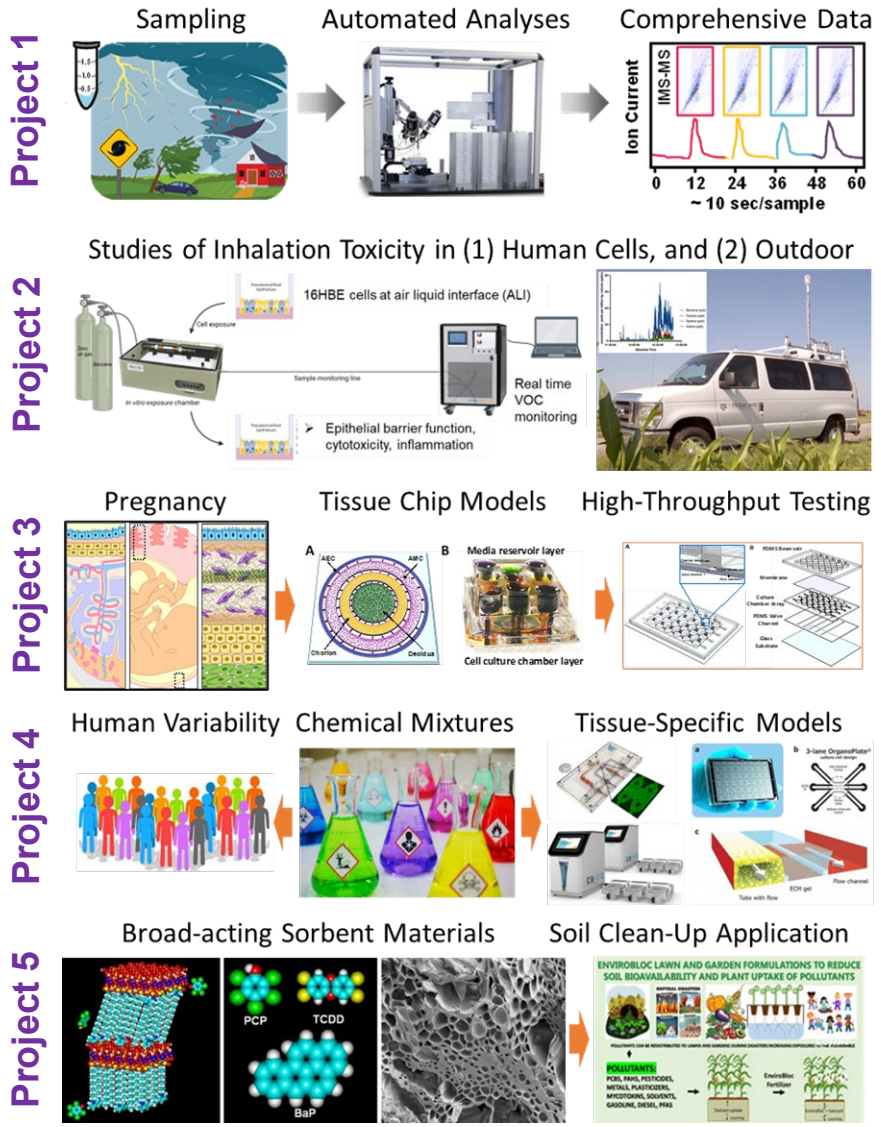
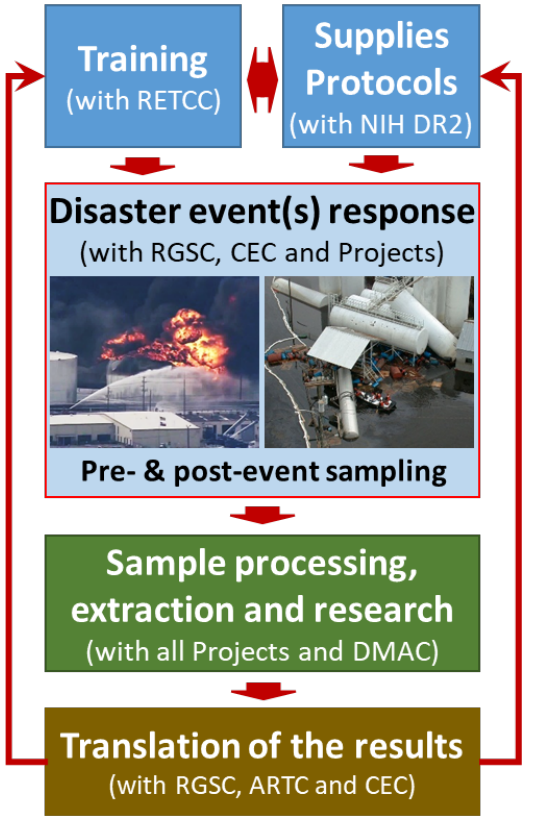
Texas A&M Superfund Center [2022-2027]





"One-Center" Approach to DR2



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Community Engagement Core

Texas A&M University Superfund Research Center

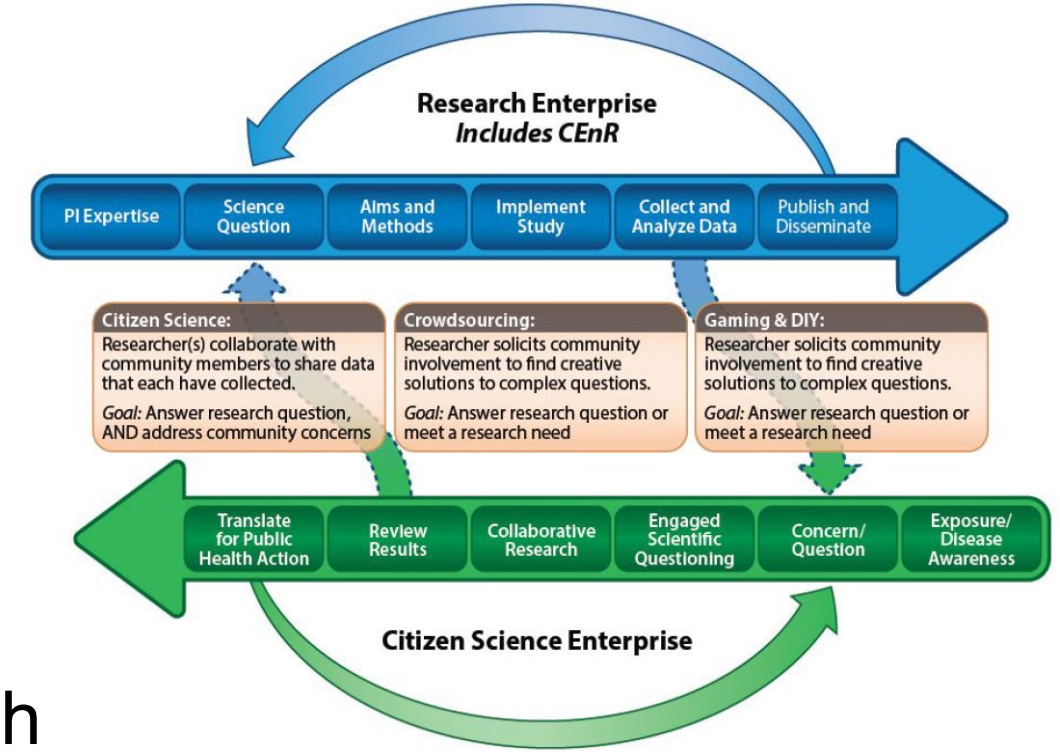
Garett Sansom, DrPH | Assistant Professor

Community Engagement Core

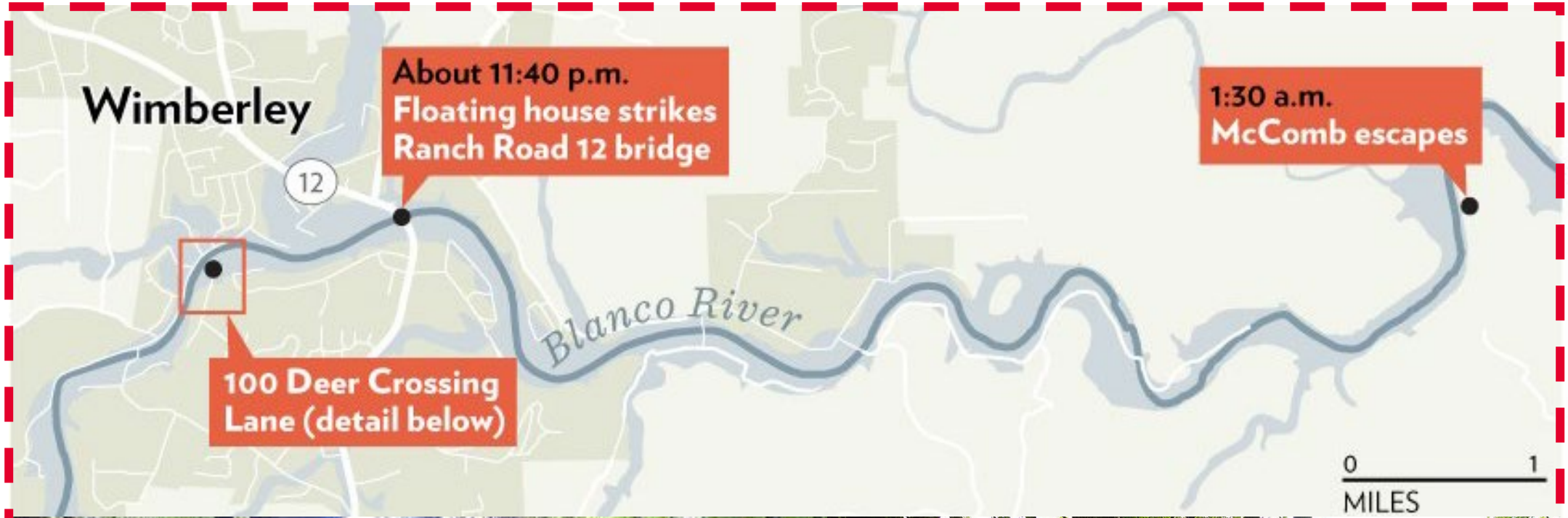
- Engages community members to determine the factors that influence and can improve environmental conditions for communities to proactively plan for and manage future environmental risk related to emergency contamination events
- Develops collaborative, participatory-based interventions aimed at reducing exposure during environmental emergencies
- Develops and implements citizen science tools for community engagement to reduce the amount and toxicity of hazardous substances
- Builds long-term resilience in the community by creating capacity for detection, assessment, and evaluation of human health concerns from hazardous substances

Operating Within the Texas A&M Superfund Center

- Engaging community partners in all stages of research
  - Proposal – Dissemination
- Connecting researchers and partnering individuals and organizations
- Assisting projects and cores in dissemination efforts
  - Community meeting, workshops, etc.
- “Closing the loop” on research, outreach and translation efforts



An Example of a DR2 Project Led by CEC


Wimberley
12
About 11:40 p.m.
Floating house strikes
Ranch Road 12 bridge
1:30 a.m.
McComb escapes
Blanco River
100 Deer Crossing
Lane (detail below)
0
1
MILES

Community Concerns and Initial Involvement

- CEC partnered with local organizations
- Initial concerns and our approach
  - Warning Signs and Recovery
  - Potential Environmental Contamination
  - Improve Local Resilience to Climate Change
  - Public Education About Future Events
- Created a community-led project to address community concerns:
  1. A community survey
  2. A citizen-led science program

Continued Involvement: Where are We After 3 Years?

Raising citizen scientists for the Valley

Louis Parks
Special to the View

Lots of kids find swimming in cool water a great way to enjoy Blue Hole Park. Some kids find analyzing Blue Hole water is pretty cool, too.

Blanco River Academy's students are learning a new way to experience the park, and doing something useful for the future of Wimberley Valley.

"We're taking water and soil samples in different locations to see what kind of things are happening by the water or the road or in different areas," said Adeline Yeary, a 12-year-old 7th grader.

As the first-ever middle school students to be part of a Texas A&M Citizen Scientist program – usually work for adults – the BRAc students are not just studying the environment; they are also learning how to interpret and protect it.

Having a good time outdoors is a bonus. "It's a fun learning experience," said 8th grader Maggie Kimbell-Jack, 13.

Citizen science efforts can provide valuable data for the commu-

SUBMITTED PHOTO
Addison Hoffman, left, and Amelia Nance work on a soil sample at Blue Hole Regional Park

Continued Involvement: Where are We After 3 Years?

- Cohesion was associated with a more robust recovery during a shorter period
- Hazard warnings failed unless they were included in community prior to hazard event
- Environmental sampling revealed a swift reduction in heavy metals in the months and years following event
- Baseline data is now available for future comparisons
- Establishment of a formal Citizen Science Program
  - Two additional groups are now engaged
    - Furr High School in Houston, TX
    - The Colonia Citizen Science Program in McAllen, TX
  - Texas A&M Superfund Citizen Science Certificates

Implementing CEC "Learnings" Into the Larger Center

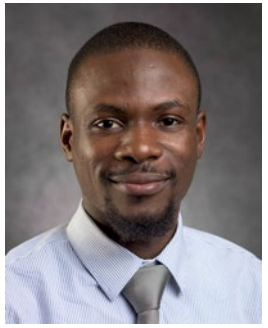
- Sharing experiences in community engagement with trainees and faculty
- Providing hands-on training for sampling campaigns
- Case studies for spatial mapping
- Working with Projects and Cores to enable longitudinal sampling of contaminates
- Case studies for short- and long-term risks based on results
- Examples of report-back to the community

Project 2: Responding to Air Pollution in Disasters

- Overall objective is to develop novel tools to rapidly characterize **pediatric respiratory health risks** from exposure to hazardous VOCs after environmental disasters

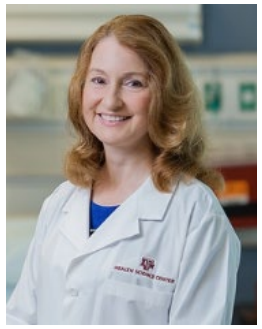
Natalie Johnson, PhD
PI, Project 2

Eva Vitucci, PhD
ES T32 Postdoc



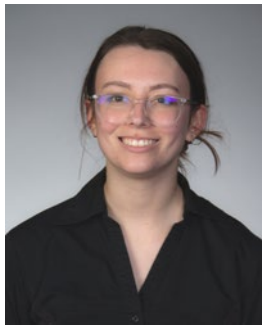
Toriq Mustapha, DVM
Predoc, 5th year

Alexandra Svetlik
ES T32 Predoc, 3rd year



Carolyn Cannon, MD, PhD
Co-I, Project 2

Mariana Saitas
ES T32 Predoc, 3rd year



Olivia Lampe
ES T32 Predoc, 1st year

Kaylyn Dinh
Predoc, 1st year

Allen Robinson, PhD
Co-I, Project 2

Albert Presto, PhD
Co-I, Project 2

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“Double Jeopardy” in Houston

Acute and Chronic Chemical Exposures Pose Disproportionate Risks for Marginalized Communities

… Residents living adjacent to Superfund sites are **disproportionately exposed** to airborne pollutants and have a higher burden of chronic respiratory disease.

… Importantly, these communities are at **high risk** for environmental contamination following emergency-related events, such as hurricanes or man-made disasters.

…There is a **critical need** to characterize respiratory health risks following exposure to airborne pollutants, particularly following environmental disasters

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Project 2 is a biomedical project highly integrated with other Center Projects and Cores

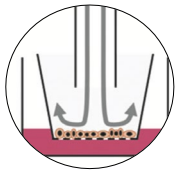
Project 1
Exposomics of environmental samples

Project 3
Tissue chip models for preterm birth outcomes

Project 4
In vitro hazard & kinetics of mixtures

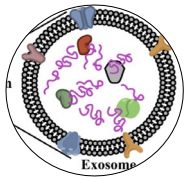
Project 5
Novel sorption materials

Aim 1



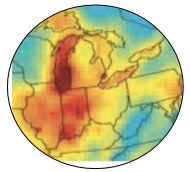
ALI 16HBE and primary pediatric bronchial epithelial cells

Aim 2



Role of VOC-associated proteomic changes in EVs

Aim 3



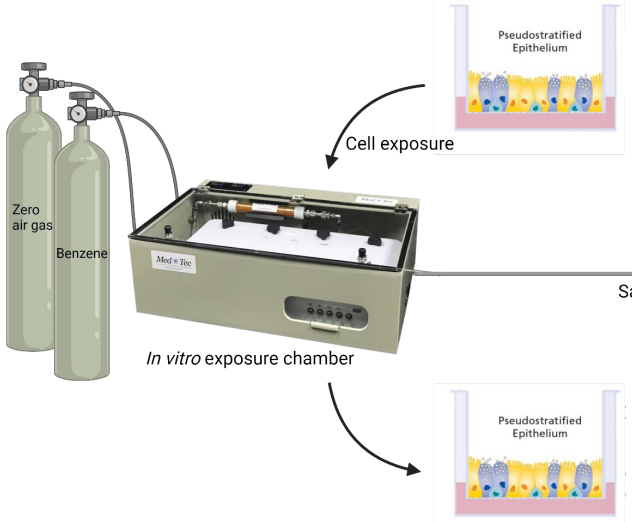
VOC characterization & distribution baseline & DR2

- Admin core
- Community engagement core
- Data management & analysis
- Risk & geospatial sciences
- Research experience & training
- Disaster research response (DR2)

Testing Health Hazards of 'Real World' VOC Exposures

Table 1. Project 2 Superfund Priority VOCs

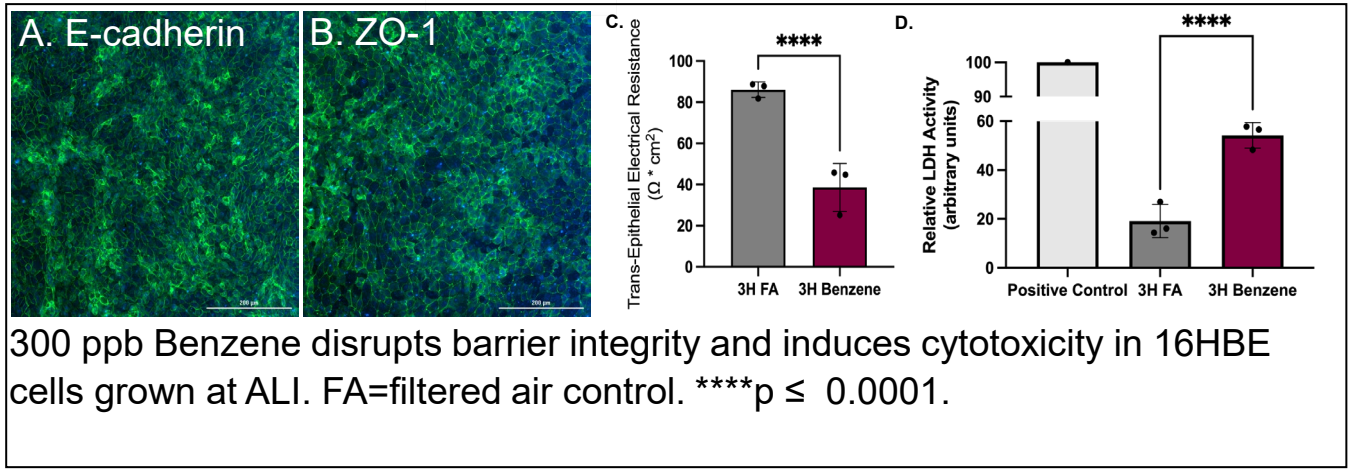
VOC name	CAS-RN	ATSDR Rank
Vinyl Chloride	75-01-4	4
Benzene	71-43-2	6
Chloroform	67-66-3	11
Trichloroethylene	79-01-6	16
Hexachlorobutadiene	87-68-3	20
Acrolein	107-02-8	31
Tetrachloroethylene	127-18-4	33
1,2-Dibromoethane	106-93-4	39
1,2-Dibromo-3-Chloropropane	96-12-8	46
Carbon Tetrachloride	56-23-5	50
Xylenes	1330-20-7	65
2-Hexanone	591-78-6	71
Toluene	108-88-3	74
1,1-Dichloroethene	75-35-4	82
1,2-Dichloroethane	107-06-2	91
1,1,1-Trichloroethane	71-55-6	127
Chlorobenzene	108-90-7	131
Ethylbenzene	100-41-4	137
1,1,2,2-Tetrachloroethane	79-34-5	146
1,3-Butadiene	106-99-0	154



16HBE cells at air liquid interface (ALI)

Real time VOC monitoring

- Epithelial barrier function, cytotoxicity, inflammation



300 ppb Benzene disrupts barrier integrity and induces cytotoxicity in 16HBE cells grown at ALI. FA=filtered air control. ****p ≤ 0.0001.

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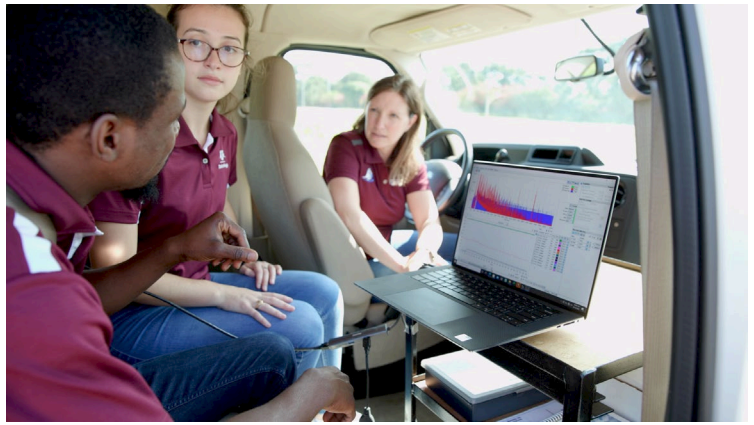
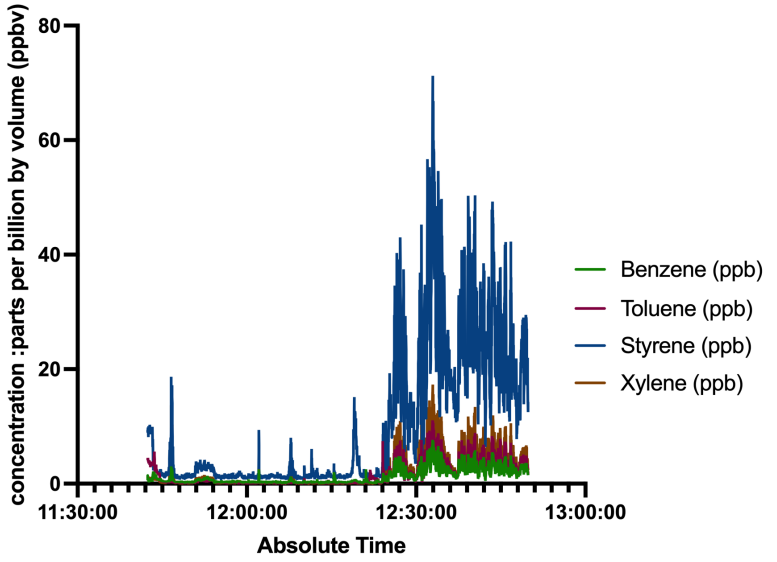
Mobile responding to air pollution in disasters (mRAPiD)

PTR-ToF-MS



Time-resolved VOC concentrations … link with location to identify both overall levels and potential “hot spot” areas

TCEQ Side by Side Aug 2022



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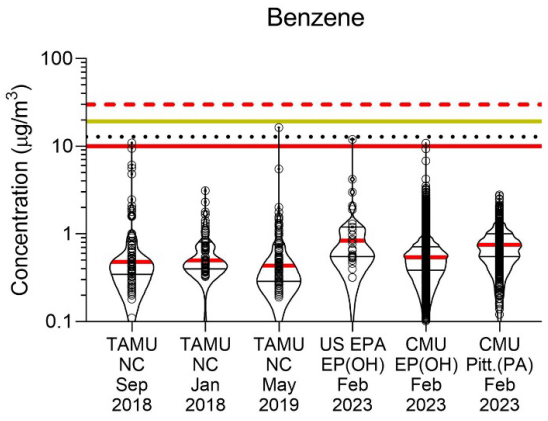
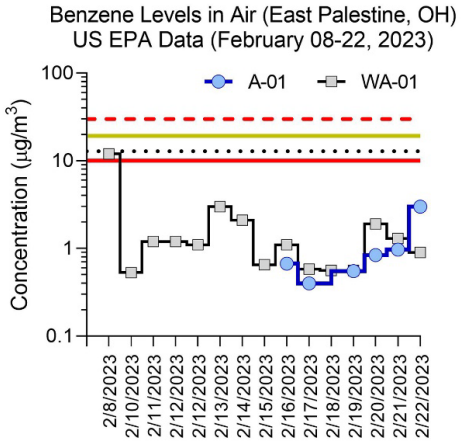
DR2 in Action: Spatially Resolved VOC Mapping

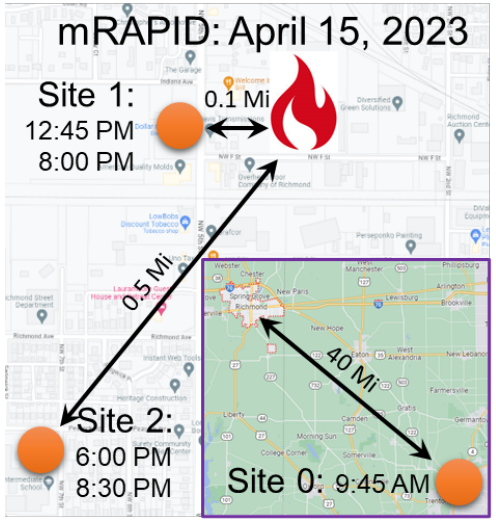
East Palestine [OH]: February – July 2023

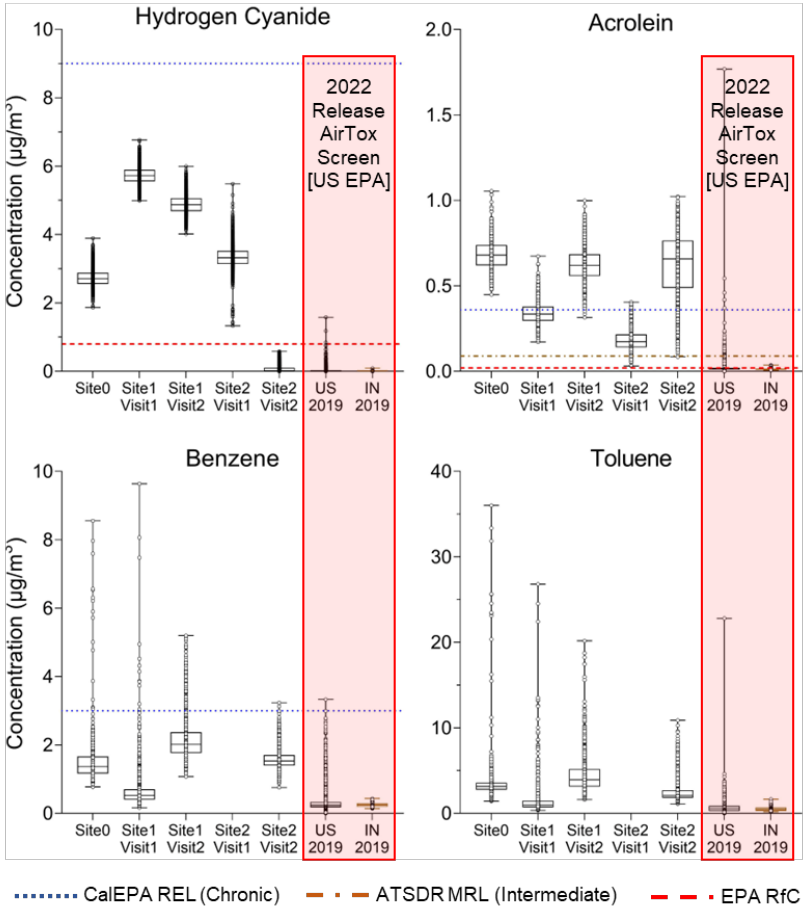
ATSDR "Intermediate (15 d - 1 yr)" MRL
ATSDR "Chronic (>1 yr)" MRL
EPA "Lifetime" RfC
EPA "Excess cancer risk 1 in 10,000"





Richmond [IN]: April 2023





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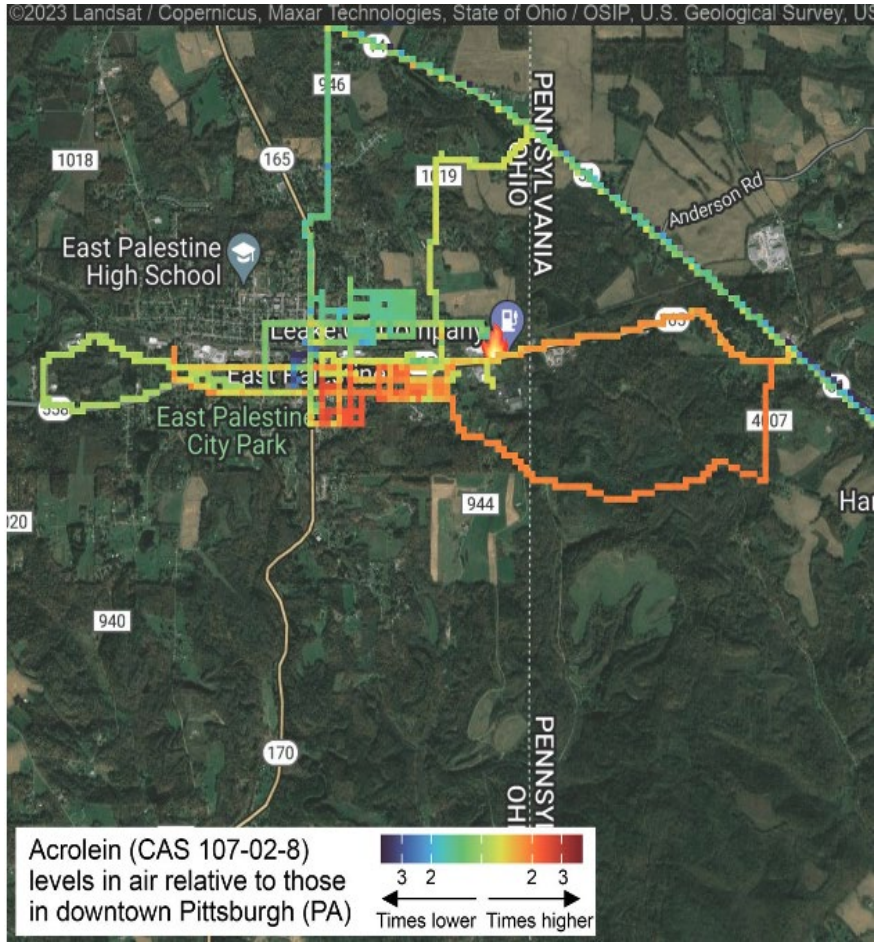
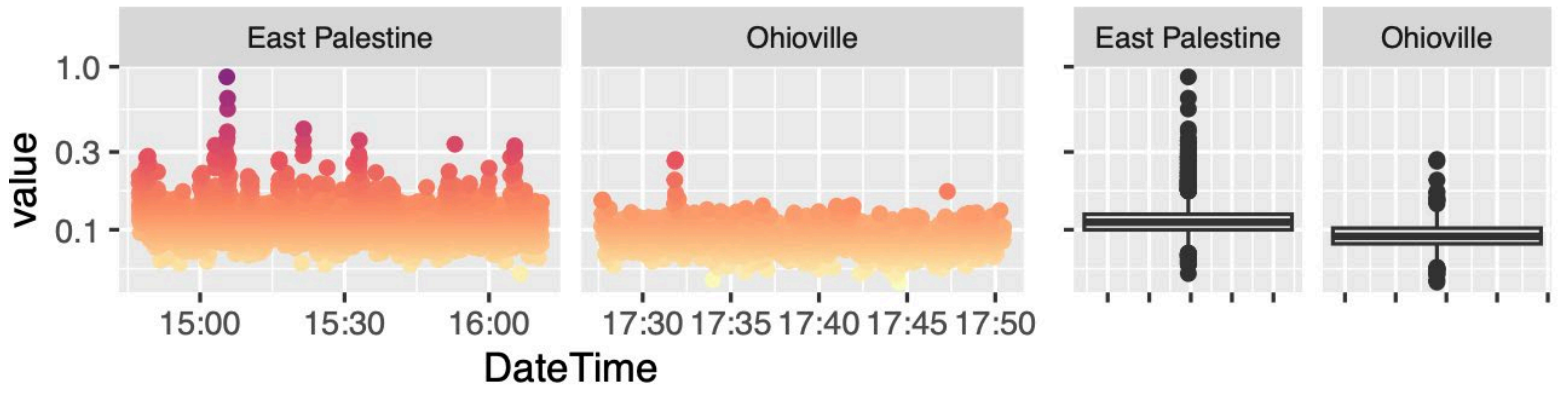
DR2 in Action: Continued Monitoring During Remediation





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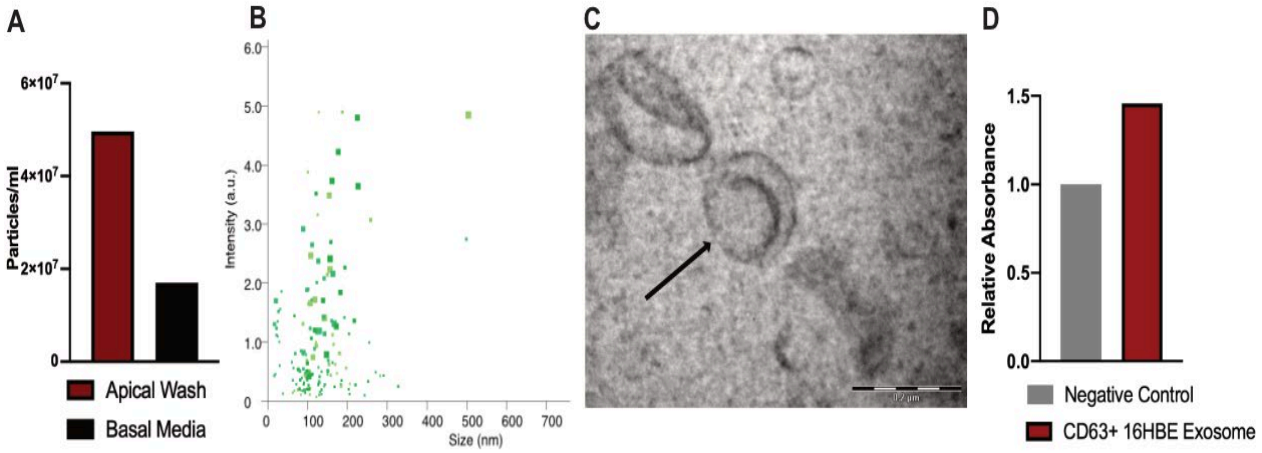
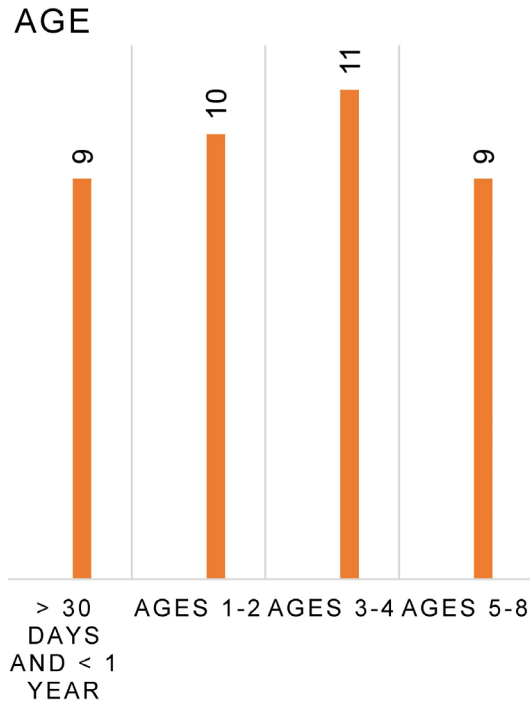
Next steps…

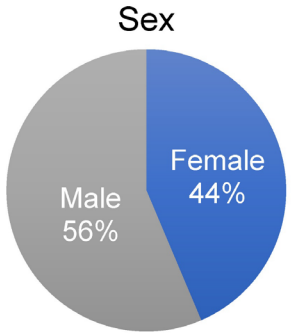
- Unique mixtures hazard ID
- Population variable responses
- Investigating mechanisms of action

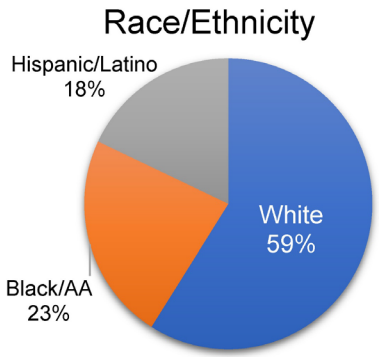


Role of extracellular vesicles (EVs)

LungMAP







400 potential donors → 39 (9 infant; 30 child)
Inclusion criteria: trauma as the cause of death, non-viral infected, no inflammation/ bronchopneumonia, or asthma

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Hazardous Waste Operations & Emergency Response (HAZWOPER) Training Course

- 8-hour refresher ***in-person*** course
  (No remote participation option is available!)
- Compliant with U.S. Occupational Safety & Health Administration (OSHA) HAZWOPER standard 29 CFR 1910.120 (e)
- Participants will receive a certificate upon completion
- Open to Texas A&M Superfund Research Center (SRC) trainees, members and trainees of other SRCs, and others interested in HAZWOPER training for disaster response and research

JUNE 13, 2023

Texas A&M University Campus | College Station, TX

For more information and to register, visit
tx.ag/HAZWOPER2023

Texas A&M Superfund Research Center
Tel: 979.862.4063 | **Web:** superfund.tamu.edu | **Email:** tamusuperfund@tamu.edu




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DISASTER RESEARCH TRAINING WORKSHOP

TOPICS INCLUDE:

- Risk communication
- Guidelines for field sampling
- Working in hazardous environments
- Human studies, disasters, and environmental emergencies
- Understanding Incident Command System & emergency ops
- Tabletop exercises focused on sample collection, community engagement, and state/local/federal interactions (facilitated by USEPA, USCG, UTH, UTMB, Shell, & Chevron)

THURSDAY & FRIDAY, DECEMBER 14 & 15, 2023

TEEX Brayton Fire Training Field | Disaster City
Texas A&M University | College Station, TX, USA

For more information and to register, visit
tx.ag/DisasterWorkshop

Texas A&M Superfund Research Center
Tel: 979.862.4063 | **Web:** superfund.tamu.edu | **Email:** tamusuperfund@tamu.edu