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Concept: Continuation of the NIEHS Environmental Health Sciences Core Centers Program

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NAEHS Council, September 12, 2024

EHSCC Team: Kristi Pettibone, James Williams, LaTavia Miller, Camilo Asuncion, Clark Phillips, Varsha Shukla, Leroy Worth, Sharmice Outen, Deborah Jones & Kindra Morrison

National Institutes of Health • U.S. Department of Health and Human Services

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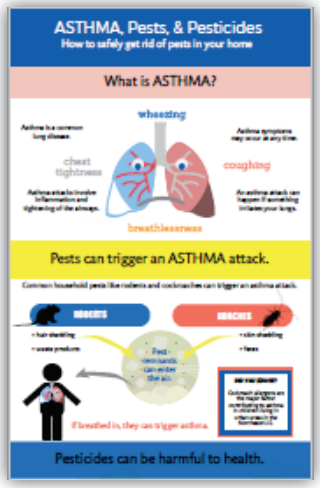
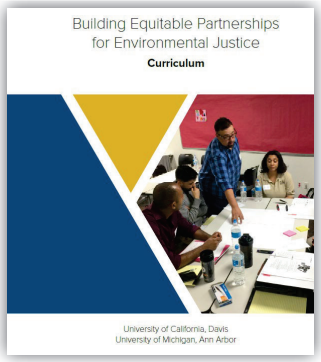
Outline

- Background and Structure
- Core Center Highlights
  - Career Development
  - Pilot Project Program
  - Translational Research
  - Disaster Response
- Summary and Future Vision for the Core Centers





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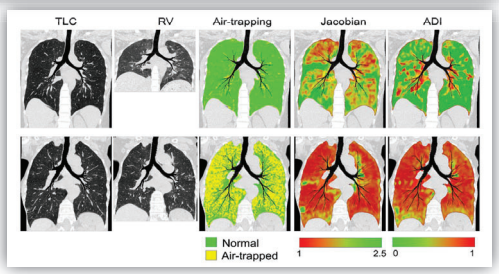
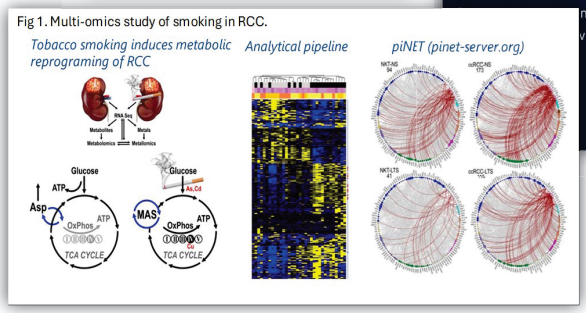
Importance of the EHS Core Center Program

By the end of this presentation, I want to have demonstrated that Centers are incubators for:

- Science
- Translational Research
- Careers
- Community-engagement/Partnerships



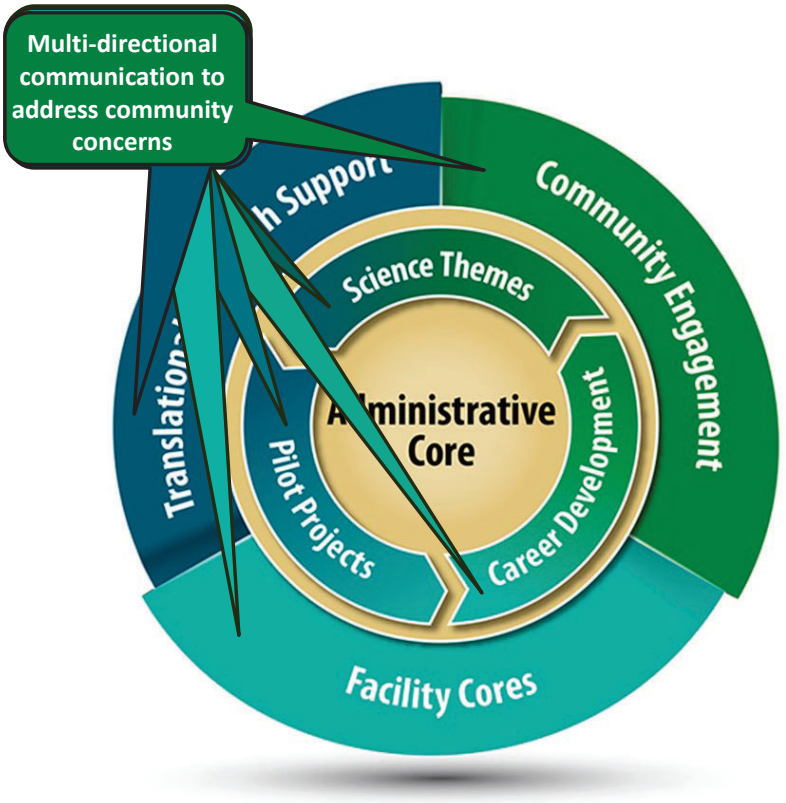


Background and Structure

EHSCC Program Goals

Environmental Health Sciences Core Centers guide and support environmental health research at an Institution or region. Their goals are to:

- Provide intellectual leadership and foster innovation
- Translate research into public health outcomes
- Support new ideas and collaborations
- Provide career development for future leaders
- Engage communities in multi-directional communication



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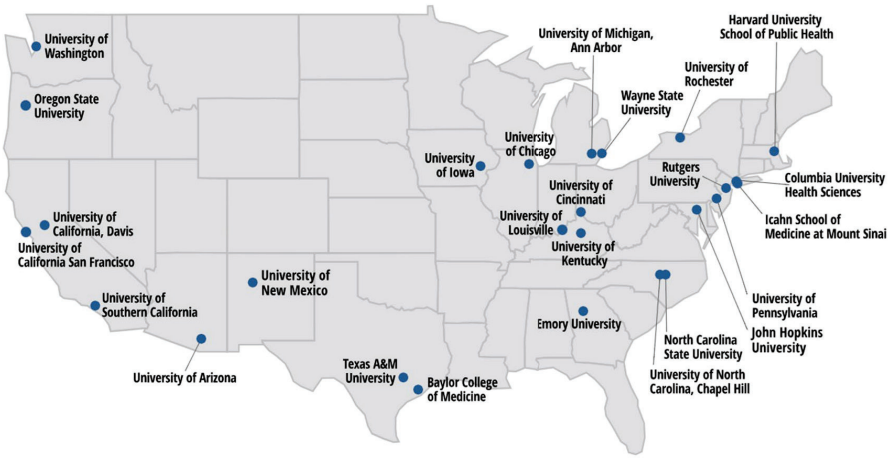
EHSCC Program By the Numbers



26	Current Centers
1,946	Members
1,682	Publications in 2023
4,411	# of times publications were cited in FY 2023
338	Resources: written and educational materials

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Core Center Highlights: Career Development

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Collaborative activities

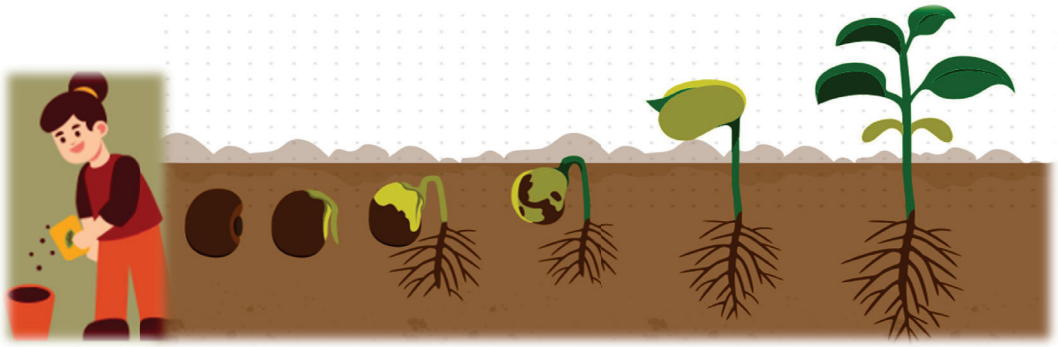
Mentoring

Research support

Leadership skills

Continuous Engagement

Financial Support



Career Development Award

Research Funding

Career Advancement

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Career Development Summary 2017-2024

- Approx. 223 career development recipients
- Approx 135 pilot awards
- Over 228 NIH grants awarded
- Over 2600 publications

*19 Centers responded to the request for career development highlights.

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Mentoring

Targeted Training

Research Support

Scientific Enrichment

Diana Hernández, Ph.D.
Columbia University

Career Development Award 2016-2018

40 Publications as awardee (100+ total)

NIH Funding R01

Deputy Director, P30 Center

Core Center Highlights: Pilot Projects

Core Center Pilot Project Impact

Pilot Project Investments
$13,338,696

→

Pilot Project Return
$158,979,393

PPP: Return on Investment
Ave $11.91 : $1
Range $2.5-$15M : 1

Since 2007, the Core Centers have funded 595 pilot projects

During this same time period, the Centers have invested over $13M into Center pilot projects

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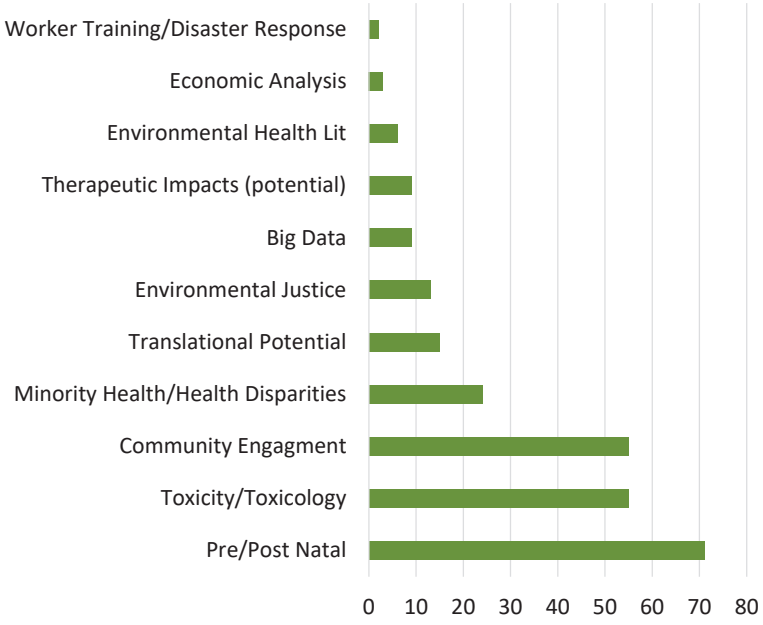
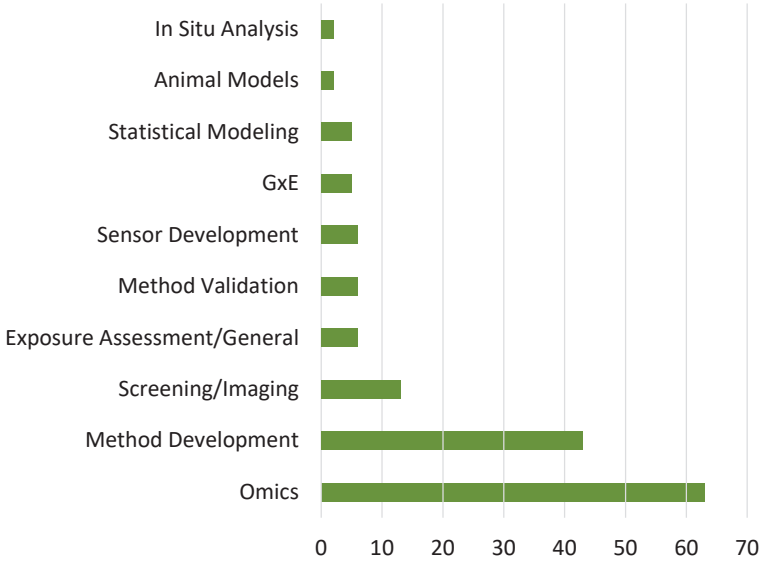
Pilot Project Approach Topics



Pilot Project Methods Topics



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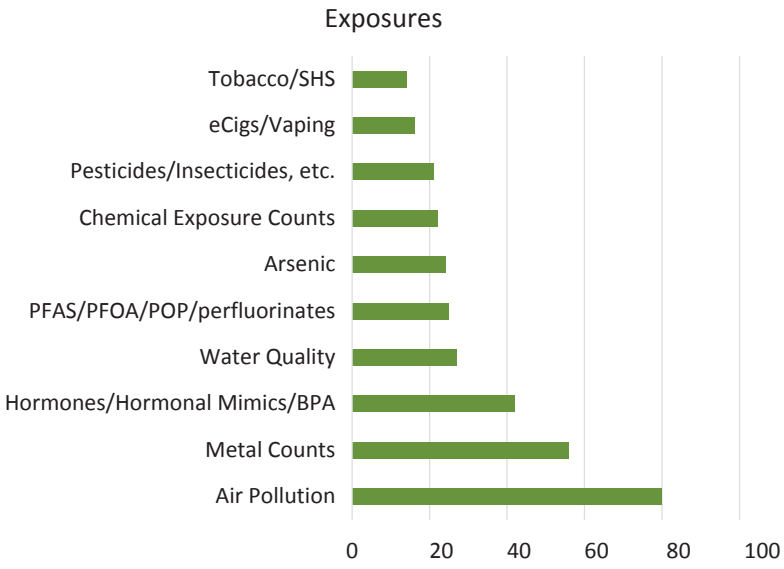
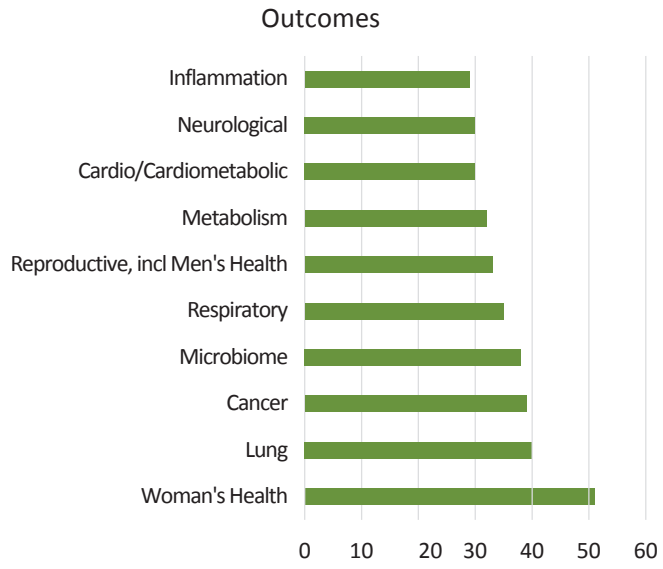
Pilot Project Top Ten Exposures and Outcomes





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EHSCC Pilot Project: Action on Spina Bifida in Bangladesh

Maitreyi Mazumdar, MD

- Pilot Project: Neural Tube Defects and Environmental Arsenic Exposure
  - case-control study to assess the relationship between environmental arsenic exposure and neural tube defects
  - Partial support for the development of a birth defect surveillance program
- R01 026317-01: Does Arsenic increase risk of neural tube defects in a highly exposed population – ONES Awardee (2016-2020)
- In June 2024, the Bangladesh Ministry of Health passed resolutions related to spina bifida including **setting standards for folate intake** and recommending a **surveillance program** for neural tube defects

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Core Center Highlights:

Nimble, translational, and collaborative

Nanoplastics: Responding to emerging topics

PNAS RESEARCH ARTICLE | CHEMISTRY ENVIRONMENTAL SCIENCES OPEN ACCESS

Rapid single-particle chemical imaging of nanoplastics by SRS microscopy

Naixin Qian[a], Xin Gao[a], Xiaoqi Lang[a], Huiping Deng[b], Teodora Maria Bratu[b], Qixuan Chen[c], Phoebe Stapleton[d], Beizhan Yan[b,1], and Wei Min[a,e,1]

240,000 – 400,000 nanoplastic particles per **Liter** of bottled water

Rutgers & Columbia

> *There's much more plastic in our brains than I ever would have imagined or been comfortable with*
> Matthew Campen, University of New Mexico

Bioaccumulation of Microplastics in Decedent Human Brains Assessed by Pyrolysis Gas Chromatography-Mass Spectrometry

Matthew Campen, Alexander Nihart, Marcus Garcia, Rui Liu, Marian Olewine, Eliseo Castillo, Barry Bleske, Justin Scott, Tamara Howard, Jorge Gonzalez-Estrella, Natalie Adolphi, Daniel Gallego, and Eliane El Hayek

▸ Author information ▸ Copyright and License information PMC Disclaimer

The quantity of microplastics in brain samples from 2024 was about 50% higher from the total in samples that date to 2016, suggesting the concentration of microplastics found in human brains is rising at a similar rate to that found in the environment.

Microplastics: Responding to Communities

University of Rochester

EHSCC P30
Pilot projects

Community
Inputs

Team
building

New COHH P01

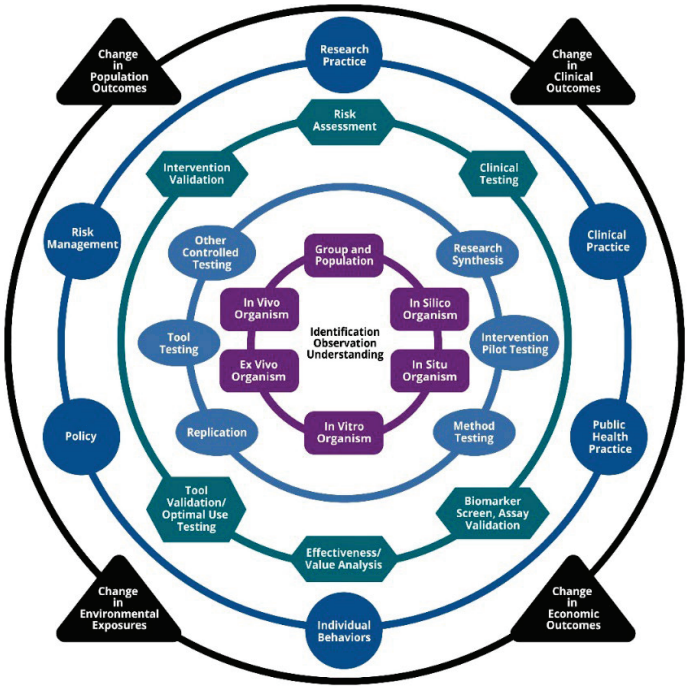
Lifecycle of microplastics, origins, distribution, human exposure, health effects, and impacts of changing climate

The over-arching goal of this new Center, led by Katrina Korfmacher, is to prevent negative human health impacts of MP in the context of climate change in the Great Lakes. The Community Engagement Core involves diverse partners in all aspects of the Center, including community science, direct action, development and dissemination of materials, and building partners' capacity to promote solutions.

EHS Core Center Meeting (September 25, 2024)
Special scientific session on micro-plastics

Promoting Translational Research

- ~2006 -- new requirement for Centers to focus on translation of research to clinical and public health practice
  - Core structure was left to the grantees to develop as needed to meet the Center's goal
- 2017 – NIEHS rolled out a new translational research framework (TRF)
- 2021 – cores renamed to Translational Research Support Cores



Translational Research:
Value of Bi-directional Community Engagement

Perelman SCHOOL OF MEDICINE UNIVERSITY of PENNSYLVANIA | CEET CENTER OF EXCELLENCE IN ENVIRONMENTAL TOXICOLOGY

Community Based Question:
Does Air Pollution Effect Lung Cancer Incidence?
(Howarth)

→

Age Adjusted Lung Cancer Incidence
(Hwang & Vachani)
(P30-ES013508
R01-ES029294)

→

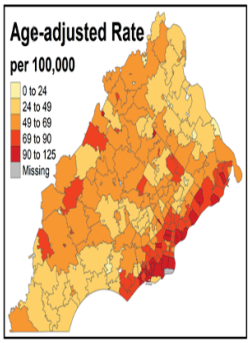
Hazard Indices Based on Point Emission for 421 Zip Codes Correlate with Lung Cancer Incidence
(Penning, Hwang, Vachani)
(P30-ES013508
R01-ES029294)

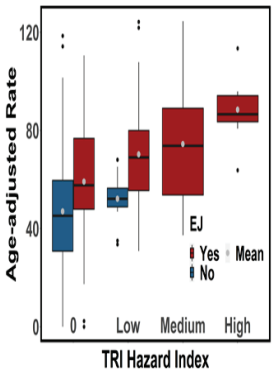
→

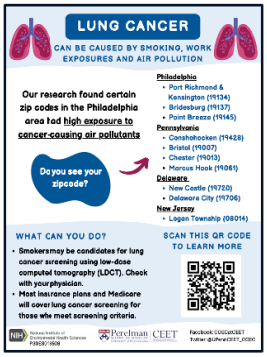
Community-based Infographic to Increase Uptake of Lung Cancer Screening
(Tan & Howarth)
(Pilot Project
Cancer Center)

→

Policy
Philadelphia City Council
Air Management Services
State Legislators
(Howarth)







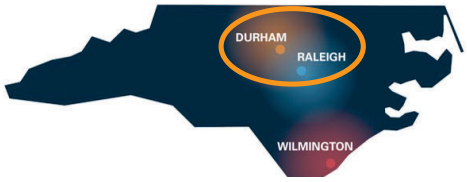
Zhu et al., Front Public Health, 2023, PMC10332161

Findings from large scale epidemiological study inform ongoing mechanistic research on Cd exposure supported by CHHE infrastructure.

Data from these studies inform ongoing CEC work with communities and educators.

Heavy metal exposure remains a concern for residents of central NC.

- State, federal policies become more protective.
- Exposure reduction behaviors informed by research and policy.



Core Center Infrastructure Supports Translational Heavy Metals Research

How do environmental exposures impact newborns? NEST Study (R01) identifies Pb, Cd clusters in Durham, NC

How does Cd impact offspring liver health and metabolism? PPP and Cores used to demonstrate effects in animal models

What does this mean for our health? CEC engages SAB, residents to understand community concerns and inform science.

NEST samples available via IHSFC - used for epigenetic studies

Facility Cores support heavy metal analyses from many matrices

CEC provides educational resources and technical assistance to communities

CEC and IHSFC support workshops & lesson plans for K12 teachers using data from Center Cd, Pb research

CEC host community SoilSHOPs to screen for metals in residential soils

New EHS research findings

EHS data used in K12 classrooms across the state

CHHE provides access to portable XRF for ongoing field screening

New collaborations with NC DHHS

STRIVE Study (UG4) funded to investigate Cd and liver cancer

2022 NC DEQ develops Preliminary Soil Remediation Goals based on human health risk

EPAs National Drinking Water standards include MCLs for iAs, Cd and action on Pb

2024 EPA lowers screening level for Pb in residential areas

Reported changes to gardening, outdoor play.
Residential exposure to heavy metals reduced.

Fundamental Questions
Application
Implementation
Practice
Impact

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Highlights: Power of Center Collaborations

Imperial Valley, California

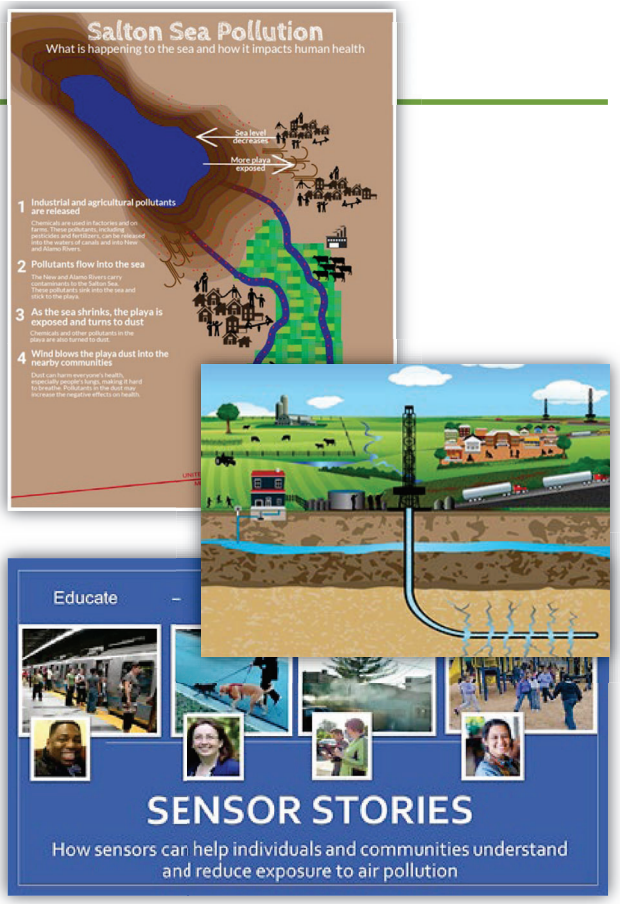
- Issue: multiple air quality concerns
- Sensor development for community air monitoring network
- Dust analysis from Salton Sea
- Examine child respiratory health outcomes

Air Sensor Stories

- Issue: knowledge gap on air sensors – types & purpose
- Workshop materials developed & tested
- Resources for communities

Hydraulic Fracturing

- Issue: new exposure with many unknown factors
- Inter-center working group established
- Data collection
- Research translation



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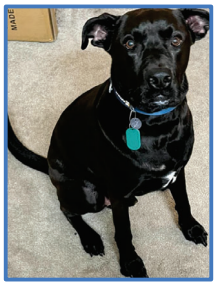
Core Center Highlights: Disaster Response

PNW EHSC at Oregon State University

Pacific Northwest Center for Translational Environmental Health Research

Translational Research Support CORE | Administrative CORE | Pilot Project Program Core | Chemical Exposure Core | Zebrafish Biomedical Research Facility Core | Community Engagement Core

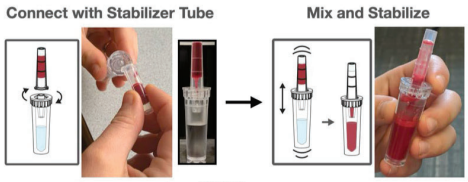
Developing capacity for research in Environmental Health Sciences



Flexible “just in time” pilot grant funding allowed a rapid response by the Chemical Exposure Core to an environmental disaster (East Palestine train derailment) to start a canine-sentinel exposure study.

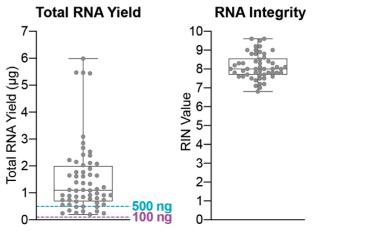
Studying inflammatory gene expression response to wildfire exposure
(pilot funded by UW EDGE Center 2022-2023 in support of rapid field research*)*

Image credit: www.tassoinc.com



*home*RNA kit stabilizer tube

RNA yield and integrity are sufficient for downstream transcriptomics analysis.



Haack*, Lim*, Kennedy, Day, Adams, Lee, Berthier, Theberge. *Anal. Chem.* **2021**, 93, 13196.

- Technology to collect blood samples at home
- Innovation to stabilize RNA for shipment
- Allows for transcriptomics analysis of samples collected remotely

EDGE pilot provided first dedicated funding for application of this approach

- Samples collected before, during, and after wildfire smoke exposure in high and low wildfire areas
- Two publications to date
- Supported new NIEHS grant 1R21ES034338-01

Images courtesy of Ashleigh Theberge

EDGE CENTER
UNIVERSITY of WASHINGTON

Summary and Future Vision for the Core Centers

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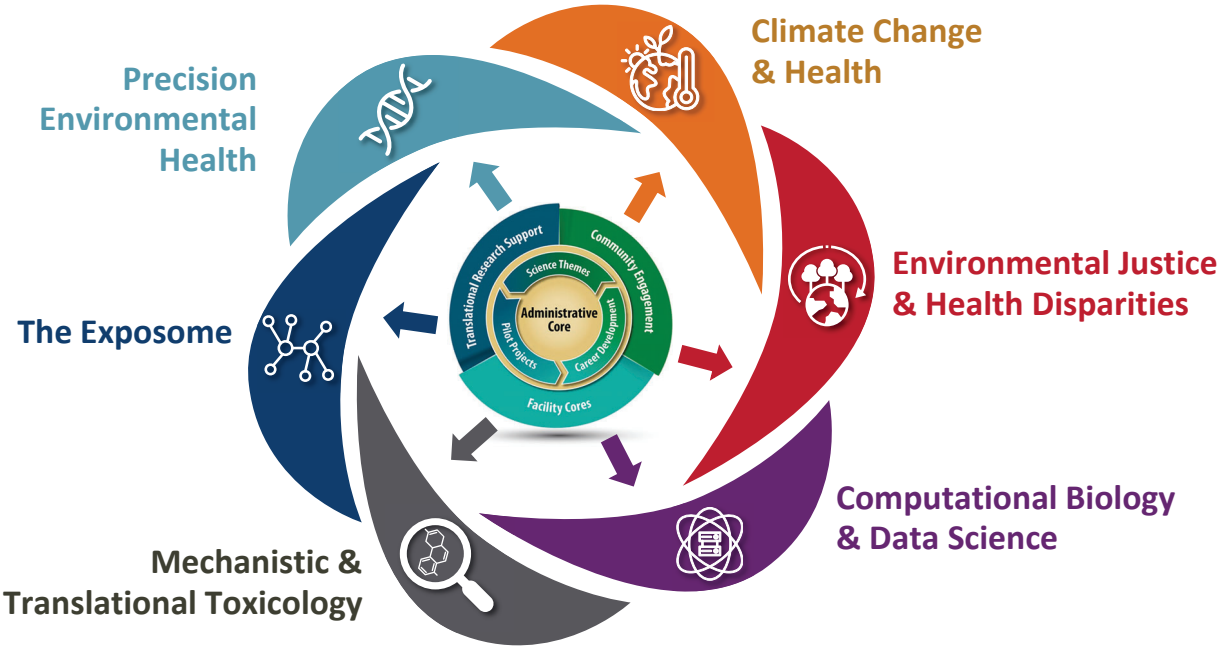
NIEHS Emerging Scientific Priority Areas



Previous Core Center Evaluations

	2004	2010	2015	2019	2024
Timeframe	1993-2003	2007-2010	2004-2014	2015-2019	2017-2024
Type	Outcome	Process	Process and Outcome	Process	Outcome
Focus	Key highlights Pilot projects Supplements	Programmatic and structural changes that were made in the 2005 FOA	Complex, Emerging and Translational Research	Impact of Centers on ESI/NI Success and Change in funding base & sliding scale	Career Development & Contribution of Centers to NIEHS grant base
Outcome	**Made major changes to FOA** **Added IHSFC**	**Updated eligibility criteria in 2013**	**Developed EHS Translational Research Framework**	**Eliminated sliding scale** **Required Translational Vision**	**Changed eligibility criteria**

Core Center Program Responsiveness

Identified Opportunities	Implemented Solutions
Building research capacity for "gap areas" on the map including MSIs, HBCUs, Tribal Colleges and Universities, and underfunded Institutions	Offering webinars and technical assistance to Institutions across the US
Leveraging NIH and other assets (federal and non-federal)	• New eligibility criteria • Growing connections through pilot projects
Enabling greater cross-Center collaborations	Actively encouraging collaborations among the Centers
Bringing DEIA into the Center structure	• Centers can now receive diversity supplements • Plans to enhance diverse perspectives have been added to the Centers

Proposed Concept

- **Mechanism:** P30
- **NOFO:** RFA with annual receipt dates for next 3 years
- **Minimum requirement:** funded research base of 3.0M in DC of supported Environmental Health Sciences projects that can be a mix of NIH, Federal and private grant support; at least 50% of the research base must be from NIH.
- **Structure:** Required
  - Admin Core
  - Facility Core
  - Career Development
  - Community Engagement Core
  - Pilot Project Program
  - Translational Vision
  - Plan for Enhancing Diverse Perspectives
- **Total cost for program:**
  - $6.0 – $7.5M/year based on availability of funds
  - New: $850K/yr for 4 yrs; Competing renewals $1.0M/yr for 5 years

Discussion and Questions

Council Discussants:

Dr. Gary Miller
Dr. Darryl Hood

Questions for Council

- What input or recommendations does Council have for advancing efforts to address the gap areas?
- A new evaluation of the Core Centers Program seems appropriate, what topics or focus areas would interest Council?

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THANK YOU