The National Institute of Environmental Health Sciences Research Programs at **Wayne State University**

Center for Urban Responses to Environmental Stressors

CLEAR Center for Leadership in Environmental Awareness and Research

Environmental Signature Core Facility (ESCF)
Chemical Analysis Core (CAC)

Points of Discussion

Analytical services and their role in addressing potential long-term community health problems.

Long-term
Environmental and Human Health Monitoring

Spilled Chemicals – Early Monitoring to Long-term Monitoring

Spilled Chemicals Tested for

- Vinyl chloride
- Butyl acrylate
- 2-Ethylhexyl acrylate
- 2-butoxyethanol

Wells

- Below detection levels

Surface Waters – Leslie Run

- 2-Ethylhexyl & Butyl acrylates (low ppb)
  Disturbed water sample resulted in mid ppb range

Sediment/Soil – Leslie Run + soil near ground zero

- 2-Ethylhexyl & Butyl acrylates (*Low to mid ug/kg)*

Sorbent Materials – Charcoal: "airborne chemicals"

- Vinyl chloride, Butyl acrylate, and 2-Ethylhexyl acrylate

Fate and Transport - Modeling of contaminants movement and degradation
Vapor Intrusion – Monitoring is needed in buildings along the creek
A forensic investigations of reoccurring health problems.
Bloody Noses, Rashes, Respiratory Problems
Continuing Exposure or Damage Tissue

Contaminants from the Controlled Burn: Testing Results

Contaminants Tested for

- PFAS (28 Compounds)
  - LC-QQQ
  - Modified EPA 571.3

Wells

- Below Levels of Concern
  - **PFOS DL – 25 ppt**
  - **PFOA DL – 5 ppt**
  - **Hazard Assessment (**DHS Tool | Wisconsin Sea Grant)

Surface Waters – Leslie Run

- Below Limits of Concern

Sediment/Soil – Leslie Run + soil near ground zero

- PFAS
  - PFOS 0.02 – 2.0 μg/Kg
  - PFOA 0.06 – 0.5 μg/Kg

Problem - T-STORM F-787A alcohol resistant aqueous film forming foam (AR-AFFF)
Fluorotelomers (Thank you Sue Fenton)
Still needs to be analyzed.

Untargeted Mass Spectrometry - Unknown chemicals

Summary of Results:

Leslie Run and near Ground Zero

- PFAS
- OPFR (possible fire containment chemicals)
- Other chemicals - probably not related to the spills

Spilled Chemicals Detected by Untargeted Mass Spectrometry

Retention Time	Peak Intensity	Name	Comment
2.8	3.2E+4	Butyl acrylate	Spilled Chemical
3.43	5.77E+4	2-Ethylhexanol	Microbial Degradation?
4.07	6.24E+5	2-Ethylhexanal	Microbial Degradation?
6.02	7.7E+5	2-Ethylhexyl acrylate	Spilled Chemical

Passive Sampling –Low-cost Sampling (Vapor Intrusion)

Exposure to Spilled Chemicals

- Butyl acrylate
- 2-Ethylhexyl acrylate

Wristband

- Butyl acrylate
  74 +/- 3 ng/Kg
- 2-Ethylhexyl acrylate
  Present
  Co-eluting Peaks

Badges

- 2-Ethylhexyl acrylate (24 hrs)
  One out of 20 had a below the “quantitation limit” positive.
- 24/7 badges to be analyzed

Urine and Blood Biomarkers

Targeted LC-MS/MS - Potential Biomarkers

- Vinyl Chloride
  N-Acetyl-S-(2-hydroxyethyl)-L-cystiene
- Acroclein
  N-Acetyl-S-(2-carbooxyethyl)-L-cysteine
- Butyl Acrylate
  N-Acetyl-S-(2-butoxycarybonyl)ethylcysteine
- 2-Ethylhexyl Acrylate
  N-acetyl-S-2-(2-ethylhexyloxycarbonyl)ethylcysteine

Untargeted LC-HRMS (Exploris Orbitrap)

1) natural abundance isotopic distribution, 2) precursor ion exact mass within 5 ppm error, and 3) *in silico* fragmentation of the expected metabolites validating the $HRMS^2$ spectra.

Thermo Orbitrap Exploris

Metabolomics (Blood and Urine)

Metabolomics aims to provide comprehensive and quantitative analyses of a wide array of metabolites in biological samples (blood or urine)

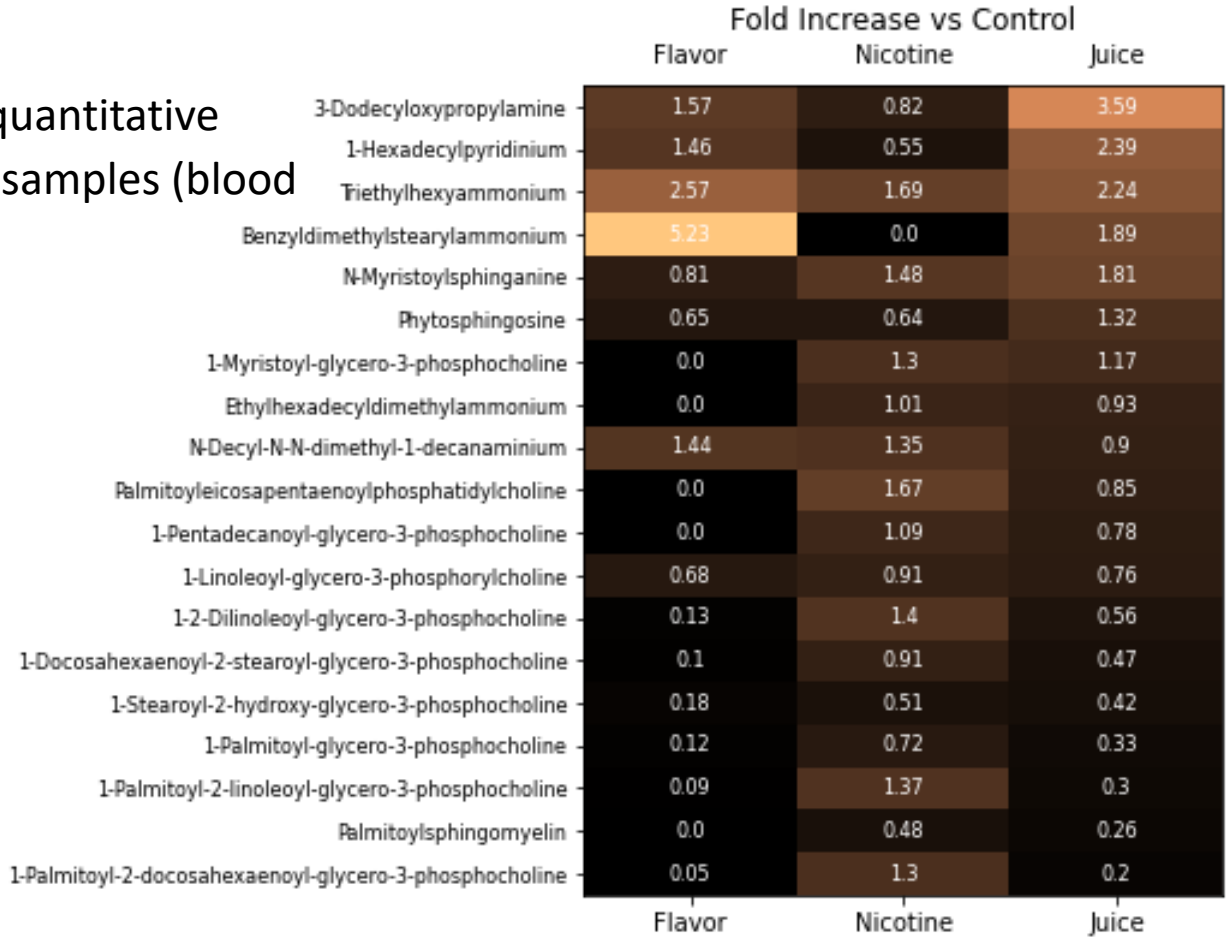
Metabolic fingerprinting, Metabolic profiling
Lipidomics

Proteomics (Blood)

Complete evaluation of the function and structure of proteins.

Proteomics, genomics, and bioinformatics can provide an understanding of biological function and disease

Biomarkers



Fold increase of lipids in vaping experiments.

Personalized Medicine - Exposomics

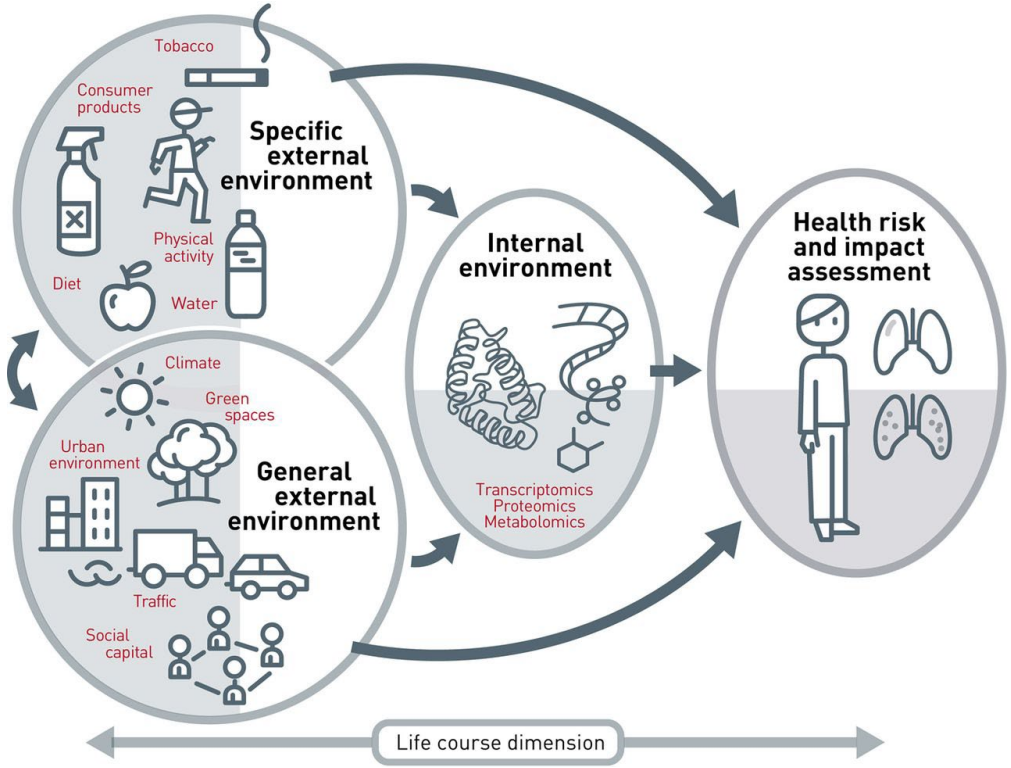
Exposures - live, work, play, and **disasters** throughout their lives shape health, including a person's risk or resilience to disease.

Understanding of how these exposures shape health and risk for disease.

Disasters?

Goals
Measure the cumulative exposures throughout a life-time

Evaluate the associations or causal relationships between exposure and any biological change



Long-term environmental and biomarker monitoring suggestions

- **Evaluation of current data**
  - **Vapor Intrusion**
  - **Fate and Transport of spilled chemicals, fire contaminant, and burn products**

- **Long-term human monitoring research**
  - **Exposomics**
  - **Metabolomics**
  - **Proteomics**
  - **Other ‘monic’**

- **Pregnant woman and children**

Public Health Research and Surveillance Priorities from the East Palestine Train Derailment, National Academy of Sciences Workshop, November 6-7, 2023

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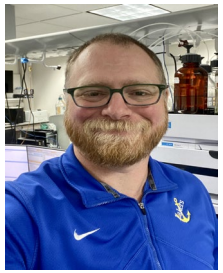

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