U.S. Centers for Disease Control and Prevention
Agency for Toxic Substances and Disease Registry

Biomonitoring Laboratory Considerations during an Emergency Response – Red Hill Water Crisis

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Biomonitoring

A potential tool to support exposure investigations

NCEH DLS provided technical assistance on results interpretation for laboratory test results from concerned community members during the Red Hill water crisis

- Biomonitoring measurement was not done by DLS

Considerations for including biomonitoring in an exposure investigation

- Timing
- Laboratory capacity
- Selectivity of biomarkers
- Results communication

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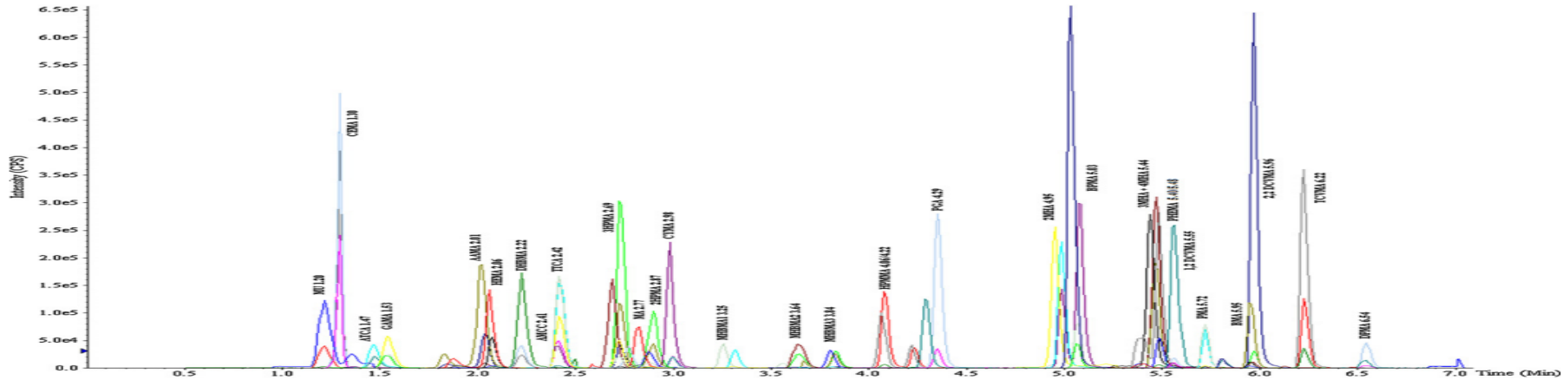
Jet Fuel

Clinical laboratory measurements for select biomarkers of jet fuel exposure

Biomarkers

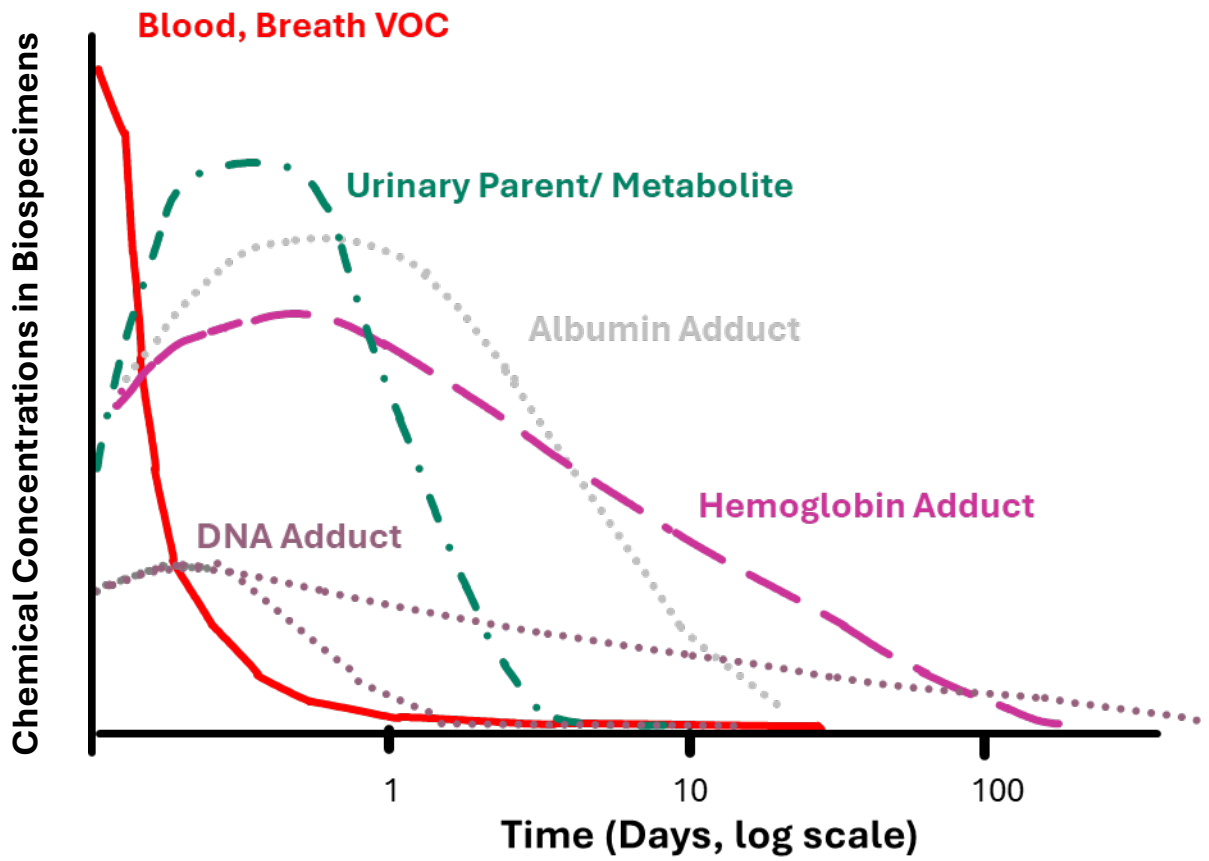
- Total Petroleum Hydrocarbons
- Volatile Organic Compounds (VOCs)
- Polycyclic Aromatic Hydrocarbons (PAHs)



Reference: Alwis KU, Blount BC, Britt AS, Patel D, Ashley DL. Simultaneous analysis of 28 urinary VOC metabolites using ultra high performance liquid chromatography coupled with electrospray ionization tandem mass spectrometry (UPLC-ESI/MSMS). Anal Chim Acta. 2012 Oct 31;750:152-60. doi: 10.1016/j.aca.2012.04.009. Epub 2012 Apr 21. PMID: 23062436; PMCID: PMC11261307.

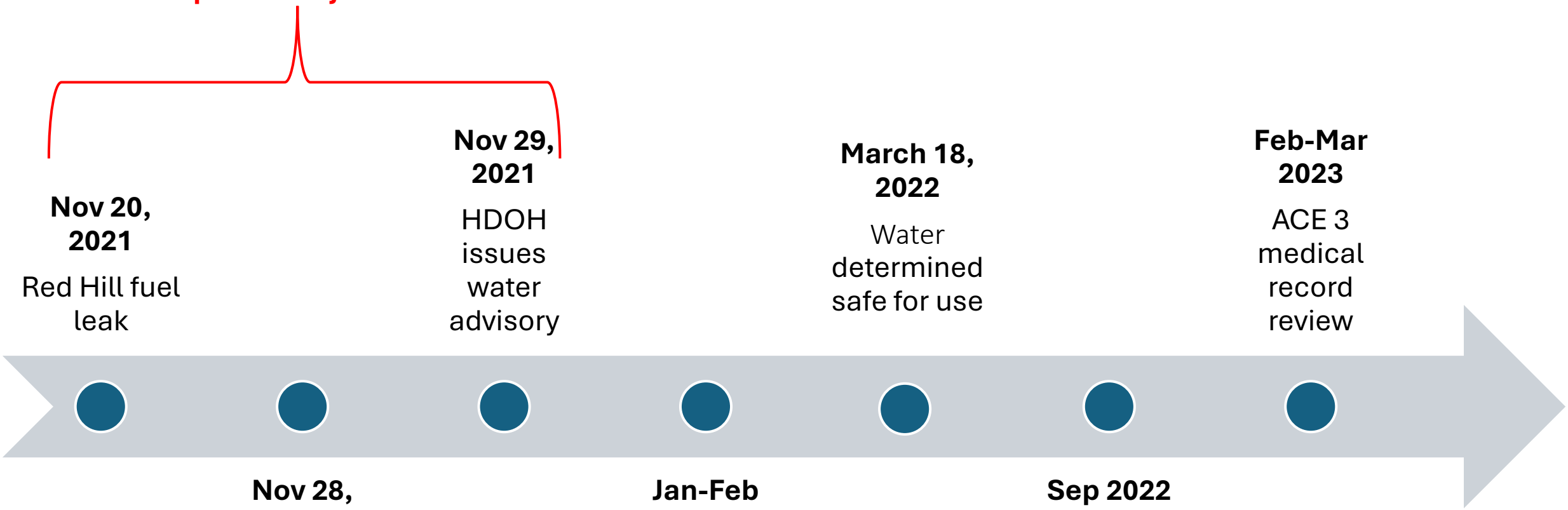
Kinetics of Biomarker Determines Exposure Window

- Parent chemicals in serum, urine, and breath
- Metabolites in serum, urine, and saliva
- Hemoglobin/albumin adducts in blood



Biomonitoring timeline to monitor exposure

Biospecimens needed to be collected to best assess exposure to jet fuel



Red Hill Results Interpretation

Communicating biomonitoring results is complex due to multiple factors

Selectivity of biomarkers

- Biomarkers may not be specific for the exposure
- Endogenous/background levels
- Toxicological/nutritional interactions

Sample Collection

- Timing of biospecimen collection past temporal window relevant to the exposure event
- Specimen collection can lead to possible analyte loss and/or contamination if not done appropriately

Communicating Health Risk

- No questionnaire data about recent alternative exposure sources
- Inappropriate comparison groups
- Limited health-based values for comparison

Laboratory Data Quality

- Analytical measurement of unknown quality (QA/QC data not presented)

Biomonitoring after an Emergency Response Incident – Lessons Learned

- **Established Response Network with Federal, State, and Local Partners**
  - Awareness by local health departments on resources available to provide technical assistance
- **Rapid Assessment**
  - After an emergency response incident –exposure assessment is needed to determine how to respond
- **Population Selection**
  - Testing people with the most acute exposures
- **Effective biomonitoring can only happen if biospecimens are collected within an appropriate time window**

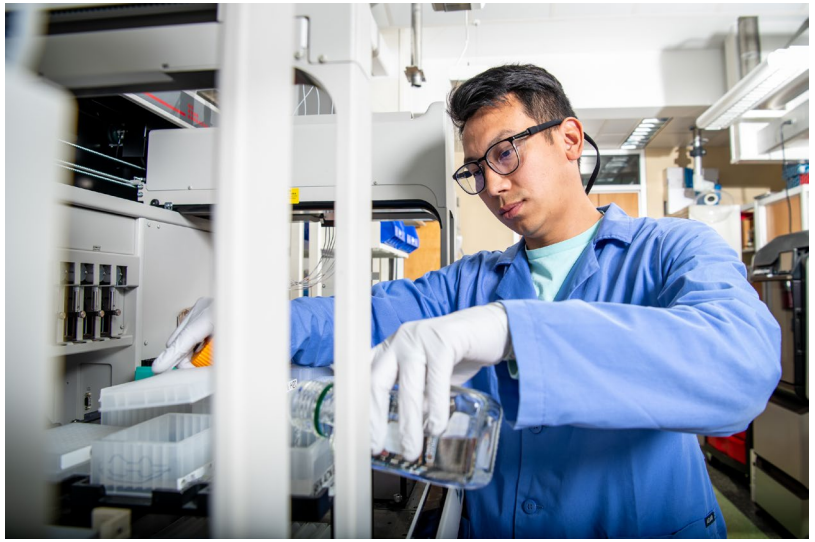


Photo by NCEH DLS

Thank you!

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the U. S. Centers for Disease Control and Prevention.