

East Palestine Community-Engaged Environmental Exposure, Health Data, and Biospecimen bank

Background. On February 3, 2023, a freight train carrying vinyl chloride (VC) and other chemicals derailed in East Palestine, OH. VC leaked into the air, soil, surface water, and groundwater, potentially impacting indoor air and drinking water. Emergency crews conducted a controlled burn of the spill further impacting these environmental media and may have used fluorochemical-containing firefighting foam. Population characteristics: East Palestine Village- 5000 people: 94% white, 21% are 65 years and older, no residential mobility (1%), 10% veterans, median income \$44,500, and 9.1% poverty. Residents are increasingly concerned about returning home and the long-term effects on their health and environment. VC is a hepatotoxicant and exposure to high concentrations can cause hepatic angiosarcoma, hepatocellular carcinoma but also non-malignant stages of liver disease, such as steatosis, toxicant-associated steatohepatitis (TASH), fibrosis and cirrhosis. Other long-term health effects are brain and lung cancers, lymphoma, and leukemia. Most of our understanding of the impact of VC exposure on human health is derived from occupational exposure studies. Environmental disasters can result in chronic psycho-social stress, further negatively impacting health outcomes in at-risk individuals. Psycho-social stress increases organismal inflammation and enhances organ damage, including cardiometabolic disease. Although this is a chemical mixture-based spill, the major chemical of concern is VC.

Time sensitive rationale. The East Palestine, OH train derailment resulted in a significant spill of volatile organic compounds including the hepatotoxicant VC, impacting a community of 5000 people and multiple environmental media. Given the volatile nature of the contaminants and the high level of stress in the community, it is critical to collect and bank time-sensitive environmental media- and biospecimen data, as well as actively characterize and address the growing psychosocial stressors. We propose to use a citizen science approach, engaging the community from design through dissemination. The **purpose** of this time-sensitive proposal is to deploy a community-engaged approach to collect, bank and analyze a subsample of environmental- biospecimen- and psychosocial stress data to mitigate the immediate and long-term impacts of exposures to VC and other VOCs spilled during the derailment disaster. **Innovation:** this investigation embeds a four-pronged innovative strategy: 1) collection of time-sensitive, interconnected invaluable exposure, health outcome-, and community health concern data to urgently protect the most vulnerable populations impacted by the chemical spill related to the East Palestine train derailment; 2) The results of this study will provide pivotal baseline data to inform long term environmental epidemiologic cohort studies; 3) deployment of a community engaged approach to ascertain the potential cumulative burden of VC exposure and psychosocial stress; and 4) The opportunity of this unique cohort to serve as an invaluable resource to guide best practices in similar future disasters.

To achieve the purpose, we propose the following 3 complementary **Specific Aims:**

Aim 1. Embed a community-engaged approach to address environmental- and health concerns.

From study design to dissemination of results, we will deploy citizen science strategies to actively engage community members in collecting environmental samples, biospecimens and health outcome data on the interaction of psycho-social stress and VC exposure. The study population will consist of 300 participants living close to the spill and the contaminated surface water streams.

Aim 2. Characterize environmental presence and distribution of VC and PFAS. Outdoors: surface water, soil and sediment samples of key sites where the greatest exposure risks exist. Residential sampling: air and well water samples will be collected from 100 homes, supplied by both municipal and artesian wells. Sampling instruments will include traditional indoor air samples, e.g. SUMMA canisters as well as community-enabled devices such as buckets (used by the LA Bucket Brigade). Geospatial analyses will be conducted to determine and predict dispersion/drainage patterns. Environmental samples will be collected and banked on an annual basis for 2 years. A subset of residential samples will be analyzed to guide the biomarker analyses.

Aim 3. Collect baseline biomarker- and psychosocial data. Serum, plasma, and genomic DNA samples will be collected and banked for future biomarker- and mechanistic studies. Samples will be stored through the University of Pittsburgh Biospecimen Core. Biomarker analyses: plasma/serum: ALT, AST, CK-18 (M65 and M30); genomic DNA; urine: Thiodiglycolic acid. Biospecimens from residents exposed to elevated indoor contaminants of concern will be collected and analyzed annually for this cohort of 300 participants. Biospecimens of 150 participants of the same cohort with elevated risk factors will be analyzed semi-annually. To measure psychosocial stress, we will collaborate with community leaders to select instruments included in the DR2 portfolio, including PSS, PHQ-9 and GAD-7.

Anticipated impact. 1) Time-sensitive environmental-and biobanking will expeditiously mitigate exposure risks in an underserved community; 2) the banked samples serve as valuable baseline data for more comprehensive cohort studies examining the cumulative impact of exposures to chemical and non-chemical stressors; 3) early community engagement helps build trust and collaboration now and in the future.