Data Brief: Outdoor Air

A Norfolk Southern freight train carrying hazardous materials derailed in East Palestine, OH on February 3, 2023. This is a summary of public data gathered after the derailment about possible impacts on outdoor air as of April 2024.

Key Points:

- **U.S. EPA:** Low levels of 21 carcinogens were detected – more information is needed to assess risk. Chemicals that can cause the reported symptoms were detected (for example acrolein).
- **University Data-Carnegie Mellon and Texas A&M:** Confirmed that some chemicals, including vinyl chloride, were present at levels that were less than the levels of concern.
  - Acrolein levels were high where the EPA did not measure (northeast of town).
  - Some chemicals were detected that could not be identified.
- **Summary:** At this time, available measurements do not allow for claims of long-term safety or risk. Levels of concern change with our scientific knowledge. We may learn more about health risks as the effects of these chemicals are studied.

Thousands of tests for chemical contaminants in air have been done. We compared these air data with "levels of concern," that are based on scientific knowledge of each chemical. Many factors are involved, but in general, the chance of health effects increases when the **concentration** of a chemical and the **duration** of exposure rise above the published level of concern.

There are limitations to examining outdoor air data. The levels of concern change as scientists learn more. Additionally, there is no comprehensive list of all the chemicals that were present after the fire. Even if there were, current methods are not good at estimating the combined health impacts of several chemicals over time.

Data and Sampling

U.S. EPA

- Samples were taken between 2/4/2023 and 1/16/2024.
- Over 15,000 samples were taken from 96 sites. A total of 156,018 tests were conducted.
- EPA tested for 67 specific chemicals.
- Most samples were taken in town to the west of the disaster site. Wind direction varies, but the predominant wind direction puts these measurements upwind from the site.

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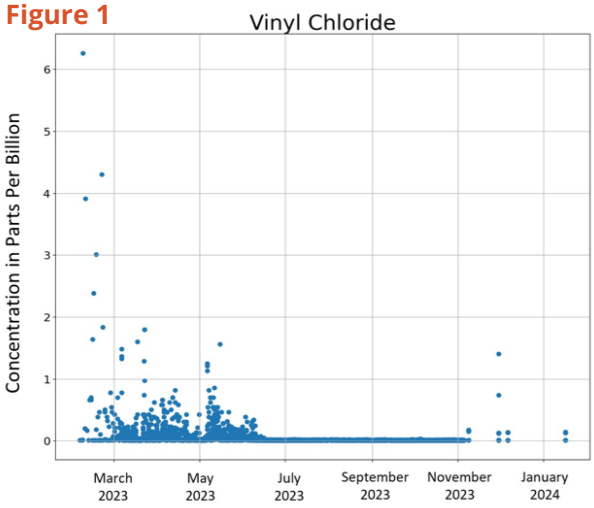
- Samples were taken on 2 days, 2/20/2023 and 2/21/2023.
- They used a mobile sampler and evaluated areas both upwind and downwind of the site.
- Some of these areas were not tested in the EPA outdoor air samples.
- They used a "non-targeted" test that allowed them to detect more than the 67 chemicals tested by the EPA. The drawback of this method is that some of the chemicals detected cannot be definitively identified (a chemical is there but the specific type is unclear).

Results

U.S. EPA

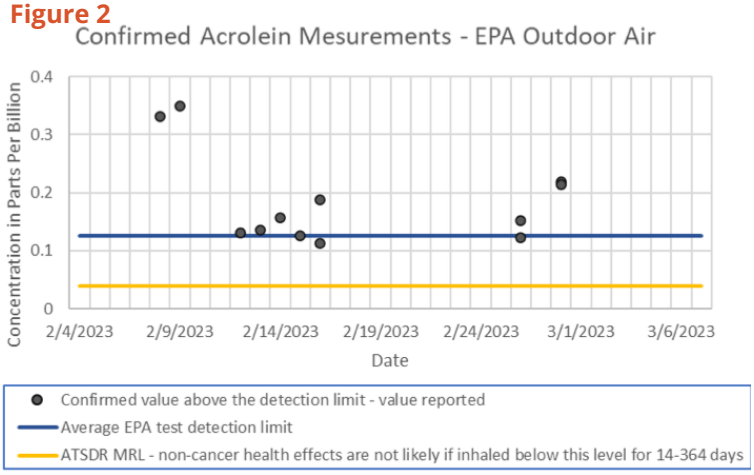
- 12% of the 156,018 tests found a chemical concentration high enough to be detected.
- 46 of the 67 chemicals tested were detected at least once.
- Vinyl chloride levels generally decreased with time. Levels did not go above any CDC ATSDR levels of concern for non-cancer effects (Figure 1).
- 2 of 2,244 naphthalene tests were above the CDC ATSDR level for nasal irritation (on 2/28 and 7/5 within 1,000 feet of the event).
- 2 of 2,246 benzene tests were above the CDC ATSDR level for immune cell toxicity (on 2/8 and 5/3 within 1,500 feet of the event).
  - If these levels had been present every day for a year and people were breathing in that area, there would be concern for these health effects.

Figure 1



- Acrolein was measured above a CDC ATSDR level of concern (0.04 ppb) during several days in February (Figure 2).
- Tests were not sensitive enough to see if acrolein levels ever went below this level of concern.
- All acrolein detections were within 3,000 feet of the incident on Taggart or East Main.

Figure 2



- Acrolein measurements were stopped in March of 2023.
- 99% of acrolein is expected to be gone after 6 days in the air (half-life=15-20 hours). It is unknown how often or how long acrolein was released.
- Acrolein degrades into formaldehyde, glycolaldehyde, carbon monoxide, and formic acid.
- Some of these chemicals have known health effects but they were not present in the EPA outdoor air data.
- The ATSDR CDC estimates that the lung, nose, and eye irritation effects by acrolein are unlikely if it is inhaled for less than 14 days at less than 0.04 ppb.

- 21 of the detected chemicals were listed as carcinogens (cancer-causing). Low levels of carcinogens are all around us in our world today, so more information is needed to determine if the derailment could increase cancer risk.
- In general, health effects are dependent on multiple known and unknown factors (including the airborne levels of the contaminants and the duration of human exposure).
- Statements claiming “safe” or “unsafe” are not justified due to the complexity and uncertainties in this situation.

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- In areas northeast of town not evaluated by the EPA, acrolein levels were 6 times higher than the local background for 2/20 and 2/21. Currently their method can cannot give an exact concentration.
- Several other chemicals were detected on these 2 days, but they could not be definitively identified. Two of these might be formamide and methyl formate, based on preliminary data. These can cause similar symptoms as acrolein. We do not have their concentrations for comparison to levels of concern, and neither chemical was measured by the EPA on any day.

Future Directions and Discussions

- Continue conversations about the criteria that should be used to decide which chemicals are monitored over time.
- Develop and recommend outdoor air monitoring protocols to support fast-paced decision making.