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Study: Toxic Chemicals From Ohio Train Derailment Spread Across 16 States

Toxic chemicals released during the Norfolk Southern train derailment in East Palestine, Ohio, last year spread to 16 states and likely Canada, according to a study published on June 16. The pollution, some of which came from the burning of vinyl chloride, a known carcinogen, spread over 540,000 square miles, indicating that "the impacts of the fire were larger in scale and scope than the initial predictions," the authors of the study, published in *Environmental Research Letters*, reported.

AP Images
Train derailment in East Palestine, Ohio, Feb. 3, 2023

Widespread Impacts

The study, titled "Widespread Impacts to Precipitation of the East Palestine Ohio Train Accident," noted that measurements of precipitation chemistry from the National Atmospheric Deposition Program (NADP) revealed significant impacts extending from the Midwest through the Northeast, likely reaching into Canada, and potentially as far south as North Carolina, covering parts of 16 states and an area of 1.4 million square kilometers where approximately 107.4 million Americans live. The affected states are Connecticut, Delaware, Maine, Maryland, Massachusetts, Michigan, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia.

The study analyzed ground depositions from the week of the train accident and the following days, covering the period from January 31 to February 14, 2023.

Health Impacts of Chloride

The study highlighted unexpectedly high chloride concentrations, elevated pH levels, and base cations surpassing the 99th percentiles of historical records, underscoring the significant environmental impact. According to medical literature, chloride is a molecule (usually salt) that poses significant health risks to humans. Even low levels of exposure can irritate the eyes, nose, and throat, while higher levels can cause more serious symptoms such as coughing, wheezing, nausea, vomiting, lightheadedness, headache, chest pain, abdominal discomfort, and corneal burns. Chronic exposure can

lead to persistent chest pain, cough, sore throat, and hemoptysis (coughing up blood), and high doses can result in acute lung injury, including pulmonary edema (accumulation of fluid in the lungs), bilateral infiltrates on chest X-rays (the presence of abnormal substances, such as fluid, pus, blood, or cells, in both lungs), hypoxemia (low blood oxygen levels), and respiratory failure.

The long-term effects of chloride exposure are particularly concerning, with potential outcomes including chronic lung problems such as bronchitis and asthma, certain types of cancer, and immediate, potentially irreparable lung damage. The build-up of fluid in the lungs can lead to suffocation and death.

Plus, chloride contamination affects various aspects of the environment and infrastructure. In some areas, it can taint groundwater, impacting its taste and healthfulness. For aquatic life, even low levels of chloride can harm fish, amphibians, and aquatic plants, disrupting their structure and productivity, while high levels are toxic. Chloride damages roadside vegetation, altering plant communities and killing trees, and degrades the soil's ability to retain water and nutrients, leading to erosion. Pets can become sick from ingesting or coming into contact with this salt, and some wildlife, such as finches and sparrows, may die from eating deicing salt (sodium chloride). Infrastructure suffers as chloride corrodes roads and bridges, raising maintenance costs.

The highest chloride levels were detected in northern Pennsylvania and near the Canada-New York border, downwind from the accident site. Additionally, exceptionally high pH levels were found in rain as far away as northern Maine.

Elevated pH and Base Cations

Elevated levels of pH and base cations refer to specific chemical properties of precipitation. Abnormally high levels of base cations and high pH in precipitation can significantly affect soil chemistry, plant health, and water bodies. These changes can alter nutrient availability in the soil and harm aquatic ecosystems by disrupting the pH balance of lakes and streams. While less directly harmful to human health compared to acidic precipitation, these chemical changes can indirectly impact humans by affecting the quality of drinking water sources and the health of ecosystems on which people rely.

The study did not examine organic compounds like dioxin or PFAS (chemicals used in firefighting foam), which likely also spread after the accident. Elevated inorganic chemical levels decreased two to three weeks post-accident. The findings point to the need for a more detailed evaluation of the accident to fully understand the atmospheric concentrations, deposition, and specific spatial impact, aiming to refine the understanding of such large-scale environmental incidents.

Researcher's Reaction

Lead author David Gay, coordinator of the National Atmospheric Deposition Program, expressed his surprise at the extent of the chemical spread. "I didn't expect to see an impact this far out," he told *The Washington Post*. According to the outlet, the researcher implied that while the absolute concentrations of harmful chemicals are low, their levels are extreme when compared to historical data, "It's not death and destruction. It's fairly low concentrations, but they are very high relative to the normal that we typically see — some of the highest we've measured in the last 10 years."

Problems With Emergency Response

The Norfolk Southern train derailed on February 3, 2023, near the Pennsylvania border and the Appalachian foothills. At least 11 of the derailed cars were carrying hazardous materials, some of which caught fire and burned for days. Authorities, allegedly trying to prevent a large-scale explosion, drained

the vinyl chloride from five cars into a trench and set it alight in a controlled burn.

This action later came under scrutiny. According to a Huffington Post report, a former U.S. Environmental Protection Agency (EPA) official has stated that the controlled burn conducted after the derailment likely violated EPA regulations. Kevin Garrahan, who worked at the EPA for 40 years, referenced a 2022 memo that described open burning of hazardous waste as a last resort and generally the least preferred method due to its environmental impact. Additionally, Jennifer Homendy, chair of the National Transportation Safety Board (NTSB), testified before the U.S. Senate that the deliberate burning of toxic chemicals was unnecessary, as alternative measures were available to handle the situation safely, per the report.

Settlements and Financial Impact

Norfolk Southern has agreed to nearly $1 billion in damages following two settlements. In April, a $600 million deal was reached with class-action plaintiffs living within 20 miles of the derailment site, pending resident approval. In May, a separate $310 million settlement was reached with the federal government. Additionally, Norfolk Southern reported spending $107 million on community support and soil removal, according to a company news release.

Despite these expenditures, the company reported a net income of $1.8 billion in 2023; this represented a 44-percent decrease from the previous year due to the financial impact of the East Palestine train derailment. The CEO, Alan Shaw, received a 37-percent increase in his compensation, bringing his total earnings to $13.4 million in 2023, up from $9.8 million in 2022, according to a Common Dreams report.

The outlet also notes that the company had raised its federal lobbying expenditures by 30 percent last year, amounting to $2.34 million.