Data Brief: Dioxins and Furans

A Norfolk Southern freight train carrying hazardous materials derailed in East Palestine, OH on February 3, 2023. This is a summary about dioxins and furans in soil samples we gathered after the derailment.

Key Points:

- **Of samples collected at 27 sites in East Palestine, two had concentrations of dioxins and furans above a 1-in-1 million risk of developing non-cancer diseases over 30 years of daily exposure; 13 had above a 1-in-1 million risk of developing cancer over 30 years of daily exposure.**
- **We found a higher percentage of samples with concentrations above the 1-in-1 million cancer risk threshold than Norfolk Southern and the EPA.**

What was the purpose?

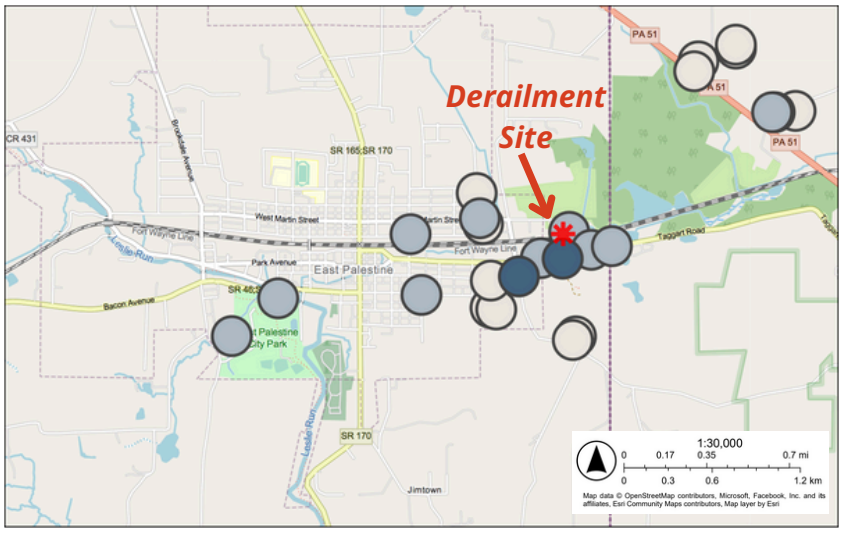
We found out that EPA and Norfolk Southern measured some high values of **dioxins and furans**, which are known to cause cancer and do not break down easily. We independently obtained soil samples and tested them to see if we also found high values that could pose a risk of cancer to the East Palestine community.

What did we do?

Soil samples were collected in East Palestine by the Louisiana State University Superfund Research Center and Kent State University in August, 2023 at 27 sites, most of which are shown on the map below with their approximate locations (exact locations masked for resident privacy).

Soil Sample Locations and Regional Screening Levels, August 2023

- Above the non-cancer Regional Screening Level, or "RSL": 51 pg/g, the soil concentration with a 1-in-1 million risk of developing diseases other than cancer over 30 years of daily exposure; collected at roadside and commercial properties
- Above the cancer RSL: 4.8 pg/g, the soil concentration with a 1-in-1 million risk of developing cancer over 30 years of daily exposure but lower than the non-cancer RSL.
- Below RSL



What did we find?

Dioxins and furans were detected at all 27 sites. Some types of dioxins and furans are more toxic than others, and we took this into account by calculating Toxic Equivalency (TEQ). Higher values of TEQ were found near the derailment site compared with the soil collected 4 miles to the west or 1 mile to the northeast of the derailment site.

Soil Samples and Regional Screening Levels, August 2023

Dioxin Range		Disease Risk	Number of samples
●	> 51 pg/g	More than 1-in-1 million risk of non-cancer diseases if exposed ever day over 30 years	2 (7.4%)
●	4.8 - 51 pg/g (RSL)	More than 1-in-1 million risk of cancer if exposed ever day over 30 years	11 (41%)
●	< 4.8 pg/g	Less than 1-in-1 million risk of cancer if exposed ever day over 30 years	14 (52%)

How can you use this information?

You can use this information to decide if you are comfortable with the level of cancer risk for outdoor activities like gardening, sports, or play, if you live in these areas.

How did our data compare with Norfolk Southern and EPA?

Soil samples were obtained in separate efforts by Norfolk Southern (263 samples), the U.S. Environmental Protection Agency (138 samples), and the Louisiana State University-Kent State University research team (27 samples). Data from Norfolk-Southern and U.S. EPA were collected in similar areas to LSU-KSU in March and April 2023, and obtained from U.S. EPA's website. All three data sets are shown together here. LSU-KSU found a higher percentage of samples above the 1-in-1 million cancer risk threshold (48%) compared to Norfolk Southern and U.S. EPA.

Soil Sampling Details from Norfolk Southern, U.S. EPA, and LSU-KSU

	Norfolk Southern		EPA		LSU-KSU
Depth	0-1 inch	1-6 inch	0-1 inch	1-6 inch	0-6 inch
Count	131	132	64	74	27
Average TEQ (pg/g)	18.6	13.5	24.2	26.8	15.8
TEQ Range (pg/g)	0.0012-662	0.00093-667	0-520	0-670	0.19-88.2
Number above 1-in-1 million cancer risk	47 (36%)	41 (31%)	21 (33%)	23 (31%)	13 (48%)
Number above 1-in-1 million non-cancer risk	8 (6.1%)	4 (3.0%)	6 (9.4%)	5 (6.8%)	2 (7.4%)

If you have questions about the data or this analysis, please email Dr. Jennifer Richmond-Bryant at North Carolina State University, jrbryan3@ncsu.edu. Data were collected by the LSU Superfund Research Center in partnership with Kent State University and reviewed by the OH/PA University Research Consortium.

LSU SUPERFUND Research Program | NC STATE UNIVERSITY College of Natural Resources | CHHE Center for Human Health and the Environment

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