

Carus Chemical Fire Health Information Series | Illinois EPA Surface Wipe Samples

Background

On January 11, 2023, a fire broke out at the Carus, LLC chemical plant in LaSalle. Initial reports indicated that the fire affected a shipping warehouse that stored more than 1 million pounds of potassium permanganate. The fire produced smoke with fine particulate matter and manganese compounds. Numerous area residents reported visible residues or granular materials on their property and vehicles.

On January 12, the Illinois Environmental Protection Agency (IEPA) collected samples at the plant and from neighborhoods north of the plant. These samples were collected to help characterize contamination from the fire and how far it spread.

- Sample X201 was collected at the plant. It was identified as a soil sample on its laboratory results report, but IEPA describes it has a ground surface waste sample of fire-related runoff. This waste sample was collected near the southwest corner of the shipping warehouse that was destroyed by the fire (Building 55).
- Sample X301 was a surface wipe sample collected from the concrete pad in the same location as Sample X201.
- Sample X302 was a surface wipe collected from a concrete pad on the east side of the plant near a sewer manhole.
- Samples X303, X304, X305, and X306 were collected in residential neighborhoods north of the site. These were wipe samples collected from surfaces that included a sidewalk, patio furniture, and fencing.

Surface Wipe Sample Results

Wipe samples are difficult to interpret and subject to limitations. They can be used to characterize airborne deposition, but no health-based guidelines or regulatory limits have been established for surface wipes.¹ The U.S. Environmental Protection Agency and IEPA have established health-based screening levels for soil samples, but these cannot be directly applied to surface wipes. Soil sample results are usually expressed in milligrams of contaminant per kilogram of soil. The results for the surface wipes collected by IEPA are expressed in micrograms (μg or ug) of contaminant per wipe. Wipes are often collected using a 100 square centimeter template (about 4 inches by 4 inches).

¹ Lead in dust is an exception. The Illinois Lead Poisoning Prevention Code establishes regulatory limits for lead in dust.

Surface wipe samples collected at the plant and the surface waste sample collected from fire-related runoff (the one identified as a soil sample on the laboratory report) were found to have high levels of metals, including manganese as high as 291,000 parts per million (ppm). This level of manganese is about 130 times greater than the highest level detected in the residential wipe samples. High levels would be expected given the proximity to the fire. Nearby residents would not be expected to have an exposure to surface contamination or firefighting runoff on the plant property due to their limited access to the property.

Manganese levels varied widely between the residential sample locations (9.27, 262, 1,480, and 2,270 µg/wipe). The U.S. Food and Nutrition Board has established tolerable upper intake levels for manganese that are considered safe for occasional consumption. Manganese exposure from samples X303 and X306 could be a concern for children ages 1-3, if they repeatedly ingest levels more than these guidelines and no steps are taken to reduce or eliminate their exposure. This reinforces the need for cleanup of surface residues on residential properties. Residential sampling results are presented in Tables 1 and 2.

Cadmium was not detected on any of the four residential samples. Thallium was present on one residential sample, but the result was near the laboratory detection limit and the laboratory notes include a qualifier that the sample may be biased high. This result and those for cobalt and selenium are not a concern for short- or long-term exposures, especially if high contact exterior surfaces have been cleaned.

How Can Manganese Affect My Health?

The most common health problems in adult workers exposed to high levels of manganese involve the nervous system. These health effects include behavioral changes and other nervous system effects, which include movements that may become slow and clumsy.

Studies in children have suggested that prolonged exposure to high levels of manganese is associated with learning and behavioral problems.

What Steps Can I Take to Reduce My Exposure?

Follow best practices for reducing exposure to contaminants in soil.

- Practice good hand hygiene. Wash your hands and children's hands after working or playing outdoors and before eating or drinking.
- Take off your shoes when you go inside and leave outdoor shoes in the garage or the entryway.
- Vacuum carpeting, rugs, and upholstery often.
- Eat a well-balanced diet with iron-rich foods. Iron may lessen manganese absorption.

Should I see my doctor?

Schedule a visit with your doctor or pediatrician if you or family members have any signs or symptoms of manganese exposure. The Pediatric Environmental Health Specialty Unit, which is affiliated with the University of Illinois at Chicago School of Public Health, is a resource for parents, pediatricians, and general practitioners. Call 312-413-3000 to schedule an appointment or request a consult.

Questions?

Call IDPH at 217-782-5830 and leave a message or email DPH.Tox@illinois.gov.

This information sheet is a collaboration between IDPH, IEPA, and LaSalle County Health Department.

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Table 1. Residential Wipe Sample Results (micrograms (µg)/wipe) and established U.S. Food and Nutrition Board Tolerable Upper Intake levels in Micrograms per Day by Age Group. Metals that were not detected in any sample are not listed.

Substance	X303	X304	X305	X306	Tolerable Upper Intake Level (years)
Aluminum	ND	ND	ND	124	-
Antimony	23.4	19.9	45.1	22.2	-
Cobalt	ND	ND	0.87	ND	-
Lead ²	ND	ND	ND	0.24	-
Manganese	1480	262	9.27	2270	2,000 (1-3) 3,000 (4-8) 6,000 (9-13) 9,000 (14-18) 11,000 (19+)
Nickel	ND	ND	0.45	ND	-
Selenium	1.29	ND	1.31	1.98	90 (1-3) 150 (4-8) 280 (9-13) 400 (14-18) 400 (19+)
Strontium	ND	ND	0.92	1	-
Thallium	ND	ND	ND	1.07	-
Zinc	13.8	8.74	10.8	28.6	7,000 (1-3) 12,000 (4-8) 23,000 (9-13) 34,000 (14-18) 40,000 (19+)

ND: Not detected above the laboratory reporting limit.

Table 2. Minerals detected in residential wipe sample results alongside recommended dietary allowance in milligrams per day. Wipe sample results have been converted to milligrams for direct comparison.

Substance	X303	X304	X305	X306	RDA (mg)
Calcium	0.118	0.084	0.216	0.118	700 to 1,300
Magnesium	ND	ND	0.034	ND	130 to 420
Potassium	0.284	0.194	ND	0.836	2,000 to 3,400
Sodium	0.110	0.145	0.290	0.173	1,500

ND: Not detected above the laboratory reporting limit.

² The Illinois Lead Poisoning Prevention Code regulatory limit for lead on horizontal exterior surfaces is 100 µg/ft².
100 µg/ft² ÷929 cm²/ft²×100=10 µg/100 cm²