

Medical Guidance for Potential Acrylonitrile Exposure

ATSDR has developed this flier to provide Health Care Providers with medical guidance for acrylonitrile exposure associated with the Maryville, TN CSX Tank Car Derailment, spill and fire that happened on July 1, 2015. This flier provides information about health effects from acrylonitrile exposure, and effects expected based on the levels found during and after the fire.

Background

A rail car carrying acrylonitrile derailed and began leaking between 11:00 pm and 12 midnight on July 1, 2015. The acrylonitrile spilled onto the tracks below the rail car and caught fire. An area 0.5 miles from the fire was initially evacuated; the evacuation zone was extended to 1.5 miles from the spill site. The fire was extinguished on Friday, July 3, 2015. Evacuated residents were allowed to reoccupy their residences beginning at noon on July 3.

THE BOTTOM LINE – Maryville Tank Car Spill and Fire Environmental Test Results

- Exposure to acrylonitrile, and breakdown products, off-site (in the community) should not harm people's health.
- Exposure to acrylonitrile on-site (spill and fire site) may cause short term health effects.
- Exposure to acrylonitrile in Culton Creek, in the vicinity of the industrial park, should not harm people's health.
- One private well, very close to the site, contains low levels of acrylonitrile and has been taken out of service.
- Environmental monitoring is ongoing; EPA is posting sampling data at: <http://epaossc.org/csxmaryvillefire>.
- ATSDR continues to monitor the situation and will review ongoing sampling results.

Acrylonitrile

Acrylonitrile, also called vinyl cyanide, is a man-made chemical used for the production of plastics and acrylic fibers. It is a colorless or slightly yellow liquid that is highly volatile. It has an onion- or garlic-like odor. Vapors are heavier than air and are very flammable and explosive. Acrylonitrile is somewhat soluble in water and easily migrates into groundwater. Hydrogen cyanide, a toxic gas, is released on burning of acrylonitrile.

Health effects of acrylonitrile exposure

Acrylonitrile is a systemic poison that is easily absorbed by inhalation, ingestion, and dermal contact. Some, but not all, of the toxicity of acrylonitrile may be due to the metabolic release of cyanide within the body. Health effects will depend upon the dose or air concentration, and duration of exposure. While some health effects are experienced immediately, the onset of other symptoms may be delayed 4 to 12 hours.

Acute inhalation health effects

Low exposures:

- No health effects are expected in individuals exposed to less than 0.1 ppm.
- No or only mild, transient health effects would be experienced by individuals exposed for up to one hour to 10 ppm or less (AIHA-ERPG-1)

Moderate exposures:

- Nose and throat irritation, sneezing, cough, chest tightness, shortness of breath
- Nausea, dizziness, headache
- Eye and skin irritation from vapor or concentrated liquid exposure

High exposures:

- Life threatening health effects are not expected at concentrations <75 ppm for an exposure of up to 1 hour (AIHA-ERPG-3).
- Cyanosis, pulmonary edema, respiratory arrest
- Convulsions, coma, death

Potential health effects of exposure to acrylonitrile and hydrogen cyanide from the Maryville incident

- Health effects from inhalation, if any, would be expected immediately or within 12 hours of exposure.
- Acute health effects from chemical inhalation are particularly relevant for this incident.
- First responders, and others in the immediate vicinity of the spill and fire when it occurred, are more likely to have experienced health effects.
- Environmental sampling data in the off-site residential area during, and after, the fire indicates chemical levels in air are below levels that are harmful to health.
- Environmental sampling data of private residential water wells indicate the wells are not contaminated with acrylonitrile at this time. Well sampling will continue.

Approach to Patient Management

Symptom Evaluation

- Focus on head, eyes, ears, nose and throat (HEENT), central nervous system (CNS), and respiratory system.

Exposure History Questionnaire

- Were you in the immediate vicinity of the area where the spill and fire occurred, or in the adjacent industrial site when it occurred?
- Are you an emergency responder to this incident?
- Were you home when the incident occurred?
- Were you told to evacuate from the evacuation zone? Did you evacuate? How soon after the derailment? When did you return?
- What symptoms are you having? When did you first experience symptoms? (At the time of event, within one day, after returning home, etc.).
- Do you have a private well that you use for your home water supply? If so, have you used it since the train derailment?

Physical Exam

- As indicated

Laboratory Testing

Laboratory testing is not indicated for the doses potentially received in this incident. Generally, laboratory testing for acrylonitrile or its metabolite, thiocyanate, is not useful since the results do not guide patient treatment. The normal range for urinary thiocyanate is 8.92 mg/L (95th percentile)*. Higher values are seen in smokers.

Treatment

- Treat and manage patient's symptoms and conditions according to standard clinical protocols guided by the patient's presentation.
- It is highly unlikely anyone was exposed to acrylonitrile at levels that cause severe acrylonitrile poisoning. In those situations antidotes used to treat cyanide poisoning are used.
- Consider other causes of the person's symptoms.

Advise/counsel patients

- As indicated, reassure patients that given the details of their exposure history, onset of symptoms, environmental sampling results, etc., health effects are not related to acrylonitrile exposure.
- Advise patients that laboratory testing for acrylonitrile will not provide information to guide their treatment.
- No long-term health effects are expected from any low level exposures to acrylonitrile. While acrylonitrile is reasonably anticipated to be a human carcinogen, the increased risk of cancer from exposure from this incident is negligible.

For more information about health effects

Consult ATSDR's Medical Management Guideline for acrylonitrile at: <http://www.atsdr.cdc.gov/MHMI/mmq125.pdf>

Contact Dr. Michelle Watters if you have medical questions.

Phone: 312-353-2979 Email: aax6@cdc.gov

Contact Rich Nickle if you have environmental questions.

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*CDC National Health and Nutrition Examination (NHANES), Updated Tables, 2015; summarized in Fourth National Report on Human Exposure to Environmental Chemicals (www.cdc.gov/exposurereport/).