Environmental and Occupational Disease Case Reporting and Investigation Protocol
Cadmium Poisoning

I. Identification and definition of cases

A. Clinical description

Cadmium is a heavy metal found in the earth's crust; all soil and rocks, including coal and mineral fertilizers, contain some cadmium. Cadmium may enter the body through inhalation or oral routes. For inhalation exposures, the lung is the most sensitive organ, and long-term effects include decreased lung function and emphysema. Occupationally exposed workers have been shown to be at an increased risk of lung cancer. Oral exposures result in damage to the kidneys and bones. They can result in renal tubular damage, glomerular damage, decreases in bone mineralization, and increased risk of bone fractures. Absorption is enhanced in individuals with low iron levels. Cadmium clears the body very slowly with a half-life of more than 26 years and accumulates in the kidneys.

Clinical Testing

Testing for cadmium in blood reflects recent exposures rather than whole-body burden. Urinary levels are more appropriate for chronic exposures.

Common Exposures

The most common exposure to cadmium is through smoking. For non-smokers, exposure can come through diet, with leafy vegetables such as lettuce and spinach, potatoes, grains, peanuts, and organ meats (liver and kidney) containing higher levels of cadmium than other foods. At-risk occupations include alloy production, battery production, pigment production and use, and smelting and refining.

B. Laboratory criteria

Confirmatory

- Blood cadmium levels ≥ 5 µg/L; **or**
- Urine cadmium levels ≥ 2 µg/L; **or**
- Urinary cadmium:creatinine ratio ≥ 2

C. Wisconsin surveillance case definition

Confirmed case

A case, with or without symptoms, that is laboratory confirmed.

II. Reporting

A. Wisconsin disease surveillance category II – methods for reporting

This disease shall be reported to the patient's local health officer or to the local health officer's designee within 72 hours of recognition of a case or suspected case, per Wis. Admin. Code § DHS 145.04 (3) (b). Report electronically through the Wisconsin Electronic Disease Surveillance System (WEDSS), or mail or fax a completed Acute and Communicable Disease Case Report (F-44151) to the address on the form.

B. Responsibility for reporting

According to to Wis. Admin. Code § DHS 145.04(1), persons licensed under Wis. Stat. ch. 441 or 448, laboratories, health care facilities, teachers, principals, or nurses serving a school or day care center, and any person who knows or suspects that a person has a communicable disease identified in Appendix A.

C. Clinical criteria for reporting

Clinical diagnosis in an adult or child.

D. Laboratory criteria for reporting

Blood cadmium levels ≥ 5 µg/L **or** urine cadmium levels ≥ 2 µg/L **or** urinary cadmium:creatinine ratio ≥ 2.

III. Case investigation

A. Responsibility for case investigation

The Division of Public Health performs case investigations unless local health departments choose to conduct routine follow-up for all cases in their jurisdictions. A case investigation may include information collected by phone, in person, in writing, or through review of medical records or communicable disease report forms, as necessary and appropriate. If reporting through WEDSS, cadmium poisonings are within the Metal Poisoning (Non-Lead) section.

B. Required documentation

WEDSS disease incident investigation report, including appropriate disease-specific tabs.

IV. Public health interventions and prevention measures

- Encourage smoking cessation. Smoking is the primary exposure route outside of occupational settings.
- Workers at risk for exposure to cadmium should use appropriate personal protective equipment (PPE) and respiratory protection in accordance with NIOSH and OSHA guidelines. At-risk occupations are those in which cadmium-containing products are heated and include alloy production, battery production, pigment production and use, plastics production, and smelting and refining. Cadmium in these settings is typically inhaled.
- For non-smokers, diet is the primary exposure route. Foods high in cadmium include leafy vegetables (such as lettuce and spinach), potatoes, grains, peanuts, and organ meats such as liver and kidney. Limit these foods if cadmium is a concern for a non-smoking individual.
- Cadmium levels may be higher in the air near places that uses cadmium, processes metal or burns coal. Individuals that are interested in learning what is being done to limit cadmium from these places, can contact the DNR. Individuals living near these places should call 911 if they smell very strong chemical odors in their home.
- Dietary cadmium is better absorbed in individuals with iron deficiency. Consider screening iron levels and adjusting as appropriate.

V. Contacts for consultation

- Local health departments and Tribal health agencies: https://www.dhs.wisconsin.gov/lh-depts/index.htm
- Wisconsin Bureau of Environmental and Occupational Health: 608-266-1120 or dhsenvhealth@dhs.wisconsin.gov
- Wisconsin State Laboratory of Hygiene: 1-800-862-1013
- Medical management of mercury poisoning: Wisconsin Poison Control Center: 1-800-222-1222

VI. Related references

- Agency for Toxic Substances and Disease Registry. (September 2012). Toxicological profile for cadmium. Retrieved from https://www.atsdr.cdc.gov/ToxProfiles/tp5.pdf

- Agency for Toxic Substances and Disease Registry (October 2012) ToxGuide for cadmium. Retrieved from https://www.atsdr.cdc.gov/toxguides/toxguide-5.pdf
- Agency for Toxic Substances and Disease Registry. (May 23, 2023). What health effects are associated with acute high-dose cadmium exposure? Retrieved from https://archive.cdc.gov/www_atsdr_cdc_gov/csem/cadmium/Acute-Effects.html#:~:text=The%20symptoms%20of%20acute%20cadmium,in%201%20second%20(FEV1).
- Elinder, Carl-Gustaf. (November, 2023). Epidemiology and toxicity of cadmium. UpToDate. Retrieved from https://www.uptodate.com/contents/epidemiology-and-toxicity-of-cadmium?search=cadmium%20poisoning&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1 on December 16, 2024.
- Kim K, Melough MM, Vance TM, Noh H, Koo SI, Chun OK. (2018, December). Dietary cadmium intake and sources in the US. *Nutrients* 11(1):2. doi:10.3390/nu11010002.