



Cadmium

Health Effects and Reducing Exposure



Learning Objectives

- Describe characteristics and identify sources of cadmium
- Discuss health effects of cadmium
- Determine actions for reducing exposures to cadmium



Uses and Sources

- Naturally occurring element
- Blue – white solid or gray – black powder
- Found at 776 National Priority List sites
- Found in soil, rocks, coal and mineral fertilizers
- Used in batteries, silver solder, pigments, metal coatings, plastics, and electroplating



How Are We Exposed?

- Inhaling air emissions from industrial processes or incineration (ex. during production of zinc, lead, and copper)
- Eating contaminated food (such as shellfish, liver, kidney, vegetables, cereal)
- Ingestion of contaminated soil
- Ingestion of contaminated water

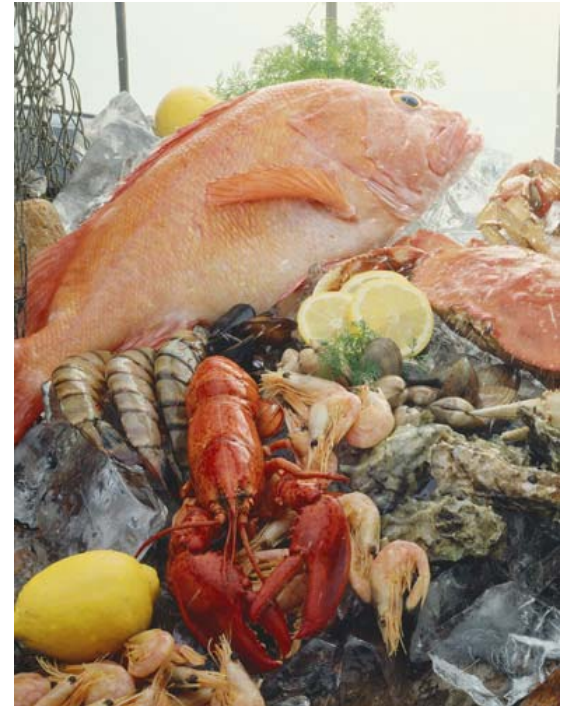
Health Effects: Inhalation



- Acute: flu-like symptoms with headache, chill, aching, and fever, “Metal-fume fever”
- Loss of smell
- Injure lungs, coughing, shortness of breath
- Fluid in the lungs
- Death

Health Effects: Ingestion

- Stomach irritation
- Nausea/vomiting
- Diarrhea



Health Effects: Kidney

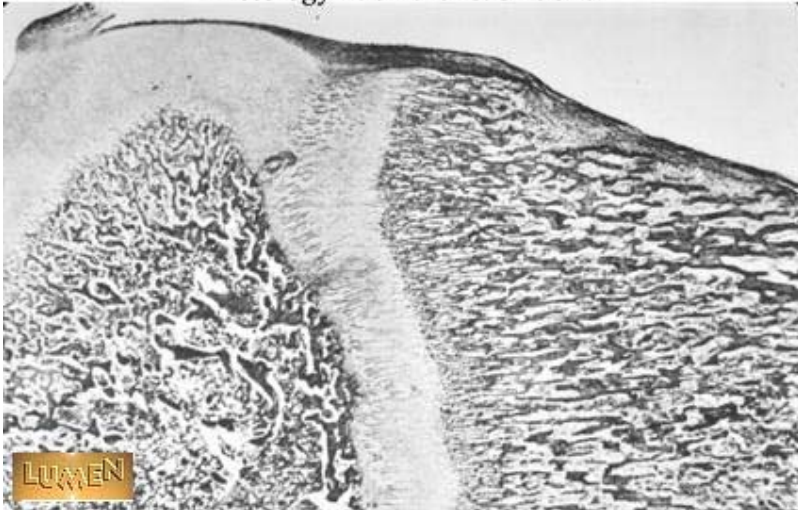
- Cadmium is stored in the body for a very long time, mostly in the kidneys
- Damages kidney tubules
- Kidney stones
- End Stage Renal Disease



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Health Effects: Bone Changes

Histology Lab Part 10: Slide 79

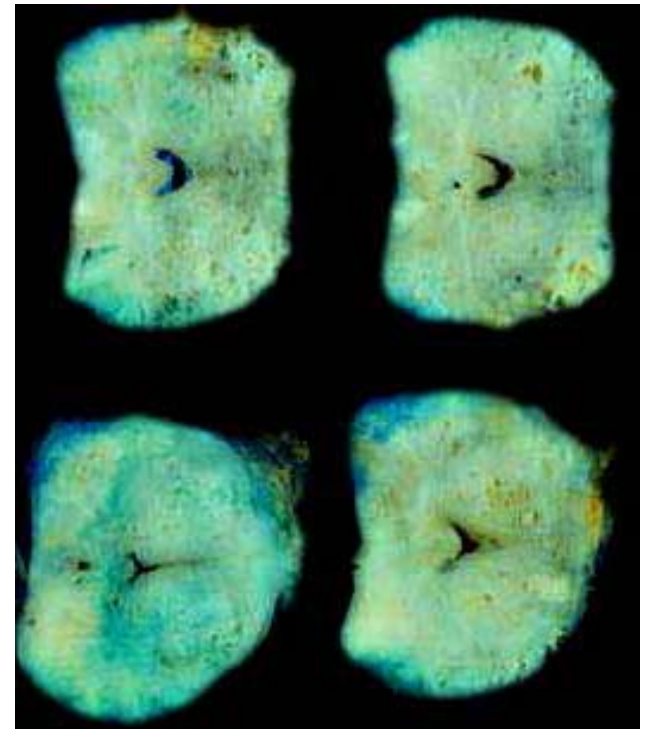


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- Osteoporosis due to depletion of calcium
- Fractures
- Effects of Cadmium are increased if person is iron-deficient

Health Effects: Cancer

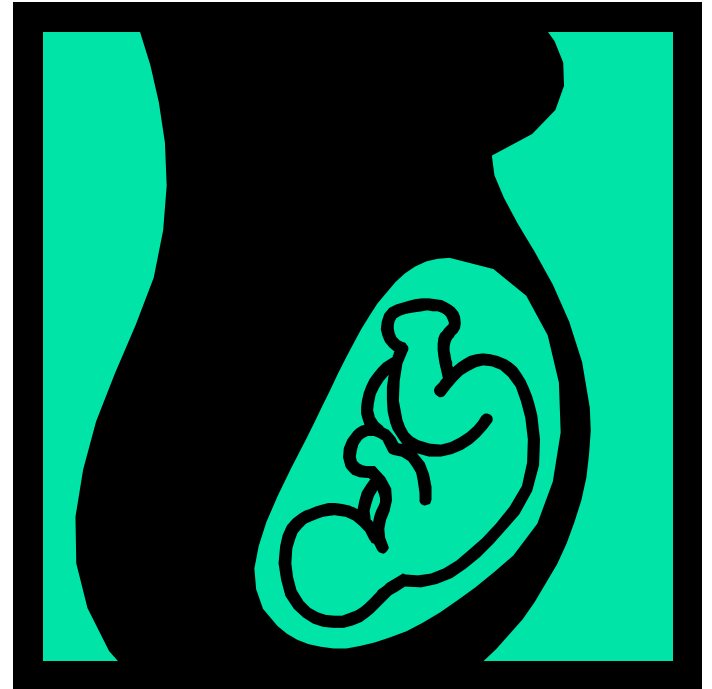
- “Probable carcinogen” meaning it is likely to cause cancer in humans
 - Prostate
 - Kidney
 - Testes
 - Lung



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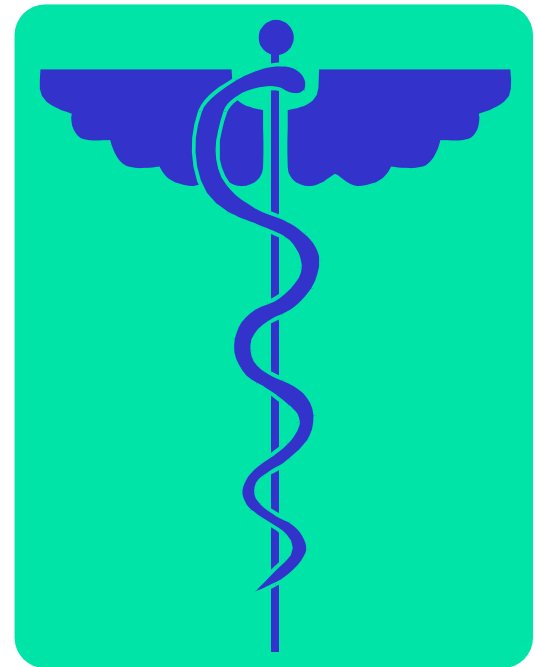
Health Effects: Reproductive

- Harms developing baby
- Damage testes
- Interrupts female cycle



Indication of Exposure

- Blood – indicates recent exposures
- Urine – can identify both recent and past exposures
- Hair and nails – unknown value of test results
- Monitor kidney function to evaluate recovery





What to Do?

- Eat a balanced diet to minimize intake of any one source that may be contaminated
- Wash vegetables thoroughly and limit intake of food grown in contaminated soil
- If exposed at work
 - Wash hands immediately and before going home
 - Change clothes at work, launder work clothes separately
 - Handle products safely - use proper protective equipment and adequate ventilation



Policy

- EPA Maximum Contaminant Level for water is 5 parts per billion (ppb)
- FDA limit for food colors is 15 parts per million (ppm)
- OSHA limit for air concentration is 5 mcg/cubic meter
 - Workers must be monitored for exposure and if elevations are found, actions must be taken to remove them from source of exposure



Resources

- ATSDR fact sheet
www.atsdr.cdc.gov/tfacts5.pdf
- EPA fact sheet on Drinking Water
www.epa.gov/OGWDW/dwh/t-ioc/cadmium.html
- NJ fact sheet
www.state.nj.us/health/eoh/rtkweb/0305.pdf



In Review

- What is cadmium and how are we exposed to it
- How does cadmium effect our health
- How can we reduce our exposure to cadmium



References

- Agency for Toxic Substances and Disease Registry (1999). Cadmium. Public Health Statement. Available on-line:
<http://www.atsdr.cdc.gov/toxprofiles/phs5.html>
- Akesson, A., Berglund, M., Schutz, A., Bjellerup, P., Bremme, K., & Vahter, M. (2002). Cadmium exposure in pregnancy and lactation in relation to iron status. American Journal of Public Health, 92: 284-287.
- Alonso, E., Cambra, K., & Martinez, T. (). Lead and Cadmium exposure from contaminated soil among residents of a farm area near and industrial site. Archives of Environmental Health, 56U(3):278-282.



References

- Hotz, P., Buchet, J., Bernard, A., Lison, D., & Lauwerys, R. (1999). Renal effects of low-level environmental cadmium exposure: 5-year follow-up of a subcohort from the Cadmibel study. Lancet, 354: 1508-1513.
- Loyola University Medical Education Network (2002). Anatomy Photographs. Available on-line at: <http://www.lumen.luc.edu/lumen/>



References

- New Jersey Department of Health and Senior Services (1999). Cadmium. Hazardous Substance Fact Sheet. Available on-line: <http://www.state.nj.us/health/eoh/rtkweb/0305.pdf>
- Stassen, J., Roels H., Emelianov, D., Kuznetsova, T., Thjis, L., Vangronsveld, J., & Fagard, R. (1999). Environmental exposure to cadmium, forearm bone density, and risk of fractures: Prospective population study. Lancet, 353: 1140-1144.