Health Consultation

Public Health Evaluation of Sediment and
Surface Water Data

PLAINVILLE PLATING COMPANY
(a/k/a PLAINVILLE ELECTROPLATING)

PLAINVILLE, HARTFORD COUNTY, CONNECTICUT

EPA FACILITY ID: CTD001149459

OCTOBER 23, 2001

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared by:

Connecticut Department of Public Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

The conclusions and recommendations in this health consultation are based on the data and information made available to the Connecticut Department of Public Health and the Agency for Toxic Substances and Disease Registry. The Connecticut Department of Public Health and the Agency for Toxic Substances and Disease Registry will review additional information when received. The review of additional data could change the conclusions and recommendations listed in this document.

BACKGROUND AND STATEMENT OF ISSUE

The Connecticut Department of Public Health (CT DPH) received a request from the U.S. Environmental Protection Agency (EPA) RCRA Corrective Action Section to evaluate whether there is a public health threat from contaminants (primarily cadmium) in sediment and surface water near the Plainville Plating Company property and whether posting or other exposure control measures are warranted.

The Plainville Plating Company is an operating RCRA facility located in Plainville, Connecticut. Figure 1 in Attachment A shows the Plating Company building, surrounding property and sampling locations. The property owned by the Plating Company is bordered on three sides by wetlands. Two small streams run behind the north side of the Plating Company property. One stream runs from the northeast corner of the facility in an easterly direction to the Pequabuck River. The source of this stream is a storm drain and groundwater seep next to the northeast side of the Plating facility. The Plating Company has a NPDES permit to discharge into this stream. The NPDES outfall is at the eastern end of the stream. There are two residences located within approximately 120 feet of this stream. The stream can be easily accessed from the backyards of the residences as there is no fence or other deterrent. There is another, smaller stream located behind the Plating Company property. The source of the smaller stream is an unknown source to the northwest of the Plainville Property. The smaller stream runs in an easterly direction and connects with the larger stream.

Groundwater data has been collected quarterly since 1987. Groundwater has been and continues to be contaminated with VOCs and metals. Concentrations of all contaminants detected in groundwater have decreased through the 1980s and early 1990s but remain at fairly consistent levels in most monitoring wells since 1993. Surface water from the streams was collected in April, June, and July, 1994; October 1999; August 2000; and April 2001. Sediment from the streams was collected in August 2000 and April 2001. Some of the same contaminants found in groundwater are also present in stream sediments and surface water. Offsite soils around the streams have not been tested.

Site Visit

CT DPH staff conducted a site visit of the Plainville Plating Company property on September 25, 2001. The wetland area behind the Plating Company property is thickly wooded but it is possible to walk along most of the larger stream. There is very easy access to the larger stream at sediment sample location SD-426-07 from two residences (Houses #4 and #5 on Figure 1).

There is evidence that children have accessed this portion of the stream. There are several wooden boards that have been placed across the stream to make a "bridge." On the north side of the stream there are boards that have been nailed together in a tree to make a "tree fort." Boards have been nailed into the tree to form a ladder up to the tree fort. The structures appear to have been made by children and indicate that children have visited this area on at least several occasions.

Access to the smaller stream above its confluence with the larger stream was not possible on the day of the site visit because the area was thickly overgrown and very wet. The highest cadmium concentration in sediments was found in the smaller stream at sample location SD-426-11.

Environmental Data

In April 2001, the Plainville Plating Company collected surface water and sediment samples from the two streams behind their property. Sediment samples were collected from a depth of 0.1 feet from14 different locations in the two streams. At the time the samples were collected, sediments were under a few inches of water. Sample locations were biased toward depositional areas in the stream where contaminant levels would be expected to be higher. Samples were analyzed for cadmium, copper, nickel, zinc, total and hexavalent chromium, cyanide, and chlorinated VOCs. Surface water samples were collected from 13 locations in the two streams. Samples were analyzed for the same contaminants as sediment samples.

Metals were detected in all the sediment samples. However, cadmium was the only metal found at levels above health-based comparison values (CT residential criteria for direct exposure to soil). VOCs were not detected as frequently in sediments as were metals. The most frequently detected VOC was 1,1,1-Trichloroethane (1,1,1-TCA). It was present in 3 out of 14 sediment samples, but not at levels above health-based comparison values.

In surface water, chromium, cadmium, and nickel were the metals most frequently detected at concentrations above health-based comparison values (drinking water standards and guidelines). VOCs were not found in surface water at levels exceeding health-based comparison values.

DISCUSSION

Exposure Pathway Analysis and Public Health Implications

To evaluate potential exposures from the Plainville Plating Company property, CT DPH considered the available environmental data for the area and how people might come into contact with contaminants. If there is no potential for exposure to contaminants, then it can be concluded that there is no possibility of adverse health effects from the contaminants. If there is potential exposure, contaminant concentrations are compared with health-protective comparison values. Comparison values are screening levels, below which, there is little likelihood of adverse health effects from exposure. When contaminant concentrations exceed comparison values, it does not

necessarily mean that health effects are likely. Rather, it means that exposures should be evaluated further.

Environmental data indicate that at the Plainville Plating Company site and in the adjacent off-site wetlands property, sediments, surface water, and groundwater have been contaminated by metals and VOCs. It is not known whether off-site soils have been contaminated as well. In order to be exposed to contaminants at Plainville Plating and the off-site property, one must come into direct contact with the contaminants by touching sediments or surface water (dermal contact), eating sediments adhered to fingers or food items (incidental ingestion), or drinking surface water (incidental ingestion). At the Plainville site, possible pathways of exposure are dermal contact with sediments, dermal contact with surface water, ingestion of sediments, and ingestion of surface water. Inhalation of sediments is not a potential exposure pathway because sediments are wet and are unlikely to become airborne. Contact with groundwater is not a potential exposure pathway at this site because groundwater is not being used for drinking water. Groundwater discharges to the streams where it has been evaluated as surface water.

To evaluate public health implications of potential exposures at this site, CT DPH compared contaminant concentrations with health-protective comparison values. For this evaluation, comparison values for sediments were taken from the Connecticut residential criteria for direct exposure to soil (CT RSRs). Comparison values for soil rather than sediment were used because there are no readily available human health-based screening values for sediments. The CT RSRs assume that contact with soil occurs every day over the long term (30 years). For surface water, CT DPH used federal drinking water standards developed by EPA (Maximum Contaminant Levels, [MCLs]) and drinking water guidelines developed by CT DPH (action levels). Drinking water standards and guidelines are extremely conservative screening values for surface water because they assume that a person drinks water at a rate of 2 liters per day for a 70-year lifetime.

Sediments

Cadmium was the only contaminant detected in sediment above its health-based comparison value (CT RSR). Cadmium was detected above the CT RSR of 34 mg/kg (ppm) in 5 out of 14 samples. The maximum concentration detected was 521 ppm. As mentioned above, that sample was collected from an area that is not easily accessible and is not located close to the residences. Cadmium concentrations in sediments located at the "bridge" and tree fort were much lower (63 ppm). Other locations where cadmium concentrations in sediment exceeded CT RSRs were next to the Plating property (120 ppm and 111 ppm) and a location approximately 100 feet upstream of the tree fort area at the confluence of the two streams (188 ppm).

Based on observations made during the site visit, the most likely location for exposure to sediments to occur on a regular and continuing basis is the area next to the "bridge" and tree fort. This area is close to and easily accessible from the two residences. It is also not as densely wooded as other areas along the streams. The area looks pristine and is an attractive area for children to play. CT DPH believes that it is reasonable that children could access this area for playing and wading quite frequently. Based on the attractiveness of the area and its

accessibility, CT DPH has estimated that children would visit the area as much as 100 days per year. This is based on an assumption that children would frequent the area on weekends (2 days per week) during the months April through June and September through October and every day (7 days per week) during the summer months when school is not in session (July and August). An exposure frequency of 100 days per year is three times less exposure than what was assumed in developing the CT RSRs. The cadmium concentration in sediment in the exposure area is 63 ppm. CT DPH acknowledges that there is uncertainty in this value because it is based on only a single environmental sample. The exposure concentration of 63 ppm is only two times higher than the CT RSR of 34 ppm. At an exposure frequency of 100 days per year (3.65 times less than 365 days per year), a cadmium concentration of 124 ppm (34 ppm * 3.65) would be as protective as the CT RSR, with all other assumptions being equal. The cadmium concentration in the exposure area (63 ppm) is significantly lower than 124 ppm.

It should be noted that the CT RSRs do not consider exposure via dermal contact. They only consider exposure via incidental ingestion. The CT RSRs also are developed for exposure to soil, not sediment. If children play or wade in the stream, there is likely to be a lot of dermal contact with sediment because wet soil or sediment adheres to the skin more readily than dry soil (EPA draft Superfund Dermal Risk Guidance, December 1999). However, dermal absorption of cadmium is reported to be very low. The Agency for Toxic Substances and Disease Registry (ATSDR) states that "...skin contact with cadmium is not known to affect the health of people or animals because virtually no cadmium can enter the body through the skin under normal circumstances (i.e., without exposure to very high concentrations for long times or exposure to skin that was not damaged). " (ATSDR Toxicological Profile for Cadmium, July 1999).

Given all the above considerations, CT DPH has concluded that exposure to cadmium in sediments adjacent to the Plainville Plating Company site would not be expected to result in adverse health impacts.

Surface Water

Chromium, cadmium, and nickel were the only contaminants detected in surface water above health-based comparison values (drinking water standards and guidelines). The highest contaminant levels were found in sample locations closest to the Plating property. Levels decrease rapidly at sample locations downstream. Cadmium was found at a maximum concentration of 0.39 ppm at the sample location closest to the Plating facility. This level is approximately 80 times higher than the EPA MCL. The maximum chromium and nickel concentrations were approximately 27 times and 7 times higher, respectively, than their drinking water comparison values.

As stated previously, comparison values developed for drinking water exposures are extremely conservative levels when used for incidental ingestion of surface water during wading because the amount of water an individual would consume during wading is so small compared with 2 liters per day (the default assumption for drinking water). EPA uses a

default value of 0.05 liters of water incidentally ingested during swimming (EPA Risk Assessment Guidance for Superfund, December 1989). Wading would likely result in even less water ingestion than swimming. Swimming in the streams is not a realistic exposure scenario because the stream is so shallow (only a few inches deep in many locations). This combined with a realistic exposure frequency of only 100 days per year makes it extremely unlikely that exposure to contaminants in stream surface water during wading would result in adverse health impacts.

Fact sheets providing background information on health impacts from exposure to chromium, cadmium, and nickel are included in Attachment B. The fact sheets are provided for general information only and are not meant to imply that these health effects would be expected from exposures at the site.

CONCLUSIONS

Based on an evaluation of environmental site data, information collected during a site visit, and comparison of site data with health protective comparison values, CT DPH has concluded that exposure to contaminants in sediments and surface water in the streams located behind the Plainville Plating Company property are not likely to result in adverse human health impacts.

ATSDR has a categorization scheme whereby the level of public health hazard at a site is assigned to one of five conclusion categories. ATSDR conclusion categories are included as Attachment C to this report. CT DPH has concluded that, based on current information and under current conditions, the site poses No Apparent Health Hazard.

RECOMMENDATIONS

1. CT DPH recommends that EPA ensure the area along the streams where contaminants are present be posted with Private Property - No Trespassing signs. CT DPH recommends that the signs also include language informing people about the presence of contaminants. Although CT DPH has concluded that, based on existing data, contaminant levels do not pose a threat to public health, posting the area is recommended as a prudent precaution. The number of samples collected is not large, especially in the most accessible area of the stream near the residences. In addition, it is not known if soils in the area are also contaminated. These uncertainties support taking precautionary steps to reduce exposure such as the recommended posting of signs.

2. CT DPH recommends that EPA schedule home visits with residents in Houses #4 and #5 to inform them about what is currently known about the nature and extent of contamination in the streams. Residents should continue to be informed as new information becomes available. If the posted signs do not include language about the presence of contamination, visits with residents are even more important.

3. CT DPH recommends that soil data be collected in areas around the top of the stream banks to confirm that contaminants present in sediments and surface water are not present in soils as well.

PUBLIC HEALTH ACTION PLAN

Actions Planned

1. CT DPH will assist EPA in visits to residents in Houses #4 and #5 to explain what is known about contamination in the area and answer health-related questions and concerns.

2. CT DPH will review additional environmental data that may be collected in the future.

Actions Taken

1. CT DPH has provided EPA with technical assistance in reviewing environmental data from the site and evaluating public health implications from exposure.

CERTIFICATION

The Health Consultation for **PUBLIC HEALTH EVALUATION OF SEDIMENT AND SURFACE WATER DATA, PLAINVILLE PLATING COMPANY** was prepared by the Connecticut Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated.

Technical Project Officer, SPS, SSAB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this Health Consultation and concurs with its findings.

Chief, SSAB, DHAC, ATSDR

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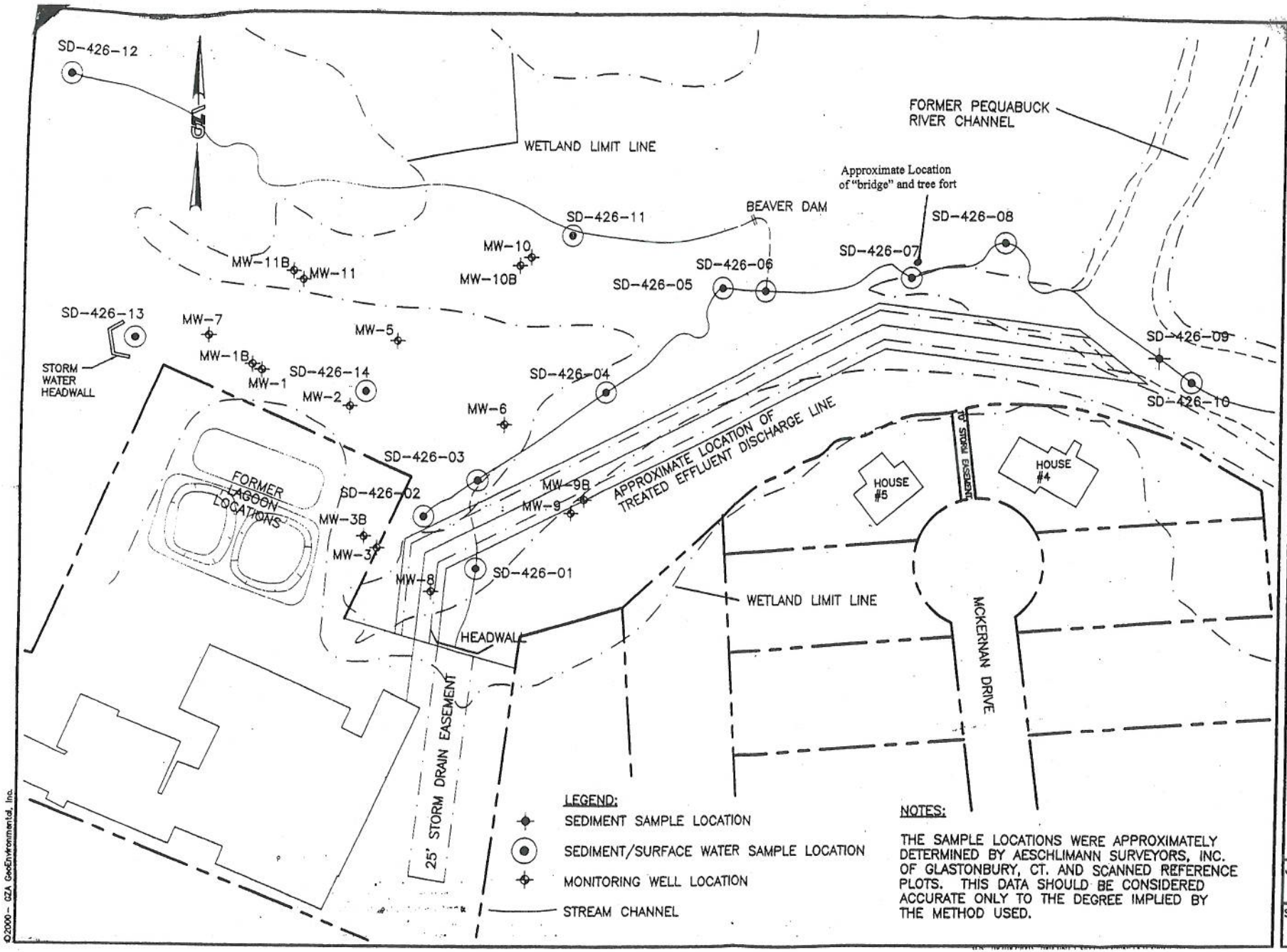
ATTACHMENT A

Figure 1
Surface Water and Sediment Sampling Locations



REV. NO. | DESCRIPTION | BY | DATE

DESIGNED BY: PEW
CHECKED BY:
REVIEWED BY:
DRAWN BY: CBK
DATE: 9/15/00

1" = 60'
0 30' 60' 120

GZA GeoEnvironmental, Inc.
27 Hoek Road
Vernon, CT 06066
P:(860)875-7655 F:(860)872-2416

PLAINVILLE PLATING COMPANY, INC.
PLAINVILLE, CONNECTICUT

SURFACE WATER/SEDIMENT SAMPLING LOCATIONS

JOB NO. 42052

SHEET NO. FIG. 1

ATTACHMENT B

Fact Sheets for Chromium, Cadmium, and Nickel

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

CHROMIUM
CAS # 7440-47-3

Division of Toxicology ToxFAQs™ February 2001

This fact sheet answers the most frequently asked health questions (FAQs) about chromium. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and can cause cancer. Chromium has been found at 1,036 of the 1,591 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, soil, and in volcanic dust and gases. Chromium is present in the environment in several different forms. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

Chromium(III) occurs naturally in the environment and is an essential nutrient. Chromium(VI) and chromium(0) are generally produced by industrial processes.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

❑ Chromium enters the air, water, and soil mostly in the chromium(III) and chromium(VI) forms.
❑ In air, chromium compounds are present mostly as fine dust particles which eventually settle over land and water.
❑ Chromium can strongly attach to soil and only a small amount can dissolve in water and move deeper in the soil to underground water.
❑ Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

❑ Eating food containing chromium(III).
❑ Breathing contaminated workplace air or skin contact during use in the workplace.
❑ Drinking contaminated well water.
❑ Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the nose, such as runny nose, nosebleeds, and ulcers and holes in the nasal septum.

Ingesting large amounts of chromium(VI) can cause stomach upsets and ulcers, convulsions, kidney and liver damage, and even death.

ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html

Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive to chromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

How likely is chromium to cause cancer?

Several studies have shown that chromium(VI) compounds can increase the risk of lung cancer. Animal studies have also shown an increased risk of cancer.

The World Health Organization (WHO) has determined that chromium(VI) is a human carcinogen.

The Department of Health and Human Services (DHHS) has determined that certain chromium(VI) compounds are known to cause cancer in humans.

The EPA has determined that chromium(VI) in air is a human carcinogen.

How can chromium affect children?

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Birth defects have been observed in animals exposed to chromium(VI).

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

How can families reduce the risk of exposure to chromium?

❑ Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.

❑ Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

Is there a medical test to show whether I've been exposed to chromium?

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. There are tests to measure the level of chromium in hair, urine, and blood. These tests are most useful for people exposed to high levels. These tests cannot determine the exact levels of chromium that you may have been exposed to or predict how the levels in your tissues will affect your health.

Has the federal government made recommendations to protect human health?

EPA has set a limit of 100 µg chromium(III) and chromium(VI) per liter of drinking water (100 µg/L).

The Occupational Safety and Health Administration (OSHA) has set limits of 500 µg water soluble chromium(III) compounds per cubic meter of workplace air (500 $\mu g/m^3$), 1,000 $\mu g/m^3$ for metallic chromium(0) and insoluble chromium compounds, and 52 $\mu g/m^3$ for chromium(VI) compounds for 8-hour work shifts and 40-hour work weeks.

Source of Information

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Chromium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-639-6359. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

CADMIUM

Agency for Toxic Substances and Disease Registry April 1993

This fact sheet answers the most frequently asked health questions about cadmium For more information, you may call 404-639-6000. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to cadmium happens mostly in the workplace where cadmium products are made. The general population is exposed from breathing cigarette smoke or eating cadmium contaminated foods. Cadmium damages the lungs, can cause kidney disease, and may irritate the digestive tract. Cadmium has been found in at least 388 of 1,300 National Priorities List sites identified by the Environmental Protection Agency.

What is cadmium?
(Pronounced kad′ mē - um)

Cadmium is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), or sulfur (cadmium sulfate, cadmium sulfide). It doesn't have a definite taste or odor.

All soils and rocks, including coal and mineral fertilizers, have some cadmium in them. The cadmium that industry uses is extracted during the production of other metals like zinc, lead, and copper.

Cadmium does not corrode easily and has many uses. In industry and consumer products, it is used for batteries, pigments, metal coatings, and plastics.

What happens to cadmium when it enters the environment?

- Cadmium enters air from mining, industry, and burning coal and household wastes.
- Cadmium particles in air can travel long distances before falling to the ground or water.
- It enters water and soil from waste disposal and spills or leaks at hazardous waste sites.
- It binds strongly to soil particles.
- Some cadmium dissolves in water.
- It doesn't break down in the environment, but can change forms.
- Fish, plants, and animals take up cadmium from the environment.
- Cadmium stays in the body a very long time and can build up from many years of exposure to low levels.

How might I be exposed to cadmium?

- Breathing contaminated workplace air (battery manufacturing, metal soldering or welding)
- Eating foods containing it; low levels in all foods (highest in shellfish, liver, and kidney meats)
- Breathing cadmium in cigarette smoke (doubles the average daily intake)
- Drinking contaminated water
- Breathing contaminated air near the burning of fossil fuels or municipal waste.

How can cadmium affect my health?

Breathing **high levels** of cadmium severely damages the lungs and can cause death. Eating food or drinking water with **very high levels** severely irritates the stomach, leading to vomiting and diarrhea.

Long term exposure to lower levels of cadmium in air, food, or water leads to a build up of cadmium in the kidneys and possible kidney disease. Other potential long term effects are lung damage and fragile bones.

Animals given cadmium in food or water show high blood pressure, iron-poor blood, liver disease, and nerve or brain damage. We don't know if humans get any of these diseases from eating or drinking cadmium.

Skin contact with cadmium is not known to cause health effects in humans or animals.

How likely is cadmium to cause cancer?

The Department of Health and Human Services (DHHS) has determined that cadmium and cadmium compounds may reasonably be anticipated to be carcinogens.

This is based on weak evidence of increased lung cancer in humans from breathing cadmium and on strong evidence from animal studies. We do not know if cadmium causes cancer from skin contact or from eating or drinking contaminated food and water.

Is there a medical test to show whether I've been exposed to cadmium?

Tests are available in some medical laboratories that measure cadmium in blood, urine, hair, or nails.

Blood levels show recent exposure to cadmium, and urine levels show both recent and earlier exposure. Urine tests can indicate kidney damage. The reliability of tests for cadmium levels in hair or nails is unknown.

Tests are available to measure cadmium in your liver and kidney. The tests are expensive, but can help a doctor evaluate your risk of kidney disease.

Has the federal government made recommendations to protect human health?

The Environmental Protection Agency (EPA) allows 5 parts of cadmium per billion parts of drinking water (5 ppb). The EPA also limits how much cadmium can enter lakes, rivers, waste sites, and cropland. The EPA does not allow cadmium in pesticides.

The Food and Drug Administration (FDA) limits the amount of cadmium in food colors to 15 parts of cadmium per million parts of food color (15 ppm).

The Occupational Safety and Health Administration (OSHA) now limits workplace air to 100 micrograms (µg) cadmium per cubic meter (m^3) as cadmium fumes and 200 µg cadmium/m^3 as cadmium dust. OSHA is planning to limit all cadmium compounds to either 1 or 5 µg/m^3.

The National Institute for Occupational Safety and Health (NIOSH) currently recommends that workers breathe as little cadmium as possible.

Glossary

Carcinogen: Substance that can cause cancer.
PPM: Parts per million.
PPB: Parts per billion.
Microgram (µg): One millionth of a gram.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Toxicological profile for cadmium. Atlanta: U.S. Department of Health and Human Services, Public Health Service.

Agency for Toxic Substances and Disease Registry (ATSDR). 1993. Case studies in environmental medicine: Cadmium toxicity. Atlanta: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns. For more information, contact: Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333, Phone: 404-639-6000.

NICKEL
CAS # 7440-02-0

Agency for Toxic Substances and Disease Registry ToxFAQs September 1997

This fact sheet answers the most frequently asked health questions (FAQs) about nickel. For more information, call the ATSDR Information Center at 1-800-447-1544. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Nickel is a hard, silvery-white metal used to make stainless steel and other metal alloys. Skin effects are the most common effects in people who are sensitive to nickel. Workers who breathed very large amounts of nickel compounds have developed lung and nasal sinus cancers. Nickel has been found in at least 709 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is nickel?

(Pronounced nĭk′əl)

Nickel is a very abundant element. In the environment, it is found primarily combined with oxygen (oxides) or sulfur (sulfides). It is found in all soils and is emitted from volcanos.

Pure nickel is a hard, silvery-white metal that is combined with other metals to form mixtures called alloys. Some of the metals that nickel can be alloyed with are iron, copper, chromium, and zinc. These alloys are used in the making of metal coins and jewelry and in industry for making metal items.

Nickel compounds are also used for nickel plating, to color ceramics, to make some batteries, and as substances known as catalysts that increase the rate of chemical reactions. Nickel and its compounds have no characteristic odor or taste.

What happens to nickel when it enters the environment?

- Small nickel particles in the air settle to the ground or are taken out of the air in rain.
- Much of the nickel in the environment is found with soil and sediments because nickel attaches to particles that contain iron or manganese, which are often present in soil and sediments.
- Nickel does not appear to collect in fish, plants, or animals used for food.

How might I be exposed to nickel?

- By breathing air or smoking tobacco containing nickel
- By eating food containing nickel, which is the major source of exposure for most people
- By drinking water which contains small amounts of nickel
- By handling coins and touching other metals containing nickel, such as jewelry

How can nickel affect my health?

Nickel is required to maintain health in animals. A small amount of nickel is probably essential for humans, although a lack of nickel has not been found to affect the health of humans.

The most common adverse health effect of nickel in humans is an allergic reaction. People can become sensitive to nickel when jewelry or other things containing it are in direct contact with the skin. Once a person is sensitized to nickel, further contact with it will produce a reaction. The most common reaction is a skin rash at the site of contact.

Less frequently, some people who are sensitive to nickel have asthma attacks following exposure to nickel. People who are sensitive to nickel have reactions when it is in contact with the skin, and some sensitized persons react when they eat nickel in food, drink it in water, or breathe dust containing it.

ToxFAQs Internet address via WWW is http://atsdr1.atsdr.cdc.gov:8080/ToxFAQ.html

Lung effects, including chronic bronchitis and reduced lung function, have been observed in workers who breathed large amounts of nickel. Current levels of nickel in workplace air are much lower than in the past, and today few workers show symptoms of nickel exposure.

People who are not sensitive to it must eat very large amounts of nickel to show adverse health effects. Workers who accidently drank water containing very high levels of nickel (100,000 times more than in normal drinking water) had stomachaches and effects on their blood and kidneys.

Animal studies show that breathing high levels of nickel compounds may result in inflammation of the respiratory tract. Eating or drinking large amounts of nickel has been reported to cause lung disease in dogs and rats and to affect the stomach, blood, liver, kidneys, immune system, and reproduction and development in rats and mice.

How likely is nickel to cause cancer?

The **Department of Health and Human Services (DHHS)** has determined that nickel and certain nickel compounds may reasonably be anticipated to be carcinogens. Cancers of the lung and nasal sinus have resulted when workers breathed dust containing high levels of nickel compounds while working in nickel refineries or nickel processing plants.

When rats and mice breathed nickel compounds for a lifetime, nickel compounds that were hard to dissolve caused cancer, while a soluble nickel compound did not cause cancer.

Is there a medical test to show whether I've been exposed to nickel?

Measurements of the amount of nickel in your blood, feces, and urine can be used to estimate your exposure to nickel. These measurements are most useful if the type of nickel compound you have been exposed to is known. However, these tests cannot predict whether you will experience any health effects.

Has the federal government made recommendations to protect human health?

The **EPA** recommends that children drink water containing no more than 0.04 milligrams of nickel per liter of water (0.04 mg/L) for 1-10 days of exposure.

The **Occupational Safety and Health Administration (OSHA)** has set an occupational exposure limit of 1 milligram of nickel per cubic meter of air (1 mg/m^3) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogen: A substance with the ability to cause cancer

CAS: Chemical Abstracts Service

Milligram (mg): One thousandth of a gram

Sediments: Mud and debris that have settled to the bottom of a body of water

Soluble: Dissolves in water

Source of Information

This ToxFAQs information is taken from the 1997 Toxicological Profile for Nickel (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Animal testing is sometimes necessary to find out how toxic substances might harm people and how to treat people who have been exposed. Laws today protect the welfare of research animals and scientists must follow strict guidelines.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-800-447-1544, FAX: 404-639-6359. ToxFAQs Internet address via WWW is http://atsdr1.atsdr.cdc.gov:8080/ToxFAQ.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATTACHMENT C
ATSDR Public Health Hazard Categories

Category	Definition	Criteria
A. Urgent public health hazard	This category is used for sites that pose an urgent public health hazard as the result of short-term exposures to hazardous substances.	evidence exists that exposures have occurred, are occurring, or are likely to occur in the future AND estimated exposures are to a substance(s) at concentrations in the environment that, upon short-term exposures, can cause adverse health effects to any segment of the receptor population AND/OR community-specific health outcome data indicate that the site has had an adverse impact on human health that requires rapid intervention AND/OR physical hazards at the site pose an imminent risk of physical injury
B. Public health hazard	This category is used for sites that pose a public health hazard as the result of long-term exposures to hazardous substances.	evidence exists that exposures have occurred, are occurring, or are likely to occur in the future AND estimated exposures are to a substance(s) at concentrations in the environment that, upon long-term exposures, can cause adverse health effects to any segment of the receptor population AND/OR community-specific health outcome data indicate that the site has had an adverse impact on human health that requires intervention
C. Indeterminate public health hazard	This category is used for sites with incomplete information.	limited available data do not indicate that humans are being or have been exposed to levels of contamination that would be expected to cause adverse health effects; data or information are not available for all environmental media to which humans may be exposed AND there are insufficient or no community-specific health outcome data to indicate that the site has had an adverse impact on human health
D. No apparent public health hazard	This category is used for sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health hazard.	exposures do not exceed an ATSDR chronic MRL or other comparable value AND data are available for all environmental media to which humans are being exposed AND there are no community-specific health outcome data to indicate that the site has had an adverse impact on human health
E. No public health hazard	This category is used for sites that do not pose a public health hazard.	no evidence of current or past human exposure to contaminated media AND future exposures to contaminated media are not likely to occur AND there are no community-specific health outcome data to indicate that the site has had an adverse impact on human health