Ask Dr. Galv

Q **I've heard that chromium can be harmful to my employees, and possibly for my customers. Can you tell me about chromium, and what the possible effects are from exposure?**

A Chromium can exist in oxidation states ranging from -2 to 6, but it is mostly found in the trivalent (CrIII) and hexavalent (CrVI) oxidation states. CrIII is naturally found in rocks, soils, plants, animals, and volcanic emissions. This form of chromium is believed by many to play a nutritional role in the human body. CrVI is the most toxic form of chromium and is produced in industrial environments when CrIII is heated in the presence of mineral bases and atmospheric oxygen—as in metal finishing processes. CrVI is found in the acid used in hot-dip galvanizing quench baths and has been used as a 0.15% wt. sodium chromate solution to prevent wet storage stain on hot-dip galvanized parts.

It is the aggressive oxidizing behavior of chromium that makes exposure to CrVI such a dangerous health risk. A person can be exposed to chromium by eating or drinking contaminated food or water, breathing contaminated air, skin contact, or living near uncontrolled hazardous waste sites that contain chromium particles.

Small amounts of CrVI that are ingested will not necessarily harm you, however, accidental ingestion of larger amounts can cause stomach upsets and ulcers, convulsions, kidney and liver damage, and even death. The levels of CrVI that cause these effects are far greater than those you might be exposed to in any type of food or regulated water sources.

Chromium compounds in the air are mostly present as fine dust particles, which eventually settle over land

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(*Dr. Galv*, continued from facing page)

and water. In galvanizing plants, inhalation could happen from working near the chromate quench tank but, since diluted concentrations are used—and the tanks are only mildly heated—agitated exposure is unlikely.

Second only to nickel, CrVI is one of the most highly allergenic metals. Skin contact with chromium compounds could result in skin sensitization and dermatitis. In sensitized workers and customers, allergic reactions consisting of severe redness and swelling of the skin have been noted. If your skin comes in contact with chromium, very little of it will enter your body unless your skin is damaged at the contact point—in which case, skin ulcers could occur. Usually, workers handling liquids or solids containing CrVI developed skin ulcers as the first sign of over-exposure.

It is believed that after six weeks of outdoor exposure, CrIII and CrVI levels greatly decrease on quenched galvanized parts. The AGA is planning to test the levels of chromium present on galvanized parts immediatlely after quenching and up to six weeks after exposure.

The figure below shows the measured levels of CrIII and CrVI in the air at six galvanizing plants that use chromium in their quench tanks:

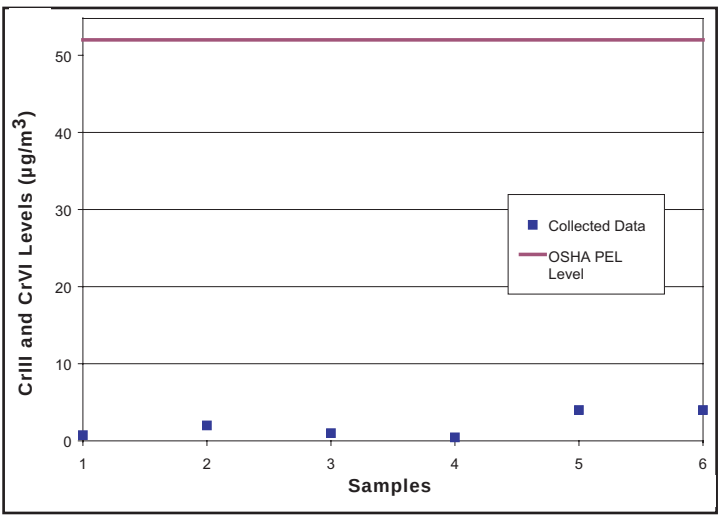

Figure 1: Chromium Levels in Galvanizing Plants vs. OSHA PEL

The “best” practice for monitoring chromium exposure is to keep up-to-date air monitoring data, test employee’s blood for chromium, and perform a wipe test to record the amount of chromium left on the surface of your galvanized products. In addition, always wear the proper protection equipment when handling materials that may contain CrVI.