Cal/EPA - Air Resources Board

Air Toxics Update #3 - March 1987

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Air Toxics Update #3

The Air Resources Board (ARB) took action on five toxic compounds during 1986 as part of California's Air Toxics Program. Three substances -- hexavalent chromium, asbestos, and chlorinated dioxins / furans -- were identified as toxic air contaminants (TACs), and decisions were made about the need to control two previously identified air toxics -- benzene and ethylene dibromide. This Update is the third in a series of publications on California's air toxics program. It provides an overview of the air toxics decisions made by the Board during 1986, and summarizes the characteristics of the three newly named air toxic substances -- chromium, asbestos, and dioxins. In addition, the benzene control plan is described, and the decision not to develop control measures for ethylene dibromide is explained. For the reader wanting a general description of California's air toxics law and how the program works, Air Toxics Program Update #1 is recommended. For a discussion of the start-up of the program and a description of the three substances identified as air toxics in 1985 -- benzene, ethylene dibromide, and ethylene dichloride -- please see Update #2.

COMPOUND REVIEW

During 1986, there were 15 compounds at various stages of the identification and regulatory phase of the air toxics program. Those substances which had completed the identification phase and moved into or were already in the control measure phase were:

- Benzene
- Ethylene Dibromide
- Ethylene Dichloride
- Hexavalent Chromium
- Asbestos
- Chlorinated Dioxins / Furans

Those substances which were in the identification phase at the end of 1986 were:

- Cadmium
- Vinyl Chloride
- Inorganic Arsenic
- Carbon Tetrachloride
- Chloroform
- Ethylene Oxide
- Methylene Chloride
- Perchloroethylene
- Trichlorethylene

Cadmium was considered and listed by the Board as a TAC in January 1987. Carbon tetrachloride, ethylene oxide, and methylene chloride are expected to follow later in the year.

Another Board action of general interest was the adoption in early 1987 of a revised compound ranking list. This list now contains 50 compounds of concern divided into three categories to reflect the status of the substances in the identification process. Category one contains those substances identified as TACs, category two includes those substances currently under review or soon to be scheduled for review, and category three contains those compounds lacking sufficient health effects information to support review at this time.

Because this list changes periodically as new health information becomes available, it is not included in this publication. A current list may be obtained by contacting ARB's Stationary Source Division in Sacramento as noted on the back page of this Update.

AIR TOXICS IDENTIFIED

Hexavalent Chromium

In January, 1986, the ARB identified hexavalent chromium as a toxic air contaminant in California and listed it as a substance without any identifiable carcinogenic threshold. Chromium was selected for review because it is known to cause cancer in humans and animals and because it is emitted from many sources in California. Its presence in the air has been documented by ARB and the Environmental Protection Agency.

Chromium is a metallic element which occurs in nature primarily as chrome iron ore (chromite). This ore is not mined commercially in the U.S. but is imported principally from South Africa and the USSR. The ore is used to produce chromium metals and alloys, refractory materials (firebrick), and chromium chemicals.

Chromium in compounds exists in several diffferent chemical (oxidation) states, but only two of them, trivalent chromium and hexavalent chromium, are commercially or environmentally important. Trivalent chromium is the most stable oxidation state and is therefore the most common form. Hexavalent chromium is less stable and occurs less often in nature because it is very reactive, readily changing to trivalent chromium in the presence of organic matter.

The health impacts of trivalent and hexavalent chromium are very different. This is partially explained because hexavalent chromium readily penetrates biological membranes while trivalent chromium generally does not. Trivalent chromium is an essential trace element in our diets, helping reduce the buildup of glucose in the blood. The hexavalent form has been identified as a cancer causing substance. Thus, depending on the chemical state, it may either play a role in nutrition or may act as a carcinogen.

Stationary sources contribute most of the known chromium emissions in California. Chromium is emitted both directly in the use and production of chromium compounds – mostly in the hexavalent form – and secondarily, or inadvertently, through the combustion of chromium-containing fuels – mostly in the trivalent form. Use of chromium in chrome plating and as a corrosion inhibitor in cooling towers accounts for most of the direct hexavalent chromium emissions in California. Secondary sources of chromium emissions -- combustion of coal and oil, cement production, waste incineration -- produce both trivalent and hexavalent chromium. Evidence suggests that chromium emitted from secondary sources is principally in the trivalent state.

The extent to which natural sources of chromium contribute to hexavalent chromium levels in the outdoor air in California is unknown. Trivalent chromium is a component of most soils and in this form is generally not easily absorbed by the body. Weathering and wind action can lift soil chromium into the air, but most of these particles are too large to be deposited in the lungs.

There is very little information available on the reactivity of chromium compounds in the atmosphere. How, and to what extent, chromium reacts in the atmosphere is not well understood, and the persistence of hexavalent chromium in the atmosphere has not been determined. Physical removal of chromium from the air occurs both by fallout (dry deposition) and by washout (wet deposition). Measurements have shown that most chromium is removed from the atmosphere through wet deposition. Small chromium particles, however, may remain airborne for extended periods of time, allowing long distance transport. Because of this, weather conditions can play a significant role in the dispersion of chromium.

Hexavalent chromium has been measured in the air at sites in many populated areas of California. To assess the public exposure around the State the ARB collected samples in eight cities during the last four months of 1985. Over 80 percent of the samples had measureable levels of hexavalent chromium and the average 24-hour concentration for all samples was 1.0 nanogram per cubic meter. This suggests that there is general population exposure to hexavalent chromium in California outside the immediate vicinity of major hexavalent chromium sources.

Many workplace studies have shown a high association between hexavalent chromium and respiratory cancer.