



A Division of The Society of The Plastics Industry, Inc.

RECEIVED

SEP 17 1990

C. A. GELLNER

September 13, 1990

TO: Health, Safety & Environment Committee

RE: California Final Draft on Proposed Identification of Vinyl Chloride As A Toxic Air Contaminant

The California Air Resources Board has completed its final draft report on vinyl chloride and it was scheduled to be reviewed by the Scientific Review Panel September 6th. The hearing has been rescheduled to October 19th. The executive summaries of parts A and B are enclosed. Part A, compiled by the Air Resources Board staff, discusses the use, emissions, atmospheric persistence and exposure to ambient as well as indoor concentrations. Part B, prepared by the Department of Health Services, addresses the efforts of vinyl chloride on public health and the risk of exposure to ambient air concentrations.

As you will recall, the VI submitted comments on September 1989 on an earlier draft document.

Michael Deth

MNS/pmb

CTL015897



TECHNICAL SUPPORT DOCUMENT

**PROPOSED IDENTIFICATION OF
VINYL CHLORIDE
AS A TOXIC AIR CONTAMINANT**

**SCIENTIFIC REVIEW PANEL VERSION
EXECUTIVE SUMMARY AND PART A**

AUGUST 1990

**State of California
Air Resources Board
Stationary Source Division**

CTL015898

SCIENTIFIC REVIEW PANEL VERSION

PROPOSED IDENTIFICATION OF VINYL CHLORIDE
AS A TOXIC AIR CONTAMINANT

EXECUTIVE SUMMARY

Prepared by the Staffs of the Air Resources Board
and the Department of Health Services

August 1990

CTL015899

EXECUTIVE SUMMARY

What is a toxic air contaminant?

According to Section 39655 of the California Health and Safety Code, a toxic air contaminant is "an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health." In addition, "substances which have been identified as hazardous air pollutants pursuant to Section 7412 of Title 42 of the United States Code shall be identified by the state board as toxic air contaminants."

Does the Air Resources Board (ARB) staff recommend identification of vinyl chloride as a toxic air contaminant?

Yes, we recommend that vinyl chloride be identified as a toxic air contaminant because:

- o there is sufficient evidence that exposure to vinyl chloride poses a public health hazard,
- o vinyl chloride is detected in ambient and indoor air near known emission sources and does not break down in the atmosphere at a rate that would significantly reduce public exposure, and
- o vinyl chloride shall be identified as a toxic air contaminant pursuant to Section 39655 of the California Health and Safety Code because it is listed as a hazardous air pollutant by the federal government pursuant to Section 7412 of Title 42 of the United States Code.

Why does the ARB staff recommend the identification of vinyl chloride as a toxic air contaminant when a State ambient air quality standard already exists?

The State ambient air quality standard of 10 ppb averaged over 24 hours merely reflects the limit of detection (LOD) for vinyl chloride ambient air concentration analysis in 1978 when the standard was promulgated. This technology-based standard is not recognized as health-protective. The identification of vinyl chloride as a toxic air contaminant would allow health-protective control measures to be implemented at concentrations below 10 ppb.

Section 41805.5 of the 1986 California Health and Safety Code required testing landfills for specified compounds including vinyl chloride. The data gathered in the Landfill Gas Testing Program will be used by air pollution control districts to provide a relative ranking of the sites based on the potential for emissions of toxic compounds and the potential for exposure. The data show that vinyl chloride was detected in the internal gas of 160 out of 340 landfills at which internal gas testing was conducted. The presence of vinyl chloride in internal landfill gas represents a potential source of vinyl chloride emissions.

The South Coast Air Quality Management District (SCAQMD) conducted long-term, intensive ambient vinyl chloride monitoring on two landfills in the South Coast Area Basin (SCAB): Operating Industries Incorporated (OII) Landfill and BKK Landfill. The test data for the OII Landfill was obtained from January 1986 through December 1986, while data for the BKK Landfill was obtained from January 1987 through December 1987. Based on ambient data from these testing periods, cumulative vinyl chloride emissions were estimated to range from 50 to 250 tons per year. Although the elevated vinyl chloride emissions of OII and BKK are not likely to be typical, there is a possibility of elevated vinyl chloride emissions from other California landfills. Since the SCAQMD's study, the vinyl chloride emission levels of OII and BKK landfills are expected to have decreased due to the installation of gas collectors and flares.

POTWs emitted an estimated 1.7 tons of vinyl chloride in 1985. PVC production facilities emitted less than 0.5 tons of vinyl chloride in 1988 while PVC fabrication facilities emitted an estimated 0.75 tons of vinyl chloride in 1982.

What is the persistence of vinyl chloride in the atmosphere?

Vinyl chloride is estimated to be degraded in 1.6 to 3.9 days through its reaction with hydroxyl radicals in the atmosphere. Therefore, vinyl chloride is sufficiently persistent to be transported throughout an air basin before it is degraded.

What is the ambient concentration of vinyl chloride?

Vinyl chloride in California poses a potential near-source risk as detectable levels are limited only to locations near identified emission sources such as landfills.

The monitoring required by the Landfill Gas Testing Program (Section 41805.5 of the 1986 California Health and Safety Code) showed ambient vinyl chloride concentrations at or above the detection limit of 2 ppbv at 24 out of 251 landfills tested for ambient concentrations.

What evidence exists that exposure to vinyl chloride poses a public health hazard?

Acute exposure to vinyl chloride has lead to narcosis, cardiovascular and respiratory irregularity, convulsions, cyanosis, and death. Chronic exposure of workers to vinyl chloride has induced acro-steolysis, vasospasm of the hands, dermatitis, circulatory and CNS alterations, thrombocytopenia, splenomegaly, and changes in liver function. However, these noncarcinogenic effects occur at vinyl chloride concentrations near or above 10 ppm which is far greater than either the California average ambient level of less than 0.5 ppb or measured ambient hot spot concentrations of about 10 to 15 ppb. Therefore, the DHS staff do not expect noncarcinogenic adverse health effects to occur from exposures to current concentrations of vinyl chloride found in ambient air.

The International Agency for Research on Cancer (IARC), the United States Environmental Protection Agency (EPA), and the California Department of Health Services (DHS) have designated vinyl chloride a chemical for which there is sufficient evidence of carcinogenicity in both humans and experimental animals. Epidemiological studies of occupationally exposed human workers have linked vinyl chloride exposure to the development of a rare cancer, liver angiosarcoma, and have suggested a relationship between exposure and cancers of the lung and brain. Chronic inhalation and oral exposures of rats, mice, and hamsters to vinyl chloride have been associated with an increased incidence of malignant and benign tumors at several sites including the liver, lungs, mammary glands, and the nervous system. Vinyl chloride is mutagenic in both prokaryotic and eukaryotic test systems.

Is there a threshold level for vinyl chloride?

Since vinyl chloride is mutagenic and there is not sufficient evidence at this time to support the designation of an exposure level below which no significant adverse health impacts are anticipated, the DHS staff recommend that vinyl chloride be treated as having no threshold exposure level.

Is vinyl chloride produced or used in California?

Vinyl chloride is not produced in California, however, it is estimated that several thousand tons are used each year by two facilities producing polyvinyl chloride. Polyvinyl chloride is used by fabricators for the production of materials employed by the construction, packaging, electrical, and transportation industries.

What are the sources of vinyl chloride emissions?

Landfills, publicly-owned treatment works (POTWs), and polyvinyl chloride (PVC) production and fabrication facilities are the major identified sources of vinyl chloride emissions in California.

sampling results showed vinyl chloride concentrations ranging from 8 to 100 ppb. Since 1985, the OII Landfill installed a gas collection system and significant levels of landfill gas are no longer detected in the water meter boxes of homes near the landfill. Presently, indoor vinyl chloride concentrations in the residences near the landfill are believed to be substantially lower due to the OII Landfill's gas collection system.

The ARB is currently sponsoring research to assess the presence of vinyl chloride in homes not located near landfills; to date, no vinyl chloride has been detected.

Are there other routes of exposure to vinyl chloride?

Exposure to vinyl chloride may also occur from ingestion of food and water that contain residues of the substance. Since vinyl chloride is not typically detected in drinking water or food products, exposure through these routes is not expected to significantly contribute to the cancer burden attributed to vinyl chloride.

What is the risk assessment for exposure to vinyl chloride?

The DHS analyzed many human occupational and animal studies in the cancer risk assessment for vinyl chloride exposure. Predictions from the majority of the studies of humans exposed to vinyl chloride occupationally are uncertain due to inadequate exposure data, insufficient follow-up time, and methodological problems. Based on the exposure estimates for vinyl chloride workers in the Waxweiler, et al. (1976) study, the 95% upper confidence limit on the lifetime unit risk of contracting cancer from vinyl chloride ranged from $2.5 \times 10^{-5} \text{ ppb}^{-1}$ to $4.5 \times 10^{-5} \text{ ppb}^{-1}$. Evaluation of animal experiments using the linearized multistage model leads to predictions of 5 upper confidence limits on unit risks for humans ranging from $3.7 \times 10^{-5} \text{ ppb}^{-1}$ to $20 \times 10^{-5} \text{ ppb}^{-1}$. Considering tumorigenicity data as well as the results of human and animal studies, the DHS staff conclude that the overall range of upper confidence limits on cancer unit risk is $2.5 \times 10^{-5} \text{ ppb}^{-1}$ to $20 \times 10^{-5} \text{ ppb}^{-1}$. In order to ensure protection of public health, the DHS has identified the best estimate of cancer unit risk to be $20 \times 10^{-5} \text{ ppb}^{-1}$, the top of the upper confidence limits range.

Because vinyl chloride has not been detected in statewide ambient air monitoring, hot spot concentrations detected by monitors near two South Coast landfills were used to assess the probable impact of vinyl chloride on the cancer burden in California. Population-weighted estimates of peak exposure concentrations for maximally exposed receptors ranged from 2 to 10 ppb at the BKK Landfill and from 0.6 to 9 ppb at the OII Landfill. An estimated 17,000 to 131,000 persons were exposed to 1 ppb of vinyl chloride near the BKK Landfill where the highest exposures were predicted from the monitoring results of 1987. Using the upper confidence limits range of risks, the DHS estimates that 3 to 36 cancers may occur in 131,000 persons due to lifetime exposure to 1 ppb of vinyl chloride.

The South Coast Air Quality Management District (SCAQMD) obtained vinyl chloride ambient monitoring (LOD = 2 ppb) from locations near two landfills in the South Coast Air Basin. At the BKK Landfill from January through December of 1987, 24-hour average concentrations of vinyl chloride ranged from below the LOD to 15 ppb with a mean of 1.2 to 2.6 ppb. At the OII Landfill from January through December of 1986, 24-hour average concentrations of vinyl chloride ranged from below the LOD to 9.8 ppb with a mean of 1.0 to 2.0 ppb. The OII Landfill is currently a federally listed superfund site. Subsequent to the SCAQMD's vinyl chloride sampling during 1986, the EPA has implemented more stringent landfill gas control measures. The EPA has also selected a remedy for landfill gas control that is expected to substantially further reduce landfill gas emissions from the OII Landfill. It is fully anticipated that these control measures will substantially lower the levels of vinyl chloride in the ambient air in the vicinity of the OII Landfill.

What is the exposure level of people living near
sources such as landfills?

Population-weighted exposure results, based on computer modeling by ARB staff, show that approximately four million people living near the OII Landfill were exposed to an estimated annual average vinyl chloride concentration ranging from 0.004 to 0.06 ppb in 1986. The maximum exposed individual living near OII Landfill was estimated to be exposed to an annual average vinyl chloride concentration ranging from 0.6 to 8.7 ppb. For the BKK Landfill, the population-weighted exposure results show that approximately two million people were exposed to estimated annual average vinyl chloride concentrations ranging from 0.08 to 0.34 ppb in 1987. The maximum exposed individual living near BKK was estimated to be exposed to an average annual concentration of 2.3 to 10.3 ppb. These exposure estimates are based on ambient data only and do not include any possible elevated indoor exposures that may occur inside homes near landfills.

The data gathered in the Landfill Gas Testing Program (Section 41805.5 of the 1986 California Health and Safety Code) will be used to provide a relative ranking of the sites based on the potential for emissions of toxic compounds and the potential for exposure.

Is there evidence of indoor air exposure to vinyl chloride?

In California, indoor air vinyl chloride has been detected only in houses near landfills. Some homes near landfills have been shown to accumulate vinyl chloride to the extent that indoor concentrations are several times greater than general outdoor concentrations. Landfill gas containing vinyl chloride may contribute to indoor air concentrations by direct outdoor air influx or by underground migration and subsequent entrance through the substructures of homes.

In 1985, elevated levels of vinyl chloride in the water meter boxes of several homes adjacent to the OII Landfill prompted a South Coast Air Quality Management District indoor air grab-sample study. Indoor air

All of the above estimates represent the upper range of plausible excess cancer risk. Estimates of actual risks at exposures near 1 ppb are uncertain and could be much lower.

What are the alternatives to identifying vinyl chloride as a TAC?

Government Code Section 11346.14 requires agencies to describe alternatives to the regulation considered by the agency and the agency's reasons for rejecting those alternatives. The only alternative to identifying vinyl chloride is not to identify it. We are not recommending this alternative because we believe that vinyl chloride meets the definition of a toxic air contaminant.

What would be the environmental impact of the identification of vinyl chloride as a toxic air contaminant?

The identification of vinyl chloride as a toxic air contaminant is not itself expected to result in any impact on the environment. The Board's identification of vinyl chloride as a toxic air contaminant may result in the adoption of control measures according to the California Health and Safety Code Sections 39665 and 39666. Implementation of control measures would benefit the public health by reducing vinyl chloride emissions resulting in a reduced health risk due to vinyl chloride exposure.

Environmental impacts identified with respect to specific control measures will be included in the consideration of such control measures pursuant to the California Health and Safety Code Sections 39665 and 39666.

What are the findings of the Scientific Review Panel?

(To be added.)

CTL015905