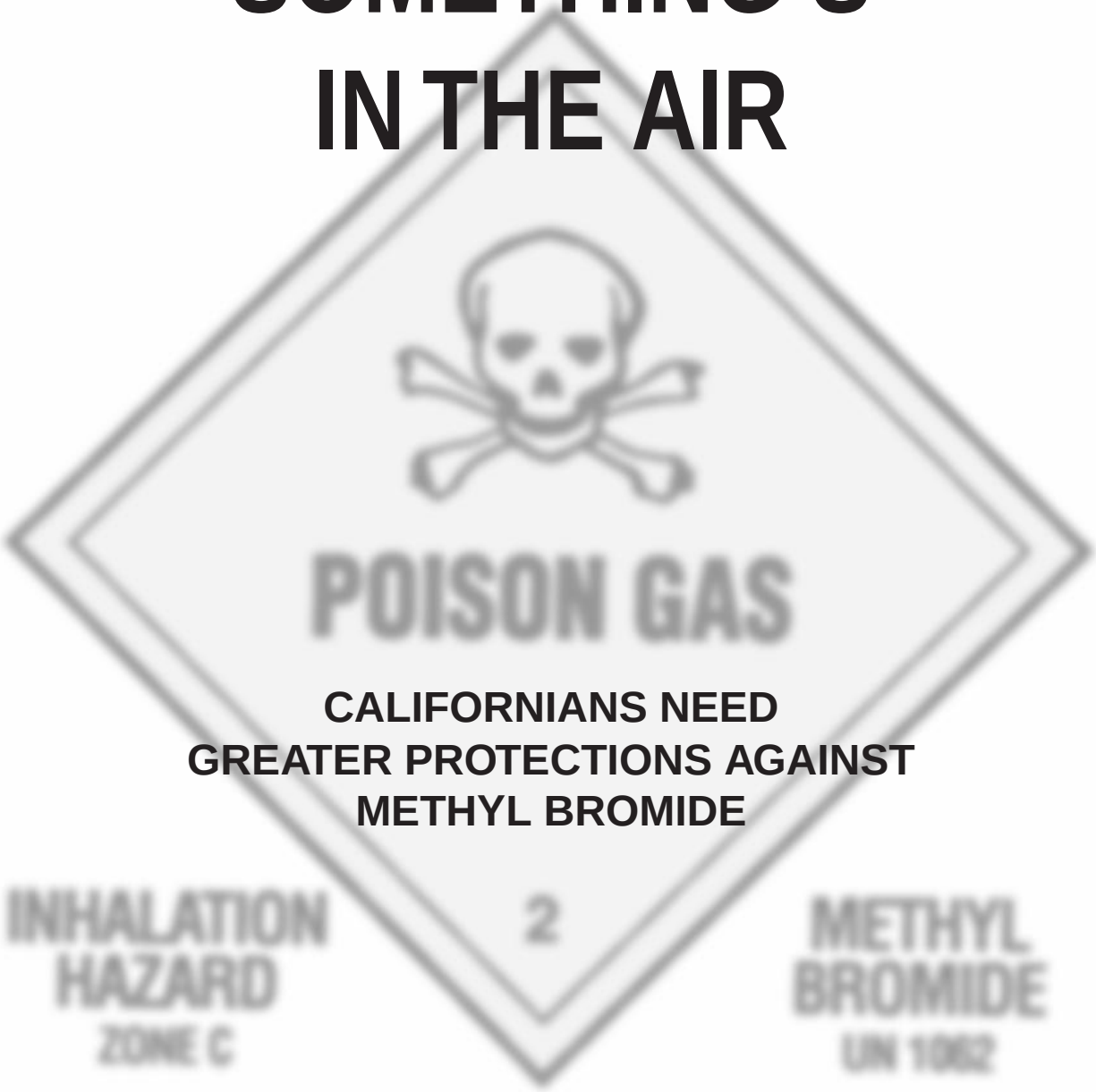
SOMETHING'S IN THE AIR



CALIFORNIANS NEED GREATER PROTECTIONS AGAINST METHYL BROMIDE

ENVIRONMENTAL WORKING GROUP™

RICHARD WILES
KERT DAVIES

Acknowledgments

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Executive Summary

Testing in suburban California neighborhoods revealed methyl bromide in the air well beyond state mandated "buffer" zones at 12 out of 16 locations tested. The levels detected ranged from less than 1 part per billion to 294 parts per billion (ppb) on average over 12 to 24 hours. Single point measurements were as high as 1,900 ppb. The California Department of Pesticide Regulation (DPR) has established rules that allow individuals, including pregnant women and children, to be exposed to an average of 210 ppb of methyl bromide in the air over a 24 hour period as a result of agricultural application. Methyl bromide is known to cause birth defects (CCR 1994, OEHHA 1993) and is extremely toxic to the nervous system (CDPR 1995a, Pease 1996).

The California DPR standard for agricultural use of methyl bromide has been repeatedly criticized as too weak.

The California DPR standard for agricultural use of methyl bromide has been repeatedly criticized as too weak (Pease 1996, Wagner 1996). Indeed, some DPR scientists have recommended a much stronger 24 hour exposure standard as low as 1 ppb (CDPR 1995b). The one-day DPR standard of 210 ppb is well above the Minimum Risk Level recommended by the U.S. Public Health Service of 50 ppb exposure on average over 24 hours (ATSDR 1996). Methyl bromide levels in air exceeded the U.S. Public Health Service recommended 24 hour safety standard at three locations — Ventura, Watsonville, and Castroville — in tests conducted by independent technicians under contract to EWG. Those air samples were taken on residential property outside of buffer zones — that is, in supposedly safe areas.

Californians can be legally exposed to thirteen times more methyl bromide on their front porch than in their living room.

The 24 hour warning level for *indoor* methyl bromide exposure is even more stringent: 15.5 ppb, or thirteen and one half times more protective than the standard for agricultural use (Sears 1997). The practical effect of this double standard is that Californians can be legally exposed to thirteen times more methyl bromide on their front porch than in their living room. This flagrant inconsistency breaches a fundamental tenet of toxicology: The dose (not the location) makes the poison.

Air monitoring by EWG has shown that Californians are exposed, perhaps routinely, to levels of methyl bromide from agricultural applications that would be considered unsafe and require written safety warnings if the exposure resulted from indoor application of the compound. Three measured 24 hour average levels, plus four individual grab samples in a total of five different locations exceeded this 15.5 ppb standard.

DPR Does Not Monitor Air for Methyl Bromide

Prior to December 1996, based on all available evidence, the DPR had not conducted "real world" monitoring of the air near a single field application of methyl bromide anywhere in California since 1993. The agency has never monitored the air in schoolyards or backyards abutting fumigated fields that until November 1996 were allowed to be included in buffer zones. Over this same period (1992-1996),

Between 1992 and 1996 some seventy-five million pounds of methyl bromide were applied to farm fields in California.

some seventy-five million pounds of methyl bromide were applied to farm fields in California. One quarter of this total was applied to strawberry fields, primarily in populated coastal counties.

In response to EWG monitoring for methyl bromide, DPR agreed to a joint monitoring project with the Environmental Working Group in December 1996 (Gosselin 1996). This joint experiment, however, was unsuccessful after growers refused to allow EWG scientists to accompany state scientists at the monitoring sites. According to sources at DPR, growers became reluctant to cooperate with EWG after they were contacted by TriCal, the largest methyl bromide application company in California. DPR apparently proceeded to monitor the air at four field locations from December 1996 through February 1997. The results of these tests have not yet been public, but the carbon filters used by the agency to monitor for methyl bromide are considered by a number of experts to be extremely poor instruments for methyl bromide detection under field conditions (Gan et al. 1995a, Gan et al. 1995b). Specifically, the method used by the California DPR may underestimate the amount of methyl bromide in air by 50 to 70 percent. (Green et al. 1992)

Testing and research by EWG revealed systematic abuses on the part of DPR, not only in their failure to monitor, but also in their manipulation of the scientific basis for so-called "buffer zones" that are supposed to protect the public from unsafe levels of methyl bromide exposure. Methyl bromide is extremely hazardous to people living or working near treated fields because it is a highly toxic and very volatile compound. Up to ninety percent of all methyl bromide applied rises into the atmosphere, where it is carried with the winds throughout the surrounding community before it drifts to the upper atmosphere and destroys the protective ozone layer (Yagi et al. 1993, 1995, UNEP 1992).

Based on our research and air monitoring results, we conclude the DPR has not taken adequate steps to protect the public from methyl bromide exposure.

DPR failed to revise safety standards for methyl bromide in response to data on neurotoxicity that the agency accepted as valid in 1992.

- DPR failed to revise safety standards for methyl bromide in response to data on neurotoxicity that the agency accepted as valid in 1992. These data would require the safety standard for 24 hour exposure to methyl bromide to drop from 210 parts per billion, to 10 parts per billion, or perhaps lower. Internal documents from the DPR suggest that the 24 hour standard should be tightened to as low as 1 part per billion, or the limit of detection (CDPR 1995b).

- DPR used inappropriate "average statewide weather scenarios" to predict methyl bromide drift and the size of protective buffer zones needed around treated fields, in spite of objections of scientists at the California Air Resources Board and other experts that this modification was not scientifically valid or sufficiently protective (Wagner 1996). The use of average weather data reduced the size of protective buffer zones by as much as a factor of ten (Sears 1996).

- DPR used a flawed model to set buffer zones (weak safety standards and average weather) and then deliberately failed to monitor the air around treated fields for over three years.

- DPR originally verified the accuracy of the buffer zone model using charcoal filter detection methods that the DPR's own scientists had concluded were largely inadequate for methyl bromide air monitoring. DPR scientists pub-

lished a peer-reviewed paper in 1992 revealing that standard charcoal filters used for methyl bromide monitoring fail to measure 50 to 70 percent of the methyl bromide actually in the air (Green et al 1992).

Recommendations

DPR buffer zone models and health risk assessments for the agricultural use of methyl bromide do not protect Californians from unsafe exposure to this extremely toxic pesticide. DPR should take a series of steps to protect the public and agricultural workers in a manner fully reflective of state of the art science

- DPR should immediately revise the 24 hour safety standard for agricultural use of methyl bromide based on the study of methyl bromide toxicity in mice that the DPR accepted as valid in 1992 (CDPR 1992, CDPR 1995b). According to DPR scientists, this will lower the acceptable 24 hour exposure level for agricultural use of methyl bromide from 210 ppb, to 10 ppb or even less (CDPR 1995b).

DPR should provide mandatory public notice of methyl bromide applications near people's homes, schools and workplaces.

- DPR should eliminate statewide average weather assumptions from buffer zone models and use the ISCST air dispersion model in the same manner as it is employed by air monitoring professionals at the California Air Resources Board and the U.S. EPA.

- DPR should incorporate these revisions of the safety standard and the air dispersion model into the formula used to calculate buffer zones around methyl bromide treated fields.

- Methyl bromide permit fees should be increased to help pay for monitoring and replacement research. DPR should immediately begin random, statistically valid monitoring of methyl bromide treated fields, using state of the art FTIR equipment, backed up by Summa canisters, and if appropriate, charcoal filters.

- DPR should provide mandatory public notice of methyl bromide applications near people's homes, schools and workplaces. Funds should be allocated from state pesticide mil tax revenues to support monitoring requests from citizens living near fields treated with methyl bromide.

- DPR should conduct field tests with simultaneous use of charcoal, Summa canisters, and FTIR equipment to determine whether charcoal is a reliable technique to monitor methyl bromide dispersion from treated fields.

- DPR should grant clear authority for local governments to adopt additional restrictions on methyl bromide use.

DPR should grant clear authority for local governments to adopt additional restrictions on methyl bromide use.

Our review suggests a pattern of accommodation within DPR that consistently tilts agency decision making in favor of special interests in agriculture and against the public interest in tighter regulation of methyl bromide. We recommend that the relevant committees in the State Legislature examine the merits of transferring authority for methyl bromide monitoring and public safety from DPR to the California Air Resources Board and the California Department of Health Services.

Chapter One

Big Money, Bad Science and Methyl Bromide in California

If methyl bromide were not sold as a pesticide, it would have to be disposed of as toxic waste. If a chemical factory releases any methyl bromide, it must be reported under the EPA's Toxic Release Inventory. The U.S. Environmental Protection Agency classifies it as a Category I acute toxin, a designation reserved for the most deadly substances. This high degree of toxicity makes this volatile gas a dangerous but highly effective agricultural sterilizing agent, capable of killing virtually all animals, plants and fungi.

It is common to find high-value crops that use substantial volumes of methyl bromide being grown on farmland adjacent to suburban neighborhoods, schools and other development.

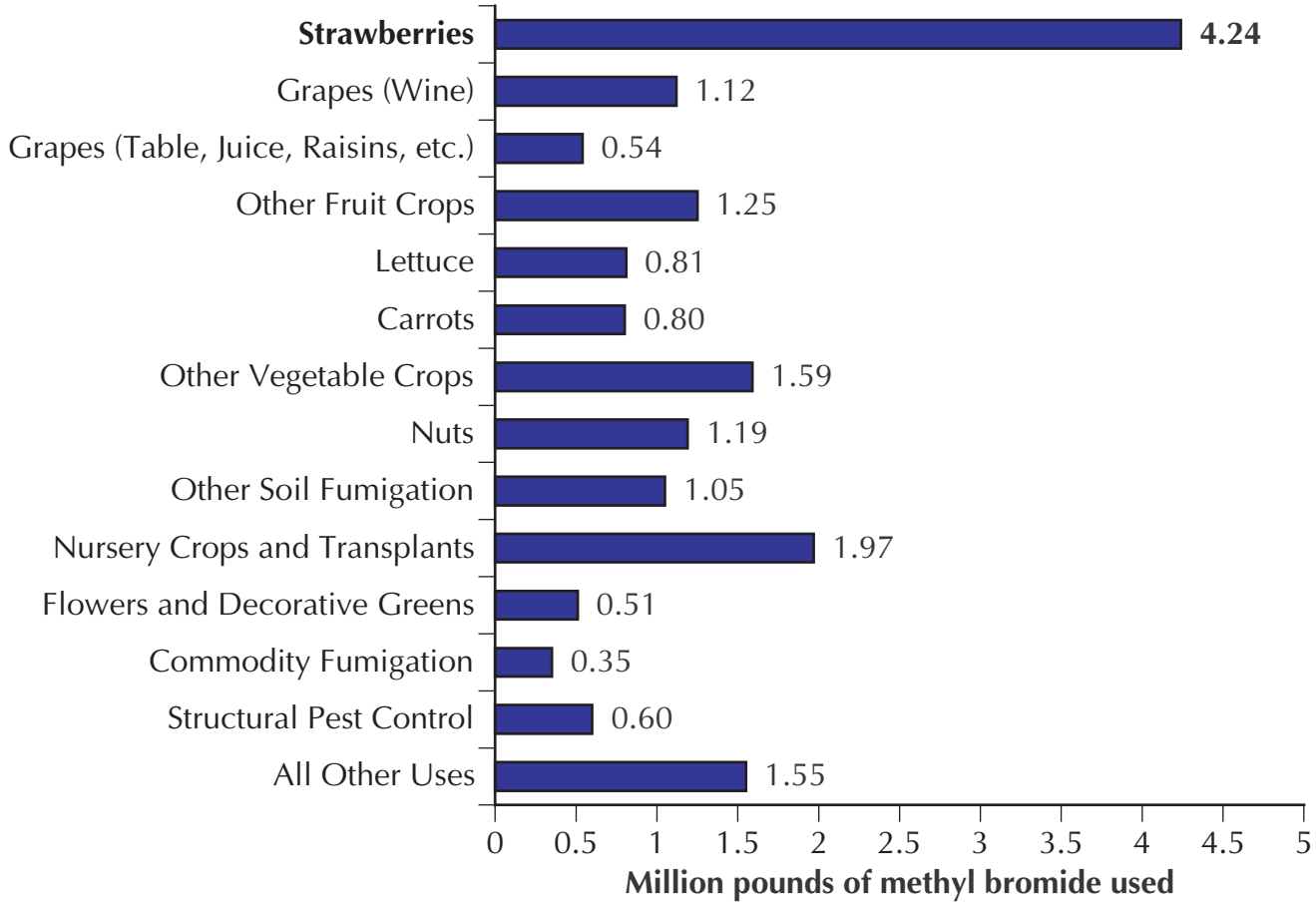
As a soil and harvested crop fumigant, methyl bromide is used in great quantities in California on strawberry fields, grape vineyards, cut flower fields, raisin and nut warehouses and in greenhouses — more than 60 crops in all. In 1995, nearly 17.6 million pounds of methyl bromide were used statewide, nearing the record 19 million pounds used in 1992, and up steadily from 16.9 million pounds in 1994 and 14.8 million pounds in 1993 (CDPR PUR). California methyl bromide use is on the rise despite a 1993 federal Clean Air Act ban on its production and sale in the year 2001 to protect the earth's ozone layer from further degradation.

In 1995, more than 4.2 million pounds of methyl bromide were sprayed in California on just one crop — strawberries, accounting for 24 percent of total use statewide that year (Figure 1). Fifty percent of the methyl bromide used in the state was applied to just five crops: strawberries, grapes (wine, table, juice and raisin), almonds, lettuce and carrots. Statewide in 1995, over 92 percent of methyl bromide consumption went to soil fumigation; 3.4 percent was used for structural fumigation; about 1 percent was used for commodity fumigation. The rest went to assorted other fumigation projects.

Methyl bromide is expensive to use because it is applied in huge concentrations — as much as 400 pounds per acre (CDPR 1996a). Many growers consider this great expense justified, however, because the return per acre on methyl bromide intensive crops is typically quite high. The California strawberry crop is now worth over $27,000 per acre at the farm level before profit is added from distribution and retail sales (CDFA 1995). Grower profits range from $10,000 to 15,000 per acre (NSWC 1996).

Over the past 25 years, during which methyl bromide use has expanded rapidly, California's population has grown even more. California methyl bromide use, which averaged less than 5 million pounds annually in the early 1970s, has grown to over 17 million pounds per year in the 1990s (Allen et al. 1995, CDPR PUR). It is increasingly common, particularly in coastal counties, to find high-value crops that use substantial volumes of methyl bromide being grown on farmland adjacent to suburban neighborhoods, schools and other development (Goldman 1988). As methyl bromide use has increased in proximity to people, the public has become concerned about the safety of its continued use. Although these concerns have

Figure 1. Strawberry growers used 24% of the 17.6 million pounds of methyl bromide used statewide in California in 1995.



Source: Environmental Working Group, Department of Pesticide Regulation Records: Pesticide Use Reporting System, 1995.

existed in agricultural regions for some time, in 1996 a series of controversial political decisions, punctuated by a rash of methyl bromide exposures in suburban neighborhoods, pushed the methyl bromide debate onto the front pages of the state's newspapers and into the hearing rooms of the California Legislature (L.A. Times 1996a & 1996b, The Sacramento Bee 1996, S. F. Chronicle 1996, Warren 1996, Wagner 1996, Kelley 1996, Zachary 1996).

Chapter Two

Methyl Bromide in Suburbia

The State of California does not regularly monitor actual "real-world" methyl bromide applications to verify the accuracy of buffer zone calculations and ensure the safety of people who live and work in the areas immediately adjacent to treated fields. Instead the state relies on buffer zones derived from a deeply flawed model that uses statewide average weather assumptions and standardized methyl bromide flux rates[1] derived from experimental measurements conducted in 1992 and 1993 by the DPR, University of California scientists and methyl bromide industry-hired consultants (Majewski et al. 1995, Ross et al. 1996, Seimer 1993.).

The State of California does not regularly monitor actual "real-world" methyl bromide applications to verify the accuracy of buffer zone calculations and ensure the safety of people who live and work in the areas immediately adjacent to treated fields.

To address concerns about the safety of methyl bromide use in close proximity to populated areas, air monitoring was conducted by the Environmental Working Group between June 1996 and November 1996. The overall goal of the EWG monitoring program is to determine the levels of methyl bromide in the air in residential neighborhoods, schoolyards, and other areas with high potential for human exposure adjacent to or in close proximity to treated fields.

A total of 29 tests were conducted at sixteen separate locations in Napa, Fresno, Monterey, Santa Barbara and Sonoma counties, using four different testing devices. Sixteen tests used tubular charcoal filters which trap methyl bromide in charcoal as air is drawn through a filter by a pump. Seven grab samples used Tedlar bags that are inflated instantaneously with a hygienic air pump. Four tests were done using Summa canisters which are evacuated spheres into which air is drawn over an eight hour period. Two samples used open path FTIR equipment which uses microchip technology to identify chemical vapor signatures that interfere with a concentrated beam of light directed along a 100 to 1,000 meter path.

Charcoal filters were employed using standard sampling protocols published by the National Institute of Occupational Safety and Health (NIOSH) and adopted by the California Air Resources Board (CARB). Prior to field testing, EWG's site specific sampling plans were reviewed by scientists at the California Air Resources Board (CARB) and the California Department of Health (CARB 1996). As a result of ongoing discussions with Air Board and Department of Health scientists, NIOSH/ CARB methods and materials were adjusted over the course of the study in response to local conditions and other technical issues described below.

FTIR samples were run using methods (TO-16) approved by the U.S. EPA US EPA 1996). The Summa canister sampling was conducted according to protocols obtained from the laboratory that provided the sampling equipment. There is no formal sampling method for collecting instantaneous Tedlar bag samples. The air collected in Tedlar bags was analyzed using the same EPA approved analytical methods used to analyze the Summa canister samples, EPA's TO-14 gas chromatography/ mass spectrometry.

At all of our testing sites samples were taken on only one side of the field, often at only one or two specific locations. All samples were taken outside state mandated buffer zones, in areas where access would not be restricted at any time during or after methyl bromide applications.

At the end of this sampling period it became clear that carbon monitors were failing to detect significant levels of methyl bromide in the air. To further investigate this problem, a series of collaborative field monitoring experiments were proposed and agreed to by EWG and the DPR (Gosselin 1996). EWG's goal in this joint experiment was to shed more light on the potential flaws with carbon testing methods. The DPR's goal was quite different — to determine whether smaller buffer zones could be used during winter months, based on the theory that colder weather reduces methyl bromide volatilization from fields. The collaboration was unsuccessful.

To the best of our knowledge DPR did monitor four field applications of methyl bromide from December 1996 through February 1997. EWG was not allowed to participate in any of these field tests, because, according to the DPR, growers refused to let EWG technicians on their land. It was also reported to EWG staff that TriCal Inc., the largest methyl bromide application company in California, contacted growers in advance of field monitoring and successfully convinced them to bar EWG scientists from monitoring methyl bromide applications.

Results

Charcoal filter/air pump samples

Charcoal filter/air pump samples were taken by EWG in 12 different locations. Methodology and protocols were obtained from state run monitoring experiments and upgraded in consultation with state air monitoring experts within the California Air Resources Board and the California Department of Health. Monitoring locations ranged from 50 to 600 feet from recently fumigated fields (Appendix A).

Of 12 locations sampled, eight tested positive for methyl bromide. Of a total of 16 samples, 10 were positive for methyl bromide. Detection levels ranged from 0.13 ppb to 5.96 ppb, using a 24-hour time-weighted average.

Instantaneous canister samples

Seven grab samples were collected at three sites using Tedlar bags instantaneously inflated with hygienic pumps. A backyard and a schoolyard near fumigated strawberry fields in Ventura County were tested, as well as residential property next to a cut flower field in Alameda County.

Of seven samples, six, positive for methyl bromide with detections ranging from 5.6 to 120 ppb. The average level of methyl bromide detected in these seven samples was 42 ppb.

Eight-hour canister samples

Summa canister sampling technology is commonly acknowledged to be more accurate and efficient than filter/extraction monitoring, because the polluted air is being captured, not filtered and it is not necessary to "extract" the pollutants from the filter medium. The Summa canisters EWG used are the most modern available, made of polished treated stainless steel, which resists bonding with pollutants.

Four, 8-hour Summa canister samples were collected in one location near Watsonville in Santa Cruz County. Methyl bromide was detected in all samples. Levels measured ranged from 110 to 190 ppb. Three 8-hour samples were run in succession to total a 24 hour average of 157 ppb. Two side by side sample canisters, taken at different heights yielded measurements of 180 ppb and 190 ppb, indicating that the sampling technique and analytical method are consistent. The level of detection for 8 hour Summa samples is typically around 1 ppb.

Methyl bromide was repeatedly detected in the air, well outside state mandated "buffer" zones.

Infrared FTIR

EWG consultants conducted two FTIR monitoring runs near methyl bromide fumigated fields in June and August of 1996, one in Monterey County and the other in Ventura County. Together these two tests produced hundreds of separate measurements of methyl bromide ranging from 80 to 1,900 ppb. In one case methyl bromide was detected at levels as high as 665 ppb more than 1,300 feet from the fumigated field, 6 times the state mandated safety "buffer zone" of 220 feet.

The open path FTIR uses microchip technology to identify chemical vapors in the air that interfere with a concentrated beam of light directed along path up to 1000 meters. Each chemical has a distinct light interference "fingerprint" that is recognized by the computer. Unlike the other methods (charcoal filtration, Summa canister sampling), the FTIR produces instantaneous real time readings of the average level of methyl bromide in the air, in adjustable intervals over the entire path, as low as one minute.

This real-time data over a 100 meter path provides a far more representative picture of methyl bromide levels along the edge of a field than a single 24 hour average level derived from a sampling device in one location. Methyl bromide levels vary widely from point to point along a buffer zone surrounding a field. If a stationary monitor happens to be placed in a spot with higher or lower than average methyl bromide concentrations, the resulting data and conclusions will be flawed. The FTIR, in contrast, allows one to view the methyl bromide flux along the entire edge of the field at once.

FTIR has a limit of detection (the lowest detectable amount) of around 40-100 ppb under ideal conditions — less sensitive than the detection limits for Summa or charcoal filters, which can detect under 1 ppb.

In October 1996, the U.S. EPA issued an approved methodology for the open path FTIR technique, recommending it for "monitoring of atmospheric gases along perimeters of industrial facilities, at hazardous waste sites, in response to accidental chemical spills or releases, workplace environments, and in ambient air..."(EPA 1996).

Overall

At twelve out of sixteen testing locations methyl bromide detected at levels ranging from less than 1 to 294 parts per billion averaged over 12 to 24 hours. Single point samples were at high as 1,900 parts per billion.

Methyl bromide was repeatedly detected in the air, well outside state mandated "buffer" zones. At twelve out of sixteen testing locations methyl bromide detected at levels ranging from less than 1 to 294 parts per billion averaged over 12 to 24 hours. Single point samples were at high as 1,900 parts per billion.

Methyl bromide was detected in one residential neighborhood more than 1,300 feet from a treated field at levels very close to the flawed DPR 24 hour health standard of 210 ppb (204 ppb average over 12 hours). DPR argues that this level is "safe" because if you assume that during the following or preceding 12 hours

there was no methyl bromide in the air at all, the 24 hour average falls to 102 ppb. The buffer zone around this field was 220 feet.

Repeated testing with charcoal filters supports the findings of prior research that charcoal monitoring technology may give lower than accurate measurements of methyl bromide under field conditions. Field testing by EWG indicates that a variety of other proven methods — Summa canisters, Tedlar bags and open-path FTIR — are far more reliable monitoring devices.

Note

[1] The "flux" rate is the rate at which methyl bromide is thought to leave the soil after injection and enter the air. The amount of methyl bromide that leaves a given field to become airborne depends on the depth of injection, the rate of application and the thickness of the tarp (if any) covering the field. Methyl bromide will easily penetrate plastic tarps, but thicker tarps and specialized plastics slow this process. Flux rates are not usually measured at the soil level by DPR, but instead "back-calculated" from measurements of methyl bromide in the air around the field.

Chapter Three

DPR Approved Monitors Underestimate Methyl Bromide in Air

Charcoal filters are the most commonly used highly sensitive method for monitoring methyl bromide and other organic pollutants. They are the analytical method for detecting methyl bromide recommended by the National Institute for Occupational Safety and Health, the U.S. EPA, and the CalEPA. Historically, all of the methyl bromide monitoring conducted by the California Air Resources Board and Department of Pesticide Regulation has employed this methodology. The technology is sensitive enough to detect methyl bromide in parts per trillion and is relatively simple. The pumps and cartridges are small and can be shipped easily to a remote lab for analysis.

It became apparent that charcoal filtration techniques are not a reliable means to measure methyl bromide levels in the air around fields treated with the compound.

Like all single point sampling devices charcoal filters are limited because they measure methyl bromide concentrations in the air at a single location next to the treated field. In contrast to this single point, the perimeter of a treated field is typically several miles long. It is virtually certain that varying levels of methyl bromide will be encountered a different points around the perimeter of a field's buffer zone. The problems with charcoal filters, however, are much more fundamental than this obvious, inherent, limitation.

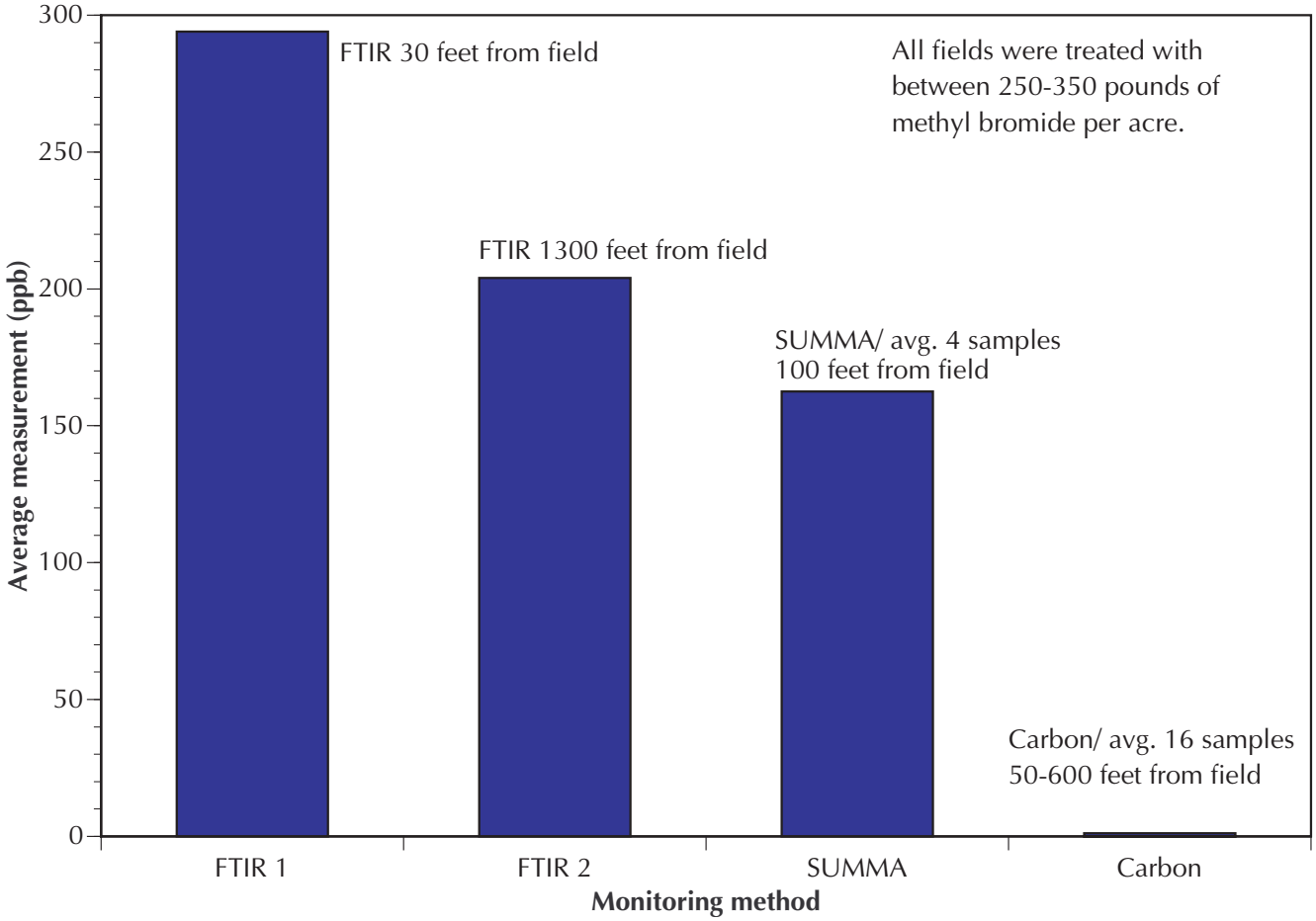
EWG Tests Confirm Problems with Charcoal Filters

Throughout the course of this monitoring project it became apparent that charcoal filtration techniques are not a reliable means to measure methyl bromide levels in the air around fields treated with the compound. The first indication that charcoal might be failing to detect methyl bromide was the relatively low levels of methyl bromide found by charcoal filters in situations very similar to those that had yielded high measurements with FTIR and Tedlar bags (Figure 2). These low measured levels led to a series of conversations with scientists at CARB and the California Department of Health and subsequent modification of EWG's charcoal monitors, including adding additional filters to capture possible methyl bromide breakthrough, adjusting flow rates and other technical changes. These modifications failed to remedy the apparent ineffectiveness of the charcoal filters.

Consequently, a simultaneous Summa canister and charcoal sample was taken in the same spatial location on Nov. 10, 1996, near Watsonville. The results of this test indicate that under normal field conditions, charcoal filtration systems fail to account for substantial amounts of methyl bromide in the air (Figure 3).

The two samples were taken approximately 100 feet from the edge of the fumigated field, in a residential yard, with the Summa canister intake positioned four inches away from the charcoal filter for the entire length of the sample period. The buffer zone assigned to the field by the state was 30 feet, putting the monitors well outside the so called buffer zone where the DPR would expect significant levels of methyl bromide in the air.

Figure 2. Methyl bromide sampling under similar conditions suggests problems with carbon detection methods.



Source: Environmental Working Group. Methyl Bromide Monitoring Project, 1996.

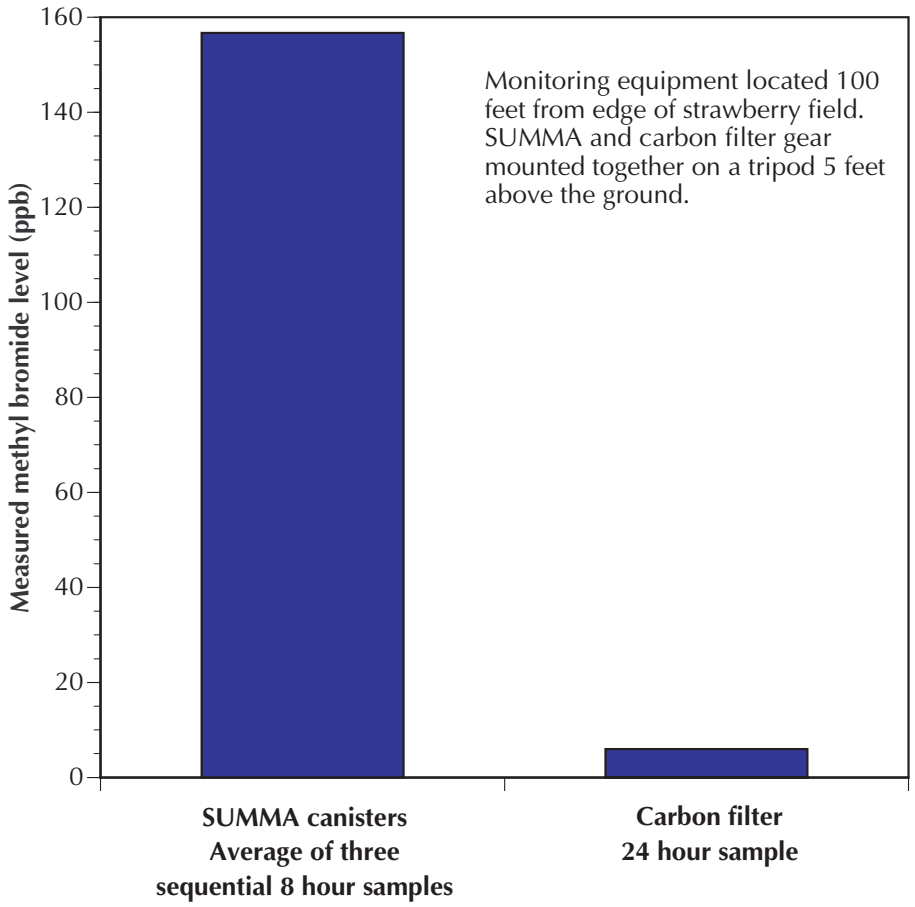
The charcoal filter measured a 24 hour average level of methyl bromide in the air of 6 ppb. In contrast, the Summa canister detected an average 24-hour level of methyl bromide of 157 ppb — 26 times higher than the levels measured by the charcoal filter.

The DPR has long been aware of the limitations of charcoal filters for capturing and retaining methyl bromide. One peer-reviewed study published by DPR and University of California scientists compared simultaneous FTIR and charcoal filter results for a methyl bromide fumigated structure. Under these controlled laboratory conditions charcoal was unable to detect 50 to 70 percent of the methyl bromide known to be in the air (Green et al 1992). In fact the DPR owns an FTIR, but because the agency does not monitor field applications of methyl bromide, it has never used this equipment to monitor methyl bromide drift from treated fields.

Deficiencies With Charcoal Filters Are Well Known

Methyl bromide is a highly reactive unstable chemical compound. It can be broken down by water, heat, ultraviolet light and other chemicals; once broken

Figure 3. Simultaneous sampling reveals sharp discrepancy between SUMMA and carbon filter measurements.



Source: Environmental Working Group. Methyl Bromide Monitoring Project, Watsonville, CA. November, 1996.

down, methyl bromide byproducts do not register as methyl bromide in lab analysis (Gan et al. 1995). Ideally, a charcoal filter would absorb all the methyl bromide in the air drawn through the filter and hold it intact until lab analysis can be performed. In reality, the problems with charcoal filters are well understood. They occur at three critical stages in the methyl bromide monitoring process: capture, retention, and extraction.

* Not all of the methyl bromide in the airstream is captured.

The rate of air flow through the charcoal directly affects the efficiency of capture. If the air is pumped too fast then methyl bromide will break through the filter and escape monitoring. For this reason we added backup charcoal tubes to capture possible breakthrough at all but two monitoring sites. Fog, a very common situation in coastal California counties, is known to substantially reduce methyl bromide capture rates in charcoal filters by clogging filter pores with water.

* Some, and perhaps a significant amount of the methyl bromide that is captured in the filter breaks down during sampling, transport, and storage.

  Heat, hydrolysis, humidity, and light, will all break down methyl bromide, and the breakdown products are not measured by standard lab analysis. According to protocols, samples must be kept cool at all times and shipped overnight to the lab where they are frozen prior to analysis. As samples are being taken, the filter tube is shielded from direct sunlight with reflective foil to prevent heating and light penetration, but it is not physically "cooled" in the field. Consequently, methyl bromide caught by the filter during the first hour of monitoring, can easily break down during the sampling period as or as the sample is shipped to the laboratory for analysis. Cooling the sample in the field is not practical, and even if it were, it would likely create significant moisture in hot field conditions that would further decrease monitoring accuracy.

* Extracting methyl bromide from the filter medium is a difficult and delicate procedure.

  Not all of the methyl bromide captured by the filter is recoverable with even the most precise methods. Under optimal laboratory conditions, the best recovery rates reported in the literature are about 80-85 percent.

EWG's experience indicates that in the field, charcoal filters fail to capture or retain 90 percent or more of the methyl bromide actually in the air at a given point around the edge of a treated field. Indeed, when chemical losses due to extraction are considered, charcoal filters, may be and even less accurate than this.

The known problems with charcoal filters and the grave discrepancies reported here between charcoal and Summa and FTIR under similar field conditions, strongly suggest that the results from EWG's charcoal filters underestimated the actual levels of methyl bromide in the air at the locations tested.

Overall, these results argue strongly for FTIR and Summa canisters as a preferred tools for air monitoring of methyl bromide.

Chapter Four

Methyl Bromide Granted Special Interest Exemptions

Special legislative session

In January 1996, Governor Pete Wilson called a special session of the California Legislature with the explicit purpose of revoking an impending ban on methyl bromide that was scheduled to go into effect at the end of March 1996. Wilson's action followed the defeat, on the last day of the 1995 legislative session, of an industry backed bill that would have extended the deadline for the ban indefinitely. According to analysts for the state Senate Natural Resources Committee, Wilson was the first California governor on record to call a special session — a parliamentary maneuver that suspends the legislature's normal rules to make it easier to pass a bill — solely for the purpose of overturning an action of the previous legislative session (Peterson 1996). State records showed that since 1992, Wilson had received almost $100,000 in campaign contributions from companies advocating postponement of the methyl bromide ban (Legi-Tech 1996).

Wilson was the first California governor on record to call a special session solely for the purpose of overturning an action of the previous legislative session.

After an intense three-month debate marked by heavy lobbying from agricultural and chemical interests, the legislature amended state law specifically to extend the use of methyl bromide until the end of 1997 — despite the absence of key chronic health effects studies which are required under the California Birth Defects Prevention Act of 1984 (SB 950). This was the third time SB 950 had been amended to accommodate pesticide producers: in 1987, and again in 1991, the law was changed to give manufacturers more time to finish incomplete animal toxicological studies. In 1991, the legislature declared 1996 the "drop dead" date, after which time those pesticides with missing health data would be suspended from use in California — but as one of the proponents of the 1996 bill noted, the state is not legally bound by such 'legislative intent' language (Richter 1996).

If the missing studies are submitted by the end of 1997, the California Department of Pesticide Regulation (CDPR) must consider the findings and decide whether to take regulatory action against methyl bromide. However, this is an action that DPR has so far only taken against one pesticide, cyhexatin, under the authority of the 1984 Birth Defects Prevention Act. In fact, at the request of DPR, the legislature agreed in 1996 to not only extend the deadline for the studies, but to completely drop certain testing requirements.

Wilson had received almost $100,000 in campaign contributions from companies advocating postponement of the methyl bromide ban.

DPR Drops Key Health Study Requirement, Perpetuates Weaker Health Standard for Methyl Bromide

Throughout 1994, methyl bromide manufacturers and users pushed for, and ultimately received, a special exemption from standard testing requirements for pesticides, in particular a study with beagle dogs.

California law requires that all pesticides be tested in long term studies using a variety of animal species. The dog study is particularly important for methyl bro-

mide, because preliminary studies show that larger animals such as monkeys, rabbits, and dogs — and perhaps humans — are more sensitive than rodents to the neurotoxic effects of methyl bromide (CDPR 1995a). Indeed studies on rodents (mice) have shown methyl bromide to be one of the most potent nervous system toxins tested.

A four day neurotoxicity pilot study on dogs completed in late 1994 confirmed extreme canine sensitivity to methyl bromide. After two days of methyl bromide exposure, the study was terminated, "due to the observation of the following [conditions in the dogs]: severe neurotoxicity (delirium, thrashing, vocalization, tremors, traumatization behavior, [defined as slamming the head and body into cage walls], depression, ataxia, irregular gait)" (CDPR 1995a).

An additional inhalation study found brain damage in all dogs exposed to methyl bromide, including lesions and holes in the cerebellum (CDPR 1995a). Even with these findings, DPR scientists concluded that "the brain data supplied... may *underestimate* the true amount of brain damage *caused* by methyl bromide" (CDPR 1995a) (emphasis added).

In spite of a DPR staff-level recommendation that a dog inhalation study was "feasible" and necessary to establish a definitive human safety standard — a no observed effects level," or NOEL — high-ranking DPR officials appointed by Governor Wilson decided in 1995 to grant an exemption from the dog study requirement for methyl bromide (CDPR 1995b).

When the dog study waiver was granted, the DPR stated it would base safety standards on data from chronic rat and mouse studies (CDPR 1995a, CDPR 1995b). Curiously, the mouse study, which was accepted by the DPR as valid in November 1992, reveals neurotoxic effects at very low doses. Indeed, were the DPR to follow through on its commitment to use these data, 24 hour exposure levels would drop from the current level of 210 parts per billion, to as low as 1 part per billion, the limit of detection for methyl bromide (CDPR 1995a, CDPR 1995b). Another rat study is due in 1997. DPR has not tightened safety standards to reflect the information provided by the mouse study, the pilot dog study, or existing rat data.

DPR has also ignored findings by its own staff toxicologists, who recommended a 24 hour safety standard of 60 ppb to protect children, in February 1992, before the mouse study was available (CDPR 1992). This more protective standard was based primarily on the higher respiratory rate of children who are thus exposed to more of a given amount of methyl bromide in the air relative to their size. If similar calculations were made based on current knowledge of its extreme neurotoxicity, allowable exposure levels would be dramatically reduced to protect public health.

Avoiding Proposition 65

During the special legislative session in 1996, the Environmental Working Group (EWG) conducted geographic analysis of California pesticide use which revealed extensive use of methyl bromide in close proximity to heavily populated suburban and rural neighborhoods (Davies 1996a). The EWG report found that over 800 schools and licensed daycare centers are located within 2 miles of sites where over 10,000 pounds of methyl bromide use was reported in 1992. Ten schools around the state were within 2 miles of at least 100,000 pounds of annual methyl bromide application (Table 1).

Sidebar 1. Proposition 65

Proposition 65 was a citizen-sponsored ballot initiative, overwhelmingly approved by the voting citizenry of California intended to provide the people of California with a warning if they are being exposed by industry to toxic chemicals known to cause adverse health effects.

"Proposition 65, formally known as the Safe Drinking Water and Toxic Enforcement Act of 1986 (Health and Safety Code, Chapter 6.6. Sections 25249.5 through 23249.13), was enacted...in November, 1986. Among other things, it was intended by its authors to protect California citizens and the states drinking water sources from chemicals known to cause cancer, or birth defects or other reproductive harm, and to inform the citizens about exposures to such chemicals."

"Proposition 65 requires the Governor to publish by March 1, 1987, and to update at least annually, a list of chemicals known to the state to cause cancer or reproductive toxicity. As of January 1, 1993, 540 chemicals have been listed: 39l carcinogens and 149 reproductive toxicants. The requirements imposed by Proposition 65 on persons doing business in California apply to chemicals that appear on the list. The California Environmental Protection Agency's Office of Environmental Health Hazard Assessment (OEHHA) is designated by the Governor as the lead agency for Proposition 65 implementation." (CEPA 1996b)

These results were of particular concern because of the provisions of the state's unique chemical right-to-know law, The Safe Drinking Water and Toxics Enforcement Act, or Proposition 65 (See Sidebar 1). Chemicals known to the state to cause birth defects or cancer are "listed" under Proposition 65. This listing carries with it the requirement of a written warning for the public.

DPR found in 1993 that if the Proposition 65 standards were applied to agricultural applications of methyl bromide, warning zones of up to four miles would be required.

DPR found in 1993 that if the Proposition 65 standards were applied to agricultural applications of methyl bromide, warning zones of up to four miles would be required around methyl bromide-treated fields (CDPR 1993). This warning requirement was never applied to agricultural methyl bromide use, however, because governor Wilson granted the pesticide a special exemption from Proposition 65. (AFL/CIO et al. v. Wilson et al. 1993) (See Sidebar 2).

Notably, in granting this waiver the governor overturned the decision of Carol J. Henry, Chief of the California Office of Environmental Health Hazard Assessment, who had previously affirmed the listing of the agricultural uses of methyl bromide under Proposition 65 on the agricultural industry's initial appeal (AFL-CIO et al v. Wilson et al 1993). In granting this special interest exemption, Governor Wilson did not challenge the fact that methyl bromide causes birth defects in animals exposed to the compound. Instead he argued that because the U.S. EPA required a birth defects warning only for structural fumigation with methyl bromide — that is, fumigating buildings to kill pests — that California should follow the federal lead, regardless of the apparent legal requirement to the contrary.

The fact that agricultural applications of methyl bromide are not listed under proposition 65 means that:

1. The health standard for methyl bromide applied to farm fields is more than thirteen times weaker than the Prop 65 warning standard for structural use.

When methyl bromide is used to fumigate a home, the ventilation periods required are intended to provide a maximum allowable average exposure for an

Table 1. The top 10 schools within 2 miles of at least 100,000 pounds of methyl bromide use.

Rank	School	City	County	Enrollment	Pounds of Methyl Bromide
1	Rio Del Valle Elementary	Oxnard	Ventura	547	255,137
2	El Rio Elementary	Oxnard	Ventura	601	224,983
3	Rio Plaza Elementary	Oxnard	Ventura	483	188,148
4	Rio Real Elementary	Oxnard	Ventura	667	153,410
5	Rio Lindo Elementary	Oxnard	Ventura	482	142,028
6	La Joya Elementary	Salinas	Monterey	680	136,345
7	Rose Avenue Elementary	Oxnard	Ventura	1135	133,298
8	Bonita Elementary	Santa Maria	Santa Barbara	70	123,964
9	Mar Vista Elementary	Oxnard	Ventura	563	108,863
10	Battles Elementary	Santa Maria	Santa Barbara	917	102,020

Source: Environmental Working Group. Compiled from California Department of Pesticide Regulation, Pesticide Use Report 1992. California Department of Education, Public/Private School Information. California Department of Social Services, Licensing Information System.

The public is not warned about agricultural use of methyl bromide.

individual over a 24 hour period of 15.5 parts per billion (ppb). But when methyl bromide is applied to an agricultural field, the same person is allowed to breathe over 13 times as much methyl bromide on average, or 210 ppb over a 24-hour period. The effect of this discrepancy is dramatic. DPR's own calculations show that warning zones[2] could extend up to 4 miles from treated fields if the 15.5 ppb health standard is employed (CDPR 1993). Currently, buffer zones extend about 30 to 200 feet around the perimeter of the treated field depending on the scale and type of fumigation done.

Monitoring by the Environmental Working Group has repeatedly shown that people are commonly exposed to levels of methyl bromide from agricultural fumigation that would be considered unsafe and illegal if the exposure limit was reduced to reflect existing toxicological data from the mouse and dog studies. California's double standard for breathing methyl bromide in your home vs. breathing it in your yard breaches an elementary rule of toxicology: The dose, not the location, makes the poison.

If your house is fumigated with under 10 pounds of methyl bromide you must be warned...But if your house is within 30 feet of a 10 acre field of strawberries treated with 3,000 pounds of methyl bromide, you receive no warning.

2. Unless local exceptions are in place, the public is not warned about agricultural use of methyl bromide even though structural use requires a warning of use and information on the health hazards of methyl bromide.

If your house is fumigated with methyl bromide, under state law you must be given a written warning and information about the health risks of the pesticide, including the fact that it causes birth defects in animals. In contrast, if you live, work, or attend school as near as 30 feet from a fumigated field, the state requires no warning of use or information on health risks. This exemption holds even if the field is fumigated with a far higher level of methyl bromide that would be applied to a structure.

For example, if your house is fumigated with under 10 pounds of methyl bromide — the leading manufacturer's recommended level is 1 to 4 pounds per 1,000 square feet — you must be warned of methyl bromide's dangers. But if your

Sidebar 2. Governor Wilson Intervenes to Deny the Public Protections From Methyl Bromide

In April of 1992, after a study on rabbits was submitted by methyl bromide manufacturers showing adverse reproductive effects, the California DPR issued an emergency regulation. It required that all product labels for methyl bromide, when used as a structural fumigant on dwellings, warehouses and other buildings to control insects and rodents, must be identified as causing reproductive toxicity (birth defects.) (CEPA 1996b).

In the fall of 1992, the U.S. EPA followed the DPR's lead and required the federal pesticide label for the pesticide to include a birth defects warning statement (CDPR 1996). Ironically, this action by the EPA triggered an additional requirement under California law that methyl bromide be listed as a reproductive toxin under Proposition 65. DPR finally placed methyl bromide on Proposition 65's list of chemicals known to the state to cause reproductive toxicity on January 1, 1993 (CEPA 1996b).

Proposition 65 requires listing by the state of all compounds known to cause cancer or birth defects. Notification is then required for exposure to all listed compounds when exposure may exceed a level of significant risk. The significant risk standard applied for birth defects is 10 times more conservative (protective) that the standard risk levels allowed for other toxic effects. Thus under the proposition 65 standard, warnings are provided at levels of exposure 10 times lower than under standard risk assessments for other effects.

In response to this listing, the DPR determined that warning zones of up to four miles would be necessary for field applications of methyl bromide to meet the tougher, Proposition 65 health standards and notice requirements (CDPR 1993). Because warning zones of this magnitude would inconvenience growers, the listing of methyl bromide was appealed by the Agricultural Council of California, an agribusiness lobbying group (Thomas 1993). (In 1996, the Council was a key member of the Methyl Bromide Coordinating Committee, who lobbied Gov. Wilson to call the special session to overturn the pending ban on methyl bromide.)

This appeal was initially denied by the Office of Environmental Health Hazard Assessment, however, on the grounds that methyl bromide was already determined to be a reproductive toxin by two government agencies (U.S. EPA and California DPR) making the listing under Proposition 65 mandatory and unconditional. Further, those appealing the listing failed to meet the legal requirement (CCR S 12902 (d)) whereby a listing may be rescinded or modified only "in the light of additional evidence received by the lead agency establishing that the listing does not satisfy the definitions" that caused it to be listed in the first place (OEHHA 1993).

On Dec. 22, 1993, with no additional scientific evidence, Gov. Wilson ordered the California Office of Environmental Health Hazard Assessment to modify methyl bromide's listing under Proposition 65 such that methyl bromide would only be listed for structural uses. The governor's action was appealed to the California Superior Court in San Francisco County by the AFL-CIO, The Natural Resources Defense Council, and the Environmental Defense Fund (AFL/CIO et al. v. Wilson et al. 1993). The appeal for injunctive relief was denied.

house is within 30 feet of a 10 acre field of strawberries treated with 3,000 pounds of methyl bromide, you receive no warning or information.

DPR alters "buffer zone" calculations, further weakening public health protections

Air pollution regulation and risk abatement in California normally falls under the jurisdiction of the California Air Resources Board (CARB). In the case of methyl bromide, however, the DPR assumed control of the exposure and risk assessment process even though the agency had never initiated an air pollution exposure assessment for any other pesticide. The DPR risk assessment team then drastically modified the standard air pollution dispersion model used by the CARB and the

Until late in the fall of 1996, buffer zones were allowed to, and often did, include residential back yards, school yards, playing fields, streets, sidewalks and other locations where people — especially children — spend considerable time.

U.S. EPA (known as the Industrial Source Complex Short Term Dispersion Model, or ISCST).

When properly applied, the ISCST model combines at least one full year of local meteorological data with information on emissions rates to predict "worst case " pollution dispersion from specific locations for specific compounds. Based on the predicted exposures, risk assessors then determine the impact of those pollution levels to people living downwind.

The DPR, however, does not consider worst case local weather conditions in determining the size of buffer zones around fields treated with methyl bromide. Instead, DPR assumes an "single standard weather scenario" for the entire state of California when calculating how fast and how much methyl bromide leaves a treated field after application (CDPR 1996).

The effect of this change is significant. When local weather data are used, buffer zones are typically ten times greater than the current DPR model predicts.

DPR conducts no monitoring of methyl bromide in actual use situations

The State of California does not monitor real world methyl bromide applications to check the validity of buffer zone calculations and ensure the safety of people who live and work in the areas immediately adjacent to treated fields. Instead the state relies on buffer zones estimated with statewide average weather assumptions and predicted dispersion rates based on charcoal filter experiments conducted in 1992 and 1993. (The dispersion rate is the rate at which methyl bromide evaporates into the air after it is injected into the soil. It is highly variable depending on soil conditions, yet as with the weather, the state uses standard dispersion or "flux" rates for the entire state. Furthermore, the state tested these flux rates in the late fall when weather was cool and wet. Flux is faster in the summer when it is hot and dry.)

DPR's failure to monitor after buffer zones were established is notable, given the radical changes made in the standard exposure assessment procedures for methyl bromide.

Until late in the fall of 1996, buffer zones were allowed to, and often did, include residential back yards, school yards, playing fields, streets, sidewalks and other locations where people — especially children, who are outdoors more often than adults — spend considerable time. In response to public pressure, and evidence of unsafe exposure in residential subdivisions, DPR is now instructing county agriculture commissioners that back yards and school yards shall not be considered to be part of a buffer zone. Some county agriculture commissioners had already taken steps to regulate use near schools in response to local concerns (CDPR 1996).

In a November 1996 report to the California Legislature, DPR announced it would conduct monitoring for methyl bromide around treated fields from December 1996 through May 1997. It appears that DPR monitored three or four field applications between December 1996 and February of 1997. The results of these tests have not yet been revealed.

Shredded documents

In April 1996, the Office of Environmental Health Hazard Assessment (OEHHA) of the California EPA sent a memo to all OEHHA personnel instructing them to destroy all documents containing any internal discussion or deliberations that were contrary to any final regulatory decision issued by the agency. This included all staff memos and analyses recommending that methyl bromide be listed as a reproductive toxin under Proposition 65. An injunction won by the Natural Resources Defense Council forced the governor to rescind the shredding order, and at that time OEHHA officials denied that any documents had been shredded under the new policy. But in October 1996, OEHHA staff scientists revealed that documents specifically dealing with whether to list methyl bromide under Prop 65 had in fact been destroyed (Lifsher 1996). CalEPA officials still deny any wrongdoing in this case, saying that no data has been destroyed and that the exercise was part of a routine culling of records to save space.

Note

[2] In 1993, DPR calculated the size of *warning* zones if the 21 ppb Proposition 65 level were in effect for agricultural uses of methyl bromide. These warning zones extended up to 4 miles from treated fields (DPR 1993b). *Buffer* zones, which are required under a separate regulatory authority, are calculated using identical air pollution modeling methods as warning zones. The key difference is that persons are not allowed to reside, work, or conduct extended activities such as attend school, within buffer zones (DPR 1996). Warning zones, in contrast, require no such evacuation or avoidance procedures.

Chapter Five

Epilogue

In December 1996, the California Department of Health Services hosted a demonstration of the open-path FTIR monitor used by EWG in our monitoring program (manufactured by Environmental Technologies Group, Inc. of Baltimore). This demonstration, by the same technician EWG had hired to monitor methyl bromide in Ventura and Castroville, was attended by at least thirteen state officials including staff from the DHS, the Air Resources Board and the Department of Pesticide Regulation. By all accounts, the demonstration showed the FTIR to be a worthy and scientifically reliable methyl bromide monitoring device. At this meeting, DPR revealed that the department has an FTIR technician on staff and has successfully used an open-path FTIR in the past to conduct laboratory experiments with methyl bromide.

In November 1996, the DPR issued its "Review of Restrictions on the Use of Methyl Bromide: A Report to the Legislature," as required by the legislation passed during the special session earlier that year. In this report, the DPR announced its intention — after a four-year hiatus — to conduct methyl bromide field air monitoring during the winter of 1996-97 (CDPR 1996).

Clearly, these experiments were initiated in response to public pressure and media attention to the lack of community air monitoring by DPR. Yet the expressed purpose of these tests was not to re-evaluate the present buffer zones for public safety, but instead to "test whether the lower methyl bromide emissions in colder winter months offset the need for larger buffer zones." The vast majority (over 65 percent) of methyl bromide fumigation statewide takes place from July through November, while January and February are among the lowest months of use (CDPR PUR).

The DPR apparently intends to allow methyl bromide use closer to people during winter weather conditions, setting even smaller buffer zones than provided for fields at other times of the year. They also state that under certain conditions where people might be in the buffer zone for less than 12 hours, "such as a normal work shift or a round of golf" the size of the buffer zone can be reduced. The DPR theory is that buffer zones are not "exclusion zones" — people can walk, drive through, work or in DPR's words "play a round of golf", as long as they don't stay in the buffer zone for 24 hours (CDPR 1996). There is a significant internal contradiction here: DPR refuses to use local, "worst-case" weather data in setting the statewide buffer zones, but goes out of its way to look for local, "best-case" cold weather data to justify even less restrictive buffer zone requirements for methyl bromide use in the winter.

In December, EWG wrote DPR, requesting permission to conduct side-by-side experiments with their scientists at one or more of the winter monitoring sites. Permission was granted after review of our experimental protocol and objectives

(Gosselin 1996). At that time DPR had already monitored one methyl bromide application, so arrangements were made for pre-notification of EWG technicians before the next DPR test took place. In a letter to EWG confirming the agreement, Randy Segawa, a senior environmental research scientist at DPR, wrote: " . . . We will both become more familiar with each other's methods. This will be a great help to both of us in the evaluation of these data and any future monitoring data."

EWG's objectives were, first, to replicate and augment DPR data collection and compare DPR's data to that collected by our technicians. This was intended as a check of the monitoring and lab analysis previously conducted by EWG during the summer and fall across the state. We were equipped to replicate the exact experimental methods and techniques used by the state, and to add to this, the simultaneous use of two state-of-the-art monitoring devices that could to provide an in-field comparison with charcoal monitoring, the DPR-preferred method. These included Summa canister monitoring, a more modern point sampling approach and open-path FTIR monitoring, the most modern of the three.

Summa canisters and FTIR have previously been shown to be more accurate than charcoal filters in monitoring methyl bromide levels. Direct in-field comparison of these three techniques, we believed, would show that the use of charcoal filter-collected data as the very basis for establishing methyl bromide buffer zones is flawed and in fact fails to reveal high exposure to methyl bromide near fumigated fields.

Unfortunately, the joint EWG/DPR experiment never took place. After six weeks of effort, and multiple aborted attempts, we were unable to execute the experiment. We were foiled first by the extensive rains that drenched California in the winter of 1996-97, then by miscommunication — and finally by TriCal Inc., California's largest methyl bromide applicator. The story of TriCal's intervention raises further troubling questions about DPR's independence and integrity.

The DPR has now completed its experiments, monitoring methyl bromide emissions at four sites during December, January and February. At the first site in December, EWG had not yet been granted full permission to participate. In mid-January, DPR monitored its second site without notifying EWG, because they were monitoring emissions from a new experimental application technique and were under the impression that we wanted to monitor only a standard application process. (In fact, as stated repeatedly in our objectives and experimental design, we simply were interested in testing out monitoring methods and any shape or size methyl bromide application would have sufficed to meet these objectives.)

Then in February, we were notified of a potential site in Madera County. Paul Gosselin, the Assistant Director of the DPR monitoring and enforcement division personally called the grower to obtain permission for our participation. He received permission and the experiment was set to take place. However, the day before the methyl bromide application was scheduled, we were informed that the grower had gotten "cold feet" and was suddenly denying EWG participation. The following week, DPR found a site in Santa Barbara Co. but EWG was again denied permission by the landowner.

EWG decided to ask DPR directly what had happened to change the farmers' mind — specifically, whether TriCal had intervened to urge the growers not to cooperate. On Thursday, February 13, 1997 EWG staff had a conversation with Paul Gosselin of the DPR, who said he could not deny TriCal's interference (Wiles 1997). Later, sources within DPR explicitly confirmed to EWG that TriCal informed

the growers of our participation and presumably scared them into denying us participation. More significantly, Gosselin admitted that DPR has no real power to monitor methyl bromide emissions at will and is entirely dependent first, on TriCal to tell them where and when they are going to apply methyl bromide and second, on landowners to grant them permission to monitor. Californians concerned about public health and safety might well wonder: Who's in charge here?

Appendix A

Methyl bromide air monitoring results, 1996.

Date	County	Crop	Level Detected	Sample Time	Methyl Bromide Applied	Distance: monitor to field
CHARCOAL SAMPLES						
8/2/96	Napa	grapes	0.4 ppb	24 hrs.	?	600 feet
8/6/96	Fresno	grapes	ND	24 hrs.	?	450 feet
8/9/96	Monterey	strawberries	ND	24 hrs.	?	300 feet
8/31/96	Monterey	strawberries	0.13 ppb	8 hrs.	?	
8/31/96	(same)	strawberries	ND	6.5 hrs.	?	
8/31/96	(same)	strawberries	ND	4 hrs.	?	
9/4/96	Napa	grapes	ND	24 hrs.	?	
10/2/96	Santa Barbara	?	0.73 ppb	24 hrs.	?	
10/14/96	Napa	grapes	ND	24 hrs.	?	
10/25/96	Napa	grapes	0.07 ppb	24 hrs.	?	
11/3/96	Napa	grapes	2.74 ppb	24 hrs.	?	
11/4/96	(same)	grapes	2.10 ppb	24 hrs.	?	
11/5/96	Napa	grapes	1.11 ppb	24 hrs.	?	
11/9/96	Santa Cruz	strawberries	5.96 ppb	24 hrs.	2,990 lbs.	
11/9/96	(same)	strawberries	0.16 ppb	4 hrs.	2,990 lbs.	
11/15/96	Sonoma	grapes	4.15 ppb	24 hrs.	?	
FTIR MONITORING						
8/13-8/16/96	Monterey	strawberries	148-665 ppb Avg.: 204 ppb	12 hrs	5,863 lbs.	1300 feet
6/1-6/2/96	Ventura	strawberries	299-1900 ppb Avg.: 294 ppb	12 hrs	15,656 lbs.	30 feet
SUMMA SAMPLES						
11/9/96	Santa Cruz	strawberries	170 ppb	8 hr	2,990 lbs.	100 feet
11/10/96	Santa Cruz	strawberries	190 ppb	8 hr	2,990 lbs.	100 feet
11/10/96	Santa Cruz	strawberries	180 ppb	8 hr	2,990 lbs.	100 feet
11/10/96	Santa Cruz	strawberries	110 ppb	8 hr	2,990 lbs.	100 feet
BAG SAMPLES						
8/13/96	Ventura	strawberries	5.6 ppb	instant	15,656 lbs.	30 feet
8/14/96	Ventura	strawberries	12 ppb	instant	15,656 lbs.	50 feet
8/15/96	Ventura	strawberries	ND	instant	15,656 lbs.	75 feet
8/16/96	Ventura	strawberries	59 ppb	instant	15,656 lbs.	50 feet
8/17/96	Alameda	flowers	120 ppb	instant	?	50 feet
8/22/96	Ventura	strawberries	60 ppb	instant	?	100+ feet
8/22/96	Ventura	strawberries	38 ppb	instant	?	100+ feet

Source: Environmental Working Group. Methyl Bromide Monitoring Project, 1996.

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