Summary

Organophosphorus Pesticide Air Monitoring Project

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This study measured certain agricultural pesticides in the air near farms to see if the levels detected could be harmful to nearby residential communities. The study measured air for four pesticides that are used in tree fruit and elsewhere to control key pests. The pesticides measured were: chlorpyrifos, azinphos-methyl, phosmet, and malathion. We also measured two toxic conversion products: chlorpyrifos-oxon and azinphos-methyl-oxon. The test methods used in this study can detect very small amounts of these pesticides in air. We used screening levels developed by the U.S. Environmental Protection Agency and the State of California to tell us how much pesticide in air might be harmful.

This study had two parts: residential air monitoring and monitoring at the edge of treated orchards. All sampling took place in two agricultural regions: the Yakima Valley and North Central Washington. A brief study description and results for each part are given below.

Residential air monitoring in Yakima Valley and North Central WA

In each region, at least three samplers were located outside different houses that were within 100 meters of an orchard. An additional sampler was located away from orchards (more than 1,000 meters from the nearest orchard) to measure the background levels of these pesticides in community air. Researchers did not know whether the orchards near each sampler were actually treated with the pesticides of interest, but samplers were placed near the type of orchards where these pesticides are commonly used. Samples were collected for 24-hour periods and therefore represent an average air concentration during that time.

Air samples were collected every other day for at least 28 days during the peak application periods for chlorpyrifos in both regions (March-April 2008).

Air samples were collected every third day for 69 days during the peak application period for azinphos-methyl in the Yakima valley only (May-July 2008). These samples were also tested for phosmet and malathion.

Most of the samples collected had detectable amounts of pesticides but the levels detected were mostly very low. None of the residential air samples exceeded EPA and California screening levels for human health concern. The highest 24-hr average concentration of chlorpyrifos detected was 607 ng/m^3 (nanograms of chemical per cubic meter of air). The highest concentration of azinphos-methyl detected was 356 ng/m^3. The background concentration of chlorpyrifos averaged 7.2 ng/m^3 in North Central and 9.2 ng/m^3 in Yakima Valley over a 28-day period. Background concentrations of azinphos-methyl averaged 3 ng/m^3 over 28 days in the Yakima Valley. Concentrations of phosmet and malathion measures were very low, mostly less than 1 ng/m^3. When oxon products were detected, they were added to the parent pesticide for a measure of the total pesticide detected.

Air monitoring at the edge of treated orchards

Another part of the study was conducted in both regions to measure for pesticides in air before, during, and for two days after an application of the pesticide with an air blast sprayer. These measurements tried to capture the worst-case exposure scenario of a home located directly next to an orchard during a pesticide application. These samplers were located just outside the orchard (within 25 feet). The areas treated were 4 to 5 acres.

These studies at the edge of orchards detected pesticide in the air during and after the application. The highest air levels were found during active spraying. Twenty-four hour average air levels of chlorpyrifos and azinphos-methyl did not exceed the California and EPA screening values. There were shorter peaks detected in some of the six-hour samples however, when averaged with air concentractions over 24 hours, they were below screening values.

Conclusion

When the results of both parts of this study are compared to existing EPA and California screening values for the protection of health, it does not appear that the agricultural spraying we monitored posed a health hazard to nearby residents and communities. The monitoring at the edge of orchards showed that concentrations of pesticides may be higher in air during short periods even when the 24-hr average air concentration is below the screening level. Health research on these pesticides is ongoing. As new health findings are incorporated into health screening values, the interpretation of this study may need to be revised.

General health information about chlorpyrifos and azinphos-methyl (Guthion) is available from the Agency for Toxic Substances and Disease Registry.

Definitions

- **Chlorpyrifos oxon and azinphos-methyl oxon** are toxic conversion products of chlopyrifos and azinphos-methyl. Conversion to the oxon product can occur in the environment or in people and animals. In this study, it appeared that some of this conversion to the oxon happened after the parent compound was trapped inside the sample tubes. This means that at least some of the oxon we detected had not been an air contaminant. In this study, we converted the oxon results to an equivalent concentration of its parent compound. We then added oxon results to its parent compound for a total amount of chlorpyrifos or total azinphos-methyl. The totals were compared to the screening values.

- **Screening levels** for human health concern in this study were adopted from EPA and CA human health risk assessments. The screening level is set to be protective of human health; it is many times lower than levels shown to cause harm to people or animals. Below the screening level, no health impacts are anticipated.

- **Nanogram** is a measurement of mass and is a tiny fraction of a gram. There are one billion nanograms in one gram.

- One **cubic meter** of air is 1,000 liters of air. This is the amount of air in 500 empty 2-liter soda bottles.

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