

Health Consultation

CRANBERRY SAMPLING FOR ANVIL 10 + 10

SOUTHEASTERN MASSACHUSETTS

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

CRANBERRY SAMPLING FOR ANVIL 10 + 10
SOUTHEASTERN MASSACHUSETTS

Prepared By:

Center for Environmental Health
Massachusetts Department of Public Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry
U.S. Department of Health and Human Services

I. BACKGROUND AND STATEMENT OF ISSUES

This health consultation presents the results of testing of cranberries before and after the aerial application of pesticides over southeastern Massachusetts. The aerial application was conducted to reduce human risk of eastern equine encephalitis (EEE) in that area of the state. The pesticide, Anvil 10+10 contains the active ingredient sumithrin (EPA registration #1021-1688-8329), which is a synthetic pyrethroid compound (piperonyl butoxide is also added to increase potency and duration of effectiveness). Aerial application of Anvil was planned to reduce the level of adult mosquitoes in areas where mosquito and avian surveillance showed the presence of EEE in human-biting mosquitoes, thereby presenting a high level of risk of EEE to humans.

In preparation of the 2006 mosquito season, the Massachusetts Department of Public Health, Center for Environmental Health (MDPH/CEH) had worked with other state agencies to evaluate alternative products for possible aerial application. The chemical properties for Anvil 10+10 provided the widest margins of safety for human and environmental health when used properly by certified professionals trained to use mosquito control pesticides. Studies also show sumithrin to be short-lived in the environment, to break down rapidly in sunlight, and to be less toxic to aquatic species than the alternatives considered (HSDB 2006; ATSDR 2005; Paul et al., 2005).

Anvil is not labeled for use in the air column over agricultural lands. However, the state declared a public health emergency due to the high risk to humans of EEE, and aerial application was warranted. MDPH and the Massachusetts Department of Agricultural Resources applied to the U.S. Environmental Protection Agency (USEPA) for an emergency exemption to apply Anvil over agricultural lands. The emergency exemption was received from EPA on August 3, 2006.

In order to ensure that residues of the pesticide would not be detected on cranberries or if they were, whether exposure opportunities to the residues through consumption of the cranberries would result in health concerns, the MDPH/CEH's Environmental Toxicology Program (CEH/ETP) developed a sampling and analysis plan and coordinated with the Cape Cod Cranberry Growers Association (CCCGA) to conduct the sampling of selected bogs in southeastern Massachusetts. This health consultation will be provided to the USEPA as part of a final report in response to their issuance of the emergency exemption.

II. METHODS

Sampling of cranberries was conducted both before (August 7) and after (August 11) the aerial application on August 8-9, 2006 (application occurred from approximately 8 PM to 2 AM). Sampling was conducted by MDPH/CEH in coordination with representatives of the CCCGA, who accompanied MDPH/CEH staff during each sampling round.

Sample Locations

MDPH/CEH worked with representatives of the CCCGA to identify cranberry bogs located within the aerial application zone (see Figure 1), as well as one bog located outside of the application zone to serve as a control or background. In addition to sampling at the control bog, six different cranberry bogs throughout the aerial application zone were identified for sampling. The locations of these bogs were as follows:

1. Pickens Street, Lakeville
2. Grove Street Middleborough
3. Ward Street, Carver
4. Federal Furnace Road, Carver (duplicate sample collected here)
5. Purchase Street, Middleborough
6. Main Street at Pleasant Street, Plympton
7. Long Neck Road at Every Road in Onset (control)

Figure 2 depicts the general locations of the selected bogs. At the time of sampling, the cranberry crop was not ripe and was not expected to be ready for harvesting for at least another month or more.

Sampling Procedure

Each bog, including the control, was sampled in the same overall manner. Five separate sample jars were collected from each bog from approximately the four corners of the bog and the center. The samples for each bog were composited (mixed) in the laboratory before analysis resulting in a single representative sample from each bog. A total of 2500 mL of cranberries was collected from each bog. Field sample jars were 500 mL in capacity, amber glass, precleaned and certified clean from the manufacturer. Amber (dark) colored bottles were selected because the target analyte (sumethrin) is known to be sensitive to photodegradation.

Three teams conducted the sampling in order to reach all the required geographical areas in a timely manner. For the pre-spray sampling, each team consisted of one member of the CCCGA and two staff from MDPH/CEH. The post-spray sampling was conducted with one member of the CCCGA and one member of MDPH/CEH staff. The cranberries were harvested from the bogs by the members of the CCCGA because of their familiarity with the activity. Cranberries were removed using a traditional cranberry harvesting tool composed of metal and wood in the form of a scoop with teeth. A photo of the tool and sampling activity can be found in Figure 3.

The amount of product for typically filling one jar was scooped from the bog by the CCCGA member. The cranberries were then transferred to the glass jar. Only cranberries were collected in each jar; sticks, vines and other non-cranberry material was excluded to the extent feasible. Each jar was filled to the top, but not packed.

Once they were filled and sealed with the lid, each jar was labeled with the name and number of the bog and the date and time of collection. The same information, along with details about the location of the bog, the locations for the individual samples, and

other notes, were collected on a sampling log sheet. Filled jars were placed in a cooler with ice.

At one location, Federal Furnace Road in Carver as indicated above, a duplicate sample was collected in the same manner as the original sample. Duplicate samples are used to assess the variability in analytical results that originate in the sampling technique or heterogeneity in the bulk material as present in the field. It is a standard quality control practice to collect and analyze duplicate samples for a percentage of sampling sites.

No specific decontamination procedures were used for the sampling tools; however, the “control” bog located in Onset was sampled before the other bogs that team sampled to reduce the potential for cross contamination from the tools used.

Sample Handling and Shipping

Samples were held in the coolers with ice until they were delivered later the same day to the MDPH State Laboratory Institute (SLI) in Jamaica Plain for temporary storage and shipment. At the SLI, the samples were logged in by staff and refrigerated. Samples were kept overnight under refrigeration and then repackaged for shipment to the analytical laboratory (Golden Pacific Laboratories in Fresno, California) the following day. Samples sent to the CA analytical laboratory were packaged with dry ice and sent via UPS next morning service. The samples were received the next morning as expected for each of the two sampling events. Chain of custody forms were used to transmit the samples to the analytical laboratory. Once at Golden Pacific Laboratories, the cranberry samples were kept stored under refrigeration until they were used for analysis.

Sample Analysis

Cranberries were analyzed for the presence of sumithrin, an active ingredient in Anvil 10+10. The handling and analysis of samples at the Golden Pacific Laboratory was conducted in accordance with the written protocol from the laboratory. The analysis protocol includes method development and verification based on the pre-spray samples; Golden Pacific Laboratories has developed and verified testing for sumethrin on other agricultural crops including leaf lettuce, alfalfa, and Sudan grass. A calibration curve was developed to be used to quantify the levels of sumethrin in the cranberry samples using a certified sumethrin reference material.

Cranberry samples were homogenized with dry ice prior to analysis by High-Pressure Liquid Chromatography and Mass Spectroscopy (HPLC/MS/MS). The pre-aerial application samples were subject to fortification with the sumethrin reference standard at 10 and 100 parts per billion (ppb) to ensure that levels of interest could be detected in post-spraying samples. This calibration curve was used to determine if the recovery of sumethrin from the fortified samples was within acceptable limits.

All analyses were performed in accordance with all Standard Operating Procedures (SOPs) for the lab using the calibration curves developed in the method development phase and any changes made to accommodate the novel sample matrix. All deviations from SOPs were documented by the laboratory and described in the report they prepared for MDPH/CEH.

III. RESULTS

Results of all analyses of cranberries for sumithrin revealed no detectable levels of sumethrin in any sample, whether taken prior to the aerial application event or after the event. The laboratory reported the Level of Detection (LOD) was 2 parts per billion (ppb). An LOD is defined as the lowest detectable limit on a given instrument for a given analysis. The level of quantification (LOQ) for the analysis was 10 ppb. The LOQ is defined as the lowest validated level established during method validation. In addition, the methods developed for the analysis of cranberries for sumethrin residues were successful under the quality assurance and quality control procedures used at the laboratory and will be documented in a separate Good Laboratory Practices report to be produced by Golden Pacific Laboratories.

IV. DISCUSSION

Results from the testing of cranberries for sumithrin, an active ingredient of the pesticide used for aerial application in southeastern Massachusetts showed no detectable levels of this compound in any cranberry sample, either pre- or post-application. The post-application samples were taken approximately 48 hours after the application and hence, it is not expected that future applications of this pesticide will result in residues. The 48-hour time period also corresponded to the USEPA requirement in the emergency exemption that a pre-harvest interval of 48 hours must be adhered to.

Although ATSDR does not have any guidance level for exposure opportunities to sumithrin, the USEPA Office of Pesticide Programs and the World Health Organization have published a chronic oral reference dose of 0.071 milligram sumithrin per kilogram body weight per day (mg/kg-d) for this compound (USEPA 1997; WHO 1990). This corresponds to ingesting a little more than 1 mg/day of sumithrin for a 15-kg child, or nearly 5 mg/day of sumithrin for a 70-kg adult. The LOD for sumithrin in the cranberry analyses was 2 ppb, or 0.002 mg/kg. In order for a child to receive 1 mg of sumithrin, the child would have to consume 500 kg, or over 1,000 pounds, of cranberries. An adult would have to consume five times that amount. Thus, the LOD achieved in the analyses of cranberries is well below any level of concern for either children or adults.

V. CONCLUSIONS

Testing of cranberries for sumithrin did not reveal the presence of this compound in cranberries sampled either before or after aerial application. Based on ATSDR criteria, ATSDR would classify the August 8-9, 2006, application of Anvil 10+10 over cranberry bogs as posing "No Public Health Hazard."

VI. RECOMMENDATIONS

The results of the cranberry sampling did not reveal the presence of sumithrin, hence, no specific recommendations or follow-up activities are recommended at this time.

VII. PUBLIC HEALTH ACTION PLAN

Copies of this report will be provided to the U.S. Environmental Protection Agency, the Massachusetts Department of Agricultural Resources, the Cranberry Growers Association, and other interested parties.

Preparer of Health Consultation

This document was prepared by the Center for Environmental Health, Massachusetts Department of Public Health. If you have any questions about this document, please contact Suzanne K. Condon, Associate Commissioner, MDPH/CEH, 7th Floor, 250 Washington Street, Boston, MA 02108.

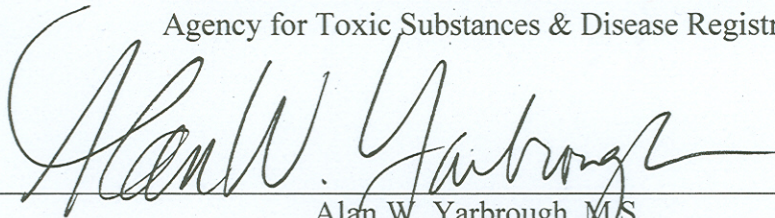
CERTIFICATION

The health consultation for cranberry sampling in Southeastern Massachusetts was prepared by the MDPH under a cooperative agreement with the federal ATSDR. It is in accordance with approved methodology and procedures existing at the time the health consultation was initiated. Editorial review was completed by the Cooperative Agreement partner.



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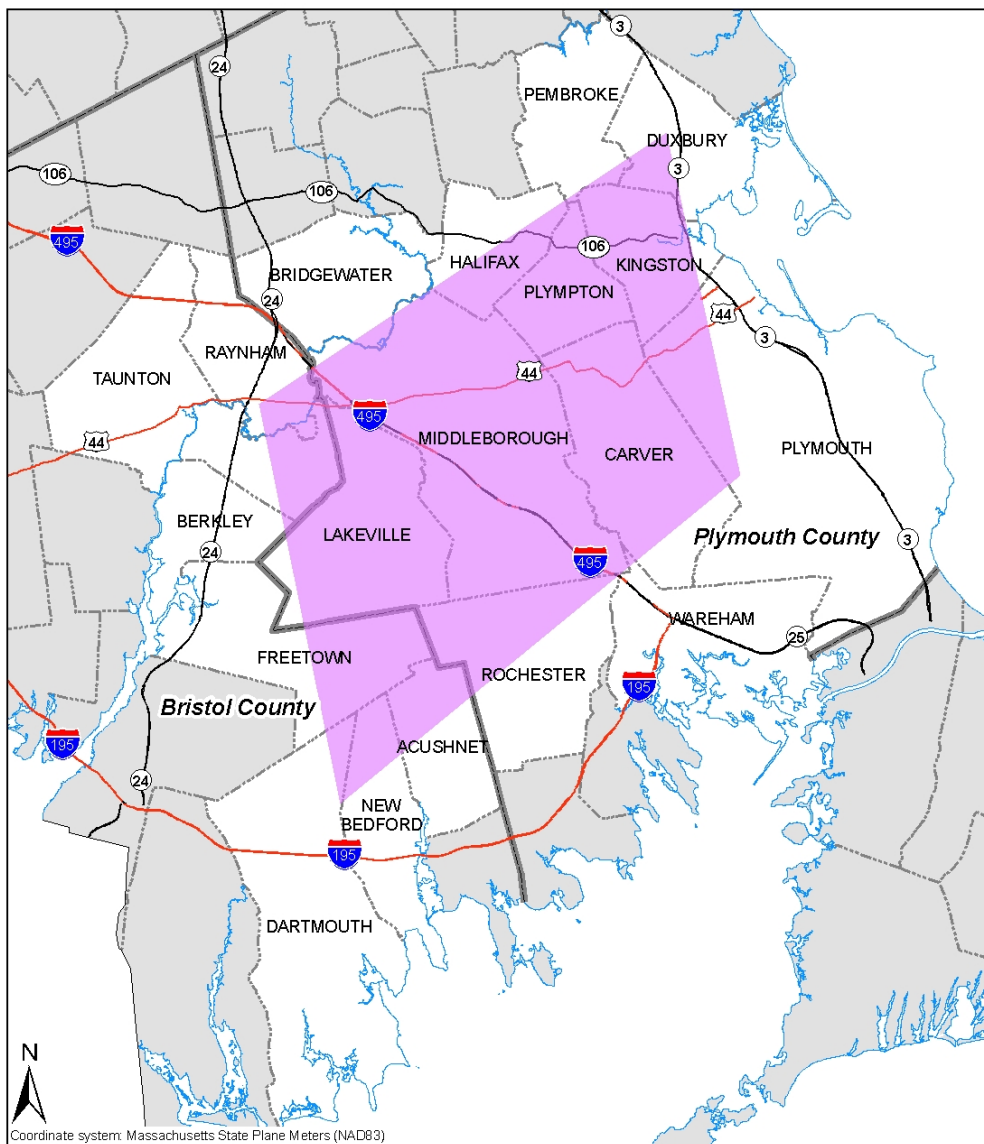
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VIII. REFERENCES

- ATSDR. 2005. Toxicological information about insecticides used for eradicating mosquitoes (West Nile virus control). Agency for Toxic Substances and Disease Registry, Atlanta, GA. April 2005.
- HSDB. 2006. Hazardous Substances Data Bank, National Library of Medicine, National Toxicology Program. Record on CASRN: 26002-80-2 (Sumithrin).
- Paul, E.A., H.A. Simonin, and T.M. Tomajer. 2005. A comparison of the toxicity of synergized and technical formulations of permethrin, sumithrin, and resmethrin to trout. *Arch. Environ. Contam. Toxicol.* 48(2):251-9.
- USEPA. 1997. Reference dose tracking report: sumithrin. U.S. Environmental Protection Agency, Office of Pesticide Programs, February 25, 1997.
- WHO. 1990. Environmental Health Criteria 96: d-Phenothrin. International Program on Chemical Safety, World Health Organization, Geneva, Switzerland.

Figure 1
 Geographic Extent of August 8, 2006 Aerial Application
 Bristol and Plymouth County, MA



Geographic data supplied by: Massachusetts
 Executive Office of Environmental Affairs, MassGIS.

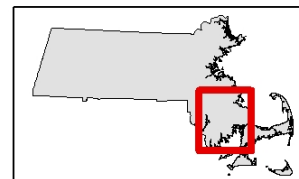
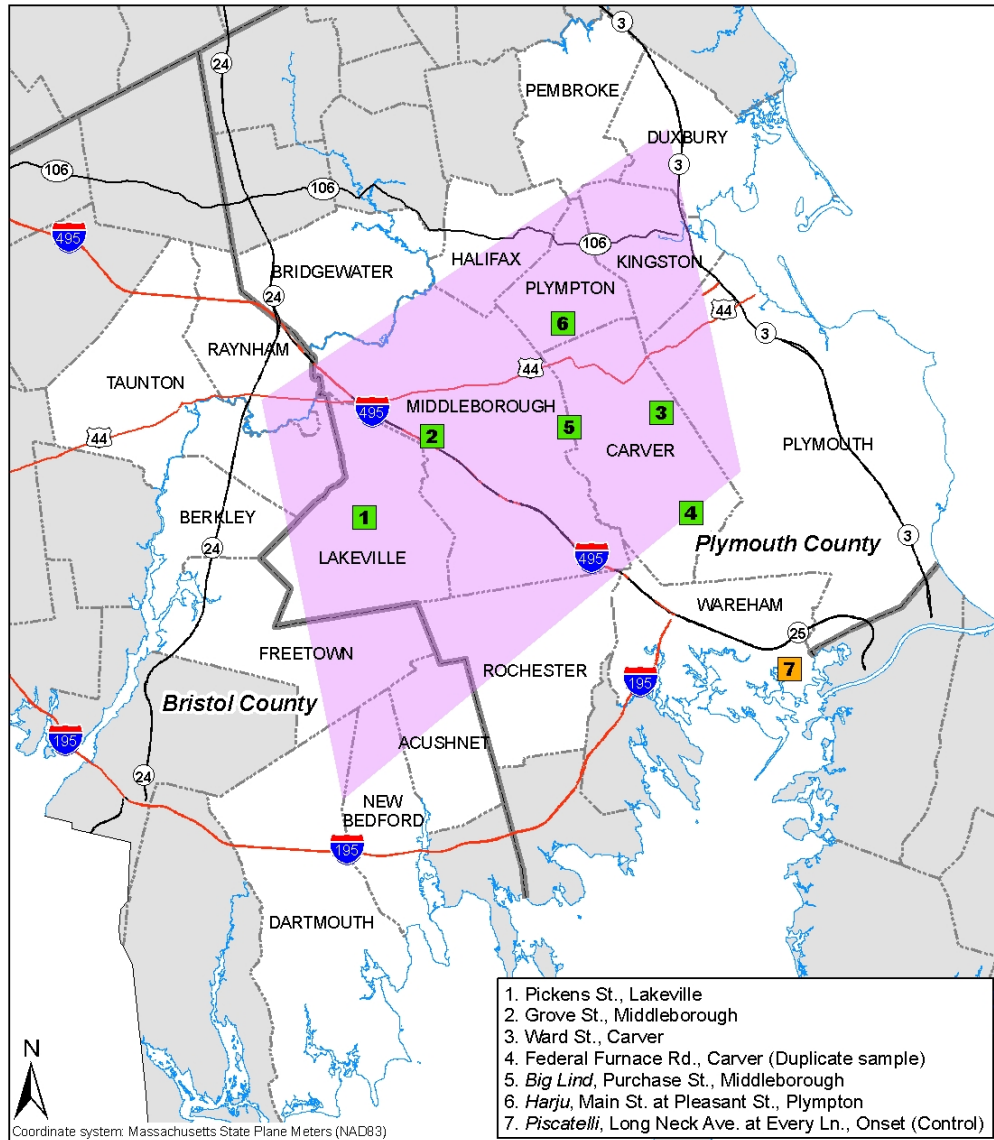


Figure 2
 Geographic Extent of August 8, 2006 Aerial Application
 with Approximate Bog Sampling Locations
 Bristol and Plymouth County, MA



Geographic data supplied by: Massachusetts
 Executive Office of Environmental Affairs, MassGIS.

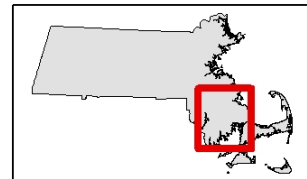
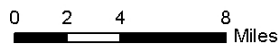




Figure 3. Cranberry Sampling Tool and Procedure