Enclosure for Letter to Redacted Regarding Pesticide Usage on Agricultural Land, Kaua'i, Hawai'i

Background

On October 10, 2014, the Agency for Toxic Substances and Disease Registry (ATSDR) was contacted by Kaua'i residents and requested to evaluate whether agro-chemical practices may be impacting the health of their communities. The communities are concerned that local agricultural companies are utilizing large amounts and a variety of pesticides for seed crop research and development (primarily corn) near Kaua'i west side communities (i.e., Waimea Valley between Ele'ele and Mana/Pacific Missile Range Facility). The petition letter stated that the local communities might be experiencing adverse and abnormally high number of health issues (e.g., congenital heart defects birth defects, respiratory problems, carcinoid syndrome) related to the pesticides being used on genetically modified organisms (GMO)/crops.

Public Health Evaluation

To address the communities' concerns, ATSDR obtained and reviewed reports, environmental sampling results, and human health statistical information from various federal, state, and local agencies, and University of Hawai'i. In addition, ATSDR cross-referenced and reviewed the recently finalized report, "*Pesticide Use by Large Agribusinesses on Kaua'i: Findings and Recommendations of the Joint Fact Finding Study Group*" (a.k.a. JFF Study Group report), coordinated by the ACCORD3.0 Network. ATSDR did not locate any additional relevant information or data than those obtained and discussed in the JFF Study Group report.

The information obtained and reviewed provided some sense of the level of pesticides found in the drinking water, surface water, and air in and around the Kaua'i west side communities. In addition, information was available about the types and quantities of regulated pesticides used on the crop fields. No environmental investigation reports located contained information about the amounts of pesticides in community soils. Below, ATSDR evaluates these environmental sampling results and discusses the available information about the occurrence of cancer and birth defects in the Kaua'i west side communities.

When environmental sampling data are evaluated, ATSDR compares the environmental sampling results to human health-based comparison screening values that different agencies have established. If the sampling results show that the level of a particular pesticide is less than an established human health-based comparison screening value, it is unlikely that contaminant would affect human health. If the results are greater than the human health-based comparison screening value, then ATSDR conducts a more in-depth evaluation to determine if human health effects are possible.

Drinking Water Investigations

Drinking water for Kaua'i west side communities is provided by the Kaua'i Department of Water. As required by the Safe Drinking Water Act, the Kaua'i Department of Water conducts regular monitoring for pesticides regulated by the Safe Drinking Water Act. No pesticides were detected

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in the drinking water at levels above detection or health comparison values. In addition, the Kaua'i Department of Water conducted a special round of pesticide sampling on March 9, 2015. That sampling effort used US Environmental Protection Agency (EPA) Method 525, which analyzes for many more pesticides, including chlorpyrifos, not regulated by the Safe Drinking Water Act. No pesticides were detected in the drinking water at levels above detection or health comparison values. Therefore, it is unlikely that residents of Kaua'i west side communities are being exposed to pesticides in their drinking water at levels of health concern.

Surface Water Investigations

In 2013 and 2014, the Hawai'i Departments of Health and Agriculture collected surface water samples from the main streams and rivers on Kaua'i and the other islands. These investigations found trace amounts of pesticides, but none were found at levels above human health comparison values. Because atrazine was used historically at sugar cane plantations, it was the most widely detected pesticide (highest detection on Kaua'i was 2 parts per billion [ppb], which is below EPA Drinking Water Maximum Contaminant Level [MCL] of 3 ppb). Metolachlor was detected at five surface water locations on Kaua'i but the highest detection was 1.07 ppb (EPA's Life Time Health Advisory is 700 ppb), which is below human health comparison screening values. Therefore, it is unlikely that residents of Kaua'i west side communities are being exposed to pesticides at levels of health concern when they swim in, have contact with, or drink from local streams and rivers.

Air Investigations

ATSDR and the JFF Study Group were able to only local one report that documented an air investigation at the Waimea Canyon School, Kaua'i. University of Hawai'i researchers conducted air sampling in response to the 2006 and 2008 evacuation incidents at Waimea Canyon School in which teachers and students reported they were sickened (e.g., dizziness, headaches, nausea, respiratory discomfort) by odors and some were seen by medical professionals. The investigation began about two years after the incidents and was conducted to determine (1) potential pesticide exposure and (2) if a locally common plant, stinkweed (Cleome gynandra), was producing odorous chemicals that may affect Waimea Canyon Middle School students and staff.

A combination of passive and high-volume air samplers were used during the University of Hawai'i investigation. For over a year, passive air sampling was used to identify chemicals in ambient air around the school and at other locations on Kaua'i for comparison. High volume sampling was conducted at Waimea Canyon Middle School and Hanalei Elementary School to detect chemicals in the ambient air and to determine the quantity of those chemicals. Approximately half of the 29 chemicals produced by stinkweed were detected both in indoor and outdoor air samples collected from the passive and high volume air samplers positioned at Waimea Canyon Middle School and other Kaua'i schools. Trace amounts, below health comparison values, of five pesticides were also detected in both the passive and high volume samples collected at Waimea Canyon Middle School. Two of the five pesticides, dichlorodiphenyltrichloroethanes (DDTs) and benzene hexachlorides (BHCs), were widely used historically for mosquito and other insect control and are no longer in use. Concentrations of chlorpyrifos, metolachlor, and methyl isothiocyanate (a stinkweed associated volatile chemical)

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in ambient air at the study sites on Kaua'i were approximately 24-, 650-, and 220-fold below the California subchronic screening levels. DDT was detected below the ATSDR Cancer Risk Evaluation Guide of 10 nanograms per cubic meter.

Because the air samples were collected about two years after the Waimea Canyon School incidents, the results of this study cannot be used to determine what occurred in 2006 and 2008. It is unclear whether the results of this study would represent typical exposures that are occurring in Waimea. If these results do represent the typical exposures occurring in Waimea, the study results indicate that the local population is not being exposed to pesticides at levels of health concern.

ATSDR was not able to determine how much pesticides the Kaua'i west side community members might be inhaling. But various scientific studies have tried to determine how much pesticides local farming populations may be exposed to from pesticide drift. Because the application of pesticides varies considerably (e.g., type being applied, when applications are conducted, length of application time, and geographical location of the application) and is influenced by weather (e.g., wind direction and speed) most of these studies have not been able to determine if pesticides drift beyond crop land boundaries and have exposed the local populations to levels of health concern. In addition, most modern pesticides used on crops tend to degrade fairly rapidly in the environment, which significantly shortens the window to collect environmental samples that could provide an accurate picture.

Soil and Dust Investigations

There have not been any systematic soil or dust sampling investigations conducted at or near the Kaua'i west side communities. Most modern pesticides used on crops tend to degrade fairly rapidly in the environment, significantly reducing the possibility that pesticides drifting off of crop lands would accumulate in soil at levels of health concern.

Pesticide Usage at Seed Crop Research and Development Areas

According the JFF Study Group report, the seed and Kaua'i Coffee companies used 23 different restricted use pesticides/herbicides (RUPs) between 2013 and July 2015 (approximately 36,240 pounds on 1,841 acres of harvested land). There is no information available about the amount of general use pesticide products used by the Kaua'i seed companies.

The JFF Study Group analysis indicates that the seed and Kaua'i Coffee companies appear to apply roughly 0.8 to 1.7 times the amounts of different RUP herbicides and rough one to three times the amounts of different RUP insecticides per acre than U.S. mainland corn production. The different rate of RUP insecticide applications between Kaua'i and the U.S. mainland are likely due to year-round warm weather and growing season and vulnerability to invasive species.

The largest difference in RUP use on Kaua'i is the insecticides bifenthrin, chlorpyrifos, and zeta-cypermethrin. Chlorpyrifos and zeta-cypermethrin are applied in greater quantities and on more acres than bifenthrin.

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The pesticide use statistics discussed above suggest Kaua'i residents might be exposed to more pesticides than U.S. mainland populations. However, it is important to note that pesticide application operations on Kaua'i are not coincidently applied to the same locations. Because the application of pesticides varies considerably (e.g., type being applied, when applications are conducted, length of application time, and geographical location of the application) and is influenced by weather (e.g., wind direction and speed), environmental air monitoring programs have not been able to accurately define the extent of local population exposures to agricultural pesticides. In addition, most modern pesticides used on crops tend to degrade fairly rapidly in the environment, which significantly shortens the window to collect environmental samples that could provide an accurate picture. Thus, although total volume of pesticides used appears to be greater, the opportunity for residents of Kaua'i west side communities to be exposed to pesticides are probably no different from the U.S. mainland.

Health Outcome Data

The permanent population on Kaua'i is about 60,000 individuals. Approximately 2,000 people live in Waimea and less than 6,000 people live near seed and Kaua'i Coffee company properties.

The state of Hawai'i has cancer and birth defects registries. The cancer registry is up-to-date but the birth defects registry is only current up to 2005.

In September 2013, HDOH issued a memo that reported the HDOH's analysis of the cancer incidence on Kaua'i. In general, the 2000-2009 cancer incidence on Kaua'i's was found to be similar to or lower than that of the rest of the State of Hawai'i. Within individual census tracts of Kaua'i, cancer incidence was generally lower than or comparable to the corresponding incident rates of the entire state. Only the incidence of melanoma was found to be significantly elevated for the time period of 2000-2004.

Scientific studies have not demonstrated an association between increased incidence of melanoma and pesticide exposures. The primary risk factor for developing melanoma is exposure to the ultraviolet radiation from the sun and tanning beds.

In 2011, HDOH released a report that evaluated the 1986-2005 incidence of birth defects in Hawai'i and counties. In addition, the JFF Study Group was able to obtain 2010-2012 birth defects incidence data for Kaua'i. Due to the small number of infants born with birth defects on Kaua'i, the statistical analysis is not able to determine whether the occurrence of birth defects is occurring more often than what would be expected on the west coast of Kaua'i.

Some of the local physicians have reported an increase in cases of cardiac/circulatory birth (e.g., transposition of the great vessels, pulmonary valve stenosis, hypoplastic left heart syndrome) and gastroschisis birth defects in their practices. HDOH has indicated they will be contacting the local physicians to obtain case information so that case follow-ups can be done.

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ATSDR Review of Pesticide Scientific Literature and the Potential Association of Birth Defects

An ATSDR Occupational and Environmental Medical Officer reviewed the available birth defects data and the scientific literature for associations between pesticide use and the birth defects of concern (e.g., transposition of the great vessels, pulmonary valve stenosis, hypoplastic left heart syndrome, and gastroschisis). That review found only a few published articles that provided support for an association of pesticide exposure and an increased rate of birth defects, including the birth defects of concern. Many of these reports, however, are not very robust and have significant limitations. There were often no exposure data (i.e., no environmental sampling results), instead residency in an agricultural area was used as a surrogate. Household use or occupational exposure were often found as contributing factors. Many of the published studies had mixed conclusions for several conditions. Atrazine and gastroschisis was the combination of pesticide and birth defect with the most number of articles where an association was reportedly found. However, exposure was linked to residency in areas with surface or groundwater contamination and it was unknown how this related to the amount of pesticides in the individual's drinking water. One article suggested that clustering of gastroschisis cases might have occurred but the results were not statistically significant. Overall, the scientific literature does not provide strong support for an association of human agricultural pesticide exposures with the birth defects of concern.

Conclusions and Recommendations

Based upon the information reviewed, ATSDR is not able to demonstrate scientifically whether people near agricultural fields in Kaua'i west side communities are being exposed to pesticides at levels of health concern. Accordingly, ATSDR will not conduct any addition public health assessment activities specifically about the pesticide use on the crop fields at Kaua'i, Hawai'i.

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