

**Triangle Lake/Highway 36 Exposure Investigation
(August-September 2011) Protocol**

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Background

Since 2005, some residents living near Triangle Lake and Highway 36 in Lane County have expressed concerns to Oregon state agencies about the human health and environmental effects from commercial herbicide applications in nearby forestland. These residents have approached several individual agencies with their concerns, including the Oregon Department of Forestry (ODF), Oregon Department of Agriculture (ODA), and the Oregon Health Authority (OHA). They also have lodged complaints with a multi-agency group called PARC (Pesticide Analytical Response Center), which investigates incidents of acute pesticide exposures in Oregon. Unsatisfied with responses from state agencies, a community grassroots organization called the Pitchfork Rebellion petitioned the U.S. Environmental Protection Agency (EPA Region 10) in the fall of 2010 to investigate illnesses that residents attributed to exposures to herbicide drift from aerial applications. EPA, in turn, requested assistance from the Agency for Toxic Substances and Disease Registry (ATSDR Region 10) in investigating these complaints. The federal agencies began looking into the Pitchfork Rebellion's complaints in the winter of 2010.

In early spring of 2011, while waiting for a response from the federal agencies, some Triangle Lake area residents had their urine tested for herbicide metabolites by a researcher at Emory University in Atlanta, Georgia. The residents had their urine collected at a community health clinic, and then mailed the samples directly to the researcher. In addition, some residents submitted samples both before and after an aerial application of herbicides near their residence. The laboratory analysis found that all of the submitted urine samples (pre- and post-spray) tested positive for metabolites of 2,4-D and atrazine. The reported levels exceeded the 95th percentile level reported by the Center for Disease Control and Prevention's (CDC) National Health and Nutrition Examination Survey (NHANES). Furthermore, the data indicated that the metabolite levels in post-spray samples were higher than the levels found in pre-spray samples. The presence of 2,4-D and atrazine metabolites in pre-spray samples suggested that residents may have chronic or ongoing exposures to herbicides, possibly through contaminated drinking water. The observed increase in 2,4-D and atrazine metabolites between pre- and post-spray samples suggested there may be acute (or short-term) exposures to these chemicals.

In April 2011, some residents publically presented the results of their urinalysis at an Oregon Board of Forestry meeting. Shortly thereafter, ODF requested PARC to provide assistance in investigating potential exposures to herbicides in the Triangle Lake area. In response, PARC initiated an exposure investigation to determine if Triangle Lake residents are being exposed to herbicides applied on nearby forest lands.

Purpose

The purpose of this investigation is to collect data to answer the following questions about human exposures to herbicides in the Triangle Lake area:

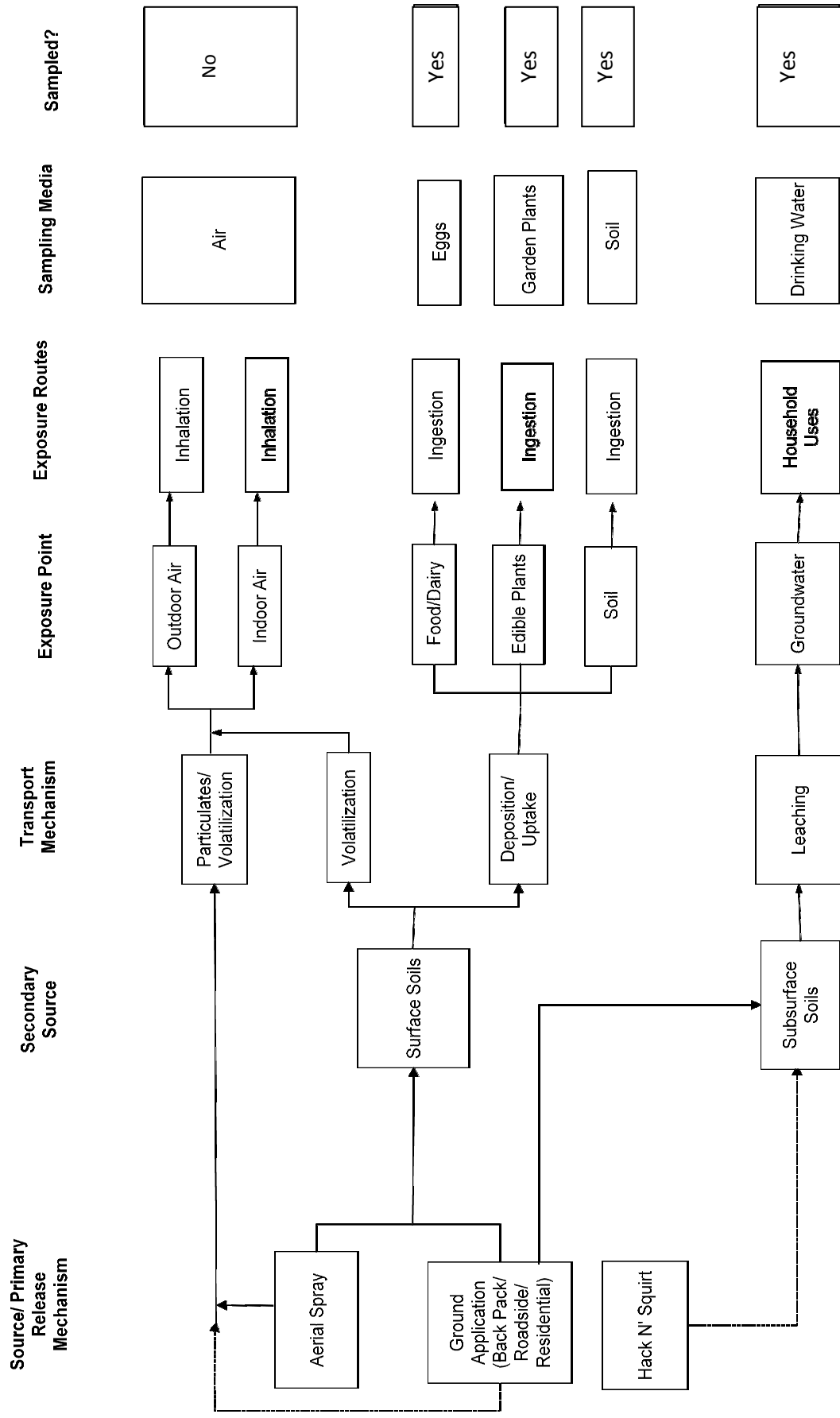
1. Are residents in the Triangle Lake/Hwy 36 area being exposed to herbicides from local application practices?
2. To what are they being exposed?
3. To what extent are they being exposed?
4. How are they being exposed?
5. What are potential source(s) of the herbicides to which they are being exposed?

This effort is a focused exposure investigation, and is not an epidemiological study. There will be no data collected or comparisons made to a “control” or “unexposed” group. The data collected will be specific to participants in the investigation, and are not intended to be generalizable to the wider community or other populations.

Potential Sources and Routes of Exposure

Exposure, which is defined as contact between a person and a chemical, can only occur if the following elements are present: a source of a chemical, a mechanism for its release and transport in the environment, a transport medium, an exposure point, an exposure route, and an exposed population. The potential sources of herbicide exposure for residents in the Triangle Lake area include: 1) commercial applications on lands that have been clear-cut for timber harvesting; 2) applications on other non-residential lands (*e.g.*, roadside spraying); and 3) applications on residential properties. Figure 1 shows the potential mechanisms for chemicals to move from the point of release to an exposure point. The primary exposure points of concern in this investigation are outdoor air, soil, food, and water; the exposure routes of most concern are inhalation and ingestion.

Figure 1. Conceptual Site Model for the Triangle Lake Herbicide Exposure Investigation.



Current data gaps

Currently, there are limited data that can be used to evaluate people’s exposures to pesticides in the Triangle Lake area. To fill these data gaps, Oregon Health Authority will collect and evaluate the following data:

- Human bio-sampling data on pesticide/herbicide levels in participants’ urine
- Environmental sampling data on pesticide/herbicide levels in residents’ water, food, and soil.
- Data on commercial pesticide and herbicide applications in the investigation area (abstracted from commercial application records requested from ODF and ODA)
- Information on participants’ potential contact with pesticides/herbicides in the environment (obtained by a questionnaire administered by OHA)

The data for this investigation will be collected in August 2011. This will be before the late summer season forestry herbicide applications and will focus on evaluating the potential for chronic or ongoing exposures to pesticides. The human urine samples and environmental (water, food, and soil) samples will be collected before the late summer spray season (see Table 1).

Table 1. Data collected for Triangle Lake Exposure Investigation.

Type of data	Information provided	Why needed
Bio-sampling data	-Concentration of 2,4-D and atrazine metabolites in participants’ urine, which provide an estimate of the internal dose of these chemicals	-Answers if participants have been recently exposed to 2,4-D and atrazine, and how levels found in participants’ urine compare to the general population
Environmental sampling data	-Concentrations of locally applied pesticides in participants’ drinking water, home-grown food, and soil*	-Provides data on what pesticides (if any) participants may be exposed to, and potential sources and routes of exposure
Notifications of commercial pesticide applications in designated area over duration of investigation	-Data on proposed commercial applications at least 15 days prior to actual application event; these data include the potential location, application methods, and chemicals that may be used	-Assists investigators to select an area for investigation and plan timing and logistics of biological/environmental sample collection

Type of data	Information provided	Why needed
Records of commercial pesticide applications in investigation area over duration of investigation	-Data on actual applications that occur in investigation area, including locations, dates, application methods, and chemicals and amounts used	-Provides an additional source of data on potential times, locations, and sources of pesticide exposure and amounts of pesticides used; may assist in interpreting environmental sampling data
Records of commercial pesticide applications in investigation area for the year before the investigation	-Data on actual applications that occurred in investigation area in the three years prior to the investigation	-Provides investigators with information on “typical” application practices; will be used to determine if application methods have been changed during the investigation period; provides information on relative amounts of pesticides used

* While air is an important exposure pathway, we were unable to mobilize the resources needed to sample air at this time. If resources can be found, subsequent phases of this investigation will include air monitoring.

Agency Involvement

The state agencies involved in this investigation are the Oregon Health Authority (OHA), the Oregon Department of Forestry (ODF), the Oregon Department of Agriculture (ODA), and the Oregon Department of Environmental Quality (DEQ) along with designated PARC consultants at Oregon State University (OSU) and Oregon Health and Science University (OHSU); the federal agencies involved in this investigation are EPA (Region 10) and ATSDR (Region 10 and headquarters). The level of agencies’ involvement in the collection, analysis and reporting of this investigation’s data depends on the type of information being collected. Table 2 summarizes this involvement. OHA will oversee the planning and implementation of this investigation, including coordination and communications between agencies, and will coordinate with the ATSDR Region 10 office in Seattle on community engagement and involvement efforts.

Table 2. Agencies' roles in data collection and analysis for Triangle Lake Exposure Investigation

	Media/Data type	Agency					
		Sample Collection	Lab Analysis	Receive/ access to raw data	Data Analysis	Report Individual Results	Report aggregate results
Human	Urine biosamples	ATSDR with assistance from OHA	CDC NCEH lab	ATSDR, OHA	ATSDR and OHA	ATSDR (in coordination with OHA)	ATSDR (urine only) OHA (all data)
	Survey data	OHA	N/A	OHA, EPA, DEQ, ODA	OHA	N/A	OHA
Environmental	Water	EPA	DEQ	DEQ, OHA, EPA	OHA	OHA	OHA
	Food	EPA	ODA	ODA, OHA, EPA	OHA	OHA	OHA
	Soil	EPA	ODA	ODA, OHA, EPA	OHA	OHA	OHA
Spray documentation	Spray notifications and records for forestry applications	ODF	N/A	OHA	OHA	N/A	OHA
	Spray notifications and records for all other applications	ODA	N/A	OHA	OHA	N/A	OHA

Methods

Investigation area

This investigation will focus on exposures among residents who live within 1.5 miles of 2010 or 2011 clear-cuts near the Triangle Lake area. These clear-cuts are expected to have more intensive applications of herbicides compared to older clear-cuts. Therefore, residents living near these units may have higher risks for exposure to pesticides that drift or migrate off of these units.

Participant eligibility criteria

In order to be eligible to participate in phase I of this investigation, people must meet the following criteria:

- Live within 1.5 miles of a 2010 or 2011 clear-cut near Triangle Lake

- Not be a professional pesticide applicator
- Be willing to participate in all aspects of this investigation

Recruiting Participants

OHA will use several strategies to identify and recruit participants for the exposure investigation. These include the following:

- Identify and sign-up residents interested in participating in the investigation during a public meeting in the Triangle Lake area on July 14th
- Call and invite people who attended the 7/14 meeting but did not express interest in participating
- Ask community contacts to refer their neighbors and acquaintances to OHA

During recruitment, OHA will call participants and ask them a few preliminary questions about their drinking water source, and food grown and eaten on the property (Attachment E). This information will help EPA, DEQ, and ODA prepare for efficient collection and analysis of appropriate environmental samples for each household.

Field activities and Laboratory Analysis

Bio-sampling

Staff from ATSDR and OHA will collect urine samples from participants over two days in August 2011. The urine samples will be sent to the National Center of Environmental Health (NCEH) laboratory in Atlanta, where they will be tested for 2,4-D and for atrazine and its principal metabolites. See ATSDR's EI protocol (Attachment A) for detailed information on urine sample collection and analysis.

Environmental sampling

Staff from EPA Region 10 and DEQ will collect drinking water, food and soil samples from participants' residences in September 2011. The drinking water samples will be analyzed by the ODEQ laboratory, and all other environmental samples (food and soil) will be analyzed by the ODA laboratory. See EPA's Quality Assurance Project Plan (Attachment B) for detailed information on environmental sample collection and analysis.

Evaluation of data

OHA will evaluate the bio-sampling and environmental sampling data by comparing the test results to comparison values. Table 3 describes one of the analytes (2,4-D) that the NCEH laboratory will measure in urine samples, and provides the comparison value against which results for that analyte will be compared. Appendix C explains how these comparison values were selected. Urine samples will also be

analyzed for several other analytes that are metabolites of atrazine, for which no comparison values have been established.

The comparison value used for 2,4-D in urine samples (Table 3) is not a health-based threshold, but rather, a comparison with the levels found in the general population of the United States overall. Therefore, an individual result that exceeds the values listed below does not indicate a health risk, but instead, implies that the individual’s test results are higher than those of “most people.”

Table 3. 2,4-D and its comparison values for urine samples.

Analyte	Comparison Value (µg/L)	Comparison Value (µg/g-creatinine)	Comparison Value Source
2,4-D	1.3	1.08	NHANES Upper 95th percentile

NHANES = National Health and Nutrition Examination Survey

N/C = not calculated

The environmental samples will be tested for a wider suite of pesticides and herbicides. Table 4 shows the primary list of analytes that will be tested in water and soil, and the comparison values for these analytes. Table 5 shows the list of analytes and their comparison values for food samples. Appendix C explains how these comparison values were selected.

Table 4. Analytes and comparison values for soil and water samples.

Analyte	Water		Soil	
	Comparison Value (µg/L)	Source	Comparison Value (mg/kg)	Source
2,4-D	100	RMEG	500	RMEG
Aminopyralid	5,000	RMEG – provisional	25,000	RMEG - provisional
Atrazine	0.3	RSL	2.1	RSL
Clopyralid	5,000	RMEG – Provisional	25,000	RMEG – Provisional
Glyphosate	1,000	RMEG	5,000	RMEG
Hexazinone	1,200	RSL	2,000	RSL
Imazapyr	20,000	HBSL	125,000	RMEG – Provisional
Metsulfuron Methyl	2,000	HBSL	12,500	RMEG – Provisional
Picloram	4,000	RMEG	4,000	RMEG
Sulfometuron-Methyl	13,750	RMEG – provisional	13,750	RMEG – Provisional
Triclopyr	500	RMEG – Provisional	2,500	RMEG-provisional

RMEG = Reference dose Media Evaluation Guide derived from EPA's RfD using ATSDR's drinking water exposure factors for children; intended for exposures lasting 1 year or longer.

RSL = Regional Screening Level (EPA)

HBSL = Health-Based Screening Level - uses same equation as EPA's Lifetime Health Advisory

Provisional RMEG = OHA used RfD from the analytes registration eligibility document (RED) and ATSDR's drinking water RMEG equation for children to derive this value. This was used as a 4th tier option following HBSLs for non-carcinogenic compounds.

Table 5. Analytes and comparison values for food items.

Analyte	Eggs		Milk		Honey		Berries		Leafy Vegetables		Tomatoes	
	Value (ppm)	Source	Value (ppm)	Source	Value (ppm)	Source	Value (ppm)	Source	Value (ppm)	Source	Value (ppm)	Source
2,4-D	50	US EPA	100	US EPA	100	Health Canada	100	US EPA	100	US EPA	100	Health Canada
Aminopyralid	100	Health Canada	30	US EPA	100	Health Canada	100	Health Canada	100	Health Canada	100	Health Canada
Atrazine	20	US EPA	20	US EPA	100	Health Canada	100	Health Canada	100	Health Canada	100	Health Canada
Clopyralid	100	US EPA	200	US EPA	100	Health Canada	4000	US EPA	3000	US EPA	100	Health Canada
Glyphosate	100	Codex	100	Codex	100	Health Canada	200	US EPA	100	US EPA	100	US EPA
Hexazinone	100	US EPA	100	US EPA	100	Health Canada	200	US EPA	100	Health Canada	100	Health Canada
Imazapyr	100	Health Canada	10	US EPA	100	Health Canada	100	Health Canada	100	Health Canada	100	Health Canada
Metsulfuron Methyl	100	Health Canada	50	US EPA	100	Health Canada	100	Health Canada	100	Health Canada	100	Health Canada
Picloram	50	US EPA	50	US EPA	100	Health Canada	100	Health Canada	100	Health Canada	100	Health Canada
Sulfometuron-Methyl	100	Health Canada	100	Health Canada	100	Health Canada	100	Health Canada	100	Health Canada	100	Health Canada
Triclopyr	50	USEPA	10	US EPA	100	Health Canada	100	Health Canada	100	Health Canada	100	Health Canada

Reporting

ATSDR, in coordination with OHA, will communicate individual bio-sampling test results back to participants. ATSDR will also produce a report that evaluates only the bio-sampling test results. OHA will communicate the environmental sampling test results back to each residence. OHA will also produce a report that evaluates the bio-sampling, environmental and survey data collected for this investigation. Currently, OHA plans to produce a report after sampling results are finalized.

Community Involvement

The goal of community involvement efforts is to support the community in having meaningful opportunities to participate in the activities that directly affect them. Prior to and during sampling, the major community involvement activities include the following:

- A public meeting to describe and answer questions about the investigation (July 14th, 2011)
- Regular updates via a list-serv and a dedicated website
- Individual communications by phone and email, providing answers and resources as needed.

In fall and winter of 2011, OHA, in coordination with ATSDR Region 10, will assist the community in establishing a Community Involvement Plan in conjunction with the community's input. The community will provide input into specific activities that they want and that OHA & ATSDR are willing and able to support. OHA/ATSDR will continue to provide the community with timely, accurate information about the exposure investigation via a listserv, a dedicated website, e-mail, telephone conversations, the postal service, and through other modes of correspondence as needed.

Appendix A. Urine sampling and analysis protocol



Exposure Investigation Protocol

Biological Monitoring for Exposure to Herbicides

Highway 36 Corridor

Lane County, Oregon

Cost Recovery Number AA1200

August 18, 2011

Prepared by:

Kenneth Orloff, PhD

ATSDR/DHAC/EISAB

Introduction

Since 2005, people living in the Triangle Lake area near Highway 36 in Lane County, Oregon, have expressed concern over possible exposures to herbicides from aerial spraying on nearby forestland. After the trees in an area are clear-cut, the area is replanted with tree seedlings, and the area is sprayed with herbicides to reduce the growth of competing weeds and underbrush.

The steep incline of some of the clear-cut areas makes it difficult to access these areas. Therefore, helicopters are often used to aerially spray herbicides over the clear-cut areas. Residents of the area have reported that herbicides drift from the spray areas and settle on their property, resulting in residential exposures. Surface water runoff from sprayed areas may also result in exposures to people living down gradient from the spray areas.

After tree seedlings are planted in a clear-cut area, the area is typically sprayed twice a year with herbicides^a. These sprayings occur in late summer and early spring. Different tracts of land are sprayed at different times at the discretion of the individual landowners. State law requires that landowners notify the Oregon Department of Forestry (ODF) two weeks before a spraying event occurs. However, the time interval between notification and spraying can vary at the discretion of the landowner. After spraying has occurred, the ODF can request the landowners to report which herbicides were used. Atrazine and 2,4-dichlorophenoxyacetic acid (2,4-D) are two of the herbicides commonly used.

Atrazine is a moderately persistent pesticide in the environment. In soil, atrazine has a half-life of 14-109 days; whereas in water, its half-life can be 200 days or more (ATSDR, 2003). 2,4-D is non-persistent (half-life = 6.2 days) in terrestrial environments, moderately persistent (half-life = 45 days) in aerobic aquatic environments, and highly persistent (half-life = 231 days) in anaerobic terrestrial and aquatic environments (US EPA, undated).

If humans were to ingest these herbicides, they would be rapidly excreted in the urine with a urinary elimination half life of 18 hours for 2,4-D and 24-48 hours for atrazine (Sauerhoff et al. 1977, Gilman et al. 1998). Therefore, urinary biomonitoring for these contaminants would reflect relatively recent exposures to these herbicides.

^a Landowners have reported to the Oregon Department of Forestry that the following herbicides were applied to clear-cut areas in the Highway 36 corridor during the past two years: Atrazine, Hexazinone, Imazapyr, Sulfometuron Methyl, Metsulfuron Methyl, 2,4-D, Clopyralid, Glyphosate, Triclopyr, Aminopyralid, and Picloram.

In the spring of 2011, a researcher at Emory University collected urine samples from 21 area residents and tested them for herbicides. The researcher reported that the participating residents had elevated concentrations of 2,4-D and a metabolite of atrazine (diaminochlorotriazine [DACT]) in their urine.

In response to these preliminary findings and the concerns of the community, the Oregon Office of Environmental Public Health (OEPH) has proposed additional investigations to evaluate the residents' potential exposure to environmental herbicides. Other agencies, including the U.S. Environmental Protection Agency, Oregon Department of Environmental Quality, and Oregon Department of Agriculture, will evaluate potential herbicide and pesticide contamination of water, air, and home-grown/raised food.

As part of this overall effort, OEPH requested assistance from ATSDR in conducting urinary biomonitoring to evaluate the residents' exposures to herbicides used on clear-cut areas. Although testing by other agencies may include other herbicides and pesticides, ATSDR's urinary biomonitoring will be limited to 2,4-D, atrazine, and its principal metabolites. These chemicals were selected as target compounds because the National Center for Environmental Health laboratory has existing analytical methods for these chemicals. They are also chemicals frequently sprayed over the clear-cut areas.

The urinary biomonitoring results and evaluation are specific to the community tested. The results are not generalizable to other populations who live near areas where aerial spraying occurs. This protocol and subsequent report will be limited to the urinary biomonitoring investigation and will not include other investigations being conducted by other agencies. Upon the completion of these multiple investigations, the OEPH will issue a report that integrates the findings of these investigations.

Project Overview

A. Purpose

The purpose of this Exposure Investigation (EI) is to conduct urinary biomonitoring for exposure to the herbicides, atrazine and 2,4-dichlorophenoxyacetic acid, in residents living along the Highway 36 corridor. The biological monitoring and analyses will be conducted using validated, state-of-the-science analytical methodologies. The results of this investigation will tell the residents if they have been recently exposed to these herbicides and/or their metabolites. This biomonitoring will be conducted prior to fall 2011 spraying operations. Thus, this EI will measure the participants' chronic exposures to herbicides that could result from exposures to environmental contamination of air and water, and the foods that they eat.

The participants of this EI are self-selected residents who live near spray areas. As such, the test results from this investigation will be specific to these participants and are not generalizable to the community-at-large or to other populations.

B. Investigators and Collaborators

The ATSDR Exposure Investigation and Site Assessment Branch (EISAB) will be the lead for this Exposure Investigation. This EI will be a collaborative effort of ATSDR and the Oregon Office of Environmental Public Health (OEPH). The National Center for Environmental Health (NCEH) laboratory will analyze the urine samples.

EISAB will:

- (1) Develop the EI protocol and consent/assent/permission forms
- (2) Work with OEPH to get consent/assent/parental permission, collect urine samples from the participants, and ship them to the NCEH laboratory for analysis
- (3) Evaluate the analytical test results
- (4) Notify the participants of their individual test results
- (5) Write a report that summarizes the collective findings of the EI

The National Center for Environmental Health (NCEH) will:

- (1) Provide supplies for collecting urine samples
- (2) Analyze the urine samples for the 2,4-D, atrazine, and six of its metabolites (see Section E for details).

The Oregon Health Authority, Office of Environmental Public Health will:

- (1) Identify and recruit participants for the EI
- (2) Make appointments for sample collection
- (3) Work with ATSDR to conduct the field activities
- (4) Provide health education to the community on the findings of the EI

METHODS

A. Criteria for participation

Residents who live in Lane County, Oregon, near an herbicide spray area are eligible for this study. Preference will be given to people who have the highest potential for exposure, that is, those who live within 1.5 miles of a spray area. Field studies have documented that following aerial spraying of pesticides in mountainous terrain, pesticide residues can be detected up to 6 kilometers (3.7 miles)

from the spray area (Allwine et al. 2002). However, if more participants volunteer than can be tested, preference will be given to those living closest to the spray area.

People with occupational exposure to pesticides (e.g., sprayers) will not be eligible for this investigation. The only age restriction is that participants must be 6 years of age or older. This age restriction is necessary because the test results will be compared to NHANES national survey data, which is limited to people 6 years of age or older (CDC, 2009).

B. Recruiting participants

Based on the above criteria, OEPH will recruit participants for this EI. The target goal is to conduct urinary biomonitoring for about 80 residents of the area. Recruitment efforts will include:

- (1) OEPH staff and a representative of ATSDR attended a public meeting on July 14 to discuss the EI and notify the community of the upcoming testing.
- (2) The Oregon Department of Forestry will identify areas that have been clear-cut in 2010-2011. Based on GIS information, OEPH will contact people who live within 1.5 miles of the property boundaries of the spray area and invite them to participate in the testing.

Eligible participants must be at least six years of age, live within the recruitment area, have no occupational exposure, and provide consent/assent/parental permission.

C. Field activities

OPEH staff will make appointments to meet with the participants in their homes. During this appointment, ATSDR/OPEH staff will administer the appropriate consent/assent/parental permission form to the participants. These forms are included in Appendix A.

During the home appointment, we will give each participant a urine collection cup with his/her identification number. We will instruct the participant to collect a urine sample as described in the Urine Collection Instructions (Appendix B). The participant will collect a urine sample of at least 40 ml in the privacy of their bathroom. The participant will then cap the cup and return the freshly voided urine sample to us. We will transfer aliquots of the urine sample to cryovials and freeze the samples on dry ice. Once collected the samples will be kept frozen on dry ice and locked in the trunk of our car.

ATSDR will prepare one field blank of distilled, deionized water for each day that samples are collected. To protect anonymity, the samples will be labeled with a coded identification number provided by the NCEH laboratory.

D. Sample handling and shipping

The urine samples will be shipped within 48 hours after collection. ATSDR staff will package the urine samples on dry ice, enclose a chain-of-custody form, and ship them by overnight delivery to the NCEH laboratory in Atlanta, Georgia, for analysis.

E. Lab processing and analysis

The NCEH laboratory will analyze the urine samples.

Urine samples will be analyzed for 2,4-D and for atrazine and its principal metabolites (Barr *et al.*, 2007). The analysis for atrazine will include the following chemicals: Atrazine (AZN), Diaminochloroatrazine (DACT), Desisopropilatrazine (DIA), Desethylatrazine (DEA), AZN-mercapturate, DIA-mercapturate and DEA-mercapturate. Urinary creatinine will also be measured to correct for urinary dilution. Results will be reported in units of $\mu\text{g/g}$ of creatinine and $\mu\text{g/L}$ of urine for comparison to the NHANES data sets.

The urinary concentrations of atrazine [2-chloro-4-(ethylamino)-6-(isopropylamino)-s-triazine] and six of its metabolites and hydrolysis products, will be determined using two dimensional high performance liquid chromatography (2D-HPLC) coupled with tandem mass spectrometry. Atrazine and six atrazine metabolites in one milliliter of urine are extracted using automated off-line solid phase extraction before separation by 2D-HPLC and quantification by positive ion atmospheric pressure chemical ionization isotope dilution tandem mass spectrometry. The limit of detection (LOD) in 1-mL of sample for atrazine and diaminochloroatrazine (DACT) is 0.5 ng/mL.

The concentrations of the herbicide 2,4-dichlorophenoxyacetic acid (2,4-D), is measured in urine by high performance liquid chromatography-isotope dilution tandem mass spectrometry using a modification of the method described in Olsson *et al.* (2004). A 1 mL sample of urine is extracted with a mix-mode solid-phase extraction sorbent using a semi-automated 96-well plate technology to achieve sample purification and a concentration factor of 25. The urine extracts are then analyzed using reversed phase high performance liquid chromatography and the target analytes are quantified by isotope dilution tandem mass spectrometry. The limit of detection of 2,4-D is about 0.1 ng/mL in 1 mL urine.

F. Evaluation of data

The concentrations of 2,4-D and atrazine mercapturate in the urine samples will be compared to national survey data from CDC's *Fourth National Report on Human Exposure to Environmental Chemicals* (CDC, 2009). This report contains data from the National Health and Nutrition Examination Surveys (NHANES). The NHANES test population is selected to be representative of the civilian, non-institutionalized population of the United States. We will not attempt to quantitatively interpret analytical results for chemicals for which we have no NHANES comparison values. Nevertheless, the presence of metabolites of atrazine in a urine sample indicates that exposure has occurred, and this qualitative information could be useful.

ATSDR classifies individuals with a urine concentration in excess of the 95th percentile of the NHANES national population as having an unusual exposure. This is a statistical determination, not a health based determination. Information is not available to assess the health impact of urinary herbicide concentrations.

Because of the short biological half-lives of 2,4-D and atrazine, the test results will reflect the participants' recent exposure to these herbicides. Test results for samples collected at another time of the year or after a spray event could be different.

Risks to the Participants

Providing a urine sample poses no risk to the participants of this investigation.

Benefits to the Participants

The potential benefit to the participants of this investigation is that they will learn if they were exposed to the herbicides tested for and how their exposures compare to the U.S. population.

Notifying the Community of Test Results

ATSDR will send a letter to the EI participants to notify them of their test results. The letter will also contain information for contacting an ATSDR staff person if they want to further discuss their test results; however, this will not be a personal medical consultation regarding his/her health care.

At the conclusion of this investigation, ATSDR will prepare a written report that presents the findings of the EI. This report will contain no personal identifiers in order to protect the anonymity of the participants. The report will be available to federal, state, and local environmental and public health agencies, as well as to the general public. The consent form will request permission from the participants for ATSDR to share their test results with other federal and state health and environmental agencies.

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Appendix A.A

U.S. Department of Health and Human Services

Agency for Toxic Substances and Disease Registry

Exposure Investigation

Lane County, Oregon

Adult Consent Form for Urine Testing

WHO ARE WE AND WHY ARE WE DOING THIS EXPOSURE INVESTIGATION (EI)?

We are from the Agency for Toxic Substances and Disease Registry (ATSDR), a sister agency to the Centers for Disease Control and Prevention (CDC). The purpose of the EI is to determine whether people who live near a Highway 36 herbicide spray area are being exposed to herbicides. The purpose of the EI is to determine whether people who live near a Highway 36 herbicide spray area are currently being exposed to the herbicides, 2,4-D and atrazine.

We are inviting you to have your urine tested for 2,4-D and atrazine and six of its break- down products.

We will only test your urine for these chemicals.

WHAT IS INVOLVED IN THIS TESTING?

We will give you a plastic cup to collect a urine sample. We will tell you how to collect your sample. It should take 5 minutes or less for you to collect your urine sample.

WHAT ARE THE BENEFITS FROM BEING IN THIS EI?

By being part of this EI, you will find out if you may have been recently exposed to these herbicides and how your exposure compares to others in the U.S.

This test will not tell you if your health may be harmed by these exposures.

There is no cost to you for this testing.

WHAT ARE THE RISKS OF THIS EI?

There is no risk from donating a urine sample

Some people may feel uncomfortable about having their urine tested for chemicals. Some people may be concerned over their test results.

WILL I BE PAID?

You will not be paid for being in this EI.

WHAT ABOUT MY PRIVACY?

We will protect your privacy as much as the law allows. We will give you an identification (ID) number. This number, not your name, will go on your urine sample. We will not use your name in any report we write. We will keep a record of your name, address, and ID number so that we can send you the test results. Your name and address will be kept in a password-protected computer. Copies of your consent form will be kept in a locked file cabinet.

After we complete the EI, your urine sample will be destroyed.

HOW WILL I GET MY TEST RESULTS

We will mail your test results to you 3-4 months after your sample is collected. We will also give you a telephone number that you can call to discuss your test results or request a copy for your family doctor. ATSDR does not provide any follow-up medical care or evaluation.

MAY WE SHARE YOUR TEST RESULTS?

Sharing the test results with other agencies may help us to understand how people might be exposed to these herbicides. May we share these test results with other Federal and State health and environmental agencies?

YES _____ NO _____

WHAT IF I DON'T WANT TO DO THIS?

You are free to choose whether or not you want to be part of this testing. If you agree to be tested, you may change your mind at any time and drop out without penalty. You must sign this consent form to be tested.

WHOM DO I CONTACT IF I HAVE QUESTIONS?

If you have any questions about this testing, you can ask us now. If you have questions later, contact the Project Officer, Dr. Kenneth Orloff, at ATSDR at 770-488-0735 or 888-232-4636 or send him an e-mail at KEO1@CDC.GOV.

If you have questions about your rights as part of this EI, please call the CDC Human Research Protection Office at 1-800-584-8814. Leave a message with your name and telephone number and say that you are calling about the Highway 36 EI. Someone will return your call.

VOLUNTARY CONSENT

I have read this form or it has been read to me. I have had a chance to ask questions about this testing and my questions have been answered. I know I can change my mind at any time. I will be given copy of this form to keep. I agree to be part of this testing.

Participant's Signature

Date

Participant's Printed Name

Age _____ Gender _____

Address _____

Telephone number _____

Lab ID Number _____

I have read the consent form to the person named above. He/she has asked questions about the investigation and had the questions answered.

Signature of person administering consent form

Printed name of person administering consent form

Date

U.S. Department of Health and Human Services

Agency for Toxic Substances and Disease Registry

Exposure Investigation

Lane County, Oregon

Parental Permission Form for Urine Testing for

Children Less than 7 Years of Age

WHO ARE WE AND WHY ARE WE DOING THIS EXPOSURE INVESTIGATION (EI)?

We are from the Agency for Toxic Substances and Disease Registry (ATSDR), a sister agency to the Centers for Disease Control and Prevention (CDC). The purpose of the EI is to determine whether people who live near a Highway 36 herbicide spray area are currently being exposed to the herbicides, 2,4-D and atrazine.

We are inviting your child to have his/her urine tested for 2,4-D and atrazine and six of its break-down products.

We will only test your child's urine for these chemicals.

WHAT IS INVOLVED IN THIS TESTING?

We will give you a plastic cup to collect your child's urine sample. We will tell you how to collect the sample. It should take 5 minutes or less for you to collect the urine sample.

WHAT ARE THE BENEFITS FROM BEING IN THIS EI?

By being part of this EI, you will find out if your child may have been recently exposed to these pesticides and how those exposures compare to others in the U.S.

This test will not tell you if your child's health may be harmed by these exposures.

There is no cost to you for testing your child.

WHAT ARE THE RISKS OF THIS EI?

There is no risk from donating a urine sample. However, your child may feel uncomfortable about having their urine tested for chemicals. Some people may be concerned over their test results.

WILL I BE PAID?

Neither you nor your child will be paid or receive any type of compensation for being in this EI.

WHAT ABOUT MY CHILD'S PRIVACY?

We will protect your child's privacy as much as the law allows. We will give your child an identification (ID) number. This number, not your child's name, will go on the urine sample. We will not use your child's name in any report we write. We will keep a record of your child's name, address, and ID number so that we can send you the test result. Your child's name and address will be kept in a password-protected computer. Copies of your child's consent form will be kept in a locked file cabinet.

After we complete the EI, your child's urine sample will be destroyed.

HOW WILL I GET MY CHILD'S TEST RESULTS

We will mail your child's test results to you 3-4 months after the sample is collected. We will also give you a telephone number that you can call to discuss the test results or request a copy for your child's doctor. ATSDR does not provide any follow-up medical care or evaluation.

MAY WE SHARE YOUR CHILD'S RESULTS?

Sharing the test results with other agencies may help us to understand how people might be exposed to these herbicides. May we share these test results with other Federal and State health and environmental agencies?

YES _____ NO _____

WHOM DO I CONTACT IF I HAVE QUESTIONS?

If you have any questions about this testing, you can ask us now. If you have questions later, contact the Project Officer, Dr. Kenneth Orloff, at ATSDR at 770-488-0735/ 888-232-4636 or send an e-mail to KEO1@CDC.GOV.

If you have questions about your rights as part of this EI, please call the CDC Human Research Protection Office at 1-800-584-8814. Leave a message with your name and telephone number and say that you are calling about the Highway 36 EI. Someone will return your call.

PARENTAL PERMISSION

I have read this form or it has been read to me. I have had a chance to ask questions about this testing and my questions have been answered. I agree that my child can be part of this testing. I know I, or my child, can change our minds at any time. I will be given a copy of this form to keep.

SIGNATURE

I give permission for my child to be tested.

Printed Name of Child

Signature of Parent

Date

Printed Name of Parent

Age of child _____ Gender of child _____

Address of child:

Telephone number _____

Lab ID Number _____

I have read the consent form to the person named above. He/she has asked questions about the investigation and had the questions answered.

Signature of person administering consent form

Printed name of person administering consent form

Date

U.S. Department of Health and Human Services

Agency for Toxic Substances and Disease Registry

Exposure Investigation

Lane County, Oregon

**Assent Form for Urine Testing for
Children 7 to less than 18 Years of Age**

WHO ARE WE AND WHY ARE WE DOING THIS EXPOSURE INVESTIGATION (EI)?

We are from the Agency for Toxic Substances and Disease Registry (ATSDR), a sister agency to the Centers for Disease Control and Prevention (CDC). The purpose of the EI is to determine whether people who live near a Highway 36 herbicide spray area are currently being exposed to the herbicides, 2,4-D and atrazine.

We are inviting you to have your urine tested for 2,4-D and atrazine and six of its break- down products.

We will only test your urine for these chemicals.

WHAT IS INVOLVED IN THIS TESTING?

We will give you a plastic cup to collect a urine sample. We will tell you how to collect your sample. It should
Appendix A: ATSDR Urine Sampling and Analysis Protocol

take 5 minutes or less for you to collect your urine sample.

WHAT ARE THE BENEFITS FROM BEING IN THIS EI?

By being part of this EI, you will find out if you may have been recently exposed to these pesticides and how your exposure compares to others in the U.S.

This test will not tell you if your health may be harmed by these exposures.

There is no cost to you for this testing.

WHAT ARE THE RISKS OF THIS EI?

There is no risk from donating a urine sample. Some people may feel uncomfortable about having their urine tested for chemicals. Some people may be concerned over their test results.

WILL I BE PAID?

You will not be paid for being in this EI.

WHAT ABOUT MY PRIVACY?

We will protect your privacy as much as the law allows. We will give you an identification (ID) number. This number, not your name, will go on your urine sample. We will not use your name in any report we write. We will keep a record of your name, address, and ID number so that we can send you the test result. Your name and address will be kept in a password-protected computer. Copies of your consent form will be kept in a locked file cabinet.

After we complete the EI, your sample will be destroyed.

HOW WILL I GET TEST RESULTS

We will mail your test results to you 3-4 months after the sample is collected. We will also give you a telephone number that you can call to discuss the test results or request a copy for your family doctor. ATSDR does not provide any follow-up medical care or evaluation.

ASSENT

Your parents said it is all right for you to have this test. You don't have to if you don't want to.

MAY WE SHARE YOUR TEST RESULTS?

Sharing the test results with other agencies may help us to understand how people might be exposed to these herbicides. May we share these test results with other Federal and State health and environmental agencies?

YES _____ NO _____

WHAT IF I HAVE QUESTIONS?

If you have questions, you can ask us now. You can talk with your parents if you want. If you have questions later, ask your parent. They can call us for answers.

SIGNATURE

I have read this form or it has been read to me. I have had a chance to ask questions about this testing and my questions have been answered. I agree to be part of this testing. I know I can change my mind at any time. I will be given a copy of this form to keep.

Signature of Minor

Date

Printed Name of Minor

Signature of Parent

Age of Participant _____ Gender of Participant _____

Address: _____

Telephone number _____

Lab ID Number _____

I have read the consent form to the person named above. He/she has asked questions about the investigation and had the questions answered.

Signature of person administering consent form

Printed name of person administering consent form

Date

Appendix A.B

Urine Collection Instructions

Urine collection cups (which hold at least 120 ml) will be provided for each participant. Label each cup with a bar-coded specimen ID label. Instruct each study participant to do the following for a clean-catch urine collection.

- Wash hands and air dry.
- Do not remove the cap from the specimen cup until ready to void.
- Place the cap turned inside-upwards on a clean and stable surface while collecting urine.
- Collect at least 30-40 ml of urine in the cup; do not touch the inside of the cup or cap at any time.
- Recap the specimen cup.
- Return the cup to the ATSDR/OPEH staff person.

Appendix B. Environmental Sampling and Analysis Protocol

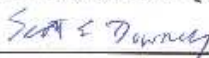
(Double click on image to open file)

Quality Assurance Project Plan
Triangle Lake Forestry Pesticides Project
Revision 0.0, 07/15/2011
Page 3 of 34

**QUALITY ASSURANCE
PROJECT PLAN (QAPP)
FOR
Triangle Lake Forestry Pesticides Project
Environmental Sampling and Analysis for
Pesticide Exposure Assessment**

Date: September 15, 2011
Revision: 0.0

APPROVAL OF QAPP:



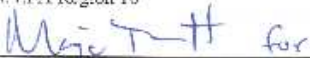
Scott Downey, Manager
Pesticides and Toxics Unit
Office of Compliance and Enforcement
U.S. EPA Region 10

Date: 9/15/11



Sheila Fleming, P.E., Manager
Risk Evaluation Unit
Office of Environmental Assessment
U.S. EPA Region 10

Date: 9/15/2011



Gina Greco-Grove, QA Manager
Office of Environmental Assessment
U.S. EPA Region 10

Date: 9/15/11

Appendix C. Comparison Values to be Used in Decision Making in Conjunction with Highway 36 Exposure Investigation

The purpose of this Appendix is to explain how the attached comparison concentrations were selected and how the OHA may use them, in conjunction with the results of the urine and environmental sampling from the Highway 36 study, to make decisions about future phases of the investigation.

Selection of Comparison Values

Many State and Federal agencies develop comparison concentrations for chemicals in various media (urine, water, food, soil, etc.). OHA developed a hierarchy for choosing which agency's comparison concentration to use for the Highway 36 Exposure Investigation as described in Tables 1-3.

Urine

Urine is a unique medium for herbicides to be measured because no clear associations have been drawn between specific urine concentrations and health outcomes in humans. Therefore, OHA will compare measured urine results to those measured in the general population through the National Health and Nutrition Examination Survey (NHANES) and reported in the Fourth National Report on Human Exposure to Environmental Chemicals. For comparison concentrations, OHA chose urine concentrations below which 95 percent of measured urine samples fell (95th percentile) in NHANES. For more information about NHANES and the National Report, follow this link: <http://www.cdc.gov/exposurereport/>.

Water

OHA used a hierarchy to select comparison concentrations in water:

Table C.1. Water - Hierarchy of Comparison Values selected/calculated

Hierarchy Level	Source of Comparison Value	Rationale
1 (Unless EPA RSL is lower)	ATSDR child-specific screening value (e.g. EMEG, RMEG, CREG)	These screening values are specific to children, and we know that some of the participants have children in their families. ATSDR is a public health agency, and they design their environmental screening values solely with public health in mind. For details about derivation methods: http://www.atsdr.cdc.gov/hac/PHAManual/appf.html
2	RSL	RSLs are calculated to include multiple pathways (oral and inhalation) to capture aggregate exposure through water. For details about derivation methods: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm .
3	HBSL	Calculated to include lifetime exposure. Includes relative source contribution adjustment, which is not appropriate for a multi-pathway, multi-media exposure investigation like this. This why HBSL is ranked as third choice. For details about derivation methods: http://infotrek.er.usgs.gov/apex/f?p=169:2:0::NO::P2 WHICH_SECTION:How are HBSLs calculated.
4	Provisional RMEG (non-cancer) or RSL (cancer)	If no other value is available, calculating a provisional value based on an endorsed RfD or CSF is necessary and is reasonable if established derivation equation is used.

EPA = U.S. Environmental Protection Agency
 RSL = Regional Screening Level – developed by EPA
 ATSDR = Agency for Toxic Substances and Disease Registry, a branch of the Centers for Disease Control
 EMEG = Environmental Media Evaluation Guide – developed by ATSDR
 RMEG = Reference Dose Media Evaluation Guide – developed by ATSDR
 CREG = Cancer Risk Evaluation Guide – developed by ATSDR
 HPSL = Health Based Screening Level – developed by the United States Geological Survey
 RfD = Oral reference dose – developed by EPA
 CSF = Cancer Slope Factor – developed by EPA

Soil

OHA used a hierarchy to select comparison concentrations in soil:

Table C.2. Soil - Hierarchy of Comparison Values Selected

Hierarchy Level	Source of Comparison Value	Rationale
1 (Unless EPA RSL is lower)	ATSDR child-specific screening value (e.g. EMEG, RMEG, CREG)	These screening values are specific to children, and we know that some of the participants have children in their families. ATSDR is a public health agency, and they design their environmental screening values solely with public health in mind. For details about derivation methods: http://www.atsdr.cdc.gov/hac/PHAManual/appf.html
2	RSL	RSLs are calculated to include multiple pathways (oral and inhalation) to capture aggregate exposure through water. For details about derivation methods: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm .
3	Provisional RMEG (non-cancer) or RSL (cancer)	If no other value is available, calculating a provisional value based on an endorsed RfD or CSF is necessary and is reasonable if established derivation equation is used.

EPA = U.S. Environmental Protection Agency

RSL = Regional Screening Level – developed by EPA

ATSDR = Agency for Toxic Substances and Disease Registry, a branch of the Centers for Disease Control

EMEG = Environmental Media Evaluation Guide – developed by ATSDR

RMEG = Reference Dose Media Evaluation Guide – developed by ATSDR

CREG = Cancer Risk Evaluation Guide – developed by ATSDR

HPSL = Health Based Screening Level – developed by the United States Geological Survey

RfD = Oral reference dose – developed by EPA

CSF = Cancer Slope Factor – developed by EPA

Food

OHA used a hierarchy to select comparison concentrations in food:

Table C.3. Food - Hierarchy of Comparison Values Selected

Hierarchy Level	Source of Comparison Value	Rationale
1	EPA Tolerance	Chemical and medium specific. Well established
2	Tolerance or equivalent from state or foreign government	Chemical and medium specific
3	Canada's general Maximum Residue Limit (GMRL)	This value is not chemical or medium specific, but it is health-based and developed by Health Canada.

Appendix D. Additional Analytes and Comparison Values for Water Samples

The Oregon Department of Environmental Quality's (DEQ's) analytical suite for pesticide analysis includes many pesticides in addition to those herbicides of greatest interest to the Highway 36 Exposure Investigation. The table below lists these additional analytes with their selected comparison values. Results for these analytes will not be used to make any decisions related to the Highway 36 Exposure Investigation, but may provide information that would guide a separate follow-up study.

Analyte	Comparison Value (µg/L)	Source	Analyte	Comparison Value (µg/L)	Source
2,4-DB	100	RMEG	Carboxin	1000	RMEG
2,4,5-T	100	RMEG	Chlorobenzilate	0.6	RSL
3,4-Dichlorobenzoic Acid	100	RMEG	Chlorophacinone		
Acetamiprid	700	Provisional RMEG	Chloroneb		
Acetochlor	200	RMEG	Chlorothalonil	22	RSL
Acifluorfen	470	RSL	Chlorpropham	2000	RMEG
Alachlor	1.2	RSL	Chlorpyrifos	10	Chronic EMEG
Aldrin	0.002	CREG	cis-Chlordane	0.1	CREG
alpha-BHC (alpha-Hexachlorocyclohexane)	0.006	CREG	Cyanazine	0.08	RSL
Ametryn	90	RMEG	Cycloate	40	HBSL
Aminocarb			Dacthal	100	RMEG
Atrazine mercapturate	0.3	RSL	DCPA acid metabolites	100	RMEG
Diaminoatrazine (DACT)			DDD	0.1	CREG
Atrazine-Desethyl (DEA)	0.3	RSL	DDE	0.1	CREG
Atrazine-Desisopropyl (DIA)	0.3	RSL	DDT	0.1	CREG
DEA mercapturate			DEET		
DIA mercapturate			delta-BHC (delta-Hexachlorocyclohexane)	0.006	CREG
Azinphos Methyl	30	Chronic EMEG	Diazinon	7	Chronic EMEG
Baygon	150	RSL	Dicamba	300	RMEG
Bromacil	70	HBSL	Dichloroprop	360	RMEG - Provisional based on Rfd
Butachlor			Dichlorvos	0.1	CREG
Butylate	500	RMEG	Dieldrin	0.002	CREG
Carbaryl	1000	RMEG	Dimethoate	2	RMEG
Carbofuran	50	RMEG	Dinoseb	10	RMEG

Analyte	Comparison Value (µg/L)	Source	Analyte	Comparison Value (µg/L)	Source
Diphenamid	300	RMEG	Permethrin	500	RMEG
Disulfoton	0.6	Chronic EMEG	Phosdrin		
Diuron	20	RMEG	Prometon	200	RMEG
Endosulfan	20	Chronic EMEG	Prometryn	40	RMEG
Endosulfan II	20	Chronic EMEG	Pronamide	800	RMEG
Endosulfan sulfate	20	Chronic EMEG	Propachlor	100	RMEG
Endrin	3	Chronic EMEG	propazine	200	RMEG
Endrin Aldehyde	3	Chronic EMEG	Propiconazole	470	RSL
EPTC	300	RMEG	Pyraclostrobin		
Esfenvalerate	300	RMEG	Pyriproxyfen		
Ethoprophos	1	HBSL	Siduron	1000	HBSL
Etridiazole	0.646664363	Provisional RSL	Silvex	80	RMEG
Fenamiphos	3	RMEG	Simazine	0.6	RSL
Fenarimol			Simetryn		
Fenvalerate	300	RMEG	Tebuthiuron	700	RMEG
Fluometuron	100	RMEG	Terbacil	100	RMEG
Fluridone	2900	RSL	Terbufos	0.9	RSL
gamma-BHC (gamma-Hexachlorocyclohexane) aka Lindane	0.06	RSL	Terbutryn	10	RMEG
Heptachlor	0.008	CREG	Terbutylazine	2	HBSL
Heptachlor epoxide	0.004	CREG	Tetrachlorvinphos	11.7671712	Provisional RSL
Imidacloprid	400	HBSL	trans-Chlordane	0.1	CREG
Imidan (Phosmet)	730	RSL	trans-Nonachlor		
Linuron	73	RSL	Triadimefon	1100	RSL
Malathion	200	Chronic EMEG	Tricyclazole		
Pendimethalin	400	RMEG	Trifluralin	5	CREG
Pentachlorophenol	0.09	CREG	Vernolate	10	RMEG

Appendix E. Recruitment Script

Hi, my name is _____, and I am calling from the Oregon Public Health Division. How are you today?

I'm calling to follow-up on your interest in participating in the pesticide exposure investigation. Are you still interested in participating?

Yes No (If no, why?)

Or: I'm calling to ask if you are interested in participating in the pesticide exposure investigation we are conducting in the area. Are you interested?

Yes No (If no, why?)

If no: OK – thanks for your time, have a nice day.

If yes: Great! Thank you.

.....

Today, I'd like to go over what you can expect when we come to your home, and answer any questions you may have for us. This should take about 10-15 minutes. Is this a good time for you to talk?

If yes: First I'd like to confirm that I have your name spelled correctly, is it _____?

If no: What is a good time and phone number to call you back?

- We (public health) are going to be in the Blachly area on August 30, & 31. Will you be there during that time?
- We will be mailing out consent forms that we'd like for you to fill out and have ready for us when we come to your house. We're also going to use an electronic scheduling tool called "doodle", which will help us see what people's availability is during our time there. We will send the link to your e-mail address, is this current email address _____? Once we have heard from every participant, we can map the addresses and will call you back to tell you the day & approximate time we will be coming to your home.
- This will be about a 15 minute appointment, during which time we will collect your consent form(s), and collect a urine sample.
- Do you have any questions so far?
- This investigation is expected to last for up to a year. That means that we could potentially collect samples from you and your property up to 5 times between now and the summer of 2012.
- Are you able and willing to stay involved in this investigation over the course of a year?

- EPA staff will be scheduling a separate visit to come to your home and collect environmental samples, the following week, which is right after Labor Day. These appointments are expected to be longer, and will range from 45 minutes to an hour.

Now I'd like to ask you a few general questions.

- What is the source of your drinking water?
- Do you use a filter or treatment system for your drinking water? Y N
 - If yes, what kind of filter or treatment system is it? (Debris filter, ion exchange, carbon filter, etc.) Is it at the tap, or for the whole house?
- Do you have animals for meat, milk, eggs, or honey?
 - If yes, what?
- Do you barter, trade, share with or buy from local neighbors?
- Do you use herbicides or pesticides? Y N

If Yes:

- What are the names of products that you use?
- Where do you use them, and how do you apply them?
- Can you estimate approximately how much you use? (gallons of mixed?)
- Do you wear protective gear when applying them?
- Do you apply pesticides as an occupation?
- What is the best way to stay in contact with you?
- That's all the questions I have for you, do you have any for me?

If asked about confidentiality:

- You will receive your personal results from the urine and environmental samples that were collected. We'll be available to answer your questions and help you understand your results.
- At the end of the investigation (a year or so), we will write up a report that summarizes the overall findings from everyone who participated, but there will no personally identifying information about participants in that report. Your confidentiality/anonymity will be carefully protected.

Appendix F. Survey questions

Hi _____

Thank you for participating in the Highway 36 herbicide exposure investigation. We have a few questions for you to answer, that will help us learn more about any potential exposure to pesticides or herbicides you may have had in the last several days. Please reply to this e-mail, with your responses to the questions below. Please call me at 971-673-1219 if you have any questions. Thank you.

We were at your house on _____.

.....

1. Approximately how much time per day did you spend outdoors around your home, in the week (7 days) before providing your urine sample? Is that typical for you?

2. Do you work at home?

3. Do you use any pesticides or herbicides on your land or in your garden?

4. Do you have a job where you handle or are around pesticides or herbicides?

If Yes:

What do you use?

What application method(s) do you use?

How much do you use on a weekly basis?

5. Did you use pesticides or herbicides in the week (7 days) before providing your urine sample?

If Yes:

When did you apply them?

What did you use?

Where did you apply it?

6. Do you know of any herbicide applications that occurred near your home (within a mile or so) in the week before you provided a urine sample?

If Yes:

Where did that application occur?

When did that application occur?

Do you know what method was used to apply them (backpack, aerial spray)?

Thank you for your time!