Health Consultation

Anniston PCB Air Sampling

ANNISTON PCB SITE

ANNISTON, CALHOUN COUNTY, ALABAMA

EPA FACILITY ID: ALD000400123

SEPTEMBER 30, 2013

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Community Health Investigations
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners 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 or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared By:

Public Health Service
Agency for Toxic Substances and Disease Registry (ATSDR)
Division of Community Health Investigations
Central Branch

Contents

Acronyms

ATSDR = Agency for Toxic Substances and Disease Registry

CREG = Carcinogenic Risk Evaluation Guide

CV = Comparison Value

EPA = United States Environmental Protection Agency

ng/m^3 = nanograms per cubic meter of air

PCB = Polychlorinated Biphenyl

Summary

The Public Health Issues

The United States Environmental Protection Agency (EPA) Region IV requested that the Agency for Toxic Substances and Disease Registry (ATSDR) evaluate air data collected at the perimeter of a former polychlorinated biphenyl (PCB) manufacturing facility in Anniston, Alabama on October 23 and 24, 2012. This health consultation discusses the ambient air polychlorinated biphenyl (PCB) data collected by the US Environmental Protection Agency (EPA) on those days. In the past, Anniston-area community members have posed questions and voiced concerns regarding polychlorinated biphenyl (PCB) levels in their air (ATSDR, 2003).

Conclusion

On the basis of the data reviewed and if the sampling on October 23 and October 24, 2012 were representative of typical conditions, ATSDR concludes that concentrations of PCBs in air at the I, J, and F sampling stations were low and are not expected to result in an increased cancer risk or other harmful health effects in people living in the neighborhoods outside the perimeter of the former PCB manufacturing facility.

Basis of Conclusion

The estimated cancer risk, based upon the maximum total PCBs detected in air on October 23 and 24, 2012, is 3×10^{-6}. This estimated risk is within EPA's target risk range of 1×10^{-6} to 1×10^{-4}. Overall, the October 2012 PCB sample results represent an estimated insignificant to slight increase in cancer risk.

Recommendations

ATSDR makes the following recommendation:

The EPA should continue to conduct periodic seasonal air sampling for PCBs in residential areas surrounding the Solutia Inc. facility to better determine community exposures.

For More Information

If you have concerns about your health, you should contact your health care provider. For questions or comments related to this Public Health Consultation please call ATSDR at 1-800-CDC-INFO:

Statement of Issues

The United States Environmental Protection Agency (EPA) Region IV requested that the Agency for Toxic Substances and Disease Registry (ATSDR) evaluate environmental data collected on October 23 and 24, 2012, in Anniston, Alabama. This health consultation discusses the ambient air PCB data collected by the US Environmental Protection Agency (EPA) on those days. In the past, Anniston-area community members have posed questions and voiced concerns regarding polychlorinated biphenyl (PCB) levels in their air (ATSDR, 2003).

Background

Between the early 1930s and the early 1970s polychlorinated biphenyls (PCBs) were manufactured in Anniston, AL (ATSDR, 2006). The term polychlorinated biphenyl (PCB) refers to any of the 209 configurations of organochlorides with one to ten chlorine atoms attached to a molecule composed of two benzene rings (biphenyl). PCBs were widely used as coolant fluids in transformers, capacitors, and electric motors. The Solutia facility in Anniston, Alabama, is one of two facilities in the United States that manufactured PCBs (USEPA, 2013). The manufacturing process included on-site burial of PCB-waste materials and consequent releases of PCBs to the environment (ATSDR, 2006). The Solutia Anniston plant (also called the Anniston Polychlorinated Biphenyl (PCB) Site), is located about one mile west of downtown Anniston and occupies 70 acres of land. The site is bounded to the east and west by residential properties, to the south by U.S. Highway 202, and north by the Norfolk Southern and Erie railroads. PCB production ceased in 1971 in Anniston (USEPA, 2013). The Site has been investigated by the U.S. Environmental Protection Agency (EPA), the Alabama Department of Public Health (ADPH), and the Alabama Department of Environmental Management (ADEM) (USEPA, 2013), The Agency for Toxic Substances and Disease Registry (ATSDR) has also completed several assessments of site-related contamination in Anniston, Alabama.[1] ATSDR has also learned that the EPA conducted additional air sampling in June 2013.The results of the June 2013 sampling are not yet available, but will be reviewed later by ATSDR if requested by the EPA.

Because PCBs are often discussed in different ways, three definitions of PCBs are provided here: Aroclor, congener number, and congener class (or homolog). A PCB Aroclor is a name given to formerly commercial PCB products. Aroclors were named according to the different percentages of chlorine, by weight that the PCB mixture contained. For example, Aroclor 1242 contained approximately 42 percent chlorine by weight. A PCB congener number refers to the specific location(s) of the chlorine(s) on the biphenyl molecule. From one to ten chlorines can be found on a biphenyl structure. For example, PCB congener number 28 is a trichlorinated biphenyl, with chlorines attached at the 2, 4, and 4' locations on the biphenyl carbons. There are a total of 209

[1] ATSDR's previous work in Anniston, Alabama is available at: http://www.atsdr.cdc.gov/HAC/PHA/HCPHA.asp?State=AL

possible congener numbers. Finally, PCB congener numbers can be grouped into one often (mono-through deca-) congener classes by number of chlorines. For example, congener numbers 4 through 15 each have two chlorine atoms; these 12 congener numbers make up the dichlorobiphenyl congener class. It should be noted that individual Aroclors were made up of varying amounts of PCBs by congener class. For example, Aroclor 1242 contained varying amounts of mono-through hexa-PCB congener classes (ATSDR, 2000).

Description of Sampling and Analysis

EPA Region IV collected 24-hour air samples on two days in October 2012 at three locations (Stations I, J, and F[2]) on the Solutia Inc. property boundaries. Figure 1 displays the locations of both the EPA air sampling stations and the meteorological station (see section below). Sampling Station I is located southwest of the Solutia Inc. site. Station J is located north of the site, and Station F is located north east of the site. Station F is located near a school, and Station I is located near private residences (USEPA, 2013).

[2] Sample Station F was also used in the EPA's June 2000 sampling of PCB's in Anniston air. The other two stations were not.

Figure 1. Locations of PCB Air Sampling Stations and Meteorological Station.

Anniston, Alabama; October 23-25, 2012

Met Site = Location of temporary meteorological station.
Source: USEPA, 2013

The EPA collected 24-hour samples in accordance with EPA Method TO-4A, and a contract laboratory analyzed the samples using a gas chromatograph (GC) with an electron capture detector (ECD), as described in EPA Method TO-4A (USEPA, 2013). Ten samples were collected including those samples needed for quality assurance and quality control purposes. Duplicate samples were taken at Sampling Station J, and a field blank was collected each sampling day. Samples were analyzed for PCB congener numbers 1 through 209 and for PCBs by mono-through deca-PCB congener classes.

Meteorological Data

The EPA set up a temporary station to collect meteorological data for the two sampling periods (see Figure 1). This meteorological station failed after the first sampling period, but data from National Weather Service Site KANB at the Anniston Airport which is located approximately 13 miles southwest of the EPA's meteorological station was still available. The first meteorological

sampling period was from October 23, 2012, 9:40 a.m. until October 24, 2012, 11:13 a.m. The second meteorological sampling period was from October 24, 2012, 9:56 a.m. until 11:32 a.m. on October 25, 2012. Wind speed varied from 1 to 11 miles per hour during the first sampling period and from calm to 6.9 miles per hour during the second sampling period. During the first sampling period the wind was primarily from the northeast and during the second sampling period the wind was out of the east (USEPA, 2013). It is worth noting the wind direction during the October 2012 sampling period was different from the wind direction reported during previous sampling periods. During EPA's June 2000 sampling for PCBs in Anniston air, the wind direction was primarily from the southwest (ATSDR, 2003). Similarly, Hermanson et al. notes the wind in Anniston typically comes from the south southwest (Hermanson et al., 2003). Therefore, the wind directions on October 23 and 24, 2012 may not be typical of the Anniston area.

Sample Results and Screening

The sample results are presented in Table 1 by total PCBs and PCB class. Table 1 also shows ATSDR's comparison value for PCBs in air.

Table 1. Results of October 23-24, 2012 Anniston PCB Air Sampling (in ng/m^3)

Analyte	Field Blank 10/23/12	Station F 10/23/12	Station I 10/23/12	Station J 10/23/12	Station J Duplicate 10/23/12	Field Blank 10/24/12	Station F 10/24/12	Station I 10/24/12	Station J 10/24/12	Station J Duplicate 10/24/12	CV (CREG)
Monochlorobiphenyl (Total)	0.00081	0.16	1.3	0.72	0.72	0.00022	0.15	0.37	0.63	0.59	
Dichlorobiphenyl (Total)	0.058	0.4	9	2.6	2.6	0.04	0.4	2.8	2.8	2.6	
Trichlorobiphenyl (Total)	0.027	0.38	10	2.9	2.9	0.019	0.37	3.6	2.6	2.4	
Tetrachlorobiphenyl (Total)	0.021	0.54	4	1.6	1.6	0.017	0.49	1.6	1.5	1.2	
Pentachlorobiphenyl (Total)	0.014	0.19	0.62	0.3	0.3	0.01	0.18	0.27	0.34	0.32	
Hexachlorobiphenyl (Total)	0.012	0.074	0.19	0.09	0.09	0.014	0.063	0.094	0.11	0.11	
Heptachlorobiphenyl (Total)	0.0012	0.022	0.036	0.021	0.021	0.0042	0.015	0.017	0.028	0.026	
Octachlorobiphenyl (Total)	0.00022	0.0051	0.0058	0.0034	0.0034	0.00022	0.0038	0.0011	0.0077	0.0068	
Nonachlorobiphenyl (Total)	0.00022	0.0025	0.0044	0.0042	0.0042	0.00022	0.0021	0.0017	0.0048	0.0042	
Total PCBs	0.13	1.8	25	8.2	8.2	0.11	1.7	8.8	8	7.3	10

ng/m^3 = nanograms per cubic meter
CV = Comparison Value
CREG = Cancer Risk Evaluation Guide
Source: USEPA 2013

Comparison Values (CVs) are chemical and media-specific concentrations in air, soil, and drinking water that are used by ATSDR health assessors and others to identify environmental contaminants at hazardous waste sites that require further evaluation. CVs are conservative and non-site specific. CVs are based on health guidelines with uncertainty or safety factors applied to ensure that they are adequately protective of public health.

The comparison of environmental data with ATSDR CVs is one of the first steps in the public health assessment process. The results of this screening step give health assessors an understanding of the priority contaminants at a site. When a contaminant is detected at a concentration less than its respective CVs, exposure is not expected to result in health effects, and it is not considered further as part of the public health assessment process. It should be noted that contaminants detected at concentrations that exceed their respective CVs do not necessarily represent a health threat. Instead, the results of the CV screening identify those contaminants that warrant a more detailed, site-specific evaluation to determine whether health effects may occur. CVs are not intended to be used as environmental clean-up levels.

CVs can be based on either carcinogenic or non-carcinogenic effects, but no ATSDR or USEPA CVs exist for the non-carcinogenic effects of PCBs in air. Therefore, Table 1 shows the Cancer Risk Evaluation Guide (CREG) developed by ATSDR for PCBs in air. Cancer Risk Evaluation Guides (CREGs) are media-specific comparison values that are used to identify concentrations of cancer-causing substances that are unlikely to result in a significant increase of cancer rates in an exposed population. ATSDR develops CREGs using EPA's cancer slope factor or inhalation unit risk, a target risk level (10^{-6}), and default exposure assumptions. Furthermore, CREGs account for a lifetime exposure (70 years). Only Station I on October 23, 2012 had a total PCB concentration above the CREG.

Several other important things can be seen in Table 1. There was good agreement between the sampling duplicates at Station J. Additionally, the sample results were very similar between the 23rd and 24th at Station F and Station J. Of the three sampling stations, Station F clearly had the lowest concentration of PCBs which could be because it was not downwind of the site on either sampling day. Low levels of PCBs were detected in the field blanks, but the EPA considers this "typical for air samples analyzed by this methodology" (USEPA, 2013). Moreover, the levels detected in the field blanks are at least an order of magnitude below the levels detected in the samples.

Discussion

In general, airborne PCB levels in the US appear to be decreasing over time, with higher levels being detected in urban areas than in rural locations (ATSDR, 2000). For example, in June 1996, atmospheric concentrations of total PCBs measured in urban and rural locations in Baltimore,

Maryland, were 0.4-3.4 and 0.02-0.3 ng/m^3, respectively (ATSDR, 2000; Offenberg and Baker, 1999). Additionally, several studies have indicated that indoor air concentrations of PCBs are generally greater than outdoor concentrations (ATSDR, 2000).

Public Health Implications

PCBs have been associated with several adverse noncancerous health effects in humans and animals, including liver, thyroid, dermal and ocular changes, immunological alterations, neurodevelopmental changes, reduced birth weight, and reproductive effects. Studies attempting to show the same health effects in humans that have been observed in animals have generally been inconclusive (ATSDR, 2000, 2003). Additionally, most studies documenting the noncancerous health effects of PCBs consider exposure to the PCBs by ingestion rather than inhalation. Many studies also considered the noncancerous health effects from exposure to commercially available mixtures of PCBs which typically are not the same as mixtures of PCBs in the environment. ATSDR has not derived a CV for noncancerous health effects for PCBs in air due to lack of adequate data in humans and animals. However, it is worth noting the animal studies available involve concentrations of PCBs in air of 9000-8,600,000 ng/m^3, levels far above the concentrations shown in Table 1(ATSDR, 2000). Studies of workers exposed to PCBs also typically involved concentrations much higher than those in Anniston (ATSDR, 2000), and the National Institute of Occupational Safety's Recommended Exposure Limit[3] for workers is 1,000 ng/m^3 (NIOSH, 2007). The results from the October 2012 sampling are typically orders of magnitude below this recommended limit.

As seen in Table 1, ATSDR's CREG for PCBs in air was exceeded on October 23, 2012 at Station I. Therefore, ATSDR calculated an estimated cancer risk from breathing PCBs at this location. Estimated cancer risks are calculated by multiplying the concentration of a substance in air by that substance's inhalation unit risk (ATSDR, 2005). EPA's inhalation unit risk for PCBs is 1 x 10^{-4} per microgram per cubic meter or 1 x 10^{-7} per nanogram per cubic meter. Therefore, the estimated cancer risk for Station I based upon the October 23, 2012 sample result is 3 x 10^{-6} (1 x 10^{-7}/ ng/m^3 x 25 ng/m^3 = 3 x 10^{-6}).

It should be noted that sampling results taken over a longer period of time would better represent long-term cancer risk exposure. Short-term exposure to carcinogens is an area of considerable debate and research; however, it is generally believed that any exposure factors that are less than what was used for the calculations will significantly decrease the calculated risk (e.g., exposed for a shorter time period; exposed to lower concentrations; exposed less frequently during the time period, etc.). Nevertheless, the estimated cancer risk, based upon the maximum total PCB concentration, falls within EPA's target range of 1 x 10^{-6} to 1 x 10^{-4}.

A key limitation of the data reviewed for this consultation is that it only involved two days of sampling in October 2012, and two of the sampling stations would not have been downwind of

[3] The Recommended Exposure Limit is for a 10 hour time weighted average exposure.

the site on either day. ATSDR's previous health consultation of PCBs in Anniston air noted the general trend of PCB concentrations being higher in the spring and summer months than in the winter and fall months. However, this trend is not seen at all Anniston locations (ATSDR, 2003; Hermanson et al., 2003). Nevertheless, the PCB concentrations in October may be lower than PCB concentrations in the summer. Fortunately, the results of the October 2012 sampling can be compared to earlier results of PCB air sampling in Anniston as well as the results of PCB air sampling in other areas of the country. Table 2 shows these comparisons.

Table 2. Comparison of October 2012 PCB Sampling to Other PCB Sampling Results.

Sample Location, Date	Range of Total PCB Concentrations, (ng/m^3)
Anniston, AL, EPA samples, Station F, Oct. 2012	1.7-1.8
Anniston, AL, EPA samples, Station I, Oct. 2012	8.8-25
Anniston, AL, EPA samples, Station J, Oct. 2012	7.3-8.2
Anniston, AL, EPA samples, June 2000	0.2* -16.2
Anniston, AL, Mars Hill Station, 1997-1998	8.7-82
Anniston, AL, Carter Street Station, 1997-1998	1.1-39
Hudson Falls and Fort Edward, NY, 2000-2002	0.10-4.0
Glen Falls, NY, 2000-2002	0.08-2.4
Baltimore, MD, urban area, 1996	0.4-3.4
Baltimore, MD, rural area, 1996	0.02-0.3
New Brunswick, NJ, urban area, 1997	0.1-3.2
*half of analytical quantitation limit ng/m^3 = nanograms per cubic meter Sources: ATSDR, 2000, 2003; Brunciak et al., 1999; Hermanson et al., 2003; Palmer et al., 2008; Offenberg and Baker, 1999; USEPA, 2013.	

As shown in Table 2, the results of the October 2012 PCB sampling are consistent with the PCB levels previously seen in Anniston. The sampling results from Station F are similar to other urban areas in the country. The sample results from Stations I and J are higher than other urban areas, but not higher than some of the previous sample results from the Anniston area.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health.

Several studies have reported that low-level PCB exposure during fetal or neonatal development can affect the infant's neurobehavioral development (Jacobson et. al., 1990; Rogan and Gladden, 1996). However, several limitations of these studies have been noted: (1) possible exposure to other neurotoxic chemicals besides PCBs (e.g., dioxins, mercury, lead, or organochlorine pesticides) that may have contributed to the effects; (2) inadequate control for confounding socioeconomic variables such as maternal smoking, alcohol, and other drug use; and (3) inadequate control for maternal birth weight and nonspontaneous deliveries (Schantz, 1997; Segal, 1996). In addition to these methodological limitations, different studies have measured different neurobehavioral endpoints, thus impeding comparisons between studies.

Therefore, these studies suggest, but do not conclusively prove, an association between prenatal or neonatal exposures to PCBs and neurobehavioral and developmental effects in young children. Furthermore, these studies involved exposures to PCBs primarily through ingestion rather than inhalation.

Conclusions and Recommendations

Conclusions

On the basis of the data reviewed and if the sampling on October 23 and October 24, 2012 were representative of typical conditions, ATSDR concludes that concentrations of PCBs in air at the I, J, and F sampling stations were low and are not expected to result in an increased cancer risk or other harmful health effects in people living in the neighborhoods outside the perimeter of the former PCB manufacturing facility.

Recommendations

The EPA should continue to conduct periodic seasonal air sampling for PCBs in residential areas surrounding the Solutia Inc. facility to better determine community exposures.

Public Health Action Plan

ATSDR will continue to evaluate PCB ambient air data from Anniston, Alabama as needed.

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