Health Consultation

PENNZOIL-QUAKER STATE REFINERY
(a/k/a ATLAS PROCESSING COMPANY)

SHREVEPORT, CADDO PARISH, LOUISIANA

EPA FACILITY ID: LAD008052334

JUNE 1, 2004

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

Health Consultation: A Note of Explanation

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

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members.

This document has previously been released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The health consultation has now been reissued. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

You May Contact ATSDR TOLL FREE at
1-888-42ATSDR
or
Visit our Home Page at: http://www.atsdr.cdc.gov

HEALTH CONSULTATION

PENNZOIL-QUAKER STATE REFINERY
(a/k/a ATLAS PROCESSING COMPANY)

SHREVEPORT, CADDO PARISH, LOUISIANA

EPA FAILITY ID: LAD008052334

Prepared by:

Exposure Investigation and Consultation Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

Table of Contents

Background and Statement of Issues

In October 2000, a community member petitioned the Agency for Toxic Substances and Disease Registry (ATSDR) to evaluate the potential public health impacts of the Pennzoil-Quaker State Refinery (PQS) in Shreveport, Louisiana [1]. The petitioner requested ATSDR involvement at the site, mainly because of an explosion that occurred at the refinery in January 2000. However, verbal communication with the petitioner, other community members, and the community group named Residents for Air Neutralization (RAN) clarified that ongoing air releases are also a concern. In July 2001, ATSDR visited the site to collect the concerns of community residents and to gather available environmental data. ATSDR released this health consultation for public comment on August 19, 2003. This final version addresses all public comments received by ATSDR (see Appendix F) and updates the air monitoring data with current information.

The Shreveport facility began operating in 1923 as a natural gas processing plant. The facility started to refine crude oil in the 1960s, under the name of Atlas Processing Company. Atlas Processing Company changed its name to Pennzoil Products Company in 1996. The facility was referred to as Pennzoil-Quaker State Shreveport Refinery from 1999 until April 26, 2001, when it was sold to Calumet Lubricants Company. The facility encompasses approximately 210 acres and is located in the northwest corner of Louisiana in Shreveport, Caddo Parish (see maps in Appendix A).

The PQS facility refined crude oil through several processes to produce products such as gasoline, diesel fuel, lubricating oils, waxes, and asphalt. The current facility, Calumet, uses less "sour" (contains less sulfur) crude oil in its processes and manufactures mostly light oils, waxes, and lubricants. The facility does not refine or produce gasoline, kerosene, or jet fuel, but it does provide storage for gasoline and jet fuel in large storage tanks on site. The facility maintains several flares, but only one is currently active. The operating flare is used in emergencies to burn excess product at a 98% efficiency to keep it from being released to the air. The sulfur in the crude oil turns into hydrogen sulfide during a portion of the manufacturing process, and into sulfur dioxide upon burning in the flare. Other chemicals that may be released during production include the volatile organic compounds (VOCs) found in crude oil and gasoline such as benzene, toluene, ethylbenzene, and xylene (BTEX). Also, chemicals used for refining that are not found in crude oil or the finished product may be released, such as methyl ethyl ketone (MEK). Other products released by the refinery into the air include combustion products; i.e., particulates, carbon monoxide, carbon dioxide and nitrogen oxides [2,3].

The former PQS facility refined crude oil by use of distillation, catalytic reforming, hydrofinishing, hydrogenation, solvent extraction, hydrotreating, propane deasphalting, MEK dewaxing, and treating process equipment to produce propane, butane, gasoline, diesel fuel, toluene, fuel oil, lubricating oil, wax , and asphalt. The refinery processed about 46,000 barrels (42 gallons/barrel) of crude oil per day [2]. The current facility, Calumet, uses less "sour" crude oil in its processes, and manufactures mostly naptha, diesel, lube oils, solvents and waxes [4]. Calumet is able to refine as much as 15,000 barrels of crude oil per day. For more information on the facility processes, please see Appendix B.

Area residents are primarily concerned about air quality. Health concerns in the community include adverse respiratory effects (e.g., asthma), cancer, diabetes, and kidney problems, including the prevalence of community members on dialysis. Other community concerns include noise from the refinery flare, odors from the facility, damage to cars and property from deposition of chemicals, potential for development of acid rain from facility emissions, facility releases to water in Brushy Bayou, fires and explosions at the facility, and flooding events that allow oil product to be carried off facility property and seep into some homes.

At the time of ATSDR's initial involvement, environmental data were not available to evaluate potential health impacts from the facility. From the time of ATSDR's initial request for data, the Louisiana Department of Environmental Quality (LDEQ) installed a continuous air monitor in November 2002, that records hydrogen sulfide (H_2S) and sulfur dioxide (SO_2) levels in the air near the facility. During 2002, LDEQ also performed several grab air samples for VOCs in the community. Grab samples are instantaneous samples of air, that represent a snapshot of air quality; the sample time is usually less than 30 seconds. This health consultation evaluates the H_2S and SO_2 data from November 2002 through March 2004, and the grab air samples for VOCs. It also addresses community concerns and identifies data gaps. The public health action plan, provided at the end of the document, serves as a mechanism to provide a status report of the agencies involved with this site, including ATSDR, and their respective ongoing activities.

Demographics

The area around the facility is mixed residential and industrial. Residential areas surround the facility to the west, south, and east. Interstate I-20 and another facility, Libbey Glass, are to the north of the PQS facility. Approximately 3417, 7501, and 20,532 residents live within ¼ mile, ½ mile and 1 mile of the facility, respectively. The community within 1 mile of the site is about 83% black/African American. About 2,000 children live within 1 mile of the facility. Please see Appendix A for more demographic information, a map of the refinery and the surrounding community, and an aerial photograph of the facility.

Discussion

Environmental Data

Grab Air Samples for Volatile Organic Compounds

In response to specific community complaints, grab air samples were taken by LDEQ and analyzed for VOCs. The samples were taken in the community in the location of the complaint or odor, following or during the time of the complaint or odor. The following chart summarizes sample information. In addition, a list of the compounds analyzed, the results, and the corresponding comparison values can be found in Appendix C.

Table 1. Summa Grab Air Samples - Descriptive Information*

Sample date	Complaint	Sample location H	Wind direction	VOCs above available health screening values?
1/31/02	Sulfur odor	3000 block of Parkhurst	NW	No
2/10/02	Rotten egg odor	3000 block of Parkhurst	WNW	No
3/09/02	Rotten egg odor	Altovista and Clark	NNW	No
3/10/02	Sulfur odor	Jewella and Baxter	ENE	No
05/23/02	Sulfur odor	Midway and Hudson Street	S	No
06/23/02	Sulfur odor	4300 block of Jewella Ave.	ESE	No

* Source of sample information: Louisiana Department of Environmental Quality, Grab air sample sheets and logs. Dates as listed above.
H Specific addresses were not listed to protect confidentiality of residents.

The grab samples represent the air contaminants for a "snapshot" of time because the Summa canister takes about 20 seconds to fill. By taking an "instantaneous" air sample, it is unknown whether the results represent a maximum amount, a typical amount, or an underestimated (minimum) amount. The levels may have been underestimated since there was a lapse in time between the community complaint due to an odor or other concern, and the actual sampling time.

It is difficult to draw health-based conclusions about these samples for several reasons:
- An accidental release of high levels of contaminants from a facility may have dissipated by the time the sample was taken.
- A snapshot of the contaminant levels does not represent what the community may be exposed to all day, every day.
- Not all chemicals potentially present in the air were sampled. For example, a rotten egg odor complaint would be a concern for hydrogen sulfide rather than VOCs. However, hydrogen sulfide was not sampled for or analyzed during this sampling event.

Although a health-based conclusion cannot be made due to the above limitations, some observations can be made regarding this dataset of six samples:
- The identified chemicals were not above their chemical-specific, health-based comparison values for short-term exposure.
- The chemicals without comparison values are mostly fuel components. Individually, these components would not pose any threat; however, taken all together, the amount of fuel components in the air in some of the samples are significant and warrant further investigation.
- Although we do not know if the concentrations are representative of exposure, the samples verify that the contaminants are present in the air at the community. However, the source of the contaminants is unclear.

The contaminants may be present in air from several different sources – motor vehicle traffic from the nearby interstate, other background sources, routine permitted releases that occur as a

part of daily operations from the facility, or releases that occur from accidents and variances (releases allowed to occur with special permission). These accidental releases are usually in much larger amounts than those normally released and may exceed reportable quantity limits. The contaminants detected in the six air samples may not represent upset conditions (e.g., accidents, variances), because of the time delay between the odor event and sampling.

Air Monitors for Hydrogen Sulfide and Sulfur Dioxide

The LDEQ air monitors are located on the north side of the facility on Fulton Street on property leased from the city of Shreveport. According to the wind data collected from the air monitor, the wind rose (a figure of wind direction – see Appendix D), and the air modeling exercise, prevailing wind direction is to the north. The air monitor is north of Calumet. The sulfur dioxide monitor can measure levels up to 500 parts per billion (ppb) and the hydrogen sulfide monitor can measure levels up to 1,000 ppb. The monitors continuously measure the contaminants and report results in 1-hour average increments [5].

ATSDR evaluated hydrogen sulfide and sulfur dioxide data collected from the monitor for 17 months (November 2002 through March 2004). A summary of the data is displayed in Table 2.

Table 2. Summary of Hydrogen Sulfide and Sulfur Dioxide Air Data (in ppb*)

	Hydrogen Sulfide		**Sulfur Dioxide**	
	Monthly average	**Maximum 1-hr average**	**Monthly average**	**Maximum 1-hr average**
2002				
November	2	23	2	24
December	2	50	1	14
2003				
January	2	9	3	19
February	2	11	2	17
March	3	22	2	12
April	1	42	2	15
May	1	10	2	15
June	1	13	1	8
July	2	24	2	40
August	1	16	3	20
September	3	24	2	13
October	4	30	3	38
November	4	39	3	12
December	6	25	4	126
2004				
January	5	21	3	14
February	4	24	3	12
March	4	16	3	11

* parts per billion

The values detected for H_2S and SO_2 ranged from non-detect to the 1-hour maximum level shown in Table 2. The levels of these chemicals measured by the ambient air monitor do not exceed air enforcement standards, action levels, or health-based standards, and are not expected to cause adverse health effects.

The Environmental Protection Agency (EPA) has set Primary Ambient Air Quality Standards for the six criteria pollutants (including sulfur dioxide) in ambient air. The standards for sulfur dioxide are 30 ppb for an annual average and 140 ppb for a 24-hour maximum level. A secondary standard of 500 ppb also exists for a 3-hour maximum level of sulfur dioxide. There are no EPA standards for hydrogen sulfide; however the state of Louisiana has set an ambient air standard of 240 ppb for an 8-hour average. LDEQ has set 24-hour action levels for this monitor: 90 ppb for a 24-hour average of sulfur dioxide and 30 ppb for a 24-hour average of hydrogen sulfide [5].

For inhalation exposure, ATSDR develops inhalation Minimal Risk Levels (MRL) for the following exposure periods: acute (less than 14 days), intermediate (14 to 365 days), and chronic (greater than 1 year). Inhalation MRLs are contaminant concentrations in air below which noncancerous harmful effects are unlikely. Exceeding an MRL does not mean that harmful effects will occur but rather that a more thorough toxicological evaluation is necessary.

The ATSDR MRL for hydrogen sulfide is 30 ppb for intermediate exposure (compare to monthly average in Table 2) and 70 ppb for acute exposure (compare to maximum 1-hour average above). The levels of hydrogen sulfide measured by the air monitor did not exceed the ATSDR comparable MRL for comparable chemicals. It is possible that a 1-hour average of 50 ppb may have briefly reached or exceeded the acute MRL of 70 ppb, because the levels will fluctuate higher and lower during that hour to result in an average of 50 ppb. This very brief period of exposure at levels above the MRL is not expected to cause any adverse health effects, even for sensitive populations, such as asthmatics. This is supported by the scientific literature where health studies suggest that exposures to levels around 2,000 ppb are necessary to cause changes in pulmonary function. This lowest observed adverse effect level (LOAEL) of 2,000 ppb is much higher than the levels measured by the monitor.

The ATSDR MRL for sulfur dioxide is 10 ppb for acute exposure (compare to maximum 1-hour averages in Table 2). Although the maximum 1-hour averages exceed the MRL, this is not expected to cause adverse health effects because the LOAEL in studies of sulfur dioxide is about 100 ppb. At 100 ppb, slight bronchoconstriction (i.e., increase in airway resistance) was observed in exercising mild asthmatics. The highest level measured by the air monitor was 126 ppb for a 1-hour average. In December 2003, there were 2 hours in which the average sulfur dioxide level exceeded the LOAEL of 100 ppb (126 ppb and 116 ppb). It is possible that sensitive populations such as asthmatics may have experienced an increase in airway resistance if they were outdoors during this 2-hour period. However, levels above or even close to the LOAEL occurred for only 2 hours during the entire 14-month monitoring period for sulfur dioxide; therefore, sulfur dioxide levels are not expected to pose a public health hazard.

Air Modeling

ATSDR contracted with EPA's Environmental Response Team (ERT) to perform air modeling to supplement the existing air data. The goals of the air modeling were to:

1. Estimate the annual average level of hydrogen sulfide and sulfur dioxide to provide a baseline concentration level expected to be in the air as a result of continuous, permitted emissions.

2. Estimate ambient air levels of hydrogen sulfide and sulfur dioxide from accidental releases above the reportable quantity limits.

3. Determine if the current air monitor is in a location that would represent the community's exposure.

See Appendix D for details on the models and the parameters used for the modeling.

ERT reported the modeling results to ATSDR in an electronic memorandum dated August 8, 2002. The modeled annual average level of sulfur dioxide in the location of the current air monitor is about 2 – 2.5 micrograms per cubic meter ($\mu g/m^3$) or about 1 ppb (see Figure 1, Appendix D). This is close to the monthly average sulfur dioxide levels measured by the air monitor (range of 1 – 3 ppb, with an average of 2 ppb) during a 5-month period. These levels would not be expected to cause adverse health effects. Data were not available to complete the same modeling exercise for hydrogen sulfide; however, modeling for H_2S may be completed when the information becomes available.

Anytime the facility releases chemicals that exceed their reportable quantity (RQ) limits, it is required to report the incident. The RQs for hydrogen sulfide and sulfur dioxide are 100 pounds and 500 pounds, respectively. Since the former facility had released these chemicals at or above this amount in the past, ATSDR modeled a hypothetical release of the reportable quantities to determine the impact a release of this nature would have on public health, and to determine if the monitor would be in an adequate location to measure the ambient air concentrations from the releases. It is unknown at this time if any accidental releases of hydrogen sulfide or sulfur dioxide have occurred at Calumet since the air monitor was installed.

A modeled release of 500 pounds of sulfur dioxide (the reportable quantity) results in an ambient air concentration of 700 $\mu g/m^3$ or 267 ppb (for a 1-hour maximum) in the location of the air monitor and a good portion of the surrounding community (see Figure 2, Appendix D). A release of 100 pounds of hydrogen sulfide (the reportable quantity) results in an ambient air concentration of 140 $\mu g/m^3$ or 100 ppb (for a 1-hour maximum) in the location of the air monitor and a good portion of the surrounding community (see Figure 3, Appendix D). The modeled ambient air concentrations are significantly higher than concentrations resulting from routine, permitted releases and are above ATSDR health-based comparison values. However, both of these models represent worst-case scenarios that are highly dependent on many factors, such as

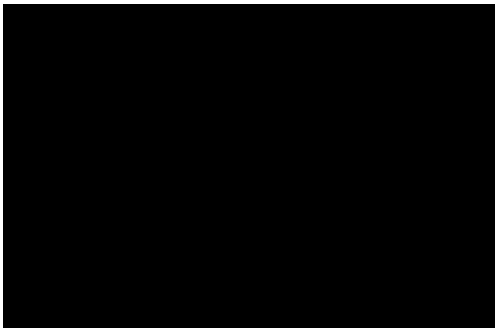
weather and chemical release parameters. Nonpermitted accidental releases need to be further evaluated with actual emissions and meteorological data.

From the modeling exercises and the wind rose (see Figure 4, Appendix D), it appears that wind direction is predominantly from the south. The air monitor is located north of the facility and the two air modeling exercises (annual averages and reportable quantity releases) show the monitor is located in the area of highest estimated concentrations; therefore, the model represents the community's exposure during the majority of the time and is in the best location for a stationary monitor.

Exposure Pathways Analysis

Air

Calumet operates under a Prevention of Significant Deterioration (PSD) permit that was issued to Pennzoil Quaker State by LDEQ. Calumet has submitted an application for a *Title V Operating Permit* that is mandated by federal EPA and state LDEQ regulations. The operating permit restricts the amount of air emissions for wastes generated by the facility. These wastes are restricted as "tons-per-year" and "pounds-per-hour" limitations. For example, the facility is permitted, or allowed, to release 3.73 tons of benzene per year without violating its permit [4]. If a release occurs that is above a reportable quantity or above what is allowed under the operating permit, the facility must file appropriate documentation with LDEQ, reporting that release within 24 hours.



Air is expected to be the most significant exposure pathway for the community. Air is how most residents are likely to come into contact with contaminants most often. Calumet discharges most of its wastes by air, rather than soil or water. The factors that influence the degree of exposure and the potential for health concern are, but not limited to, weather conditions (including wind direction), amount and type of chemical released, and the location of the release (e.g., height of stack). Inhalation of chemicals present in air emissions near the site is a completed exposure pathway.

Drinking Water

Drinking water in the community is obtained from municipal water, not private wells; therefore, no exposure pathway exists for drinking water.

Surface Water

The only source of surface water in the community is Brushy Bayou. Brushy Bayou receives discharge of stormwater and treated wastewater from Calumet, but also receives water from area stormwater runoff, wash-down activities at area small businesses, and unconnected sewage lines. Calumet is required to regulate discharges to water under an EPA National Pollutant Discharge

Elimination System (NPDES) permit and a Louisiana Pollutant Discharge Elimination System (LPDES) permit [4]. These permits require monitoring of the wastewater discharge to comply with state and federal standards, and Calumet is compliant with these requirements. Such requirements include monitoring of priority pollutants, and chronic and acute toxicity tests on aquatic animals (see public comment #16, Appendix E). No restrictions are placed on access to the off-site outfalls (water discharge areas) from the facility or the rest of Brushy Bayou. There are reports of children playing in the outfalls, especially when rainwater has filled them to a high level. ATSDR has no off-site water sampling from Brushy Bayou or from downstream of the facility. In addition, contamination from stormwater runoff from other sources may enter Brushy Bayou. This pathway is a potential exposure pathway because it is unknown if off-site surface water is contaminated.

Soil

There are two possible ways for off-site soil to become contaminated from the facility. The first is deposition of chemicals from the air. VOCs would not be heavy enough for air deposition; however, semi-volatile organic chemicals (SVOCs) and particulates (including metals) have properties favorable for air deposition. ATSDR has no data for off-site soil sampling in the community that would measure chemicals from air deposition. The soil pathway is a potential exposure pathway because it is unknown whether soil in the community is contaminated.

Besides deposition of chemicals from air emissions, some residents in the community have reported that two stormwater flooding events have taken place in the past that allowed chemicals contained on site (possibly in soil) to travel off site by means of rainwater. This contaminated water reportedly seeped into some nearby homes, leaving a sludge residue. ATSDR has no further information or sampling results to identify the composition of the sludge material, or to assess if any current contamination is occurring in the homes that were affected. More information on these flooding events is needed to evaluate health concerns from this potential exposure pathway.

Public Health Implications

The only data that is currently available to make a health-based conclusion are the hydrogen sulfide and sulfur dioxide air monitoring data. ATSDR reviewed this data and determined that the levels measured by the air monitor do not pose a health concern. However, modeling of these contaminants indicates a potential health concern during accidental or nonpermitted releases from the facility. More information is needed to assess the health effects from these types of releases. ATSDR also reviewed data for VOC grab air samples; however, these data do not sufficiently represent exposure to the community. Therefore, more data are needed on the levels of VOCs in the community to make a health-based conclusion. General health information regarding hydrogen sulfide and sulfur dioxide is provided in Appendix E.

Health Outcome Data

The Louisiana Department of Health and Hospitals (LDHH) analyzed cancer incidence data from the Louisiana Tumor Registry for a 10-year period (1988 – 1997) for the following zip codes: 71103, 71108, and 71109 (see Appendix A for the location of the zip codes). The data for these zip codes were compared with the overall rates for Louisiana [6].

The results indicated a significant increase in lung and bronchial cancers among white males for the 10-year period. No significant increases in any type of cancer were found for white females, black/African American males, or black/African American females. The cancer sites analyzed were bladder, brain, breast, cervix, colorectal, uterine, esophagus, kidney, liver, lung and bronchus, other biliary, ovarian, pancreas, prostate, skin, soft tissue, stomach, thyroid, and the lymphatic cancers (such as leukemia, Hodgkin's disease, non-Hodgkin's lymphoma, and multiple myeloma) [6].

No other disease rates, such as asthma, are collected by the state of Louisiana; therefore, these data are not available for analysis.

Community Concerns

The following list attempts to address the community's concerns related to the Calumet (formerly Pennzoil) facility:

<u>Environmental Concerns</u>

1. Air quality – There are many factors that determine the air quality in a particular area. All urban and industrial areas have problems with air quality due to the large number of industrial facilities and the high volume of motor vehicle traffic. Interstate 20 is a major highway running east-west through the area and it is adjacent to the north-side of the facility and the air monitor. This document begins to address the community's concerns about air quality related to the Calumet facility. ATSDR will continue to evaluate data concerning air quality as it becomes available.

2. Noise from the refinery flare(s) – Residents state that when the flare is actively used, the noise is disruptive to nearby community residents. This is a common complaint at most oil refineries. Refineries use flares to burn any excess product that may have accidentally escaped from a normal process. The products of combustion that are released from the flare are normally safer than the raw products that would be released otherwise. However, the facility should use the flare only for emergency events. A noise ordinance may be in place in the city of Shreveport that would help to determine if noise from the flare is within city guidelines.

3. Odors from the facility – The most common odor complaint seems to be a rotten-egg odor, followed by a gasoline odor. Hydrogen sulfide is responsible for the rotten-egg odor. This chemical is a common air pollutant from refineries because sulfur is in the crude oil that is being refined. Sulfur is extracted from crude oil by a process that forms hydrogen sulfide. Most of the

hydrogen sulfide is converted to sulfur dioxide and then released into air. However, some hydrogen sulfide is left over and sometimes even accidentally released in large quantities. Most people can smell hydrogen sulfide at a concentration of about 0.5 ppb, lower than the level at which health effects would be a concern [7]. Since the monthly averages of hydrogen sulfide measured by the air monitor are about 2 ppb, residents probably will smell hydrogen sulfide frequently. Gasoline odors can occur from a number of VOCs found at the refinery. Odors are a nuisance, and odors alone can make some people feel nauseous or give them headaches. However, no other health effects are expected from the hydrogen sulfide odors at the levels measured. It is not known at this time if the gasoline odors contain chemicals at a level of health concern.

4. Acid rain and damage to cars and properties from deposition of chemicals – Sulfur dioxide and nitrogen oxides (NO_x) are the primary causes of "acid rain". Acid rain occurs when these gases react with water, oxygen, and other chemicals to form various acidic compounds. Sunlight increases the rate of most of these reactions. The result is a mild solution of sulfuric acid and nitric acid. "Acid rain" is a term that describes how acids may fall from the atmosphere to the ground. Acid rain is also called "acid deposition". Acid deposition can be either "wet" (acid rain, fog, or snow) or "dry" (acid gases and particles) [8].

Residents could be affected by acid rain since Calumet, other area industries, and motor vehicle traffic all contribute SO_2 and NO_X emissions that can lead to acid deposition. Acid deposition could lead to the types of environmental concerns expressed by community residents. Acid deposition may accelerate decay of building materials and paint [8].

5. Facility releases into water in Brushy Bayou – Residents are concerned about the safety of the water in Brushy Bayou since it has been reported that children sometimes play in the water. ATSDR has no water data to evaluate contaminants in the water in Brushy Bayou located off site. Although the facility operates under federal and state permits that limit discharges, it is possible that chemicals may be released accidentally. Because Brushy Bayou contains water discharges from an active facility, children should not be permitted to play in the water.

6. Fires and explosions at the facility – Residents have reported fires and explosions occurring at the facility. ATSDR has no environmental data to determine if any chemicals released during these events would be a health concern. The residents, the city, LDEQ, and the facility may want to review emergency evacuation guidelines to ensure that they are protective of public health.

7. Flooding events that allowed on-site chemicals to move onto the off-site property of some nearby homes, and possibly into the homes – Residents have shown ATSDR staff photographs of homes containing a sludge-like substance. Besides the photographs and reports from residents about these events, ATSDR has no detailed information about how the events happened, whether past events have contaminated off-site property, and whether these events were or are of health concern. More information is needed to evaluate this concern.

Health Concerns

1. Cancer – Residents are concerned about perceived elevated incidences of cancer in the community, such as lung cancer, leukemia, thyroid cancer, multiple myeloma, mesothelioma, and Hodgkin's disease. LDHH analyzed cancer rates (see Health Outcome Data section) for all of these conditions, except mesothelioma. No increase in cancer was seen except for lung cancer in white males. Smoking is the primary cause for lung cancer in the United States. Mesothelioma was not analyzed for, but it is primarily caused by exposure to asbestos. Some chemicals emitted by the Calumet facility are known carcinogens (i.e., they cause cancer); however, given the existing information, it is not possible to link any of these carcinogens with lung cancer.

2. Adverse respiratory effects – Residents have complained of adverse respiratory effects, such as asthma, breathing problems, and sinus problems. Unlike cancer, the incidence of asthma is not tracked by the state of Louisiana; therefore, it is unknown if area residents have a higher rate of asthma or respiratory problems. Hydrogen sulfide and sulfur dioxide can cause adverse respiratory problems; however, no data are available to suggest that hydrogen sulfide and sulfur dioxide released by Calumet are at levels high enough to cause these problems.

3. Kidney problems – Residents have reported a higher incidence of kidney problems in the community, including the number of people on dialysis. In the United States, the two main causes of kidney disease are diabetes and high blood pressure [9,10]. In addition, kidney disease affects blacks/African Americans more than other subpopulations [9,10]. Exposure to high doses of heavy metals, such as lead and cadmium, may cause kidney damage [11,12].

4. Diabetes – Residents have reported a concern for a large number of people with diabetes in the community. Diabetes is caused by the inability to produce or use insulin, a hormone that regulates blood glucose (sugar) levels in the body when food is eaten. Diabetes affects blacks/African Americans more than other subpopulations [13].

5. Headaches – Headaches are very common in all populations and can have numerous causes such as illness, injury, food, drugs/medicines, chemical exposure, allergies, neurological problems, and others. Although environmental exposures can cause headaches, a cause-and-effect relationship cannot be established because of the possibility of so many other causes.

Child Health Considerations

Children are at greater risk than adults for certain kinds of environmental exposures for several reasons:

< The developing systems of children can sustain damage if toxic exposures occur during certain growth stages.
< Children play outside more than adults, and therefore have an increased likelihood of coming into contact with chemicals in the environment.

< Since they are typically shorter than adults, children breathe more dust, soil, and heavy vapors that are close to the ground.
< Children are also smaller, resulting in relatively higher doses of chemical exposure per body weight.

ATSDR evaluated the types and quantities of chemicals detected in the community to determine how children might be exposed and whether the levels detected could be associated with any reproductive or developmental adverse health effects. ATSDR staff closely reviewed possible exposure situations for children while evaluating this site and did not find any hazards for children on the basis of the current available data. However, ATSDR did note special concerns for children living in this community.

- Residents have told ATSDR staff that children sometimes play in Brushy Bayou, a small stream of water that catches stormwater in addition to facility discharges. Although there are no data to evaluate whether any chemicals are present in Brushy Bayou that might be at levels of health concern, children should not be permitted to play in Brushy Bayou or in facility outfalls because both contain discharges from an active facility (see Community Concerns section).
- Children are more susceptible than adults in developing adverse respiratory conditions, such as asthma. At this time, the data do not support evidence that the levels of hydrogen sulfide and sulfur dioxide in the community could cause these effects. However, ATSDR recommends continuing monitoring for hydrogen sulfide and sulfur dioxide and evaluating the monitoring data in light of children's health.

Conclusions

1. Grab air sampling during odor events did not detect VOCs at concentrations of health concern. However, the levels of VOCs and other petroleum compounds detected in the grab air samples do not sufficiently represent the community's exposure to these chemicals. Therefore, ATSDR determined that the community's exposure to VOCs is currently *an indeterminate public health hazard*.

2. The levels of hydrogen sulfide and sulfur dioxide detected by the air monitor during November 2002 through March 2004 are *not a public health hazard*. The data most likely reflect routine, permitted releases.

3. The hydrogen sulfide and sulfur dioxide levels modeled from accidental releases that were above the reportable quantity (i.e., nonroutine releases) resulted in some exceedances of health-based screening values.

4. Insufficient information is available to determine whether the community's exposure to soil and surface water (e.g., Brushy Bayou) is of health concern. However, children should not play in Brushy Bayou because of possible uncontrolled contamination from stormwater runoff.

Recommendations

1. Conduct long-term air sampling for VOCs to measure low-level exposures (e.g., daily, weekly, or monthly averages) as well as peak exposures (e.g., 1-hour maximum).

2. Continue to monitor for hydrogen sulfide and sulfur dioxide.

3. Evaluate the effect(s) of non-permitted and/or non-routine releases on public health.

4. Consider taking a representative number of soil composite samples in the community to identify potential soil contamination by polyaromatic hydrocarbons (PAHs) and/or metals from air deposition or stormwater runoff.

5. Evaluate the Brushy Bayou exposure pathway if off-site data become available. However, children should not play in Brushy Bayou.

Public Health Action Plan

Completed Activities

In July 2001, ATSDR conducted an initial scoping visit to gather available environmental data and community concerns.

In summer 2002, ATSDR modeled emission information for hydrogen sulfide and sulfur dioxide because of a lack of available data. The modeling estimated contaminant concentrations in air from both routine and non-routine releases, and also determined the best location for the air monitor.

In summer 2002, LDHH evaluated cancer statistics for the three zip codes surrounding the Calumet Lubricants facility.

In 2002, LDEQ took six grab air samples to measure VOCs in response to community complaints.

In October 2002, LDEQ installed an air monitor to measure levels of hydrogen sulfide and sulfur dioxide in the community.

In fall 2002, Technical Outreach Services for Communities (TOSC), an EPA-funded program, entered into an agreement with the RAN community group to provide technical outreach services regarding environmental issues in the community.

On February 22, 2003, TOSC sponsored a workshop for the community on the Calumet Lubricants and Libbey Glass facilities. ATSDR participated in the February workshop and provided health information on facility emissions and health concerns.

In September 2003, ATSDR held a community meeting to discuss the conclusions and recommendations contained in the public comment version of the Health Consultation, and to explain the public comment process.

In December 2003, LDHH visited the community to discuss residents' concerns about asthma and health education needs for a health fair to be held in 2004.

In March and April 2004, ATSDR addressed public comments and released this final Pennzoil Quaker State Health Consultation.

Ongoing Activities

LDEQ is monitoring for hydrogen sulfide and sulfur dioxide.

Future Activities

ATSDR will evaluate the effect of non-permitted/non-routine releases on public health by determining if any have occurred since implementation of the air monitor. If non-routine releases have occurred, such as those at levels above the reportable quantity limit, ATSDR will compare modeled concentrations with real-time monitoring data. [*2004 update: No incident reports have been filed with LDEQ for sulfur dioxide or hydrogen sulfide releases above the reportable quantities. Therefore, ATSDR cannot evaluate the effect of such a release at this time. ATSDR recommends that LDHH evaluate this data if it becomes available*.]

TOSC will continue to serve the community as a technical assistance provider and as a facilitator of community concerns.

LDHH, under ATSDR's state Cooperative Agreement Program, will evaluate any additional sampling results and their effects, if any, on public health. The community has concerns about cancer; therefore, LDHH will continue to assess cancer rates in this area. Asthma also is a health condition that is of concern to residents in the area. LDHH will examine respiratory illnesses in the area as requested.

LDHH will organize a health fair for the community to be held in Summer 2004, in response to community concerns and local community needs.

LDEQ will monitor for sulfur dioxide and hydrogen sulfide levels until at least November 2004.

Preparer of Report:

LT Jennifer A. Freed, MPH
Environmental Health Scientist
ATSDR/DHAC/EICB/PRS

Reviewers of Report:

Donald Joe, PE
Deputy Branch Chief
ATSDR/DHAC/EICB

John E. Abraham, PhD, MPH
Branch Chief
ATSDR/DHAC/EICB

References

1. Letter from Petitioner to ATSDR. Atlanta: US Department of Health and Human Services; October 2000.

2. Louisiana Department of Environmental Quality. Memorandum to Richard Bromley from Otis Randle concerning the May 30-June 1, 2000, Inspection of Pennzoil Quaker State Refinery. Shreveport, Louisiana. June 6, 2000.

3. U.S. Environmental Protection Agency (EPA). Sector Notebook Project: Profile of the Petroleum Refining Industry. Washington DC: US Environmental Protection Agency. September 1995.

4. Technical Outreach Services for Communities (TOSC). Educational Workshop for Residents of Air Neutralization (RAN) Booklet concerning environmental issues at Calumet and Libbey Glass. February 22, 2003.

5. Louisiana Department of Environmental Quality. Quality Assurance Project Plan for the Shreveport Special Air Monitoring Project. October 30, 2002.

6. Louisiana Department of Health and Hospitals (LDHH). Report of LDHH's review of cancer statistics in community near the Calumet facility. June 26, 2002.

7. Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological Profile for Hydrogen Sulfide. Atlanta: US Department of Health and Human Services; 1999.

8. U.S. Environmental Protection Agency (EPA). Effects of Acid Rain (Acid Rain Fact Sheet). Updated June 26, 2001. Available at URL: http://www.epa.gov/airmarkets/acidrain/effects/index.html. Accessed on May 23, 2003.

9. National Kidney Foundation. Ten Facts About African-Americans and Kidney Disease. Available at URL: http://www.kidney.org/general/news/african-american.cfm. Accessed on May 23, 2003.

10. National Kidney Foundation. Kidney Diseases: Causes. Available at URL: http://www.kidney.org/general/atoz/content/kidneycauses.html. Accessed on May 23, 2003.

11. Agency for Toxic Substances and Disease Registry (ATSDR). ToxFAQs™ on Lead. June 1999. Available at URL: http://www.atsdr.cdc.gov/tfacts13.html. Accessed on May 23, 2003.

12. Agency for Toxic Substances and Disease Registry (ATSDR). ToxFAQs™ on Cadmium. June 1999. Available at URL: http://www.atsdr.cdc.gov/tfacts5.html. Accessed on May 23, 2003.

13. Louisiana Department of Health and Hospitals. Fact sheet on Diabetes (Public Information Series). Available at URL: http://oph.dhh.state.la.us/chronicdisease/diabetes/docs/diabetesfactsheet.pdf. Accessed on May 23, 2003.