Health Consultation

Red River Aluminum Site Health Outcome Data and Post-Remediation Review

RED RIVER ALUMINUM
HIGHWAY 82
STAMPS, LAFAYETTE COUNTY, AR 72476

EPA FACILITY ID: AR0000605322

Prepared by the
Arkansas Department of Health

MARCH 6, 2012

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
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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SUMMARY

INTRODUCTION

Red River Aluminum (RRA) is an abandoned aluminum dross processing facility. Final remedial action was taken in 2010 to properly contain or remove the on-site metal contamination in soil in order to improve current site conditions. A formal public petition from a private citizen was received by ATSDR to request the evaluation of public health outcome data surrounding this site.

CONCLUSION

ADH and ATSDR conclude that touching or accidentally ingesting the surface soil at the RRA remediated site is not expected to harm people's health because elevated levels of aluminum and copper in the topsoil have been removed and/or are now below levels of health concern. Also, there are no incidences of elevated cancer rates in Lafayette County.

BASIS FOR DECISION

Aluminum and copper can both be found in air, soil, and water after being released from manufacturing, industrial use, or through disposal of products containing these elements. They also both occur naturally throughout the environment. When visiting or trespassing on the RRA remediated site, the amount of aluminum or copper that might get into an child's or adult's body by touching or accidentally ingesting a small amount of the surface soil is below a level that would harm their health. Exposure dose and risk modeling calculations were performed, and values are below levels of public health concern. Also, a statistical evaluation found no significant differences in cancer cases and cancer deaths in Lafayette County in comparison to the rest of the state.

NEXT STEPS

No additional public health actions are needed concerning the RRA remediated site soil. Public health education may be provided, as necessary or requested.

FOR MORE INFORMATION

If you have concerns about your health, you should contact your health care provider. You can also call Arkansas Department of Health at 501-661-2936 and ask for information on the Red River Aluminum remediated site.

Statement of Issues

Red River Aluminum (RRA) is an abandoned aluminum dross processing facility located within the community of Stamps, Lafayette County, Arkansas. Documented environmental issues related to this site date back to the 1990's. Remedial activities and removal of contaminated environmental media was begun in 2000 by the U.S. Environmental Protection Agency's (EPA) Region 6 Response and Prevention Branch, directed by the Superfund Technical Assistance and Response Team (START). Later, after initial clean-up, investigations showed environmental conditions had become compromised again due to site deterioration and vandalism. In 2008, the Arkansas Department of Environmental Quality (ADEQ) began further remedial activities [1]. According to the "Remedial Action Report," released on October 22, 2010, the purpose of the final remedial action was to properly contain or remove the on-site metal contamination, oil contamination, and aluminum dross material, and to improve the site so it may be removed from ADEQ's management [2].

Beginning in March 2010, several requests from the public were made to ADEQ and the Arkansas Department of Health (ADH) to address the most recent environmental conditions around the site. On November 19, 2010, an official citizen petition for RRA regarding the deteriorated site conditions and related health concerns was received by the Agency for Toxic Substances and Disease Registry (ATSDR) headquarters in Atlanta, Georgia. An official ATSDR response letter dated January 20, 2011, was sent to the citizen regarding plans for this evaluation of the RRA site. Under a cooperative agreement with ATSDR, ADH has prepared this health consultation to discuss the current conditions of the RRA site, to review the environmental data associated with the final remediation project, and to addresses community concerns regarding public health effects related to environmental contamination from this site.

Background and History

RRA, which operated for approximately 10 years, shut down in 1998 and declared bankruptcy in 1999. This site qualified for removal action under EPA's Comprehensive Environmental Response and Liability Act (CERCLA) and Superfund Amendments and Reauthorization Act (SARA) of 1986. Since clean-up actions began, ADEQ has supervised the site using state funds. The property is currently under the jurisdiction of the State Land Commissioner's office and is maintained by ADEQ.

During its years of operations, RRA used a product obtained from other primary aluminum smelting facilities that created a waste product called 'aluminum dross'. For approximately 10 years, RRA accepted this aluminum dross and further processed the material to extract more aluminum. The extraction process separated the aluminum from the by-products that created a residue called "salt cake," which often contained elevated levels of copper and other metals. During the time of the facility's active processing, RRA reportedly produced approximately 80,000 cubic yards of salt cake and stored it in large piles on the eastern side of the property [1].

The site currently stands as an inactive industrial property, and until recently still retained five abandoned structures (two buildings used as offices on the north side of the property and three buildings related to the processing operations). According to the “Remedial Action Report”, the site has been disturbed by years of industrial activity and the subsequent removal action, which resulted in the construction of a large in-ground cell (on-site landfill) to contain 100,000 cubic yards of salt cake waste in 2001. The cell was covered with clay, topsoil, and then seeded with grass [2].

Approximately 30% of the property is covered by mixed pine and hardwood trees. About 50% of the property is covered by grasses, shrubs, and weedy vegetation, and about 20% of the site is bare, paved, or covered by stockpiled aluminum dross. Although this site is currently inactive, the city has expressed interest in using it in the future as a possible site for public recreation [1].

ADH/ATSDR has previously written the following documents based on past public health concerns and/or environmental issues at the RRA site:

1. “Red River Aluminum Superfund Site” Health Consultation; *March 19, 2001* [3];
2. “Health Implication of Exposure to Contaminated Soil in Residential Yards Adjacent to the Red River Aluminum Site” Health Consultation; *July 9, 2002* [4];
3. “Assessment of Potable Water Quality in Residences Located in the Vicinity of the Red River Aluminum Superfund Site” Health Consultation; *April 30, 2003* [5];
4. “Assessment of Indoor Air in Residences Adjacent to the Red River Aluminum Site in Stamps, Arkansas” Health Consultation; *July 17, 2003* [6];
5. “Health Implications of Potential Exposure to Depleted Uranium at the Red River Aluminum, Incorporated Site” Health Consultation; *April 4, 2005* [7].

For a complete description of the historical site-contamination, data evaluations, and past remedial actions, please refer to the ATSDR documents listed above [3 – 7].

The RRA property is located on approximately 120 acres of land and is bounded to the north by US Highway 82; to the east by residential properties along Lowe Street and undeveloped land; to the south by the St. Louis Southwestern Railway; and to the west by undeveloped land and the municipal wastewater treatment facility. From a Comprehensive Site Assessment done in March 2008, contamination was identified in the on-site shallow groundwater and on-site soil [1]. Although shallow groundwater is currently not used for any purpose at the site, it had been shown to contain high levels of total dissolved solids (TDS), sulfate, chloride, and metals. Soil samples showed elevated concentrations of metals and total petroleum hydrocarbon (TPH) [1]. The Comprehensive Site Assessment also identified large piles of waste material left at the site at the time of closure due to bankruptcy. Since then, there has been evidence that trespassers have picked through the abandoned wastes piles and spread aluminum dross material throughout the site.

Discussion

Exposure to contaminants of concern (COCs) is determined by examining human exposure pathways. An exposure pathway has five parts:

1. A source of contamination (e.g., hazardous compound(s)),
2. An environmental medium such as soil, water, or air that can hold or move the contamination,
3. A point at which people come in contact with a contaminated medium,
4. An exposure route, such as skin contact with the surface soil, and
5. A population who could come in contact with the contaminants.

An exposure pathway is eliminated if at least one of the five parts is missing and will not occur in the future. For a completed pathway, all five parts must exist and exposure to a contaminant must have occurred, is occurring, or will occur. To evaluate the contaminants in an exposure pathway, ATSDR Health Comparison Value (HCV) screening levels were used as comparison concentrations [8]. HCVs are substance concentrations set well below levels that are known or anticipated to result in adverse health effects; concentrations occurring at or below the relevant HCV may reasonably be considered below levels that could result in adverse health effects for children and adults.

For the purposes of this health consultation, the exposure pathway to on-site groundwater has been eliminated [5]. As stated in the "Remedial Action Report" there is a restrictive covenant between RRA and ADEQ (enacted approximately 10 years ago), which prohibits use of groundwater on-site [2]. Therefore, it is unlikely that on-site groundwater has been used in the past 10 years or will be used in the future by a near-by resident or trespasser for drinking water. Furthermore, residents previously raised concerns in the early 2000s, and felt that runoff from the site was corrosive or could damage potable water lines [5]. The ATSDR April 2003 health consultation determined that all residents close to the site were connected to a potable drinking water system, not private drinking water wells, and it was concluded that no public health hazards were associated with the potable water sources off-site. Since there is the possibility that future re-use of this site would be for some type of public recreation, the creation of community gardens or on-site groundwater (i.e., well water) use for any purpose is not recommended due to the existing restrictive covenant.

On-site groundwater samples collected by ADEQ on April 5, 2011, show nine metal or mineral elements with concentrations exceeding ATSDR HCV screening levels. These elements are: aluminum, arsenic, beryllium, cadmium, cobalt, copper, manganese, nickel, and selenium. Arsenic, beryllium, cadmium, cobalt, and nickel are compounds that are known or reasonably suspected to be human carcinogens; aluminum, copper, manganese, and selenium are not human carcinogens [9 - 17]. Of the nine elements found at concentrations above HCVs, only cadmium and selenium may accumulate through plants, fish, and/or animals from the environment (soil or groundwater contamination) up the food chain; the other seven elements listed have no known or very limited bioavailability (environmental uptake or accumulation) [9 - 17]. A potential pathway of dermal (skin) contact or incidental ingestion of groundwater does not exist at this site as long as the restrictive covenant is intact and strictly adhered to and/or monitored. To ensure that this continues to be the case, future gardening activities or groundwater use of any kind is not recommended at this site.

The exposure pathway for surface soil at RRA is a complete pathway since a source of documented contaminants existed in the surface soil on-site and people were potentially exposed to it before or during clean-up activities. Should the city take over the property after clean-up has been completed, the potential exists for the land to be used as a public recreational space. Therefore, all precautions should be taken to eliminate a future exposure pathway through surface soil for all children and adults (see Recommendations Section for more detail). For the purposes of this evaluation, surface soil is defined as the first 6 inches of top soil. After evaluation of the “Remedial Action Report,” metal contamination in soil samples was identified that required further analysis.

ADH used HCVs for soil, where available, when making an initial evaluation of the soil data as presented in the “Remedial Action Report” [2, 8]. A total of 83 soil samples were taken at the site as part of the post-remediation activities [2]. These samples were a combination of verification samples, delineation samples, and duplicate samples taken to ensure that contaminated soil had been completely removed. Soil samples with metal concentrations exceeding the HCVs were further examined to determine a daily exposure dose for public health effects. See Table 1 for the list of metals found in the on-site soil at RRA during remedial activities. In Table 1, the values in bold represent an exceedance above the ATSDR HCV (note that contaminated soil has been removed or remediated).

There are no soil HCVs listed for iron, thallium, or total chromium, so an alternative comparison screening value was used for each compound. ATSDR has not derived any acute, intermediate, or chronic-duration oral Minimal Risk Levels (MRLs) for these contaminants because no data on effects of chronic-duration dermal exposure have been found. Iron and thallium were screened against naturally occurring background levels documented for soil less than 2.5 feet below ground surface. Naturally occurring background levels for iron in soil range from 5.4 – 45,600 milligram per kilogram (mg/kg) [18]. The maximum concentration of iron found in the post-remediation sampling was reported at 38,100 mg/kg, which falls between the naturally occurring background levels. Naturally occurring background levels for thallium in soil range from 6.5 – 175 mg/kg [18]. The maximum concentration of thallium found in the post-remediation sampling was reported at 11.5 mg/kg, which also falls between the naturally occurring background levels for this compound. Therefore, both iron and thallium can be eliminated from further evaluation since their concentrations do not exceed their respective comparison screening (background) values; iron, and/or thallium at levels found at this site are not expected to cause acute or chronic adverse health effects in children or adults.

During the time of operation, RRA reprocessed aluminum dross on site and fluxed it with sodium chloride, potassium chloride, and a small amount of calcium fluoride and remelted it in gas-fired furnaces to recover additional aluminum [7]. This electrical-furnace process did not require the use of chromium, which is not expected to be a contaminant of concern at this site [19]. In the laboratory results, the chromium was not speciated between trivalent chromium [III] and hexavalent chromium [VI]. It is ADEQ's standard protocol to sample only for total chromium unless requested otherwise. There is no reason to suspect high chromium levels, or chromium VI levels, at this site because no plating or chromium processing materials were used at this site, and there is no historical evidence of chromium in the dross waste product at this site [3]. Therefore, when evaluating the maximum concentration of total chromium found in post-remediation soil samples at RRA, the HCV for chromium III (*i.e.*, trivalent chromium) was used for screening purposes.

Table 1. Red River Aluminum Site Soil Analysis Comparison Chart

Contaminant	ATSDR HCV Child (mg/kg)	ATSDR HCV Adult (mg/kg)	Maximum Concentration in Remedial Action Report* (mg/kg)	Sample ID
Aluminum	50,000	700,000	**51,900**	Area 3-South
Arsenic	20	200	7.15	Area 3-N-12
Beryllium	100	1,000	1.14	Area 1-J-22
Cadmium	5	70	3.59	Area 3-South
Trivalent Chromium	80,000	1,000,000	131**	Area 3-South
Copper	500	7,000	**1,520**	Area 3-South
Iron	n/a	n/a	38,100	Area 4-I-14
Manganese	3,000	40,000	487	Area 1-E-7
Nickel	1,000	10,000	95.1	Area 3-South
Selenium	300	4,000	0.57	Area 5-J-6
Thallium	n/a	n/a	11.5	Area 4-I-14
Vanadium	500	7,000	37.3	Area 5-J-6
Zinc	20,000	200,000	1,380	Area 3-South

ATSDR = Agency for Toxic Substances and Disease Registry; HCV = Health Comparison Value [6]; mg/kg = milligram per kilogram; ID = identification; n/a = not applicable
*Data provided by: Environmental Testing & Consulting, Inc. Analysis Report 5/28/2010;
**Maximum concentration listed for total chromium.

Also note that information was received from ADEQ stating that the soil at this site was suspected to be at or below a pH of 12 since the soil was thought to be slightly alkaline due to the high salt corrosiveness previously found at RRA [19]. Soil at this pH level (or lower) is contained in the on-site landfill cell, which is capped and fenced off to the public. It is unlikely

that anyone would gain access to this part of the site due to the locked and gated chain-linked fencing. Therefore, the exposure pathway to soil in this landfill is eliminated.
Additional calculations were performed to determine exposure dose scenarios for children and adults using the maximum concentrations of either aluminum or copper as the basis for theoretical risk modeling. When examining risk values for exposure to these contaminants, the Hazard Quotient (HQ) for potential non-cancer risks (*i.e.*, health effect other than cancer-causing effect) was determined. A theoretical Lifetime Excess Cancer Risk (LECR) was not calculated for this health consultation because neither aluminum nor copper is classified as a carcinogen (a substance that causes cancer).

Exposure dose calculations were performed using ATSDR's software program Dose Calculator [20]. For the dermal (skin) contact exposure pathway, an exposure factor of 1.0 was used for both children and adults. For adults, a body weight of 70 kilograms was used, and the skin surface area included arms, hands, legs, and feet exposure. For children, a body weight of 30 kilograms was used, and the skin surface area included the head, torso, arms, hands, legs, and feet exposure (*i.e.*, whole body). For an accidental ingestion pathway, the hypothetical amount of soil ingested for an adult was 10 milligrams per day and for a child was 20 milligrams per day. See Appendix B for all individual variables used in calculations.

To put the calculated exposure doses into a meaningful context for non-cancer, short-duration effects [meaning a rapid onset of an illness, or an illness that happens in less than a year], the HQ was calculated for both the potentially exposed child and adult. An HQ is the average daily intake divided by a chemical specific reference dose (RfD) set by the U.S. EPA. If the HQ for a chemical is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If the HQ exceeds one, there is some possibility that non-cancer effects may occur, although an HQ above one does not indicate an effect will definitely occur. This is because of the margin of safety inherent in the derivation of all RfD values. The larger the HQ value, the more likely it is that an adverse effect may possibly occur. There were no HQ values that were above one (or 1.0) in this evaluation. See Table 2 for all HQ values for each exposure pathway.

Table 2. Red River Aluminum Site Soil Exposure Calculations

Contaminant	Maximum Concentration (mg/kg)	Exposure Population	Hazard Quotient (HQ) for Dermal Contact	Hazard Quotient (HQ) for Accidental Ingestion
Aluminum	51,900	Child	0.303	0.065
		Adult	0.058	0.007
Copper	1,520	Child	0.223	0.048
		Adult	0.043	0.005

mg/kg = milligrams per kilogram

According to the reports, metal contaminated soil areas were excavated about 12 inches deep [2]. Area 3-South was the area where the maximum concentrations of both aluminum and copper were found that exceeded ATSDR HCVs. Once the area was considered completely remediated, a survey was performed to estimate the amount of excavation in each area. The excavated area was then backfilled with clean soil, and each area was hydroseeded and mulched. Approximately 2,610 cubic yards of metal-contaminated soils were disposed of in the on-site landfill. Excavation of the metal-contaminated areas found during the Comprehensive Site Assessment was completed by June 6, 2010 [2]. The on-site, lined, landfill cell should not be disturbed below the first 6 inches of topsoil.

Contaminants of Concern

ATSDR's Toxicological Profiles for the compounds previously identified in the soil at the RRA site were used to classify the public health relevance for each contaminant. The acute, non-carcinogenic properties and their potential impact on children and adults, depending on the exposure dose, are summarized here.

Aluminum: Everyone is exposed to low levels of aluminum from food, soil, water, and air. Only very small amounts of aluminum that an individual may inhale, ingest, or have skin contact with will enter the bloodstream. Exposure to aluminum is usually not harmful, but exposure to high levels can affect your health. Workers who breathe large amounts of aluminum dusts can have lung problems, such as coughing or abnormal chest X-rays. Some workers who breathe aluminum dusts or aluminum fumes have decreased performance in some tests that measure functions of the nervous system [9].

Some people with kidney disease store a lot of aluminum in their bodies, and sometimes develop bone or brain diseases which may be caused by the excess aluminum. Some studies show that people exposed to high levels of aluminum may develop Alzheimer's disease, but other studies have not found this to be true. It is not known for certain whether aluminum causes Alzheimer's disease [9].

Studies in animals show that the nervous system is a sensitive target of aluminum toxicity. Obvious signs of damage were not seen in animals after high oral doses of aluminum. However, the animals did not perform as well in tests that measured the strength of their grip or how much they moved around. It is not known if aluminum will affect reproduction in people. Aluminum does not appear to affect fertility in animals [9].

Children with kidney problems who were given aluminum in their medical treatments developed bone diseases. It does not appear that children are more sensitive to aluminum than adults. It is not known if aluminum will cause birth defects in people. Aluminum in large amounts has been shown to be harmful to unborn and developing animals because it can cause delays in skeletal and neurological development. Aluminum is found in breast milk, but only a small amount of this aluminum will enter the infant's body through breastfeeding [9].

The Department of Health and Human Services (DHHS) and the EPA have not evaluated the carcinogenic potential of aluminum in humans. Aluminum has not been shown to cause cancer in animals [9].

Copper: Everyone must absorb small amounts of copper every day because copper is essential for good health. High levels of copper can be harmful. Breathing high levels of copper can cause irritation of an individual's nose or throat. Ingesting high levels of copper can cause nausea, vomiting, and diarrhea. Very-high doses of copper can cause damage to the liver and kidneys [10].

Exposure to high levels of copper will result in the same type of effects in children and adults. It is not known if these effects would occur at the same dose level in children and adults. Studies in animals suggest that the young may have more severe effects than adults, but it is not known if this would also be true in humans. There are a very small percentage of infants and children who are unusually sensitive to copper. It is not known if copper can cause birth defects or other developmental effects in humans. Studies in animals suggest that high levels of copper may cause a decrease in fetal growth [10].

It is not known whether copper can cause cancer in humans. The EPA has determined that copper is not classifiable as to human carcinogenicity [10].

Typically, individual chemicals for specific exposure pathways are examined for potential health effects. However, some exposures can involve multiple chemicals, or "mixtures", and can also occur through more than one exposure pathway. The ATSDR Guidance Manual was consulted for effects of mixtures. As indicated by research, if detected levels of chemicals are generally below conservative screening values, then exposure to these chemicals collectively is not expected to be of health concern [21]. Furthermore, the toxicological profile for each COC was reviewed, and potential toxic interactions at environmentally relevant doses of aluminum or copper, including the concentrations of aluminum and copper indicated in this public health review, show no known evidence of additive toxicity.

Evaluation of Health Outcome Data

Health outcome data identify certain health conditions that occur in populations. These data can provide information on the general health of communities living near an abandoned hazardous waste site. They also can provide information on patterns of specified health conditions. Some examples of health outcome databases are tumor registries and vital records (or statistics). Information from local hospitals and other health care providers can be used to investigate patterns of disease in a specific population. When a complete exposure pathway or community concern exists, ADH and ATSDR review appropriate and available health outcome data. Although the COCs identified at this site are not known carcinogens (cancer-causing), the evaluation of health outcome data was specifically evaluated due to community requests and concerns.

Because a request was made concerning cancer and disease rates in the area in which they reside, statistical analysis was used to evaluate the available percentage of cancer cases in Lafayette County compared to the state of Arkansas, and an examination of health outcome data was undertaken. In this assessment, data from the Arkansas Central Cancer Registry information was evaluated to compare general cancers in Lafayette County to the state of Arkansas.

The ADH Arkansas Central Cancer Registry maintains the cancer morbidity (the rate of newly diagnosed cancers in a population) information. With this information, a crude rate for a county can be estimated, but should not be construed as an accurate estimate of cancer risk. Crude rates are specific to a population and can be used only in populations with similar distributions of age, gender, race, socioeconomic class, geographic distribution, or any other variable that might affect the magnitude. Adjusted rates allow better comparisons between populations without influence of confounding factors, such as those previously listed. The crude rates reported for the state and county area can be used for general evaluation with the understanding that no adjustments exist for confounders in the population. In this analysis, age-specific analysis was evaluated, but there was no significant difference in cancer morbidity between Lafayette County and the state results.

To determine whether a rate could have been higher just by chance, a confidence interval (CI) is calculated for the rates. The CI has a minimum (lower) value and a maximum (higher) value. Analysts commonly use a 95% CI, meaning that the true ratio is within the range between the lower and higher value calculations with 95% certainty. If the ratio is greater than one, but the CI includes the number one, then the ratio is within expected statistical limits. If the CI does not include the number one, then the ratio is statistically significant. A statistically significant elevated ratio means more cases than expected were diagnosed and the result may not have happened by chance. Although the calculated values can tell investigators the statistical significance of cancer rates, the 95% CI alone cannot determine the factors as to what causes may make the values significant.

Arkansas Central Cancer Registry data rely on accurate reporting from area hospitals and physicians. Even if a resident receives treatment outside the area of residence, the data are collected because of data-sharing agreements with other registries. However, review of cancer morbidity data does not indicate exposure route or exposure duration.

Reporting to the cancer registry in the state began in 1996. During the first year of reporting, only facilities with 100-plus beds were required to report their data. However, beginning in 1997, all hospital and clinic data regardless of bed capacity were required to report these data. Therefore, cancer data reported from the time period 1997 – 2008 were combined and analyzed. Cancer incidence for Lafayette County, as well as statewide, from 1997 to 2008 The results can be found in Table 3. The age-adjusted cancer incidence rates decreased from 2007 to 2008 for both Lafayette County and for the state, and seem to be following a similar trend. There were relatively few cancers diagnosed each year in the county (N = 46 per year). Also, the county-level age-adjusted incidence rate (combined 1997 – 2008) is significantly lower than the state rate for all cancers (Lafayette County age-adjusted cancer rate = 430.3, 95% Confidence Interval = 394.4 – 469.2; Arkansas age-adjusted cancer rate = 473.9, 95% Confidence Interval = 471.7 – 476.2).

Table 3. Cancer Incidence Rates in Lafayette County and Arkansas
All Sites, 1997-2008

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Combined 1997-2008
Lafayette County													
Population at Risk	8902	8778	8643	8527	8349	8192	8181	8065	7933	7754	7716	7669	98709
Total Cases	43	57	53	48	48	53	40	35	41	43	51	37	549
Crude Rate	483	649.4	613.2	562.9	574.9	647	488.9	434	516.8	554.5	661	482.5	556.2
Age-Adjusted Rate	377.8	518.5	469.5	452.1	462.6	511	368.1	333.2	381.7	452.9	492.7	368.8	430.3
95% Confidence Interval Lower	271.7	390.3	350.7	331.6	338.8	380.7	261.6	230.4	270.9	323.6	364.6	257.6	394.4
95% Confidence Interval Upper	520.6	684.2	627.1	612.9	624.5	680.2	514.7	477.7	538.5	628.9	666.5	526.3	469.2
Arkansas													
Statewide Age-Adjusted Rate	443.6	455.9	464.1	466.5	481.1	473.2	486.7	482.8	485.8	485.3	492.2	466	473.9
Statewide 95% Confidence Interval Lower	435.7	448	456.2	458.6	473.1	465.3	478.8	474.9	477.9	477.5	484.5	458.5	471.7
Statewide 95% Confidence Interval Upper	451.5	463.9	472.1	474.5	489.2	481.2	494.7	490.8	493.7	493.2	500.1	473.6	476.2

Note: All rates are per 100,000. Rates are age-adjusted to the 2000 U.S. Standard Million Population.
Based on data released February 08, 2011.

Lafayette County had relatively few deaths due to all cancers (N = 24) for the period 1997 to 2007. The county age-adjusted mortality rates (combined 1997 – 2008) are not significantly different from the state rates for all cancers (Lafayette County age-adjusted cancer mortality rate = 212.1, 95% Confidence Interval = 186.8 – 240.8; Arkansas age-adjusted cancer mortality rate = 207, 95% Confidence Interval = 205.4 – 208.5). This is shown in Table 4. The review of cancer rates for Lafayette County suggests that cancer rates are not elevated. County data did not indicate a higher rate of cancer than the state rates; however, this review is limited to county-level data, and can therefore only make inferences towards the whole county, not the immediate RRA site area.

Cancer, like other chronic diseases, is multi-factorial in origin. Factors that may contribute to the development of cancerinclude an individual’s past and current health status, genetic make-up, or lifestyle choices. For example, tobacco use increases the risk of cancers of the lung and bronchus, cancers of the oral cavity and pharynx, and cancers of the kidney. For more specific details on what may cause cancer in individuals, see Appendix C.

Although age can be accounted for, information on years of residence and occupation of patients with these cancers in Lafayette County is limited. Since there is a long latency period (or time from initial exposure to development of disease) for most types of cancers, it is important to have all the residential information and occupation history of the patients with cancer. However, as with the smoking history of each individual, this type of information is not currently available. Additionally, information about direct exposure to the contaminants associated with the RRA site for each individual is limited.

Table 4. Cancer Mortality Rates in Lafayette County and Arkansas
All Sites, 1997-2007

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	Combined 1997-2007
Lafayette County												
Population at Risk	8902	8778	8643	8527	8349	8192	8181	8065	7933	7754	7716	91040
Total Deaths	25	27	23	36	20	18	24	23	18	16	31	261
Crude Rate	280.8	307.6	266.1	422.2	239.6	219.7	293.4	285.2	226.9	206.3	401.8	286.7
Age-Adjusted Rate	228	227.1	210.2	319	182.5	176.6	201.7	207.5	158.3	146.2	277.5	212.1
95% Confidence Interval Lower	146.6	148	131	222	110.9	103.3	128.3	130.6	92.7	83.1	187.3	186.8
95% Confidence Interval Upper	347.6	344.5	331.4	456.3	293.2	291.8	315.7	326.7	272.7	257.3	414.3	240.8
Arkansas												
State wide Age-Adjusted Rate	215.9	210	211.3	209.4	207.9	211.4	203.7	207.2	206.3	195.3	199.9	207
Statewide 95% Confidence Interval Lower	210.5	204.7	206	204.2	202.8	206.2	198.6	202.1	201.2	190.4	194.9	205.4
Statewide 95% Confidence Interval Upper	221.4	215.4	216.7	214.8	213.3	216.8	208.9	212.4	211.4	200.3	204.9	208.5

Note: All rates are per 100000. Rates are age-adjusted to the 2000 U.S. Standard Million Population.
Based on data released October 27, 2010

Community Health Concerns

As stated earlier, several members of the community near the RRA property in Lafayette County have expressed concern to ADEQ, ADH, and ATSDR regarding site conditions in the form of telephone calls and electronic-mail correspondence. An official citizen's petition letter for RRA regarding the deteriorated site conditions and health concerns was received by ATSDR headquarters in Atlanta, Georgia on November 19, 2010. An official ATSDR response letter dated January 20, 2011, was sent to this citizen. The ATSDR response letter can be found in Appendix D.

According to remediation reports, the RRA facility has been cleaned of the aluminum dross and metal-contaminated soils previously identified. Aluminum dross material that was located throughout the site and metal-contaminated soils discovered during the remediation activities have been placed in the on-site landfill. Excavation areas from removal of contaminated soils have been backfilled with clean fill, seeded, and mulched; grass has reportedly started to come up in these areas. The on-site landfill has been capped with a 12-inch protective cover layer and a 6-inch layer of top soil. A 6-foot-high chain link fence with barbed wire deters people from trespassing on the landfill (see Appendix E for site photos) [2]. ADH and ATSDR will continue to provide public health education to the community surrounding this site as needed or requested in order to prevent harm to human health and diminished quality of life from possible exposure to hazardous substances at the RRA.

Child Health Considerations

In communities faced with soil contamination, the many physical differences between children and adults may require special emphasis. Children could be at greater risk than 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. Additionally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Therefore, adults need as much information as possible to make informed decisions regarding their children's health.

During this health consultation evaluation of the RRA site contaminated soil samples, the individual child exposure was examined due to the factors listed above. Scenarios of a child accidentally ingesting a small amount of some soil and/or making skin contact with the soil on the property were examined. There are no lifetime cancer risks associated with the metal contaminants at this site. The HQ for non-cancer, acute effects [meaning a rapid onset of an illness, or an illness that happens in less than a year (short duration)], was calculated for each potentially exposed child, and it was determined that there was not a potential risk of children developing acute health effects from exposure to the soil since the HQ values fell below one (or 1.0). Because the soil containing concentrations of the contaminants were removed from the site or disposed of below the ground surface in the on-site land cell, it was determined that post-remediated soil would not be a likely health risk for children exposed to elements on site. Although the remediated lot was seeded, parents and guardians of children in the area around the RRA site should, as a prudent public health practice, make a concerted effort to keep all children from digging in the soil greater than 6 inches below ground surface.

Conclusions

After review of the maximum concentration levels of metals found in the soil at the RRA site, ADH and ATSDR conclude that aluminum and copper in the soil at RRA are not expected to harm people's health. It was determined that the HQ values for both a child and adult exposed to contaminated soil through possible skin contact or ingestion are below the acceptable risk standard of one (1.0) and therefore unlikely to cause adverse health effects.

Also, after a statistical evaluation of cancer incidence and mortality rates in Lafayette County and the state of Arkansas, it was revealed that there is no significant difference to indicate elevated cancer cases when comparing health outcome data.

Recommendations

As prudent public health practice, ADH/ATSDR recommends:

- ADEQ (or future property owner) regularly monitoring to ensure property restrictions remain intact.
- In the future, if property is used as a public area or if intended property use changes (which impacts public exposures), additional environmental reviews would be warranted. This should be the responsibility of the future property owner(s). ADH can evaluate any future environmental data to determine potential health risks.

Public Health Action Plan

The purpose of the Public Health Action Plan (PHAP) is to ensure that this health consultation not only identifies any public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. The PHAP implemented by ADH/ATSDR with regards to the RRA site is as follows:

Completed Actions

- ADH received a private citizen's request for a review of the cancer rates in Lafayette County.
- ADH Environmental Epidemiology personnel consulted ADH Chronic Disease and Cancer Registry Epidemiologist to determine cancer rates for Lafayette County and Arkansas.
- ADH contacted the citizen that made the request and informed them of the findings.
- ATSDR received a citizen petition to investigate the public health status of this site; ADH has written this health consultation in response to the petitioner's request.

Future Activities

- ADH/ATSDR will continue to work with state and federal officials regarding this site. Should new information or environmental data become available, ADH/ATSDR will review for public health evaluation.
- ADH/ATSDR will continue to educate the public and address citizen request in regards to this site, as necessary or requested.

REPORT PREPARATION

This Health Consultation for the Red River Aluminum Site was prepared by the Arkansas Department of Health (ADH) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented.

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18. Phone conversation from Annette Cusher, Project Manager, Arkansas Department of Environmental Quality, 10:00 a.m.; March 19, 2010.

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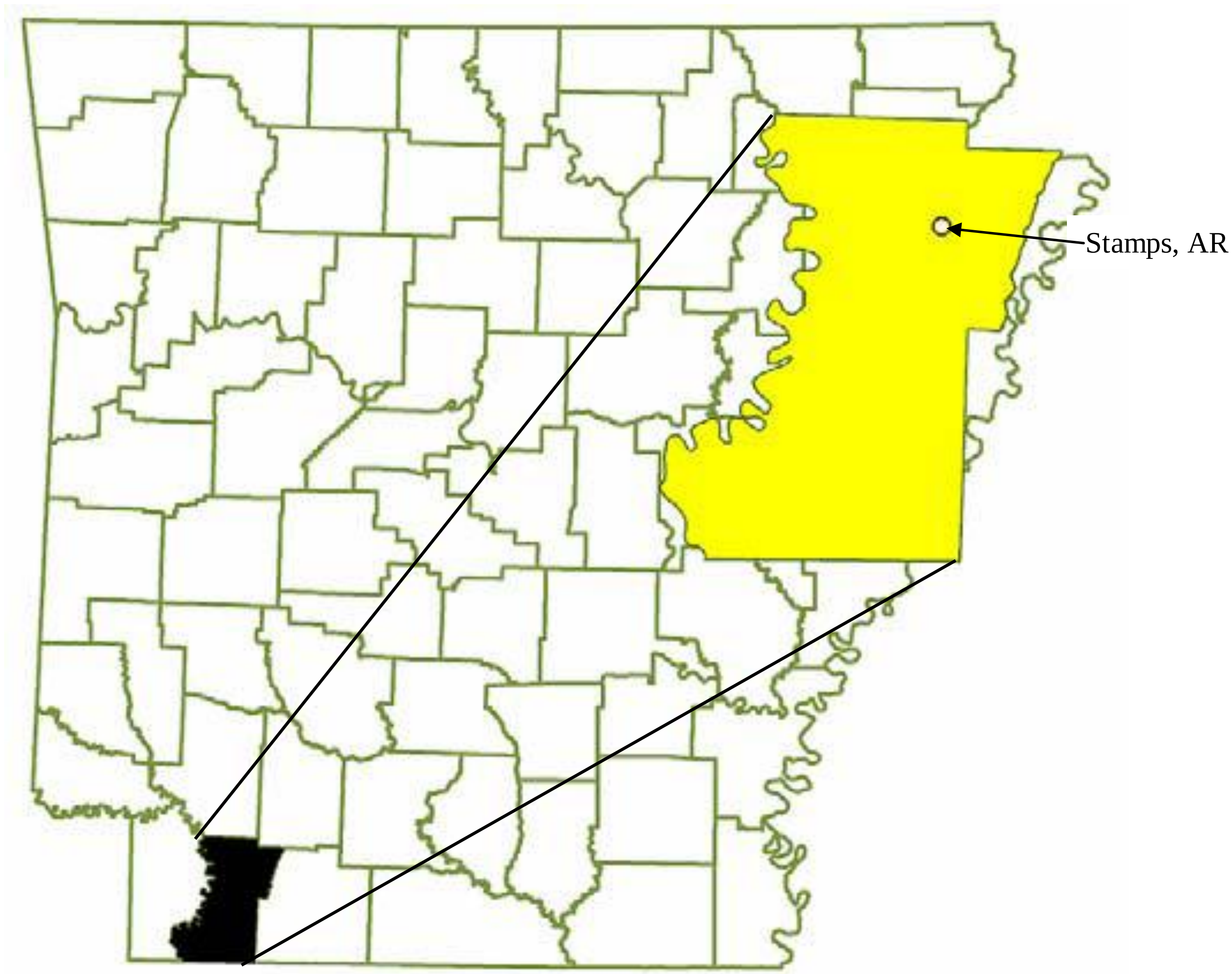
Appendix A: Map Of Lafayette County Within The State Of Arkansas



The former Red River Aluminum site is located in Stamps, Lafayette County, Arkansas. In the 2000 census, the population of Stamps, AR was 2,131, and the population of Lafayette County was 8,555. The town of Stamps has approximately one-fourth the population of Lafayette County.

Appendix B: Variables Used in Exposure Dose and Theoretical Risk Calculation Scenarios

Exposure Dose Equation for Dermal (Skin) Contact

ED = (C x A x AF x EF x CF) / BW

ED = Exposure Dose (milligrams per kilogram per day, mg/kg/day)
C = Contaminant Concentration (milligrams per kilogram, mg/kg)
A = Total Soil Adhered (milligrams, mg) = Exposed Skin Area x Soil Adherence Concentration
AF = Bioavailability Factor (unitless)
EF = Exposure Factor (unitless)
CF = Conversion Factor (1E-06)
BW = Body Weight (kilograms, kg)

[EXAMPLE: Exposure Dose for child exposed to aluminum through whole body dermal contact
ED = (51,900 mg/kg x 1750.875 mg x 1E-01 x 1 x 1E-06) / 30 kg = 3.03E-01 mg/kg/day]

Child Scenario Variables:
C = 51,900 mg/kg aluminum; 1,520 mg/kg copper
A = 1750.875 mg (whole body)
AF = 1E-01; EF = 1; CF = 1E-06
BW = 30 kg

Adult Scenario Variables:
C = 51,900 mg/kg aluminum; 1,520 mg/kg copper
A = 780.67 mg (arms, hands, legs, and feet only)
AF = 1E-01; EF = 1; CF = 1E-06
BW = 70 kg

Exposure Dose Equation for Accidental Ingestion

ED = (C x IR x EF x BF x CF) / BW

ED = Exposure Dose (milligrams per kilogram per day, mg/kg/day)
C = Contaminant Concentration (milligrams per kilogram, mg/kg)
IR = Intake Rate of Soil Digested per Day (milligrams per day, mg/day)
EF = Exposure Factor (unitless)
BF = Bioavailability Factor (unitless)
CF = Conversion Factor (1E-06)
BW = Body Weight (kilograms, kg)

Appendix B, Continued

[EXAMPLE: Exposure Dose for child exposed to aluminum through accidental ingestion
ED = (51,900 mg/kg x 20 mg/day x 1 x 1 x 1E-06) / 16 kg = 6.49E-02 mg/kg/day]

<u>Child Scenario Variables:</u>
C = 51,900 mg/kg aluminum; 1,520 mg/kg copper
IR = 20 mg/day
EF = 1; BF = 1; CF = 1E-06
BW = 16 kg

<u>Adult Scenario Variables:</u>
C = 51,900 mg/kg aluminum; 1,520 mg/kg copper
IR = 10 mg/day
EF = 1; BF = 1; CF = 1E-06
BW = 70 kg

<u>Hazard Quotient Equation for Estimating Short-Term Health Effects</u>

HQ = ED / RfD

HQ = Hazard Quotient (unitless)
ED = Exposure Dose (milligrams per kilogram per day, mg/kg/day)
RfD = Reference Dose (milligrams per kilogram per day, mg/kg/day)

RfD for aluminum = 1.0 mg/kg/day
RfD for copper = 4.0E-02 mg/kg/day

[EXAMPLE: Hazard Quotient for child exposed to aluminum through accidental ingestion
HQ = 6.49E-02 mg/kg/day / 1.0 mg/kg/day = 0.065]

Appendix C: ATSDR Cancer Fact Sheet

Cancer Fact Sheet

Overview

Cancer is not a single disease. It is a group of more than 200 different diseases. Cancer can be generally described as an uncontrolled growth and spread of abnormal cells in the body. Cells are basic units of life. All organisms are composed of one or more cells. Normally, cells divide to produce more cells only when the body needs them.

Sometimes cells keep dividing and thus creating more cells even when they are not needed. When this happens, a mass of tissue forms. This mass of extra tissue is called a tumor. Tumors are found in all kinds of tissue, and can be benign or malignant.

Tumors

Benign

Benign tumors are not cancer. They usually can be removed and, in most cases, they do not come back. Most important, cells from benign tumors do not spread to other parts of the body. Cells from benign tumors stay together and often they are surrounded by a containing membrane. Benign tumors are not usually a threat to life.

Examples of Benign Tumors

- Papilloma - A projecting mass on the skin (for example, a wart)
- Adenoma - A tumor that grows in and around the glands
- Lipoma - A tumor in fatty tissue
- Osteoma - A tumor originating in the bones
- Myoma - A tumor of muscle tissue
- Angioma - A tumor usually composed of small blood or lymph vessels (for example, a birthmark)
- Nevus - A small skin tumor of one variety of tissues (for example, a mole).

Malignant

Malignant tumors are cancer. Cancer cells can invade and damage tissues and organs near the tumor. Cancer cells also can break away from a malignant tumor and enter the lymphatic system or the bloodstream, which is how cancer can spread to other parts of the body. The characteristic feature of cancer is the cell's ability to grow rapidly, uncontrollably, and independently from the tissue where it started. The spread of cancer to other sites or organs in the body through the blood stream or lymphatic system is called metastasis.

Malignant tumors generally can be classified in two categories.

- Carcinomas. These cancers originate in the epithelium. The epithelium is the lining cells of an organ. Carcinomas are the most common type of cancer. Common sites of carcinomas are the skin, mouth, lung, breast, stomach, colon and uterus.
- Sarcomas. Sarcomas are cancers of connective and supportive tissue (soft tissues) of all kinds. Sarcomas can be found anywhere in the body, and they often form secondary growths in the lungs.

Characteristics of Benign and Malignant Tumors

Characteristic	**Benign**	**Malignant**
Differentiation	Tumor cells resemble the original mature cells	Tumor cells might not resemble the original mature cells
Growth Rate	Slow; might stop or regress	Rapid, autonomous; usually does not stop or regress
Type of Growth	Expand and displace	Invade, destroy, and replace
Metastasis	No	Yes
Health Effect	Usually does not cause death	May cause death if not diagnosed and treated

Some Causes of Cancer

Different types of cancer have different causes and are likely to depend on many factors. Some cancers are more common than others, and chances for survival vary among different types. Most cancers do not have known causes from a chemical, environmental, genetic, immunologic, or viral origin. Cancers also can arise spontaneously from causes that are thus far unexplained.

The causes of cancer are very complex, involving both the cell and factors in the environment. Much progress has been made in identifying possible causes of cancer, including:

Chemicals and other substances. Being exposed to substances such as certain chemicals, metals, or pesticides can increase the risk of cancer. Any chemical that is known to cause cancer is called a carcinogen. Asbestos, nickel, cadmium, uranium, radon, vinyl chloride, benzidene, and benzene are examples of well-known carcinogens. These may act alone or along with another carcinogen, such as cigarette smoke, to increase the risk of cancer. For example, inhaling asbestos fibers increases the risk of lung diseases, including cancer, and the cancer risk is especially high for asbestos workers who smoke.

Tobacco. The most common carcinogens in our society are those present in cigarette smoke. Tobacco smoke is known to contain at least 60 carcinogens and 6 developmental toxicants. In addition to being responsible for 80 to 90 percent of lung cancers, cigarette smoking is also associated with cancers of the mouth, pharynx, larynx, esophagus, pancreas, kidney, and bladder. Avoiding tobacco products is one way to decrease a person's risk of cancer.

Ionizing radiation. Certain types of radiation, such as x-rays, rays from radioactive substances, and ultraviolet rays from exposure to the sun, can produce damage to the DNA of cells, which might lead to cancer.

Heredity. Certain types of cancer occur more frequently in some families than in others, indicating some inherited predisposition to the development of cancer. Even in these cases, however, environment plays a part in the development of cancer.

How Cancer Develops

Cancer can develop in people of all ages, but it is more common in people over 60 years old. One of every three people will develop cancer at some point in their lives. Because people are living longer, the risk of developing cancer is increasing.

The development of cancer is a long process that usually starts with genetic changes in the cells, and continues in the growth of these cells over time. The time from genetic change to development of cancer is called the latency period. The latency period can be as long as 30 years or more. This means that some cancers diagnosed today may be due to genetic changes that occurred in the cells a long time ago.

Theoretically, the body develops cancer cells continuously, but the immune system recognizes them as foreign cells and destroys them. The body's ability to protect itself from cancer can be impaired by some drugs and viral infections.

Symptoms of Cancer

Everyone should be familiar with certain signs that may indicate early cancer. It is important to report them immediately, before the condition spreads. It is unfortunate that early stages of cancer are typically painless; because they are painless, diagnosis and treatment are often delayed.

Early symptoms can include

- unaccountable weight loss
- unusual bleeding or discharge
- persistent indigestion
- the presence of white patches inside the mouth or white spots on the tongue

Detection of Cancer
Early detection and prompt treatment are directly responsible for increased survival rates. Tools for cancer detection include:

- Self-exams
- Biopsy (the removal of living tissue for the purpose of microscopic examination of cells)
- Ultrasound (the use of reflected high-frequency sound waves to differentiate various kinds of tissue)
- Computed tomography (CT) (the use of x-rays to produce a cross-sectional picture of body parts)
- Magnetic resonance imaging (MRI) (the use of magnetic fields and radio waves to show changes in soft tissues without the use of x-rays).

Health Promotion Tips

- Reduce or avoid exposure to known or suspected carcinogens or cancer-promoting agents, including cigarettes and sun exposure.
- Eat a balanced diet that includes vegetables, fresh fruit, whole grains, and adequate amounts of fiber.
- Reduce the amount of fat and preservatives in the diet, including smoked and salt-cured meats.
- Participate in regular exercise.
- Obtain adequate, consistent periods of rest (at least 6 to 8 hours per night).
- Eliminate or reduce stress and enhance the ability to effectively cope with stress.
- Go to annual health check-ups.
- Enjoy consistent periods of relaxation and leisure.
- Learn to practice self-examination (breast and testicular).
- Seek immediate medical care if cancer is suspected.

Risk Factors for Cancer
Because cancer is not a single disease, it does not have a single cause. Many causes or risk factors can contribute to a person's chance of getting cancer. Risk factors are different with each type of cancer. It is important to remember that 1 in 3 people will develop a cancer during their lifetime.

Risk factors can include such things as age, race, sex, genetic factors, diet, and exposure to chemicals, radiation, and tobacco. Genetics play a large role for many cancers, such as breast and colon cancer. This means that a family's health history can be a risk factor for some types of cancers.

Lifestyle Factors
Personal choices we make about the way we live our lives can increase our chance of developing cancer. These choices are called lifestyle factors, and they include smoking, heavy drinking, and eating foods that have excess calories, high fat, and low fiber. Other factors that increase risk are related to sexual contact and sunlight exposure.

Tobacco
Thirty percent of all cancers are attributed to smoking or chewing tobacco. Cigarette smoking is also associated with cancers of the mouth, pharynx, larynx, esophagus, pancreas, kidney, and bladder.

Diet
Researchers found that different types of food you eat affect your risk of developing cancer. Approximately 30% of cancers are related to diet.

Infectious Agents
Some viruses have the ability to transform cells into cancer. Examples include (a) human papilloma virus (HPV) and cervical cancer, and (b) Epstein-Barr virus and lymphoma.

Occupational Exposure
Occupational exposure includes high-risk occupations such as uranium miners, asbestos factory workers, certain chemical plant workers, and workers in nuclear power plants.

Reproductive Factors
The reproductive factors category refers mostly to women's risk factors. For example, the risk of breast cancer goes up if a woman does not have children before the age of 30. Sexually transmitted diseases also increase the risk of cervical cancer.

Sedentary Lifestyle
Not moving around much during the day may increase the risk of cancer. The body's own defenses work better when you exercise and maintain an ideal weight. Moderate exercise such as walking or climbing a flight of stairs can help.

Alcohol/Drugs
Alcohol contributes to the risk of developing cancer. People who drink too much or abuse drugs may not eat well or take care of themselves, which will increase their overall risk of cancer.

Pollution
Although people think environmental pollution is a major cause of cancer, in fact few cancers have been found to be caused by pollution, but research is still ongoing. The cause of many cancers is not known. Other factors that interact to increase the risk of cancer are age, hormonal balance, response to stress, and status of the immune system.

Risk and Protective Factors in the Development of Cancer

Protective Factors				Risk Factors			
Type of Cancer	Vegetables	Fruits	Physical Activity	Alcohol	Obesity	Tobacco Use	Environmental Exposure
Lung	GL	SL	ML	MR		HR	SR
Colon/Rectum	GL		GL	SR	MR	MR	
Breast	SL	SL	ML	SR	SR		
Prostate	ML						MR
Stomach	GL	GL					MR
Oral/Pharynx	GL	GL		MR		HR	MR
Kidney	ML				SR	MR	
Ovary	ML	ML					
Pancreas	SL	SL				HR	
Liver	ML			HR			MR
Cervix	ML	ML				HR	
Bladder	SL	SL				HR	SR
Esophagus	GL	GL		HR		HR	MR
Larynx	SL	SL		HR		HR	MR
Thyroid	ML	ML					SR
Uterus	ML	ML			HR		
Gallbladder					MR		
Nasopharynx						SR	MR

GL = Greatly lowers your risk
SL = Somewhat lowers your risk
ML = Might lower your risk
SR = Somewhat raises your risk
MR = Might raise your risk
HR = Highly raises your risk

Adapted from: Westcott S. A Journey Into Cancer's Causes. Anchorage (AK): Alaska Native Health Board; 1999. p. 11.

Cancer and Children

It can be especially difficult to understand and accept when a child develops cancer. The most common cancers in children are leukemia, brain tumors, and lymphomas. Nearly 1 in 450 children will be diagnosed with cancer before the age of 15.

Many pediatric cancers occur very early in life and many parents want to know why. The cause of most childhood cancers is not known; although some of these cancers are the result of genetic predisposition (cancer runs in the family). Radiation exposure also contributes to certain types of childhood cancers. Other factors that have been implicated in childhood cancers include infectious diseases, prenatal conditions, environmental pollutants, electromagnetic fields, and use of medications.

Unlike most cancers of adults, childhood cancers are not significantly related to lifestyle risk factors such as tobacco or alcohol use, poor diet, or not enough physical activity. Many organ systems in children are undergoing rapid growth and development in the first years of life. These systems are especially vulnerable to injury during these periods of development.

The types of cancer that occur in children vary greatly from those seen in adults.

Most Common Cancers in Children and Adults

Children	Adults
Leukemias: acute lymphocytic (lymphoblastic)	Lung
Brain and Other nervous system tumor: neuroblastoma	Breast (carcinoma)
Lymph-node cancers (lymphomas)	Colorectal
Bone (osteosarcoma)	Prostate
Soft-tissue sarcomas: rhabdomyosarcoma	Skin (melanoma)
Kidney: Wilms tumor	
Eye: retinoblastoma	
Adrenal gland (adrenocortical carcinoma)	

This information on children and cancer was compiled from "Childhood Cancer-General Statement", published by the American Cancer Society.

Acute lymphocytic leukemia (ALL) is the most common childhood malignancy. ALL accounts for almost one-third of all childhood cancers.

Brain and spinal cord cancers are the second most common cancers in children. Most brain cancers of children involve the cerebellum or brain stem. Adults are more likely to develop cancers in different parts of the brain -- usually the cerebral hemispheres. Spinal cord tumors are less common than brain tumors in both children and adults.

Bone cancer is uncommon. The incidence of primary bone cancer (cancer starting in bones) is highest in children and adolescents. Cancer that spreads to the bones is more common than primary bone cancer in all age groups. Osteosarcoma is the most common type of primary bone cancer in children and young adults. Ewing sarcoma is a less common primary bone cancer that occurs mostly in children and adolescents.

Detecting Cancer in Children
Cancers in children are often difficult to recognize. Parents should take their children to regular medical checkups and should be alert to any unusual signs or symptoms that persist. It is important to report unusual signs or symptoms to a health care provider.

Unusual signs or symptoms include

- unusual mass or swelling
- unexplained paleness
- loss of energy
- sudden tendency to bruise
- persistent, localized pain or limping
- prolonged, unexplained fever or illness
- frequent headaches, often with vomiting
- sudden eye or vision changes
- excessive, rapid weight loss.

What About Chemicals in the Environment?

"All substances are poisons: there is none which is not a poison. The right dose differentiates a poison and a remedy."

Environmental pollutants are only one of the many connections between cancer and our lives. Not all contaminants are deadly or even cause disease.

The amount of a contaminant a person is exposed to, plus the length of time that person is exposed, plus how many times that person is exposed, plus how the person was exposed equals whether a person will experience negative health effects from an exposure.

Exposures to some chemicals in the environment, at home, and at work may contribute to an individual's risk of developing cancer. Toxic substances such as benzene, asbestos, vinyl chloride, and arsenic can increase the risk of cancer in those exposed to them. The International Agency for Research on Cancer (IARC) classified these substances as known human carcinogens because studies showed a link in humans between exposure to these substances and cancer. Some chemicals have been shown to cause cancer in animals, but there is not enough evidence to show that these chemicals also cause cancer in humans. These chemicals are classified by IARC as possibly or probably carcinogenic to humans. Chloroform, DDT, formaldehyde, and polychlorinated biphenyls are examples of such chemicals.

Most of what we know about chemicals and cancer in humans comes from scientists' observation of workers. The most significant exposures to cancer-causing chemicals have occurred in workplaces where large amounts of toxic chemicals have been used regularly.

The amount of toxic chemicals found in food, air, and drinking water are typically much lower than those in the work environment. Therefore, cancer risk from environmental exposures is thought to be lower compared to the risk in occupational settings. In fact, the cancer risk from environmental exposures is often difficult to measure.

Environmental Toxicants

Environmental toxicants are classified by the National Toxicology Program as (a) known human carcinogens and (b) reasonably anticipated to be (suspected) human carcinogens to differentiate the level of evidence available to support the carcinogenicity of a probable toxicant. Carcinogens include a wide diversity of synthetic and naturally occurring substances, including hormones, immunosuppressants, organic and inorganic chemicals, and cytotoxins.

It is difficult to study populations living near a hazardous waste site and determine if their cancers are associated with exposures. A major difficulty for those studying these populations is not knowing the exact level of individual exposure to a carcinogenic agent. Waste sites often contain more than one chemical, which makes it difficult to associate health outcomes to a single exposure. Often other variables must be accounted for before making any associations of the disease outcome to a given exposure from the site.

Because of the long latency period of cancer development and the type of behavioral risk factors associated with cancers (such as tobacco use, alcohol consumption, and diet), it is difficult to collect information about environmental exposures that occurred years ago.

A List of Known and Suspected Human Carcinogenic Agents by Organ

Human Carcinogenic Agent		
Organ	**Known**	**Suspected**
Lung	Arsenic Asbestos Benzo(a)pyrene bis(Chloromethyl)ether Chromium Nickel subsulfide Zinc chromate Tobacco smoking Mustard gas Uranium	Acrylonitrile Beryllium Cadmium 1,2-Dibromo-3-chloropropane Polyclic aromatic hydrocarbons (PAHs)
Kidney	Coke oven emissions Zinc chromate	Tetrachloroethylene
Bladder	Benzidine Tetrachloroethylene Cyclophosphamide 4-Aminodiphenyl Tobacco smoking Chloraphazine	Tetrachloroethylene
Stomach	Zinc chromate	Ethylene oxide
Skin	Arsenic Benzo(a)pyrene Overexposure to the sun	PAHs Tetrachloroethylene
Liver	Vinyl chloride Aflatoxin Alcoholic drinks	
Mouth, pharynx, larynx, esophagus	Alcoholic drinks Tobacco smoking Tobacco chewing (mouth only) Mustard gas (larynx)	
Prostate	Cadmium	

Source: Lybarger JA, Spengler RF, DeRosa CT, editors. Priority health conditions: an integrated strategy to evaluate the relationship between illness and exposure to hazardous substances. Atlanta: Agency for Toxic Substances and Disease Registry; 1993. p. 61.

For more information about Cancer:

Contact your Health Care Provider
Your local American Cancer Society Chapter
or visit the following sites on the Internet:

http://www.cancer.gov/

http://www.yourdiseaserisk.wustl.edu/hccpquiz.pl?lang=english&func=home&page=cancer_index

http://www.cdc.gov/cancer/

http://www.acor.org

http://www.pbs.org/wgbh/nova/cancer

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Cancer Warrior, NOVA On-Line, (2001); www.pbs.org/wgbh/nova/cancer

Cancer Source Book for Nurses, 7th Edition; (1997); American Cancer Society

Cancer Facts and Figures 2001; (2001); American Cancer Society

Childhood Cancers; (2001); Pediatric Oncology Resource Center,
www.acor.org.diseases/ped-onc/diseases/diseases.html

NCI Fact Sheet: National Cancer Institute Research on Causes of Cancers in Children; (1999);
www.oncolink.upenn.edu/pdq_html

Cancer Information Service; www.fhcrc.org/cipr/pnwcis

For more information,
contact ATSDR's toll-free information line:
(888) 42-ATSDR. . .(888) 422-8737

Appendix D: ATSDR Response Letter to Petitioner

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Agency for Toxic Substances
and Disease Registry
Atlanta GA 30333

JAN 20 2011

[redacted]

Dear [redacted]

Thank you for your recent letter received by the Agency for Toxic Substances and Disease Registry (ATSDR) on November 19, 2010. In your letter, you described your concern about the exposure you, your family, and neighbors may have had due to environmental contaminants possibly released from the Red River Aluminum facility located in Stamps, Arkansas. Your letter states that the Red River Aluminum facility was an aluminum waste processing plant [redacted], and that contaminants released from the plant damaged the environment. You also state that members of your family and community have suffered from a number of serious illnesses and medical conditions such as cancer, respiratory infections, heart disease and neurological problems. Because of your concerns about the Red River Aluminum facility and the health of your family and community, you requested that ATSDR consider performing a public health assessment. This letter is sent to confirm our receipt of your letter and provide information about how your request is being addressed.

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as Superfund), Congress provided ATSDR with the authority to conduct certain public health assessment activities following a request from a community member. ATSDR conducts these activities to determine whether people have been, or are currently being exposed to hazardous substances released into the environment—and determine the actions that should be taken to stop or reduce exposures that could harm human health. These evaluations are based on available environmental monitoring data typically gathered by the U.S. Environmental Protection Agency (EPA) or the state environmental regulatory agency.

It is important to note that ATSDR's public health assessment activities are conducted to evaluate whether an exposure is potentially harmful. However, these activities are not able to determine the cause of an individual's disease, or identify whether a particular exposure caused a disease or an increased incidence of a disease in a community. As a result, an ATSDR public health assessment activity would not be able to determine the cause of the cancers, respiratory infections, heart disease, neurological problems or other illnesses or medical conditions that have occurred in your community.

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ATSDR worked with colleagues from the Arkansas Department of Health (ADH) to gather available information about the former Red River Aluminum facility. We learned that in March 2010, the Arkansas Department of Environmental Quality (ADEQ) began more detailed environmental investigation and clean-up efforts at the site. These efforts began as a result of reports from concerned neighbors that water, from the stored salt wastes collected during the plant's operations, was flowing off-site and affecting neighboring properties. As a part of their investigation, ADEQ will be collecting additional environmental sampling data describing the concentration of site-related contaminants in the soil, groundwater and surface water on the facility's property. ADH has also been contacted by neighboring residents concerned about their exposure to site-related contaminants. Through a cooperative agreement between ATSDR and ADH, ADH already has plans to take the lead to review the environmental sampling data that will be collected by ADEQ and evaluate whether community members near the plant were or are being exposed to contaminants from the facility at levels that could harm human health. Once the evaluation is completed, the results will be shared with you in a follow-up letter. The ADH point of contact for this evaluation is Ms. Lori Simmons, Environmental Epidemiology Section Chief. Ms. Simmons may be reached at (501) 661-2936 or by email at Lori.Simmons@arkansas.gov.

Additionally, ADH and ATSDR have completed four previous health consultations between 2001 and 2005. These documents evaluate the environmental sampling data that have been collected from the site in the past. A copy of each of these documents is enclosed with this letter. I hope you find this information helpful.

Thank you for forwarding your concerns to ATSDR. If you have additional questions about our petition program, please contact CAPT Susan Neurath, ATSDR Petition Coordinator, at (770) 488-3368 or email SNeurath@cdc.gov.

Sincerely,

William Cibulas

William Cibulas Jr., Ph.D.
CAPT, U.S. Public Health Service
Director
Division of Health Assessment and Consultation

Enclosures

cc:
Lori Simmons, ADH

Appendix E: On-Site Photos

A pile of aluminum dross material left on the Red River Aluminum site before clean up began (pre-remediation).

Completed on-site landfill surrounded by chain link fence after final clean up (post-remediation).