Final Report

Frisco Blood Lead Testing
FRISCO, COLLIN COUNTY, TEXAS

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TEXAS
Department of
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Purpose and Health Issues

The Texas Department of State Health Services (DSHS) Environmental and Injury Epidemiology and Toxicology Unit (EIET) conducted blood lead screening for residents living in the Frisco area. The blood lead test results, presented in this report, were compared to those previously obtained from the general United States (US) population, the Texas population, and from people living in Frisco, Texas. A full list of the acronyms and abbreviations used in this report are included in Appendix A, tables are presented in Appendix B, and information about lead is provided in Appendix C.

Background

In 2008, the Environmental Protection Agency (EPA) lowered the National Ambient Air Quality Standard for lead which resulted in a portion of Frisco, Texas, being identified as a non-attainment zone; the concentration of lead in air from this zone is predicted to be above the new standard. The designation of this zone as non-attainment caused concerns among local residents about exposures to lead. In response to these concerns and with funding provided by the Texas Commission of Environmental Quality (TCEQ), DSHS collected blood samples from Frisco area residents and analyzed them for lead.

Blood Lead Screening

Although children are at greatest risk for blood lead poisoning, this blood lead screening effort was offered both to children and adults. A flyer with the dates, times, and location of the clinic were distributed to over 100 local child care facilities and the local school district. The City of Frisco also distributed flyers and it was posted on local websites and advertised through the media. Parents were encouraged to bring their children for testing.

Blood Sampling

The blood collection clinic was held at the George A. Purefoy Municipal Center in Frisco, March 24 through 27, 2011. Public health nurses from Collin County and DSHS Region 2/3 assisted with the blood draws.

Each participant signed an informed consent which outlined the purpose of the testing; the procedures involved; the expected time commitment; any reasonably foreseeable risks or discomforts; potential benefits to the participant or to others; how their information will be kept confidential; and who they could contact with any questions or concerns regarding the consent form or the specimen collection procedures.

Blood samples were collected using validated procedures and materials to assure that the reported results were not biased by contamination or loss. Venous blood samples were collected from participants by a public health nurse who placed the blood into 2 mL (milliliter) Vacutainer® K2 EDTA 3.6 mg (milligrams) tubes (“purple top tubes”). For infants and people from whom a venous sample could not be collected, capillary blood samples were collected by fingerstick into Becton Dickinson (BD) Microtainer® 250-500 µL (microliter) tubes. Blood samples were examined for acceptable volume and transported to the DSHS Clinical Chemistry Laboratory in Austin, Texas. All samples meeting laboratory standards were analyzed for lead using a graphite furnace atomic absorption spectrophotometer.

Participants were mailed their individual blood lead test results along with an explanation of their results.

Data Analysis Procedures

The purpose of the blood lead screening effort was to provide people with information about the level of lead in their blood. We compared each individual's test result both to the standard blood lead level of concern set by the Centers for Disease Control and Prevention (CDC), and to the blood lead levels seen in the general US population, as reported in the CDC's National Health and Nutrition Examination Survey (NHANES). NHANES provides information about the health, nutrition, and exposure status of children and adults across the United States.

We also compared the March 2011 testing results of children to historical results in the DSHS Texas Child Lead Registry (TCLR) for Frisco and the rest of the state. The DSHS TCLR collects and maintains blood lead test results for all Texas children tested under the age of 15.

Results and Discussion

Blood Lead Results

From March 24 through March 27, 2011, DSHS collected blood samples from 621 participants, 13 (2%) of which were rejected for not meeting laboratory standards[1]. The rejection of a sample by the laboratory has no relationship to the amount of lead that may be in the sample. Statewide approximately 2%-3% of samples collected are rejected for not meeting laboratory standards. Summary results for the remaining 608 blood samples are presented in Table 1.

Of the 608 blood samples tested by the DSHS laboratory, 575 (95%) did not contain detectable levels of lead (i.e., were reported as less than 2 micrograms of lead per deciliter of blood [µg/dL]). All children were found to have blood lead levels of less than 10 µg/dL (CDC's level of concern for children), and less than five[2] adults had levels that equaled or exceeded 10 µg/dL. Because adults are less sensitive to the harmful effects from lead than children, the CDC and the United States Department of Health and Human Services (DHHS) recommend that adult blood lead levels should be lower than 25 µg/dL. The highest blood lead level measured in an adult was 15 µg/dL.

According to NHANES most people have some lead in their bodies. Of the 608 people tested in Frisco, 594 (98%) had blood lead levels consistent with those found in people in their respective age groups throughout the United States. Eight adults and less than 5 children had blood lead levels less than 10 µg/dL but higher than 95% of the people in their age group as reported in NHANES. It is important to note that having a blood lead level greater than the 95th percentile as

[1] DSHS offered retesting for those participants whose blood sample was rejected by the laboratory.
[2] Counts of 1 to 4 are expressed as less than 5 to protect confidentiality.

reported in NHANES does not mean that the people with these levels will experience harmful effects.

While the data fluctuate from year to year, over the last 10 years the data for Frisco compared favorably to that of Texas. Frisco had a lower percentage of children with blood lead levels 10 µg/dL or greater, a lower percentage of children with blood lead levels between 2 and 10 µg/dL, and a greater percentage of children with blood lead levels less than or equal to 2 µg/dL (Table 2).

Limitations

This report reflects the results of the current blood lead screening effort which by themselves cannot be used to determine the source of lead in any specific individual. Information also was provided comparing blood lead data from NHANES as well as historic blood lead information contained in the TCLR.

The blood lead collection clinic was open to all Frisco residents, including current residents, former residents, and people who work in Frisco but reside elsewhere. Thus, these data only are representative of those people who came in to be tested and may not be representative of the City of Frisco as a whole or of those who live in the predicted non-attainment area.

Data maintained in the TCLR includes all children who have had a blood lead test in Texas. While blood lead testing is recommended for all children, testing is required for children enrolled in Medicaid or who live in targeted high risk areas based on zip code. Therefore, many of the children listed in the TCLR are likely to be at greater risk for exposure to lead.

Data in the TCLR includes both capillary and venous sample results and while capillary test results can be accurate, improper cleaning of the skin surface prior to collection can result in an overestimate of the blood lead level.

Conclusions

All adult and child blood lead levels were below their respective CDC levels of concern. The results of this blood lead screening are consistent both with national and state data where the majority of people had blood lead levels less than 2 µg/dL. There were 8 adults and less than 5 children who had levels below 10 µg/dL but higher than the level found in 95% of the people in their age group measured in the national survey. For adults, levels below 10 µg/dL are probably not of concern. However, for children, evidence continues to accrue that commonly encountered blood lead concentrations, even those less than 10 µg/dL, may impair cognition, and that a threshold for this effect has not been identified. In 2007, CDC's Advisory Committee on Childhood Lead Poisoning Prevention recommended that clinicians consider more frequent rescreening of children found to have blood lead levels approaching 10 µg/dL.

Recommendations

As recent literature suggests that blood lead levels below 10 µg/dL might affect a child's physical and mental development, children with blood lead levels approaching 10 µg/dL should have more frequent blood lead screenings. People concerned about exposure to lead should follow standard precautions for reducing exposure to lead. More information about reducing exposure to lead can be found at http://www.dshs.state.tx.us/epitox/education.shtm.

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Appendix A: Acronyms and Abbreviations

BD	Becton Dickinson
CDC	Centers for Disease Control and Prevention
DHHS	Department of Health and Human Services
DSHS	Department of State Health Services
EIET	Environmental and Injury Epidemiology and Toxicology Unit
EPA	Environmental Protection Agency
mg	milligrams
µg/dL	micrograms per deciliter
mL	milliliters
µL	microliters
NHANES	National Health and Nutrition Examination Survey
TCEQ	Texas Commission on Environmental Quality
TCLR	Texas Child Lead Registry
US	United States

Appendix B: Tables and Figures

Table 1. Summary of blood lead sample results collected from 608[a] Frisco area residents.

Age Group	Number Tested	Range (µg/dL)	Number of Detects	US Population Comparison Value (µg/dL)[b]	Number above US Population Comparison Value	Number above CDC Health-Based Level of Concern[c]
1-5 years	69	<2 – 9	<5[d]	4.10	<5	0
6-11 years	98	<2 – 7	<5	2.50	<5	0
12-19 years	54	<2 – 4	<5	1.90	<5	0
20+ years	387	<2 – 15	26	3.90	10	0

[a] Of the 621 participants, 13 blood samples were rejected for not meeting laboratory standards.

[b] Comparison Value was obtained from the NHANES, as presented in the Fourth National Report on Human Exposure to Environmental Chemicals and represents the 95[th] percentile by age group for survey years 2007-2008. Having a blood lead level higher than the comparison value does not mean that there will be actual harm; it only indicates that the person had a greater exposure to lead than most people.

[c] The CDC considers a blood lead level of 10 µg/dL to be elevated for children. The CDC and the DHHS recommend that adult blood lead levels should be less than 25 µg/dL.

[d] Counts of 1 to 4 are expressed as <5 to protect confidentiality.

Table 2. Summary statistics of blood lead data from the Texas Child Lead Registry (2001 to 2010, combined).

Geographic Area	Less than or equal to 2µg/dL	Greater than 2 µg/dL and less than 10 µg/dL	Greater than or equal to 10 µg/dL
Texas	63%	36%	1.3%
Frisco	71%	28%	1.1%

Appendix C: Lead

Lead is a naturally occurring heavy metal. It usually exists in the environment with two or more other elements to form a lead compound. Lead compounds are used as a pigment in paint, dyes, and ceramic glazes and in caulk. However, the amount of lead used in these products has been reduced over the years. Lead can be combined with other metals to form lead alloys, which are commonly found in pipes, storage batteries, weights, ammunition, cable covers, and sheets used for blocking radiation. The use of lead in ammunition and fishing sinkers also is being reduced. Lead was previously used in gasoline as an additive to increase octane ratings. However, this use was phased out in the United States in the 1980s, and beginning January 1, 1996, lead was banned for use in gasoline for motor vehicles.

Most lead used today is obtained from recycled lead-acid batteries. Other lead used in industry comes from mined ores (Alaska and Missouri in the United States) and recycled scrap metal. Although lead occurs naturally in the environment, most of the high levels found throughout the environment are the result of human activities. Over the last 300 years, environmental lead levels have increased over 1,000-fold due to human activities. Prior to banning the use of leaded gasoline, most environmental lead came from vehicle exhaust. The greatest increase in environmental lead over the last three centuries (which occurred between 1950 and 2000) was attributed to the increased use (worldwide) of leaded gasoline. Other environmental sources of lead include releases from mining lead and other metals and from factories that make or use lead, lead compounds, or lead alloys. Weathering and chipping of lead-based paint from buildings and other structures also contributes to lead contamination in soil.

Very small lead particles in the atmosphere can travel long distances. Lead is removed from the atmosphere by rain and by particles falling to the earth. Lead deposited onto soil sticks strongly to soil particles and remains in the upper layer of soil. Lead may enter rivers, lakes, and streams when soil particles are moved by rainwater. Lead stuck to soil and sediment remains for many years, and typically does not move into groundwater.

Lead is commonly found in soil near busy highways, railways, older houses, mining areas, industrial sites, landfills, and hazardous waste sites. People may be exposed to lead by breathing air, drinking water, eating foods, or swallowing dust or soil that contain lead. Skin contact with lead occurs daily, and inexpensive costume jewelry can contain high levels of lead. However, not much lead enters the body through the skin. Other potential exposures to lead include some hobbies, home remedies, hair and cosmetic products, occupational exposures, and home renovation that removed lead-based paint.

Lead that gets into the body via inhalation enters the lungs and moves quickly to other parts of the body. Most of the lead that gets into the body comes through swallowing, either by the ingestion of food or water that contain lead or by inhaling particles that are too large to get into the lungs. The amount of lead that is absorbed by the body through ingestion depends on the age of the person and when they ate their last meal. Children absorb about half of the ingested lead. Adults who have not eaten in a day and are exposed to lead absorb more lead than those who had recently eaten. Although lead does not pass through the skin easily, lead on the surface of the skin can be accidentally ingested when people eat, drink, smoke, or apply cosmetics.

Lead that gets into the body travels in the blood to soft tissues and organs. After several weeks, most lead moves into bones and teeth. Lead can stay in the bones for decades, but may be released back into the bloodstream during pregnancy and periods of breastfeeding, after a bone is broken, and during advancing age.

Health effects related to exposure to lead are the same, regardless of the exposure route. For both adults and children, the main target for lead toxicity is the nervous system. Long-term, occupational exposure to lead has been linked to decreased performance in tests that measure nervous system function. Weakness in fingers, wrists, or ankles also is associated with sufficiently high lead exposure. Exposure to very high levels of lead can cause brain and kidney damage in adults and children, and may lead to death. It can also cause miscarriages in pregnant women and damage to organs responsible for sperm production in men.

There is no conclusive proof that lead is a human carcinogen. Kidney tumors have developed in mice and rats exposed to high levels of lead compounds. The Department of Health and Human Services view lead and lead compounds as reasonably anticipated to be human carcinogens, the Environmental Protection Agency has determined that lead is a probable human carcinogen, and the International Agency for Research on Cancer has determined that inorganic lead is probably carcinogenic to humans. The International Agency for Research on Cancer also has determined that organic lead compounds are not classifiable as to their carcinogenicity in humans based on inadequate evidence from studies in humans and animals.

Exposure to lead can cause learning disabilities and behavioral problems, as well as more severe effects at higher doses such as seizures, coma, and death. Although the Centers for Disease Control and Prevention recommends public health actions be taken when a child's blood lead level exceeds 10 µg/dL, recent literature suggests that blood lead levels below 10 µg/dL might affect a child’s physical and mental development.

Reference: Agency for Toxic Substances and Disease Registry. Toxicological Profile for Lead. U.S. Department of Health and Human Services. Agency for Toxic Substances and Disease Registry. August 2007.