

An Open Letter to the Community of Saline County

November 8, 2016

Dear Community Member,

This letter summarizes an investigation by the Kansas Department of Health and Environment (KDHE). This investigation was undertaken in response to routine surveillance which identified a number of Saline County children with elevated blood lead levels.

Background

In late February 2016, during routine surveillance and monitoring of elevated blood lead levels in children throughout the state, it was noted that Saline County had a number of elevated children for whom in depth investigations had not been performed to identify the source of the lead exposure. In response to this finding, KDHE developed an investigation design that entailed: 1) determining whether the elevated cases were geographically clustered in any particular part of the county, 2) reviewing environmental data collected by KDHE to assess the potential for county-wide air and soil contamination, 3) testing finished drinking water samples at each child's home for lead contamination, 4) interviewing families to gather information on potential sources of lead exposure, 5) collecting wipe samples to look for lead contamination at the homes, and 5) where needed, collecting soil samples near homes.

Contaminants of concern, possible routes of exposure, and potential health effects

Lead is found throughout our environment. It is a naturally occurring bluish-gray metal found in small amounts in the Earth's crust. A good amount of lead in our environment comes from human activities including burning fossil fuels, mining, and manufacturing. In the United States, the most common source of exposure for lead-poisoned children is lead-based paint while the majority of adult cases are workplace-related.

Most of the lead that enters a body is through ingestion, for example, through eating contaminated food, water or lead containing paint chips. In general, if adults and children swallow the same amount of lead, a bigger proportion of the amount swallowed will enter the blood in children than in adults. Children absorb about 50% of ingested lead.

Some of the lead that enters a body comes from breathing in dust or chemicals that contain lead. Once the lead gets into the lungs, it moves quickly to other parts of the body through blood. Larger particles that are too large to get into the lungs can be coughed up and swallowed.

Dust and soil that contain lead may get on the skin, but only a small portion of the lead will pass through skin and enter the blood if it is not washed off. However, a person can accidentally swallow lead that is on the hands when eating drinking, smoking, or applying cosmetics.

Shortly after lead gets into the body, it travels in the blood to the "soft tissues" and organs (such as the liver, kidneys, lungs, brain, spleen, muscles, and heart). After several weeks, most of the lead moves into bones and teeth. Some of the lead can stay in the bones for decades; however, some lead can leave the bones and reenter the bloodstream and organs under certain circumstances (for example, during pregnancy and periods of breast feeding, after a bone is broken, and during advancing age).

The body does not change lead into any other form. Once it is taken in and distributed to the organs, the lead that is not stored in bones leaves the body through urine and feces. About 99% of the amount of lead taken into the body of an adult will leave as waste within a couple of weeks, but only about 32% of the lead taken into the body of a child will leave the body as waste.

When a person is exposed to lead, many factors will determine whether or not they experience health effects. These factors include the dose (how much), the duration (how long), and how (route of exposure) the person came in contact with the lead. Other factors such as other chemical exposures, age, sex, diet, family traits, lifestyle, and general state of health will also affect whether or not a person experiences health effects. The health effects of lead exposure include intellectual and behavioral deficit in children and hypertension and kidney disease in adults.

Children are an especially high risk population because their brains are still developing, they absorb more lead than adults, they have different diets from adults (for example, some infants may primarily get their nutrition from formula and if this formula is made with lead contaminated water, then this will have an impact on their lead levels), longer lifespan (more years to accumulate lead exposure), and high risk behaviors (for example, putting contaminated objects in their mouths and chewing on window sills painted with lead-based paint).

Results of investigation

KDHE investigated 32 children ages 0 to 15 years tested between January 1, 2015 and March 31, 2016 whose test results showed elevated blood lead levels of 5 micrograms per deciliter (ug/dL) or greater. For the purposes of this investigation, children with either an elevated capillary or elevated venous test were included. Meaning, children with an elevated result after taking a finger stick (capillary sample) and collecting blood on filter paper were considered a case, even though the filter paper test is technically a screening test which needs confirmation from a more accurate test. The test results from a venous sample which is drawn from the vein is considered a more accurate and confirmatory test.

To assess whether the elevated cases were geographically clustered in any particular part of the county, each child's residential address at the time that their blood sample was taken was geocoded and plotted on a map of Saline County. Not surprisingly, the majority of the cases were located in Salina, which is where the majority of children in Saline County live. The cases were not geographically clustered in any particular part of the city. The mapping also looked at all testing results for Salina to see if physicians were only testing children in a particular part of the city. The mapping showed that doctors are testing evenly across the city.

The review of air monitoring and soil sampling data collected by KDHE does not show county-wide, or city-wide, contamination in either air or soil. The amount of lead in the air is routinely monitored as part of enforcing the National Ambient Air Quality Standards. A soil study was conducted by KDHE in 2010 to evaluate lead concentrations in soil samples collected from property adjacent to the north and downwind of a battery manufacturing plant. Results of the KDHE soil study identified one of 24 soil samples contained a total lead concentration exceeding the *Residential Risk Based Standard for Kansas (RSK)* level of 400 milligram/kilogram (mg/kg). The soil sample was collected approximately ten feet north of the property boundary. The sample analysis identified a total lead concentration of 410 mg/kg. The area exceeding the Residential RSK level for lead was subsequently excavated in 2014 to levels below the Residential RSK. An additional KDHE soil study was completed in 2011. Four soil samples were collected north and downwind of the battery manufacturing facility, two soil samples were collected south and upwind from the facility and one soil sample was collected to the east and side-gradient of the facility. Total lead concentrations in the seven soil samples collected did not exceed the Residential RSK for lead.

During the last week of June and the first week of July, 2016, KDHE contacted each family with one or more children with elevated blood lead levels and offered free finished drinking water testing. Twenty-one households, representing 23 children with elevated levels (71.9%), participated in the water testing. Of those 21 households, 19 had no detectable lead levels in their drinking water. The remaining 2 households had very low levels, both at 1 microgram per liter ($\mu\text{g/L}$ or 1 part per billion) of lead detected. The Environmental Protection Agency's established action level for lead in drinking water is 15 $\mu\text{g/L}$.

On June 22nd and 23rd, 2016 the Saline County Health Department held a blood lead screening clinic. During this two-day clinic, the health department screened 323 children and adults ages 6 months and older. One of the aims of the clinic was

to identify any additional elevated blood lead children to include in the KDHE investigation. Of the 323 people screened, only one result came back elevated with a result between 5 ug/dL and 10 ug/dL. Saline County Health Department recommended that a confirmation sample from a venous draw be taken. A confirmatory test result was not received and the child was not included in the KDHE investigation.

During the month of July, 2016, KDHE contacted each family to schedule an in-person interview to gather information on potential sources of lead exposure. Of the 32 Saline County children with elevated blood lead levels, the families of 16 children (50%) agreed to the in-person interview. The families of 4 of the children declined to participate in the investigation and the families of 12 did not respond to numerous contact attempts.

During the interviews, each family was asked when their home was built. The year that a home is built is important because the majority of homes built before 1978 were painted using lead-based paint. Lead-based paint for residential use was not banned until 1978. Parents of 15 out of 16 children knew when their home was built; 11 of the 15 children (73.3%) live in homes built before 1978.

Parents or close relatives of 5 of the 16 children, as well as 2 additional children whose parents declined to participate in the investigation, work in an occupation where they are exposed to lead (7 out of 18 children; 38.9%). Parents of 7 out of the 16 children investigated (43.8%) participate in a hobby where they are exposed to lead. Examples of hobbies included target practice, making lead bullets, using lead solder, and car/motorcycle repair. When parents or other adults work in occupations or have hobbies where they are exposed to lead, they potentially expose children if they do not take precautions to limit the spread of lead into homes and other areas where children live and play. When asked whether children are held before showering after working at jobs or participating in hobbies where the adult is exposed to lead, of the 9 children that had parents or other guardians that participated in a job or hobby where there was a potential to bring lead exposure home, 5 out of the 9 (55.6%) said that they hold children before showering. The families of all 16 children (100%) reported that they do not separate work and hobby clothes when doing laundry.

Because children can potentially ingest chipping lead-based paint or put items in their mouths that are contaminated by lead from paint or other sources, wipe samples were collected to look for lead contamination at the homes. The wipe sampling showed lead contamination in the homes of 11 out of the 16 children (68.8%).

Families were also asked whether there were bare soil areas where the child likes to play. Of the 15 responses, 10 children (66.7%) play in bare soil. Samples of the soil were tested for each child and of the 10 children that play in bare soil, sampling found 6 of the play sites (60%) contaminated with lead. The most common source of lead contamination in the soil was from chipping lead-based paint. Other sources included discarded car batteries and lead shot that were found near the play areas. Furthermore, during the interviews, parents of 9 out of 16 children (56.3%) indicated that their child does not wash his or her hands before eating.

Conclusions

The results of the investigation showed that, for the 16 elevated blood lead children in Saline County that we were able to investigate, the likely sources of lead exposure included contamination from deteriorating lead-based paint and take-home lead from parents' occupations and hobbies. A number of children were likely ingesting lead from playing in contaminated bare soil areas, as well as from contamination making its way in to homes.

Recommendations

The lead hazard that is created by deteriorating lead-based paint on windows and doors can be stabilized by properly preparing the surfaces and repainting with lead-free paint. This activity can potentially create a large amount of lead-contaminated dust, especially during the prep work. Extra precautions need to be taken by the homeowner or contractor to limit and contain the dust that is generated. For example, methods that should not be used include dry scraping or dry sanding, using an electric sander, grinder or planer that lacks a HEPA filtered dust collection system, burning with a heat gun or torch, water blasting or power washing, abrasive blasting, using chemical strippers that contain methylene chloride, and removal of dust and chips with a regular vacuum cleaner without a HEPA filter. For homeowners who choose to repaint themselves, some information on safe work procedures is available through the Environmental Protection Agency http://www.kshealthyhomes.org/download/RR_KDHE_Modded.pdf and the National Lead Information Center at 1-800-

424-LEAD (5323). All firms performing interim control or lead abatement activities must be certified by the State of Kansas. A list of lead abatement firms or renovation firms licensed in the State of Kansas can be found at <http://www.kshealthyhomes.org> or by calling (866) 865-3233.

The lead hazard created by contaminated soil is from the lack of ground covering and how easily accessible the contaminated soil is to children. There are multiple measures that can be taken to reduce the accessibility, such as applying mulch, grass seed or decorative rock. This temporary measure will not eliminate the lead contaminated soil but will help prevent children from accessing the contaminated soil. Another option is to remove and replace the soil with lead free soil. Precautions should be taken with this approach because of the potential to contaminate other areas with the lead-contaminated soil. Enclosure with concrete or asphalt is another permanent option to cover the bare soil.

There are a number of recommendations that can help minimize or eliminate take-home lead from jobs and hobbies. Preferably, adults should shower and wash their hair prior to coming home. If showers are unavailable, hands and faces should be washed at the worksite and the adult should shower as soon as they come home and before interacting with children. Lead contaminated work and hobby clothes should never be worn in the home or in the car. Work clothes should be kept separate from street clothes while at work or at the hobby site, in the car, and in the wash. Lead contaminated clothing should be stored in a plastic bag. Work and hobby clothes should be laundered separately from the rest of the family's clothes, and these clothes should be rinsed an extra time when washing. Other items, such as lunchboxes, tools, gloves, etc. can also become contaminated during work and hobbies and should not be brought in to the home. Where possible, for example with lunchboxes, disposal options should be used. Adults working or participating in hobbies where they are exposed to lead should always follow lead-safe work practices such as wearing personal protective equipment, using proper ventilation, and HEPA vacuums to clean up lead dust.

Sincerely,



Farah S. Ahmed, MPH, PhD
Environmental Health Officer
Bureau of Epidemiology and Public Health Informatics
Kansas Department of Health and Environment



D. Charles Hunt, MPH
State Epidemiologist and Director
Bureau of Epidemiology and Public Health Informatics
Kansas Department of Health and Environment

PC: Jason Tiller, Administrator, Saline County Health Department
Rick Brunetti, Director, KDHE Bureau of Air
Leo Henning, Director, KDHE Bureau of Environmental Remediation
Jaime Gaggero, Director, KDHE Bureau of Water
John White, Program Manager, KDHE Healthy Homes and Lead Hazard Prevention Program
John Mitchell, Director, KDHE Division of Environment
Gary Mason, Deputy Secretary for Environment, KDHE