ENVIRONMENTALLY SPEAKING

Peter Schwartzman

Get the lead out

L-E-A-D. What is it? Oh, everyone knows. Or do we? As a child, your first conscious awareness of lead was probably the black substance found in pencils. But soon enough you considered yourself learned when you came to find out that "lead" in pencils is really just graphite (actually it is a graphite and clay mixture). Later you became thoroughly confused when you learned that graphite and diamond have the same chemical formula, yet are so different visually and economically. To clarify some of these confusions consider that lead was used as a line writing tool all the way back to the Egyptians. But when graphite became the preferred writing filament in the mid-16th century, and chemistry had not yet sufficient discriminated graphite from lead (that was to come in 1779 by K.W. Scheele), people started calling graphite filled pencils, "leaded." Unfortunately, the confusion surrounding lead goes well beyond its associations with the pencil. A closer look at lead reveals some much more important issues as well.

Your first real contact with lead occurred before you used your first pencil or could even spell it. It is an element that entered your body when you were just an embryo and from that point on has affected you and your children in ways that you probably didn't even realize. For this reason, lead definitely deserves a closer look.

The use of lead throughout human history, from its discovery in Turkey some 8,000 years ago, is a story that could fill many book volumes. And from the earliest beginning of its use, it has been strongly associated with human suffering. Many have speculated that the Roman Empire fell in part due to the influences of lead poisoning largely because its wide use in items including face powder, paint, birth control (spermicide), wine preservative, and most importantly, plumbing pipes. In modern times, lead and lead derivatives can be found in paints, pipes, and gasoline. In fact, most homes in Galesburg likely have lead pipes or lead paint somewhere on their property and all the soil in the area still contains traces of lead emitted via vehicle exhaust, despite that the primary phaseout of leaded gasoline in the United States took place in 1986.

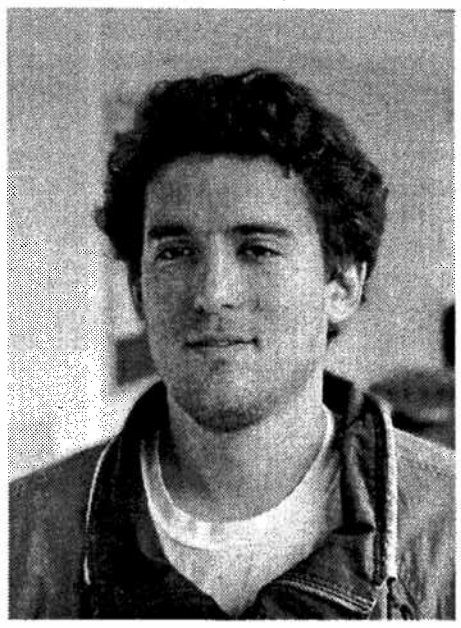
So lead is clearly present, but how is it so destructive and insidious? Surprisingly, in its elemental form (written Pb), lead isn't poisonous to humans! However, when lead comes in compound form (that is, when it reacts with another chemical) and becomes oxidized or dissolves, it can be deadly. (For the purposes of simplicity, for the remainder of this essay, "lead" will used in its most general sense, which includes all of the compounds in which it is commonly found.) Lead, which the human body has a hard time differentiating from calcium, disrupts bodily functions and accumulates in the bones and teeth. For example, lead, upon entering the bloodstream, is known to interfere with the production of hemaglobin and therefore in moderate concentrations can result in anemia. Lead is also associated with impairment of cognitive functions, kidney damage, high blood pressure, and adverse reproductive consequences. Most lead is also fat-soluable and therefore can find a home and do damage in the brain as well. In fact, even low lead levels in children have been found to be associated with learning disabilities and attention disorders. In fact, in the mid-1980's, it was estimated that ~17% of U.S. children has high lead levels and that poor and minority children were disproportionately affected; a recent report issued by the Knox County Health Department notes that 35 out of 138 (that is 25.4 percent) children recently tested showed excessive levels of lead in their blood. In this way, chronic lead exposure is not only a by-product of poverty but it is a condition that perpetuates the cycle of poverty generation after generation. The connection between lead and the propagation of poverty is potentially one of the major untold stories in modern America.

Another pernicious aspect of lead is that it accumulates in the body and can remain in the bone tissue for over 25 years. Everyone has a tolerance for very small quantities of lead, but the characteristic of lead to grow in concentrations over one's life makes almost all levels of exposure detrimental. Children, who are light in weight and who have higher frequency of intake due to their elevated hand-to-mouth activity, and pregnant mothers, who are obviously carrying developing embryos, are most susceptible to the effects of elevated lead levels. Making matters worse, lead doesn't have a unique smell or a "special" taste so a potential victim doesn't sense that it is in the water or soil and according to the Center for Disease Control, "most poisoned children have no [obvious] symptoms."

Despite the knowledge of its damaging effects, we continue to have lead in our local environment. Apparently, the Romans were also not ignorant of lead's potential harmful influences, but, they, similar to our attitude over the past century, considered the risks of using lead to be the price that had to be paid for all of its benefits. The difference is, in modern times, lead is not required; expect perhaps for nuclear containment shelters — given lead's characteristic ability to absorb high energy radiation. So if it isn't needed, why is it still so abundant in our local environs?

Although people have been poisoned by lead for centuries, lead concentrations in the global environment didn't become ubiquitous until 1923 when leaded gasoline went on sale in select American markets. According to Jamie Kitman, who has written an extremely comprehensive article on the subject, entitled, "The Secret History of Lead," (published in *The Nation*, March 20, 2000), General Motors and Du Pont were responsible for the doping of gasoline with tetraethyl lead for its supposed use as an "anti-knock" agent. Through many visible and "behind the scenes" efforts these two corporations were sufficiently powerful enough to create and control a market for tetraethyl lead that lasted in the U.S. for more than 50 years; amazingly "leaded" gasoline is still being sold by oil companies overseas, although the European Union banned its sale just last year. And for those fifty-plus years, despite incontrovertible knowledge implicating lead in a wealth of disabling health problems and despite strong evidence suggesting that tetraethyl lead didn't even work that effectively as an "anti-knock" agent, Americans breathed in lead dust from the emissions of vehicles and suffered from innumerable ailments for supposedly "unknown" reasons. Given the number of people the world over that were/are poisoned by lead, the case of tetraethyl lead is one of the most tragic tales in modern world history.

Gasoline, however, isn't the place Galesburgites, and other Americans, should look for lead today. (Missouri, our neighbor, is the leading state in the production of lead; thus our ties to lead are more immediate than most.) Currently the primary sources of lead nationally come from water pipes and paints. (Although in



heavily urbanized and near road environments, significant lead residue still remains.) Because of its malleable and ductile properties, lead pipes were very convenient for use during the formative stages of plumbing in Knox County. According to Larry Cox, Galesburg's Director of Public Works, no main pipes are composed of lead, but many service lines are. Galesburg's Water Department has been removing these service lines (some of which go back to the 1800s) at the request of residents; the city will pay for labor, the resident must pay for parts and plumbing fees. Lead-based paints were commonplace throughout the 1900s until they were banned in 1978. Thus, many homes still have it on their walls and ceilings. While some have painted over these older paints with new, leadless versions, anytime the paint begins to peel, lead exposure is a dangerous potential hazard.

At the present time, there are many strategies that local people can use to reduce their exposure and consumption of lead. First and foremost you should try to eliminate the sources, if possible. So, remove lead pipes in (or leading to) your residence, remove all peeling paint as soon as possible, and instruct your children not to consume paint, soil, dirt, or dust (that is, no more mudpies, sorry). (To determine if you have a lead service line or if you want to have your lead pipes removed, contact Lui Spinillo at 345-3649. The EPA also recommends that children get blood tests to determine their lead level.) However, if the sources cannot be eliminated immediately, there are several steps that residents can take to reduce lead exposure. First, it is wise to let tap water run until it reaches its coldest temperature before consuming it; usually 30 seconds to a 1 minute will do. There are two reasons you should let the tap water run: (1) Tap water that sits in lead pipes for six hours or more is likely to have the highest lead concentrations; and (2) The warmer the water, the more easily it has become contaminated by lead. Even if you don't have lead pipes, water that remains in any pipes too long (say 6 hours or so) may become lead contaminated because of lead soldering that is often present.

Locally, lead paint, according to Cyndi Johnson, the Knox County Health Department's Case Manager, appears to be the more problematic source of elevated childhood lead levels. Lead-based paints often have a sweet taste to them, so many small children find chewing on paint very inviting. Since the majority of homes in the Galesburg area still contain layers of lead, residents should consider removing paint residue as soon as it becomes apparent; areas of high activity, such as window sills and doorways are the most likely places to find it. Residents should take cracking or peeling paint very seriously and attempt to eliminate it carefully and responsibly. The EPA suggests that residents should consult a professional before trying to remove paint themselves, largely because in the removal process, tremendous amounts of hazardous lead dust can be produced. If the expense of a professional is prohibitive at this time, the Knox County Health Department has a very handy pamphlet which guides residents through the process of removing paint in a safe and effective manner; the pamphlet can be obtained by calling the Health Department at 344-2224. I can't stress how important it is for parents to take the extra time necessary to reduce the production of paint dust and thereby reduce lead exposure to their children.

The U.S. Environmental Protection Agency (EPA) provides many free documents on lead, I encourage you to visit the following websites for more information: http://www.epa.gov/iaq/pubs/lead.html and http://www.epa.gov/opptintr/lead/leadpbed.htm. If you don't have Internet access yet, then you can obtain such documents directly from the EPA at 1-800-424-LEAD (5323). The National Lead Information Center (1-800-LEAD-FYI) also provides a wealth of documents in Spanish as well as English.

Who would have thought that such a useful material could be responsible for so many problems over such a long period of time?

Peter Schwartzman, a resident of Galesburg since 1998, is chair of the Environmental Studies Program at Knox College, where he has been an assistant professor since his arrival. He is a research climatologist with several peer-reviewed publications in the area of climate change and human population growth.