# Health Effects of Lead Exposure

## Introduction

**Lead poisoning is the presence of too much lead in the body. Lead poisoning is one of the most common and preventable pediatric health problems in the United States today.**

Lead poisoning, particularly its negative impact on children during the early growth years, is a public health problem of continuing importance. As an understanding of the ramifications of lead poisoning has continued to evolve, public health advocates have pushed for legislation that has decreased the amount of lead in gasoline, residential paint, metal solder and plumbing components. As a result, few children suffer from the most serious effects of lead poisoning such as seizures, comas or death. However, a great deal of old leaded paint still exists in older housing, and thousands of children continue to be exposed to lower doses of lead that can result in subtle but serious health problems.

## Lead in the Body

**Lead is stored in the bone for decades, causing long-term internal exposure.**

Lead enters the body primarily through inhalation and ingestion of lead containing dust. Once in the body, lead travels in the blood to soft tissues such as the liver, kidneys, lungs, brain, spleen, muscles, and heart.

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 the bones is eliminated slowly from the body by the kidneys and gastrointestinal tract; negligible amounts of lead are lost through perspiration. About 99% of the amount of lead taken into the body of an adult will leave in the waste within a couple of weeks, but only about 32% of the lead taken into the body of a child will leave in the waste. (Barry 1975)

The half-life of lead varies from about a month in blood, 1-1.5 months in soft tissue, and about 25-30 years in bone (ATSDR 2007). Lead in bone is considered a biomarker of cumulative exposure because lead accumulates in bone over the lifetime and most of the lead body burden resides in bone. Some of the lead can stay in the bones for decades; however, some lead can leave the bones and reenter the blood and organs under certain circumstances, for example, during pregnancy and periods of breast-feeding, after a bone is broken, and during advancing age.

# Effects of Lead

**There is no biologic function or need for lead. There is no such thing as a "normal" lead level, only that level which we are willing to tolerate.**

Lead is a toxic substance that poses a variety of dangers for humans. Lead has been shown to affect virtually every organ and/or system in the body in both humans and animals. Young children and the developing fetus are particularly at risk. Lead damages the central and peripheral nervous system, the kidneys and the body's ability to regulate vitamin D. Lead negatively affects the formation of red blood cells. Very high levels of lead can cause seizures, coma and death. At lower levels of exposure, a child can suffer from developmental delay, lower IQ, hyperactivity, learning disabilities, behavioral problems, impaired hearing and stunted growth. Many of these effects are irreversible. Increasing the problem of lead poisoning is the fact that signs of lead poisoning are not always obvious. At low lead levels, a child may show no symptoms at all. Many children who are lead-poisoned look and act healthy. Sometimes the vague symptoms may be mistaken for other illnesses.

Young children, especially those under the age of 6, are at greatest risk for lead poisoning. Children explore their environment by putting their toys, hands and other objects in their mouths. Children may chew on painted windowsills, railings, furniture and toys. In addition, they spend a lot of time on the floor where sources of lead are likely to be found. Through normal play, they may eat lead that has come from deteriorating paint, paint chips, or dust. Young children also absorb lead more easily than adults. Up to 50% of the lead a child ingests can be absorbed, compared to only 10% in adults. Children also are not as efficient in eliminating the lead they have absorbed. When a child has an iron deficiency, lead is more easily absorbed from the gastrointestinal tract. Children have more trouble than adults in sequestering lead in the bones, so a larger fraction of any lead that might be present in the body is available to a child's targeted organs. A child's developing brain and central nervous system are more susceptible to the toxic effects of lead since the blood-brain barrier is not complete until approximately 36 months of age and during that time there is extensive neuron development. Many of these effects are irreversible.

Blood lead levels as low as 2 μg/dL may not cause distinctive symptoms but are associated with decreased intelligence and slower neurobehavioral development in the form of cognitive and language deficits. Many other effects can begin to occur at these low blood levels. Recent studies suggest that lead absorption is harmful at any concentration and that no safe level of lead exposure exists (Canfield et al. 2003; Lanphear et al. 2000, 2005b; Schwartz 1994; U.S. CDC 1991).

Absorption of lead increases with pregnancy. Pregnant women absorb up to 85% of the lead to which they are exposed. Research indicates that lead in pregnant women can cross the placenta, affecting children even before they are born. Maternal cord blood lead levels of 10 μg/dL to 15 μg/dL appear to be associated with an increase in premature births, reduced birth weight, decreased stature and inability to maintain steady posture. Studies show that babies exposed to lead before birth may have learning and behavior problems that can last a lifetime. High levels of lead exposure during pregnancy may cause harm to the fetus, including birth defects, brain damage, hearing loss or even death.

# References

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