BIOLOGICAL PROPERTIES OF LEAD

The absorption, distribution, and subsequent health effects of lead illustrate the basic principles of toxicology. Foremost is the sensitivity of children to the adverse effects of even low levels of lead exposure. There are many reasons that children are more sensitive to lead. Children are much smaller than adults and will receive a much higher dose by weight given the same exposure.

They also absorb lead at a higher rate: adults absorb only 5-10% of orally ingested lead, while children absorb approximately 50% and can absorb much more depending on nutrition. Both children and pregnant women absorb more lead because their bodies have a greater demand for calcium and iron. Lead substitutes for calcium and is thus readily absorbed, particularly if a diet is low in calcium and iron. Children in low-income families, who often have poor diets and live in older housing containing lead, are most vulnerable to the developmental effects of lead. The same is true for pregnant women, whose bodies need more calcium.

Lead distributes in several compartments within the body, each with a different half-life. When lead enters the bloodstream it attaches to red blood cells and has a half-life of about 25 days in blood. Lead readily crosses the placenta, thus exposing the developing fetus and fetal nervous system to lead. Lead is also stored in the muscle, where it has a longer half-life of about 40 days. Calcium requirements for children are high in part because of rapid bone growth. Lead readily substitutes for calcium and is stored in bone, which is visible in X-rays of children with very high lead exposure (fortunately this is very rare now, at least in the United States). In normal circumstances, bone turnover or half-life is very long, so the half-life of lead in the bone is about 20 years. However, if bone turnover is increased, the lead in the bone is mobilized into the blood. This can occur during pregnancy or in older women subject to osteoporosis.

We accumulate lead over a lifetime, but particularly when we are young, so that as adults our bone and teeth contain approximately 95% of the total lead in the body. As we shall see, the short half-life of lead in the blood made tooth lead levels an important indicator of childhood lead exposure and a vital marker to use in correlating exposure with developmental effects.

Source : http://www.toxipedia.org/display/toxipedia/Biological+Properties+of+Lead