

Still Treating Lead Poisoning After All These Years

Bruce Lanphear, MD

Twenty-five years ago, in a commentary published in *Pediatrics*, Drs Needleman and Jackson¹ asked whether we would still be treating lead poisoning in the 21st century. Unfortunately, despite considerable progress, our public health system is still failing to prevent children from being lead poisoned and the specter of lead poisoning continues to cast a shadow over the country: over 500 000 American children have a blood lead level of >5 µg/dL (>50 ppb); 23 million homes have 1 or more lead hazards; an unknown number of Americans drink water from lead service lines; and federal standards for lead in house dust, soil, and water fail to protect children.^{2,3} We have understandably focused on the plight of children in Flint, Michigan, but children in hundreds of other cities have blood lead levels higher than the children of Flint.⁴

Studying the impact of lead and other toxic chemicals, which are regularly found in the blood and body fluids of pregnant women and children,⁵⁻⁸ is only possible because technology was developed to measure them at extraordinarily low concentrations. The Centers for Disease Control and Prevention's (CDC) environmental health laboratories has been at the forefront of developing laboratory techniques to measure a vast array of chemicals, such as lead, mercury, bisphenol A, and polybrominated diethyl esters. Beginning in 1976, the CDC has measured the concentrations of chemicals in participants of the NHANES, which is a nationally representative sample of the US population.⁸

Lead was one of the first blood tests to be used in NHANES. The figure showing blood lead levels plummeting from 1976 to 1980, during the phase out of leaded gasoline, is among the most iconic figures in public health.⁹ Since then, children's blood lead levels have declined further because of the continued phase out of leaded gasoline and the ban on lead in paint, canned foods, and other consumer products.¹⁰ Unfortunately, as described by Caldwell et al,¹¹ the Clinical Laboratory Improvement Amendment for blood lead has not been updated since 1988, when blood lead levels >25 µg/dL (>250 ppb) were considered elevated. Not surprisingly, they found that many commercial laboratories were not able to achieve the accuracy and precision of blood lead analyses necessary for pediatricians to effectively manage lower blood lead test results typical for contemporary children.¹¹

As children's blood lead levels declined and the technology needed to measure minute quantities of lead in children's blood was developed, numerous teams of investigators from around the world found that exceedingly low concentrations of lead adversely impacted brain development.¹²⁻¹⁴ In 2012, the National Toxicology Program of the National Institutes of Health concluded that blood lead concentrations <5 µg/dL (<50 ppb) are linked with IQ decrements, diminished academic abilities, and elevated rates of attention-related behavior problems and problem behaviors, such as attention-deficit/hyperactivity disorder and conduct disorder.¹⁴ In that same year, the CDC reached the remarkable conclusion that there is

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“no safe level of lead in children’s blood.”¹⁵

Our failure to adopt or use existing technology is the primary reason for the ongoing epidemic: we have failed to promulgate scientifically based environmental standards for lead in housing, soil, and water; we have failed to deploy lead sampling tools to identify lead hazards before a child is exposed; and we have failed to eliminate recognized lead hazards and ban nonessential uses of lead. Predictably, pediatricians are still treating lead poisoning after all these years.

Moreover, we have failed to learn from the lead epidemic that low-level exposure to environmental chemicals can be toxic; we lean on old familiar ways. It shouldn’t be surprising that low concentrations of environmental contaminants can be toxic. The range of lead and other toxic chemicals that are routinely found in pregnant women and children (~50–300 ppb) is equivalent to the therapeutic window for some drugs, like methylphenidate.¹⁶ This is ironic because the chemical industry, which argues that the concentrations of lead and other toxic chemicals in the blood of pregnant women and children are too low to be of any consequence, gave rise to the pharmaceutical industry.¹⁷

Parents, pediatricians, and even scientists who study toxic chemicals cannot hope to keep up with the plethora of poisons that impact children. Children are regularly exposed to dozens, if not hundreds, of chemicals; most of them have not been tested for toxicity.^{5,18} Requiring industries to prove that chemicals are not toxic before they are put on the market or emitted by polluting industries is the only way to protect children. Unfortunately, this will not happen anytime soon. In 2016, Congress passed the Lautenberg Chemical Safety Reform Act that failed to enact regulations necessary to protect children’s

health. So pediatricians can expect to treat another generation of children who have been harmed by an array of insidious and largely untested toxic chemicals, even before the epidemic of lead poisoning has faded.

What should pediatricians do? The American Academy of Pediatrics Council on Environmental Health recommends greater emphasis on screening children’s environments to identify lead hazards before a child is poisoned, using tools to sample and test house dust, soil, or water for lead. Pediatricians can advocate for regulations to inspect and abate lead hazards in older housing before occupancy or during renovations, replace lead service lines, and ban the use of lead in aviation gas, wheel weight, and bullets.^{19,20} Pediatricians can also advocate for regulations to protect children from toxic chemicals as well as chemicals of unknown toxicity.⁵ Pediatricians are not trained in environmental health or compensated for advocacy, but it is unlikely that we will protect children from toxic chemicals until there is a concerted effort that involves pediatricians.

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ABBREVIATION

CDC: Centers for Disease Control and Prevention

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