PEDIATRIC MANAGEMENT OF BLOOD LEAD LEVELS LESS THAN 10 
UG/D: WHY IS THIS NECESSARY?

Introduction:

There is no safe level of lead in young children (CDC, 2007; AAP 2005; US EPA, 2006).

Recent studies have strengthened the evidence that children’s physical and mental development can be affected at blood lead levels (BLLs) below 10 ug/dl. This newsletter provides information on BLLs in this range relating to cognitive harm in young children.

Lead remains the most important pediatric environmental health problem that contributes to the burden of childhood disease in developed and developing countries alike. The costs associated with lead-associated morbidities are estimated to be in the billions of dollars. Deaths from lead intoxication, although rare, still occur. From a public health standpoint, a major concern is a possible ‘silent pandemic’ of neuro-developmental disorders resulting from children’s continuing exposure to low levels of lead (Bellinger, 2008).

Major Sources of Exposure:

The CDC and the American Academy of Pediatrics recommended that
preventive care for every child should include assessment of environmental history (see Appendix) and identification of the occupational lead exposure of household members (CDC, 2007). The major source of lead exposure in US children is lead-contaminated household dust from deteriorating lead-based paint. The extent of lead paint hazards on interior and exterior surfaces is associated with BLLs in children. Typically, lead contamination of water contributes less to a child’s lead burden than do home sources. Children also are exposed to non-housing lead sources (lead in foods, pottery, folk remedies, toys and cosmetics).

Lead based paint hazards are likely to be present in homes built before 1978. Homes of this age should be presumed either to have a lead hazard present or to contain intact lead-based paint unless a licensed lead inspector has determined otherwise. Lack of a deteriorated surface decreases the likelihood of lead-contaminated dust being present, but does not ensure its absence. Knowledge of housing age and dangers of lead-based paint provide an understanding for parents to recognize the relative safety of their home environment.

**Adverse Cognitive Outcomes At BLLs Less Than 10 ug/dl:**

Recent studies demonstrate that 10 ug/dl has no special biological significance with regard to neuro-development, suggesting that the current screening guideline is best interpreted as a risk management tool. Significant inverse associations have been reported in study cohorts in which most or all children had a blood lead level below 10 ug/dl and in some cohorts with a
mean as low as 1-2 ug/dl.

Not only do many studies support the existence of adverse effects below 10 ug/dl, but the rate of decline in IQ scores appears to be greater at blood lead levels below 10 ug/dl. In a pooled analysis of seven major prospective studies involving 1,333 children, a log-linear model, the functional form that best described the relationship, predicted a 9.2-point decline in IQ over the range of less than 1-30 ug/dl. Two-thirds of this decline (6.2 points) was predicted to occur in the range of less than 1-9.9 ug/dl, with an additional 1.9-point decline between 10 and 19.9 ug/dl and a 1.1-point decline between 20 and 30 ug/dl.

Lead-associated deficits have been reported in most domains of function, including verbal IQ, performance IQ, academic skills such as reading and mathematics, visual/spatial skills, problem-solving skills, executive functions (planning, organization), fine and gross motor skills, and memory and language skills. Recent studies have assessed the import of BLLs below 10 ug/dl on children’s success in meeting the challenges they meet in common settings such as school. In a cross-sectional study of 100 6-10-year-olds, children with blood lead levels of 5-10 ug/dl scored 5.9-8.7 points lower than children with levels of 1-2 ug/dl on academic skills such as word reading, reading comprehension, listening comprehension, math reasoning and math calculations. Similarly, in a study of Taiwanese 8-12-year-olds with a mean blood lead level of 5.5 ug/dl, significant inverse association were found on class ranking in Chinese, history and society, mathematics, and natural science. In Mexican first-graders, a supra-linear relationship was observed between blood lead level and
math achievement score, with the steepest decline evident among children with levels below 10 ug/dl. Among 8,600 fourth-grade students in North Carolina, inverse associations were found between blood lead levels as low as 2 ug/dl, measured between 0 and 5 years of age, and end-of-grade reading and mathematics achievement scores.

**BLL- Screening Strategies:**

The CDC and the American Academy of Pediatrics have recommended that health care providers conduct BLL tests for children enrolled in Medicaid and those identified as being at risk on the basis of the state or local screening plan or risk assessment process. *Federal policy requires that all children enrolled in Medicaid receive BLL-screening tests at 12 and 24 Months of age and that BLL screening be performed for children 36 to 72 months of age who have not been screened previously.* Despite this, BLL-screening rates for Medicaid-enrolled children have been low (<20 %) and in certain areas remain ~20 %. In 1997, the CDC requested that state and local health officials use local community-wide data (BLL prevalence, housing age, and poverty status) to develop plans for BLL screening for their jurisdictions and provide them to clinicians. These plans recommend either universal or targeted BLL screening (state and local screening plans are available at [www.cdc.gov/nceh/lead/grants/CPP%20Map.htm](http://www.cdc.gov/nceh/lead/grants/CPP%20Map.htm).

However, in certain local health departments such as those in Chicago, IL; New York, NY; and Philadelphia, PA, BLL screening is recommended at younger ages or more frequently. Those departments recommend BLL testing starting at 6 to 9 months of age in high-risk areas, BLL testing at more-frequent
intervals (every 6 months for children <2 years of age, or the provision of additional education and more rapid follow-up of BLL testing for children <12 months of age with BLLs of 6 to 9 ug/dL.

Roles of the Pediatric Health Care Provider (AAP, 2005; CDC, 2007):

The CDC and the AAP recommend that preventive management for every child should include risk assessments based on an environmental history and identification of occupational lead exposure and other possible sources of lead in a child’s environment (for New York State and New York City-based risk assessments, see the Appendix). Pediatric health care providers should:

1) Review office procedures and policies to ensure that lead exposure risk assessment or blood lead screening is performed on all children as required by state or local health officials or as recommended by the CDC.

2) Provide anticipatory guidance to parents of all young children regarding sources of lead and help them identify sources of lead in their child’s environment.

3) Perform a diagnostic blood lead test on all children suspected of having lead exposure or an elevated blood lead level and institute the recommended management guidelines if a child’s blood lead level increases to above 10 ug/dl.

4) Become informed about lead exposure prevention strategies of local or state health departments, and partner with public health agencies, community groups and parents to work toward establishing lead safe environments in homes and schools for all children and the reduction of exposure to lead from all sources.
Illustrative Bibliography:


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Risk Factors for Childhood Lead Exposure

Health care providers in New York State are required to assess every child from six months to younger than six years of age for risk of lead exposure. Children who have risk factors for lead poisoning should be tested. Risk factors include:

- Having a sibling or playmate with a high blood lead level
- Living in, or regularly visiting, an older home (built before 1960) or other location with peeling or damaged paint
- Living in, or regularly visiting, an older home (built before 1960) or other location that is being, or was, renovated within the last 12 months
- Having developmental delays
- Eating non-food items such as paint chips, crushed pottery or soil
- Moving to the United States from, or traveling to, a foreign country where lead poisoning may be common**
- Ingesting imported health remedies, cosmetics, spices, food or pottery
- Eating food prepared, served or stored using lead-glazed pottery
- Playing in bare soil near a heavily-traveled highway, bridge or elevated train where there is peeling paint
- Interacting with an adult whose job or hobby involves exposure to lead
- Being enrolled in Medicaid or the New York City Early Intervention Program

NYC DOHMH

If the answer to any of the questions above is YES, then the child should be considered to be at high risk of excessive lead exposure and should be screened with a blood lead test.
Lead Exposure Risk Assessment Questionnaire

- Preguntas sobre evaluación de riesgos (Spanish version)

In addition to the required screening at ages one and two, assessment of risk for high-dose lead exposure should be done at least annually for each child six months to six years of age. These questions serve as a risk assessment tool based on currently accepted public health guidelines. Children found to be at risk for lead exposure should receive a blood lead test whenever such risk is identified.

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<tr>
<th>Risk Assessment Questionnaire</th>
<th>Answer</th>
<th>Yes</th>
<th>No</th>
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<tbody>
<tr>
<td>1. Does your child live in or regularly visit a house/building built before 1978 with peeling or chipping paint, or with recent, ongoing or planned renovation or remodeling? Note: This could include a day care center, preschool, and the home of a babysitter or a relative.</td>
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<td>2. Has your family/child ever lived outside the United States or recently arrived from a foreign country?</td>
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<td>3. Does your child have a brother, sister, housemate or playmate being followed or treated for lead poisoning?</td>
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<td>4. Does your child frequently put things in his/her mouth such as toys, jewelry, or keys? Does your child eat non-food items (pica)? Note: This may include toys or jewelry products that have been specifically recalled by the Consumer Products Safety Commission (CPSC) due to identification of unsafe levels of lead.</td>
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<td>5. Does your child frequently come in contact with an adult whose job or hobby involves exposure to lead? Note: Jobs such as house painting, renovations, construction, welding or pottery making. Hobby examples are making stained glass or pottery, fishing, making firearms and collecting lead figurines.</td>
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<td>6. Does your child live near an active lead smelter, battery recycling plant, or another industry likely to release lead or does your child live near a heavily traveled major highway where soil and dust may be contaminated with lead? Note: May need to alert parent/caregiver if such an industry is local. Ask any additional questions that may be specific to situations in a particular community.</td>
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If the answer to any of the above questions is YES, then the child is considered to be at risk of high dose lead exposure and should be screened with a blood lead test.

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