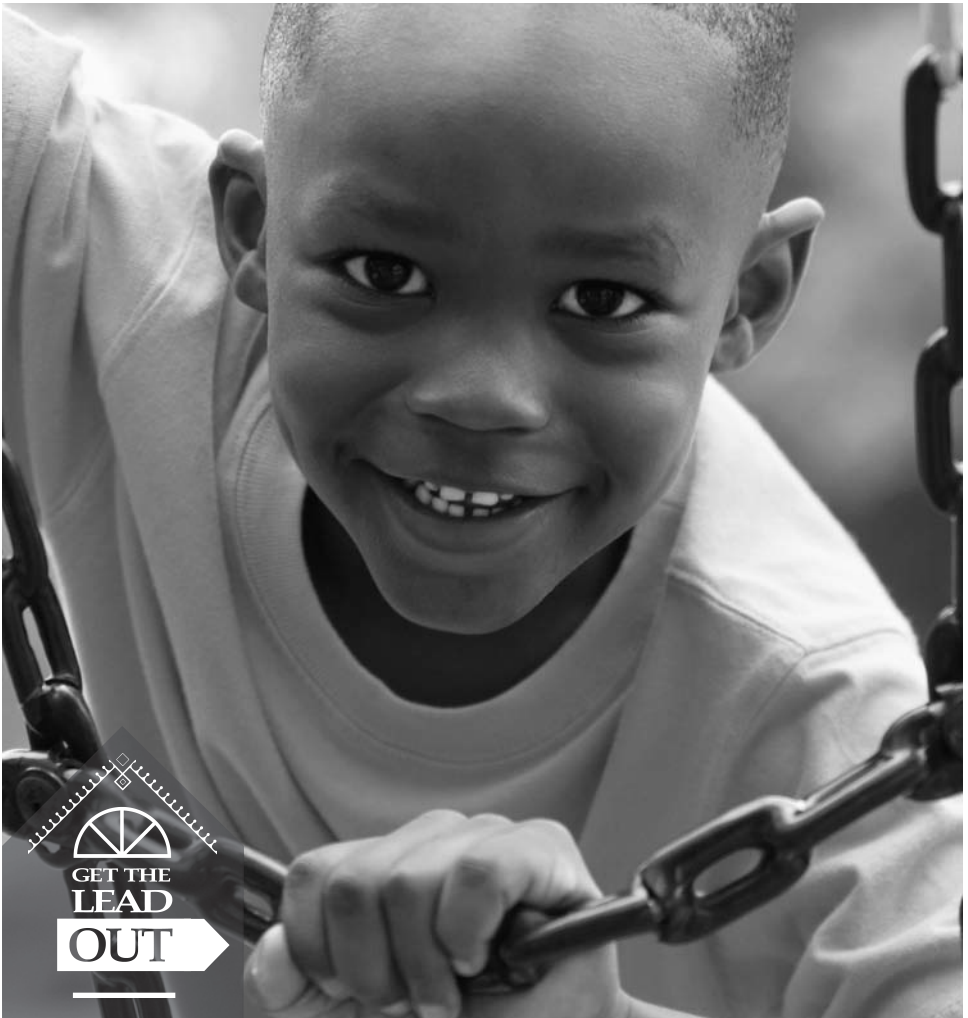




# Preventing and Screening for Childhood Lead Poisoning

A Reference Guide for Physicians and Health Care Providers





# Guidelines for Illinois Physicians and Health Care Providers

July 2008

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Illinois Lead Program  
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The Illinois Department of Public Health is providing you with these recommendations for lead risk assessment and blood lead screening. This document summarizes key guidelines and directs you to more detailed sources of information and related agencies.

Several dedicated pediatricians, child advocates and local health department staff participated in the development of this document. Their various backgrounds and interest in protecting Illinois children from the harmful effects of lead poisoning helped immensely with the development of this reference guide. Their input was vital and should help physicians and child advocates who treat young children.

# TABLE OF CONTENTS

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<b>Lead Poisoning Risks</b> . . . . .	<b>1 - 2</b>
The Risk of Lead Poisoning in Illinois Children . . . . .	1
Children at Highest Risk . . . . .	1
Transfer of Maternal Lead to the Fetus and Infant . . . . .	2
<b>Major Sources of Lead Poisoning</b> . . . . .	<b>2</b>
<b>Effects of Lead</b> . . . . .	<b>3</b>
Acute Symptoms of Lead Poisoning . . . . .	3
<b>Screening for Lead Poisoning</b> . . . . .	<b>4 - 8</b>
Under Illinois Law You Must Conduct Blood Lead Tests and Risk Assessments, as Appropriate . . . . .	4
Which Children are Required by Law to Have Blood Lead Tests? . . . . .	4
Which Children Could be Evaluated Using a Risk Assessment Questionnaire Only? . . . . .	5
Blood Lead Tests For Diagnostic Purposes . . . . .	5
Recommendations for International Adoptee and Refugee Children . . . . .	5
Blood Lead Sample Collection . . . . .	6
Follow-Up Blood Lead Testing . . . . .	6
Reporting Obligations . . . . .	7
Public Health Follow-Up Services . . . . .	8
Children's Proof of a Blood Lead Test or Risk Assessment Before Admission to a Child Care Facility or School . . . . .	8
Management of Children with Blood Lead Levels <10 µg/dL . . . . .	8
Preventive Counseling . . . . .	8
<b>Management of Elevated Blood Lead Levels</b> . . . . .	<b>9 - 14</b>
Medical Evaluation . . . . .	9
Education . . . . .	10
Treatment Recommendations Vary by Child's Blood Lead Level . . . . .	10
Chelation Cautions . . . . .	12
<b>Resources</b> . . . . .	<b>15 - 23</b>

# THE RISK OF LEAD POISONING IN ILLINOIS CHILDREN

Of approximately 297,000 Illinois children tested in 2007, 5,270 (1.8 percent) were reported to have an elevated blood lead level (defined as blood lead  $\geq 10$   $\mu\text{g}/\text{dL}$ )<sup>1</sup>. However, many children at risk for exposure, are not tested.

## CHILDREN AT HIGHEST RISK

- **Young children and those with persistent oral behaviors.**

The most common way for children to get lead into their body is by ingesting it. Frequent hand exposures to surfaces with lead-containing dust (e.g., crawling on the floor, playing at a window) and oral behaviors promote lead ingestion.
- **Children residing in older homes.**

Nationally, an estimated 25 percent of U.S. children younger than age 6 years live in a home where there is a lead hazard (defined as lead in an accessible condition, such as deteriorated lead-containing paint, or lead-contaminated dust or dirt).<sup>2</sup> Of homes built before 1940, an estimated 68 percent have a lead hazard; 43 percent of homes built between 1940 and 1959 have a lead hazard. Rental units where low-income families and young children reside are most likely to have a lead hazard.

  - In Illinois, 25 percent of homes were built before 1940 and 23 percent were built between 1940 and 1959.
  - In Chicago, 46 percent of homes were built before 1940 and 23 percent were built between 1940 and 1959.<sup>3</sup>
- **Children in low-income households**

Among Illinois children aged 12 to 72 months enrolled in Medicaid/ All Kids in 2006, 5 percent had a blood lead level  $\geq 10$   $\mu\text{g}/\text{dL}$ .
- **African-American and Hispanic children**

In Illinois, African-American children are three times more likely and Hispanic children are two times more likely to have an elevated blood lead level compared to white children.<sup>4</sup>
- **Children with low iron**

Absorption of lead increases in the low-iron state. Iron deficient children can absorb up to about 50 percent of the lead they ingest.

## **TRANSFER OF MATERNAL LEAD TO THE FETUS AND INFANT**

Lead is transferred to the fetus during pregnancy and to the infant through breast milk.<sup>5</sup> Adequate calcium intake during both pregnancy and lactation reduces maternal circulating lead somewhat (by about 10 percent) and, thus, can reduce transfer.<sup>6</sup> Breastfeeding has many beneficial effects, and it should be encouraged unless the mother's blood lead level is  $\geq 40 \mu\text{g}/\text{dL}$ .

Currently there are no requirements for testing of pregnant women for lead poisoning. Physicians and health care providers may recommend screening of pregnant women who are at risk due to current high-dose exposure. Pregnant women at highest risk for having an elevated blood lead level include: workers in several high-risk occupations; foreign-born recent immigrants; and those practicing high-risk behaviors, such as pica. Because lead persists for years in the body, the lead exposures may have occurred before pregnancy.

## **MAJOR SOURCES OF LEAD POISONING**

- Lead-based paint and lead-contaminated-dust in older homes
- Unsafe renovation or remodeling practices causing lead-contaminated dust (likely with scraping or sanding of paint containing lead)
- Outdoor exposures to soil or track-in of soil contaminated with lead (from past exterior paint deterioration, past use of leaded gasoline, deposition from past industrial emissions or industrial contamination)
- Specialty foods, such as imported Mexican candies and spices from various countries
- Imported food cans with lead solder seams (production banned in United States)
- Some traditional medicines or cosmetics
- Pottery with glazes containing lead
- Parental hobbies or occupations that involve exposures to lead
- Toys or other objects containing lead (medical provider judgment on a case-by-case basis) (Refer to page 22 for the American Academy of Pediatric's Web link and page 23 for CDC Web link for recalls)

- Water contamination from the corrosion of lead solder, pipes or fixtures. (On average, drinking water contributes to low levels of lead exposure and may be minimized by flushing waterlines, using cold water or using water filters. You may consult Environmental Protection Agency Safe Drinking Water Hotline, 1-800-426-4791, for more information).

You may obtain a fact sheet on the various sources of lead poisoning including specific hobbies and occupations by contacting the Illinois Lead Program.

## **EFFECTS OF LEAD**

No safe level of lead has been identified for children. Lead damages the developing brain and nervous system, leading to:

- Reduced cognitive potential and increased learning disabilities;
- Higher risk for behavior problems, including aggression and hyperactivity;
- Interference with red blood cell formation leading to anemia (at blood lead levels  $\geq 40 \mu\text{g/dL}$ ); and
- In its most advanced stages, seizures, coma and sometimes death.

## **ACUTE SYMPTOMS OF LEAD POISONING**

Despite experiencing the effects of lead on behavior and development, most children with elevated blood lead levels have no obvious acute symptoms. Symptoms of severe lead poisoning may include:

- Irritability
- Headaches
- Vomiting
- Seizures
- Anemia/fatigue
- Loss of appetite and/or weight loss
- Stomachaches and cramping/constipation

Since these symptoms are not specific to lead poisoning, rigorous risk assessment and blood lead testing are the only effective ways to detect lead poisoning.

## **UNDER ILLINOIS LAW YOU MUST CONDUCT BLOOD LEAD TESTS AND RISK ASSESSMENTS, AS APPROPRIATE**

The Illinois Department of Public Health has identified ZIP code areas in which children have an increased risk for exposure to lead due to higher percentages of older homes and low-income families (see Appendix A). Illinois law mandates that every physician and health care provider must obtain a blood lead measurement on children living in high-risk ZIP code areas.<sup>7</sup> Children living in low risk ZIP code areas must be assessed using the Childhood Lead Risk Assessment Questionnaire (see Appendix B) and those deemed at risk through the assessment process must receive blood lead testing as described below. (Refer to page 20 for web link to the Act). (See Appendix C, Assessment and Screening Algorithm on page 18).

### **WHICH CHILDREN ARE REQUIRED BY LAW TO HAVE BLOOD LEAD TESTS?**

- 1. CHILDREN ELIGIBLE FOR MEDICAID OR ALL KIDS HEALTH INSURANCE** are required to have a blood lead test at 1 and 2 years of age. If a child presents at ages 1 and 2 years with an unknown blood lead status, a blood lead level is required. For children ages 3 through 6 years, with unknown blood lead test status or increased lead exposure, a blood lead level is required.
- 2. CHILDREN LIVING IN HIGH-RISK ZIP CODE AREAS (REGARDLESS OF THEIR ELIGIBILITY FOR MEDICAID/ALL KIDS)** are required to have a blood lead test at ages 1 and 2 years. If a child presents at ages 1 and 2 years with unknown blood lead status, a blood lead level is required. For children ages 3 through 6 years, with an unknown blood test status or increased lead exposure, a blood lead level is required.
- 3. ALL CHICAGO CHILDREN ARE CONSIDERED TO LIVE IN A HIGH RISK ZIP CODE.** Because of higher rates of elevated blood lead levels in Chicago, Chicago children age 3 years and younger should have a blood lead test at 6, 12, 18, 24 and 36 months OR at 9, 15, 24 and 36 months. (Refer to page 23 for Web link to Chicago lead screening guidelines.) Children aged 4 through 6 years with past blood lead levels  $<10 \mu\text{g}/\text{dL}$  should have an annual risk assessment. A blood lead test should be performed if risk for exposure increases or if the child has persistent oral behaviors.



## **WHICH CHILDREN COULD BE EVALUATED USING A RISK ASSESSMENT QUESTIONNAIRE ONLY?**

- 1. ASSESSMENT OF CHILDREN LIVING IN LOW-RISK ZIP CODE AREAS** should start by using the Illinois Lead Risk Assessment Questionnaire (available by contacting the Department or by selecting “L” [for lead] at [www.idph.state.il.us](http://www.idph.state.il.us) under heading A – Z Topics List to locate the questionnaire in the Lead Forms section), which has been developed for annual use, particularly to determine the need for blood lead testing at ages 1 and 2 years and to evaluate changes in exposures to lead for older children.
- 2. CHILDREN WITH ANY QUESTIONNAIRE RESPONSE** answered “YES” or “DON’T KNOW,” need a blood lead test at approximately ages 1 and 2 years. If past blood lead tests are known and are  $<10 \mu\text{g}/\text{dL}$ , additional blood lead testing at ages 3 and older is not needed unless risk for exposure to lead has increased.

## **BLOOD LEAD TESTS FOR DIAGNOSTIC PURPOSES**

A blood test is indicated at any time for:

- Children with known or suspected exposures to lead;
- Young children (ages 0 through 6 years) having a sibling with an elevated blood lead level; and
- Older children with developmental delay and unknown blood lead status.

## **RECOMMENDATIONS FOR INTERNATIONAL ADOPTEE CHILDREN**

These children should have a blood lead test upon entering the United States. (Additional testing and medical care related to blood lead results should adhere to state and local policies and laws, as above).

## **RECOMMENDATIONS FOR REFUGEE CHILDREN**

- 1.** All refugee children 6 months to 16 years of age must be tested within 90 days of entry to the United States.<sup>8</sup> Pre-existing health conditions such as malnutrition, and iron deficiency, along with cultural, language, and economic barriers may increase refugee children’s risk for exposures to lead.
- 2.** For ALL refugee children aged 6 months to 6 years, repeat the blood lead test three to six months after the child is in a permanent residence. Repeat testing of older children with initial blood lead levels  $<10 \mu\text{g}/\text{dL}$  may be warranted by assessments of risks for exposure to lead.

Further information on blood lead screening and management for this population can be obtained from the Department. Health education material in many languages is available on the CDC Web site. (Refer to page 22 for Web link).

## BLOOD LEAD SAMPLE COLLECTION

- Venous blood samples analyzed at a licensed laboratory are most reliable.
- Blood collected via finger stick can be used for screening. Environmental contamination can be minimized if proper collection technique is followed. Elevated finger stick tests require confirmation. A venous sample analyzed at a licensed laboratory is the preferred confirmation method.
- For parents who refuse venous confirmation or for children who are a difficult stick, two finger stick capillary tests conducted within 90 days analyzed at a licensed laboratory can be considered confirmatory.
- Filter paper sampling is used by some providers. Elevated results need confirmation using a method other than filter paper collection. Filter paper lead results may be less accurate in children with anemia.

## FOLLOW-UP BLOOD LEAD TESTING

If there is reason to believe that the blood lead level may rise rapidly, follow-up testing sooner than that presented in Table 1 may be indicated. Timing of additional testing is based on medical and environmental assessments and follow-up test results.

**Table 1. Follow-up testing**

<b>If result is:</b>	<b>Perform test in: *</b>
1 – 4 µg/dL	As recommended by guidelines
5 – 9 µg/dL	Consider testing sooner than screening guidelines suggest based on risks (see following NOTE)
10 – 19 µg/dL	1 – 3 months
20 – 44 µg/dL	1 week – 1 month
45 – 59 µg/dL	48 hours
60 – 69 µg/dL	24 hours
70 µg/dL or above	Immediately

*\*See the Centers for Disease Control and Prevention (CDC) treatment and case management recommendations: **Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention, U.S. Dept. of Health and Human Services, Public Health Service, March 2002.** (Refer to page 20 for Web link) <sup>9</sup> To obtain a printed copy of the new Case Management document, you may call (toll-free) 888-232-6789.*

**NOTE:** If there is a BLL of 5 – 9 µg/dL, consideration should be given to repeating the blood lead test sooner than the screening guidelines, especially for a child aged <2 years (blood lead is likely to be on the rise in this age group), or if testing was done in winter or spring, (when blood lead results are generally lower).

## **REPORTING OBLIGATIONS**

**Directors of private laboratories** that perform blood lead analyses are required by Illinois law to report **all results to the Illinois Department of Public Health, INCLUDING LEVELS BELOW 10 µg/dL.** (Refer to page 19 for Web link to law).<sup>10</sup> This includes all blood lead tests analyzed in medical office laboratories. **NOTE:** All tests at all blood lead levels must be reported to the Department along with child identifying information.

Every physician, health care provider, nurse, hospital administrator or public health officer who has verified information of any child’s blood lead result is required to report this information to the Department lead program. Providers using the Department Lab are not required to report blood lead tests processed at that laboratory.

Check with your laboratory regarding their reporting status. About 20 percent of blood lead results sent by laboratories to the Department have insufficient information to identify the child’s home address, or even the county in which the child lives. Child identifying information is needed for home evaluation and nurse case management. When in doubt, report.

Reports should be made to the Illinois Lead Program Reporting system:  
Phone: 217-782-3517      Fax: 217-557-1188

- A blood lead fax reporting form is available at:  
[http://www.idph.state.il.us/envhealth/pdf/Blood\\_Lead\\_Test\\_Result.pdf](http://www.idph.state.il.us/envhealth/pdf/Blood_Lead_Test_Result.pdf)
- BLL ≥10 µg/dL must be reported within 48 hours.
- Results <10 µg/dL must be reported within 30 days of the end of the month in which the test was performed.

## **PUBLIC HEALTH FOLLOW-UP SERVICES**

Follow-up and case management services are provided for children throughout Illinois. Some local health departments also offer free or low cost blood lead testing. Contact your local health department if you have questions regarding follow-up services. Contact the Illinois Lead Program or your local health department for more information.

## **CHILDREN NEED PROOF OF A BLOOD LEAD TEST OR RISK ASSESSMENT BEFORE ADMISSION TO A CHILD CARE FACILITY OR SCHOOL**

Under Illinois law, a parent or guardian of any child between the ages of 6 months through 6 years is required to provide certification from a physician or health care provider that his or her child has been screened (a blood lead test) or received an annual assessment for lead exposures in accordance with Illinois guidelines (using the Lead Risk Assessment Questionnaire) before that child may be admitted to a licensed day care center, day care home, preschool, nursery school, kindergarten or other licensed child care facility. This statement must be provided prior to admission and subsequently in conjunction with required physical examinations. See the Illinois Lead Poisoning Prevention Act. (Refer to page 20 for Web link).

## **MANAGEMENT OF CHILDREN WITH BLOOD LEAD LEVELS <10 µg/dL**

Environmental assessment and counseling is a necessary and recommended part of all health maintenance visits.

Lead education handouts are **available for FREE** through Illinois Department of Public Health's Web address or by contacting the Department toll free at 866-909-3572. Parent handouts to assess risk for exposure to lead and to recommend ways to reduce exposures also can be downloaded from the city of Chicago Web link. (Refer to page 23 for Web link).

## **PREVENTIVE COUNSELING SHOULD FOCUS ON:**

- Effects of lead
- Sources of lead exposure
- Methods to reduce exposures to lead (Be sure to caution families that special procedures and training are needed before disturbing paint containing lead. They can contact their local health department for further advice.)

- Ensuring iron sufficiency to reduce absorption of ingested lead and promoting healthy nutritional status including adequate calcium intake
- Educating families about ways to identify sources of lead in their home and their child's environment

For recommendations from the CDC Advisory Committee on Lead Poisoning Prevention, clinicians should read *Interpreting and Managing Blood Lead Levels <10 µg/dL in Children and Reducing Childhood Exposures to Lead*,<sup>11</sup> which is available at: <http://www.cdc.gov/MMWR/preview/mmwrhtml/rr5608a1.htm>.

## MANAGEMENT OF ELEVATED BLOOD LEAD LEVELS

Medical management services for children with elevated BLLs fall into four categories:

- Medical evaluation and repeat testing
- Education
- Social services referral to assist in obtaining other needed services or the family
- Referral/coordination with the local health department

### 1. MEDICAL EVALUATION

- **CONFIRM AND MONITOR BLOOD LEAD LEVELS WITH SERIAL TESTING, AS INDICATED**
- **Clinical history**, including clinical symptoms, oral behaviors, nutritional and iron status, family history of lead poisoning, and previous blood lead test results
- **Environmental history**, including exposures/sources of lead (in the home and other places where the child spends time) and occupational histories of adults in the household
- **Developmental screening**, with further evaluations as needed
- **Evaluation of nutritional status**, particularly to identify and address iron insufficiency

Serial blood lead measurements should be interpreted appropriately. Laboratories are allowed to be within  $\pm 4 \mu\text{g/dL}$  or 10 percent of an expected value, whichever is greater. Thus, a change of  $5 \mu\text{g/dL}$  or more may represent a change in exposures. Some laboratories can achieve a proficiency of  $\pm 2 \mu\text{g/dL}$ .

## 2. EDUCATION

- Advise families to identify and address sources of lead for their child. Families can contact their local health department for advice.
- Caution families never to disturb lead paint surfaces themselves without first being trained to do this safely. While repairs are made, **the entire family should be out of the home until thorough post-repair cleanup is completed.** Contractors trained and licensed to perform repairs are available in many areas. Some local health departments provide lead hazard training to property owners to conduct safe repairs. Unsafe disturbance of lead-containing paint can increase the potential for exposures to lead.

## TREATMENT RECOMMENDATIONS VARY BY CHILD'S BLOOD LEAD LEVEL

A list of available treatments is shown in Table 2.

For a full discussion of **treatment recommendations for children with elevated blood lead levels**, clinicians should read *Managing Elevated Blood Lead Levels Among Young Children* (chapter 3), a CDC publication. (Refer to page 20 for Web link or to order).

Table 2. Chelation Agents

Product Name	Generic Name	Chemical Name	Abbreviation
Calcium Disodium Versenate	Edetate disodium calcium	Calcium disodium ethylenediamine tetra acetate	CaNa <sub>2</sub> EDTA
BAL in Oil	Dimercaprol	2, 3-dimercapto-1-propanol	BAL
Chemet	Succimer	Meso 2, 3-dimercaptosuccinic acid	DMSA

**Table 3. Treatments by Blood Lead Level**

Blood Lead Level	Treatment Recommendations
<p>BLL 10-14 µg/dL and</p>	<ul style="list-style-type: none"> <li>• Medical evaluation</li> <li>• Monitor BLLs every three to six months or more often, as indicated</li> <li>• Screen for iron deficiency</li> <li>• Provide education and information for source identification and avoidance</li> <li>• Ensure that all blood lead test results are reported to Illinois Department of Public Health</li> <li>• Refer to public health department for environmental investigation and public health nurse visit as mandated by local regulations. All Illinois children aged 36 months and younger with confirmed blood lead levels in this range are to receive a home inspection</li> </ul>
<p>BLL 15-19 µg/dL</p>	<ul style="list-style-type: none"> <li>• Above actions, plus:</li> <li>• Monitor BLLs every one to three months or more often, as indicated</li> </ul>
<p>BLL 20-44 µg/dL</p>	<ul style="list-style-type: none"> <li>• Medical evaluation</li> <li>• Monitor BLLs monthly until stable and falling and lead hazards have been identified and remediated, then can lengthen testing intervals</li> <li>• Screen for iron deficiency</li> <li>• Provide education and information for source identification and avoidance</li> <li>• Ensure that all blood lead test results are reported to the Department</li> <li>• Refer to local health department for environmental investigation and public health nurse visit</li> <li>• Refer to latest CDC and American Academy of Pediatrics recommendations related to chelation management</li> </ul>
<p>BLL 45-69 µg/dL</p>	<ul style="list-style-type: none"> <li>• Above actions, plus:</li> <li>• Succimer (oral, 350 mg/m<sup>2</sup>/dose) or CaNa<sub>2</sub>EDTA (IV, 1000 mg/m<sup>2</sup>/day x 5 days, in divided doses)</li> <li>• Abdominal radiograph to check for lead chips, evacuate bowel as needed</li> <li>• Hospitalize, as necessary to ensure lead-safe environment and medical management</li> <li>• Do not start iron therapy if on CaNa<sub>2</sub>EDTA</li> <li>• Hospitalize if acute symptoms are present and monitor BLLs</li> </ul>

Blood Lead Level	Treatment Recommendations
BLL $\geq 70$ $\mu\text{g}/\text{dL}$	<ul style="list-style-type: none"> <li>• Hospitalize and monitor BLLs</li> <li>• Abdominal radiograph to check for lead chips, evacuate bowel as needed</li> <li>• Begin management with BAL (IM, BAL 450 mg/m<sup>2</sup>/day, Q4 hours, x up to three days; four hours after a first BAL dose initiate CaNa<sub>2</sub>EDTA therapy - rationale CaNa<sub>2</sub>EDTA transiently increases blood lead levels, while BAL does not</li> <li>• Stop BAL when blood lead level <math>&lt; 50</math> <math>\mu\text{g}/\text{dL}</math></li> <li>• CaNa<sub>2</sub>EDTA for five days by continuous infusion or in divided doses</li> <li>• Ensure adequate hydration</li> <li>• Monitor urine for heme</li> <li>• A minimum of two weeks between courses is recommended, unless more prompt treatment is indicated</li> <li>• Do not start iron therapy if on CaNa<sub>2</sub>EDTA</li> </ul>
SYMPTOMATIC CHILDREN	<ul style="list-style-type: none"> <li>• Above with these modifications:</li> <li>• Use BAL, as above x three days and CaNa<sub>2</sub>EDTA 1500 mg/m<sup>2</sup>/day x five days</li> <li>• Interrupt therapy for two days and repeat treatment, as necessary</li> </ul>

## CHELATION CAUTIONS

Contact your local or state lead poisoning prevention program, local poison control center, or Illinois Department of Public Health with questions. A child with an elevated blood lead level and signs or symptoms consistent with encephalopathy should be chelated in a center capable of providing appropriate intensive care services.

The appropriate level at which to initiate chelation therapy and which drugs are most appropriate is controversial. A double-blinded, randomized, controlled trial of up to three 26-day courses of Succimer treatment of young children with blood lead  $< 45$   $\mu\text{g}/\text{dL}$  lowered their blood lead, but failed to improve their neurodevelopmental test scores. (Refer to page 21 for Web link).

Chelation therapy is addressed in an American Academy of Pediatrics, 1995 document on pharmaceutical agents in the treatment of lead poisoning.<sup>12</sup> (Refer to page 21 for Web link).



## Succimer (Chemet)

The Food and Drug Administration has approved Succimer for use in lead poisoned children with blood lead levels  $\geq 45 \mu\text{g}/\text{dL}$ . Succimer (Chemet) is an oral chelating agent which lowers blood lead levels. The drug's specificity for lead substantially reduces the risk of essential mineral depletion associated with conventional parenteral chelating agents.

**Indications and Usage** - Succimer is indicated for the treatment of lead poisoning in children with blood levels  $\geq 45 \mu\text{g}/\text{dL}$ . An active, ongoing reduction in exposures to lead should always accompany use of Succimer.

**Dosage and Administration** - Dosage should begin at  $350 \text{ mg}/\text{m}^2$  per dose orally three times daily for five days. The dose should then be reduced to  $350 \text{ mg}/\text{m}^2$  per dose two times daily for an additional two weeks. Doses based on administration of  $10 \text{ mg}/\text{kg}$  dose results in substantial under-dosing for most young children. The total length of a single treatment course is 19 days. Succimer is in capsule form (100 mg) containing beads. The capsule can be separated and the beads mixed with food or fruit juice drinks for young children who cannot swallow the capsule whole. The beads have a "rotten egg" sulfur odor due to the presence of the sulfhydryl moieties in the molecular structure.

**Side Effects** - Adverse effects have been reported in very few instances. The most common are gastrointestinal symptoms and rash.

**Monitoring Parameters** - Baseline and post-chelation therapy blood lead concentrations are, of course, important parameters to follow in patients being treated with Succimer. An expected rebound in blood lead after one 19-day course of Succimer is to 78 percent of the baseline level, due to redistribution of body stores of lead. Repeat testing is recommended within seven to 21 days, until the blood lead levels are stable. A two-week interval between courses is recommended unless the clinical condition indicates a need for more rapid intervention. Succimer chelates are excreted in urine; therefore, adequate hydration is essential. In the succimer chelation trial elevations of liver enzymes and blood count abnormalities were similar in placebo and drug treatment groups.<sup>13</sup>

### **Post Chelation Follow-Up:**

Recheck blood lead levels seven to 21 days after treatment. Determine if retreatment is necessary. Then, follow the evaluation schedule for elevated blood lead levels as shown on Table 1.

In children who received chelation therapy, repeat hospitalization and treatment with BAL and CaNa<sub>2</sub>EDTA are indicated if the blood lead concentration rebounds to  $\geq 70 \mu\text{g}/\text{dL}$  or if symptoms are present. When the rebound level is  $< 70 \mu\text{g}/\text{dL}$  and there are no symptoms, treatment with Succimer can be considered.

Do not discharge a child from the hospital until a lead safe environment can be assured. For some children, appropriate alternative housing is necessary while all lead hazards in his/her home or elsewhere are being controlled and eliminated. Lead-safe housing (usually with friends or relatives) where the child can live with his/her family during the entire abatement/remediation process through clean up should be identified.

Blood lead levels may remain elevated for prolonged periods. The expected time for 50 percent of children with a blood lead level of 25-29  $\mu\text{g}/\text{dL}$  to reach a blood lead level  $< 10 \mu\text{g}/\text{dL}$  is 24 months.

Children with past elevated blood lead levels need monitoring and may need referrals for further evaluation and services. For any questions, concerns or for referrals to speak with medical doctors with experience in the treatment of lead poisoned children, please contact Illinois Department of Public Health at 217-782-3517.

# APPENDIX A

## PEDIATRIC LEAD POISONING HIGH-RISK ZIP CODE AREAS

<b>Adams</b>	<b>Champaign</b>	<b>De Witt</b>	<b>Fulton</b>	<b>Henry</b>	<b>Knox</b>
62301	61815	61727	61415	61234	61401
62320	61816	61735	61427	61235	61410
62324	61845	61749	61431	61238	61414
62339	61849	61750	61432	61274	61436
62346	61851	61777	61441	61413	61439
62348	61852	61778	61477	61419	61458
62349	61862	61882	61482	61434	61467
62365	61872		61484	61443	61474
		<b>DeKalb</b>	61501	61468	61485
<b>Alexander</b>	<b>Christian</b>	60111	61519	61490	61489
62914	62083	60129	61520		61572
62988	62510	60146	61524	<b>Iroquois</b>	
	62517	60550	61531	60911	<b>Lake</b>
<b>Bond</b>	62540		61542	60912	60040
62273	62546	<b>Douglas</b>	61543	60924	
	62555	61930	61544	60926	<b>La Salle</b>
<b>Boone</b>	62556	61941	61563	60930	60470
61038	62557	61942		60931	60518
	62567		<b>Gallatin</b>	60938	60531
<b>Brown</b>	62570	<b>DuPage</b>	62934	60945	61301
62353		60519		60951	61316
62375	<b>Clark</b>		<b>Greene</b>	60953	61321
62378	62420	<b>Edgar</b>	62016	60955	61325
	62442	61917	62027	60966	61332
<b>Bureau</b>	62474	61924	62044	60967	61334
61312	62477	61932	62050	60968	61342
61314	62478	61933	62054	60973	61348
61315		61940	62078		61354
61322	<b>Clay</b>	61944	62081	<b>Jackson</b>	61358
61323	62824	61949	62082	62927	61364
61328	62879		62092	62940	61370
61329		<b>Edwards</b>		62950	61372
61330	<b>Clinton</b>	62476	<b>Grundy</b>		
61337	62219	62806	60437	<b>Jasper</b>	<b>Lawrence</b>
61338		62815	60474	62432	62439
61344	<b>Coles</b>	62818		62434	62460
61345	61931		<b>Hamilton</b>	62459	62466
61346	61938	<b>Effingham</b>	62817	62475	
61349	61943	None	62828	62480	<b>Lee</b>
61359	62469		62829		60553
61361		<b>Fayette</b>	62859	<b>Jefferson</b>	61006
61362	<b>Cook</b>	62458		62883	61031
61368	All Chicago	62880	<b>Hancock</b>	Jersey	61042
61374	ZIP Codes	62885	61450	62030	61310
61376	60043	<b>Ford</b>	62311	62063	61318
61379	60104	60919	62313		61324
	60153	60933	62316	<b>Jo Daviess</b>	61331
<b>Calhoun</b>	60201	60936	62318	61028	61353
62006	60202	60936	62321	61075	61378
62013	60301	60946	62330	61085	
62036	60302	60952	62334	61087	<b>Livingston</b>
62070	60304	60957	62336		60420
	60305	60959	62354	<b>Johnson</b>	60460
<b>Carroll</b>	60402	60962	62367	62908	60920
61014	60406	61773	62373	62923	60921
61051	60456		62379		60929
61053	60501	<b>Franklin</b>	62380	<b>Kane</b>	60934
61074	60513	62812		60120	61311
61078	60534	62819	<b>Hardin</b>	60505	61313
	60546	62822	62919		61333
<b>Cass</b>	60804	62825	62982	<b>Kankakee</b>	61740
62611		62874		60901	61741
62618	<b>Crawford</b>	62884	<b>Henderson</b>	60910	61743
62627	62433	62891	61418	60917	61769
62691	62449	62896	61425	60954	61775
	62451	62983	61454	60969	
		62999	61460		
	<b>Cumberland</b>		61469	<b>Kendall</b>	
	62428		61471	None	
			61480		

## APPENDIX A (continued)

### PEDIATRIC LEAD POISONING HIGH-RISK ZIP CODE AREAS

<b>Logan</b>	<b>McDonough</b>	<b>Peoria</b>	<b>St. Clair</b>	<b>Vermilion</b>	<b>Woodford</b>
62512	61411	61451	62201	60932	61516
62518	61416	61529	62203	60942	61545
62519	61420	61539	62204	60960	61570
62548	61422	61552	62205	60963	61760
62543	61438	61602	62220	61810	61771
62635	61440	61603	62289	61831	
62643	61470	61604	Saline	61832	
62666	61475	61605	62930	61833	
62671	62374	61606	62946	61844	
				61848	
<b>Macon</b>	<b>McHenry</b>	<b>Perry</b>	<b>Sangamon</b>		
62514	60034	62832	62625	61857	
62521		62997	62689	61865	
62522	<b>McLean</b>		62703	61870	
62523	61701	<b>Piatt</b>		61876	
62526	61720	61813	<b>Schuyler</b>	61883	
62537	61722	61830	61452		
62551	61724	61839	62319	<b>Wabash</b>	
	61728	61855	62344	62410	
<b>Macoupin</b>	61730	61929	62624	62852	
62009	61731	61936	62639	62863	
62033	61737				
62069	61770	<b>Pike</b>	<b>Scott</b>	<b>Warren</b>	
62085		62312	62621	61412	
62088	<b>Menard</b>	62314	62663	61417	
62093	62642	62323	62694	61423	
62626	62673	62340	<b>Shelby</b>	61435	
62630	62688	62343	62438	61447	
62640	<b>Mercer</b>	62345	62534	61453	
62649	61231	62352	62553	61462	
62672	61260	62355		61473	
62674	61263	62356	<b>Stark</b>	61478	
62685	61276	62357	61421		
62686	61465	62361	61426	<b>Washington</b>	
62690	61466	62362	61449	62214	
	61476	62363	61479	62803	
<b>Madison</b>	61486	62366	61483		
62002		62370	61491	<b>Wayne</b>	
62048	<b>Monroe</b>			62446	
62058	None	<b>Pope</b>	<b>Stephenson</b>	62823	
62060		None	61018	62843	
62084	<b>Montgomery</b>		61032	62886	
62090	62015	<b>Pulaski</b>	61039	White	
62095	62019	62956	61044	62820	
	62032	62963	61050	62821	
<b>Marion</b>	62049	62964	61060	62835	
None	62051	62976	61062	62844	
	62056	62992	61067	62887	
<b>Marshall</b>	62075		61089		
61369	62077	<b>Putnam</b>		<b>Whiteside</b>	
61377	62089	61336	<b>Tazewell</b>	61037	
61424	62091	61340	61564	61243	
61537	62094	61363	61721	61251	
61541	62538		61734	61261	
		<b>Randolph</b>		61270	
<b>Mason</b>	<b>Morgan</b>	62217	<b>Union</b>	61277	
62617	62601	62242	62905	61277	
62633	62628	62272	62906	61283	
62644	62631		62920		
62655	62692	<b>Richland</b>	62926	<b>Will</b>	
62664	62695	62419		60432	
62682		62425		60433	
	<b>Moultrie</b>			60436	
<b>Massac</b>	61937	<b>Rock Island</b>			
62953		61201		<b>Williamson</b>	
	<b>Ogle</b>	61236		62921	
	61007	61239		62948	
	61030	61259		62949	
	61047	61265		62951	
	61049	61279			
	61054			<b>Winnebago</b>	
	61064			61077	
	61091			61101	
				61102	
				61103	
				61104	

## APPENDIX B

### Illinois Department of Public Health Childhood Lead Risk Assessment Questionnaire

ALL CHILDREN 6 MONTHS THROUGH 6 YEARS OF AGE MUST BE ASSESSED FOR LEAD POISONING  
(410 ILCS 45/6.2)

Name \_\_\_\_\_ Today's Date \_\_\_\_\_

Age \_\_\_\_\_ Birthdate \_\_\_\_\_ ZIP Code \_\_\_\_\_

**Respond to the following questions by circling the appropriate answer.**

**R E S P O N S E**

- |   |     |    |            |
|---|-----|----|------------|
| 1. Is this child eligible for or enrolled in Medicaid, Head Start, All Kids or WIC?   | Yes | No | Don't Know |
| 2. Does this child have a sibling with a blood lead level of 10 mcg/dL or higher?   | Yes | No | Don't Know |
| 3. Does this child live in or regularly visit a home built before 1978?   | Yes | No | Don't Know |
| 4. In the past year, has this child been exposed to repairs, repainting or renovation of a home built before 1978?  | Yes | No | Don't Know |
| 5. Is this child a refugee or an adoptee from any foreign country?  | Yes | No | Don't Know |
| 6. Has this child ever been to Mexico, Central or South America, Asian countries (i.e., China or India), or any country where exposure to lead from certain items could have occurred (for example, cosmetics, home remedies, folk medicines or glazed pottery)?  | Yes | No | Don't Know |
| 7. Does this child live with someone who has a job or a hobby that may involve lead (for example, jewelry making, building renovation or repair, bridge construction, plumbing, furniture refinishing, or work with automobile batteries or radiators, lead solder, leaded glass, lead shots, bullets or lead fishing sinkers)? | Yes | No | Don't Know |
| 8. At any time, has this child lived near a factory where lead is used (for example, a lead smelter or a paint factory)?  | Yes | No | Don't Know |
| 9. Does this child reside in a high-risk ZIP code area?   | Yes | No | Don't Know |

**A blood lead test should be performed on children:**

- with any "Yes" or "Don't Know" response
- living in a high-risk ZIP code area

All Medicaid-eligible children should have a blood lead test at 12 months of age and at 24 months of age. If a Medicaid-eligible child between 36 months and 72 months of age has not been previously tested, a blood lead test should be performed.

If there is any "Yes" or "Don't Know" response; and

- there has been no change in the child's living conditions; and
- the child has proof of two consecutive blood lead test results (documented below) that are each less than 10 mcg/dL (with one test at age 2 or older), a blood lead test is not needed at this time.

Test 1: Blood Lead Result \_\_\_\_\_ mcg/dL Date \_\_\_\_\_ Test 2: Blood Lead Result \_\_\_\_\_ mcg/dL Date \_\_\_\_\_

If responses to all the questions are "NO," re-evaluate at every well child visit or more often if deemed necessary.

\_\_\_\_\_  
Signature of Doctor/Nurse

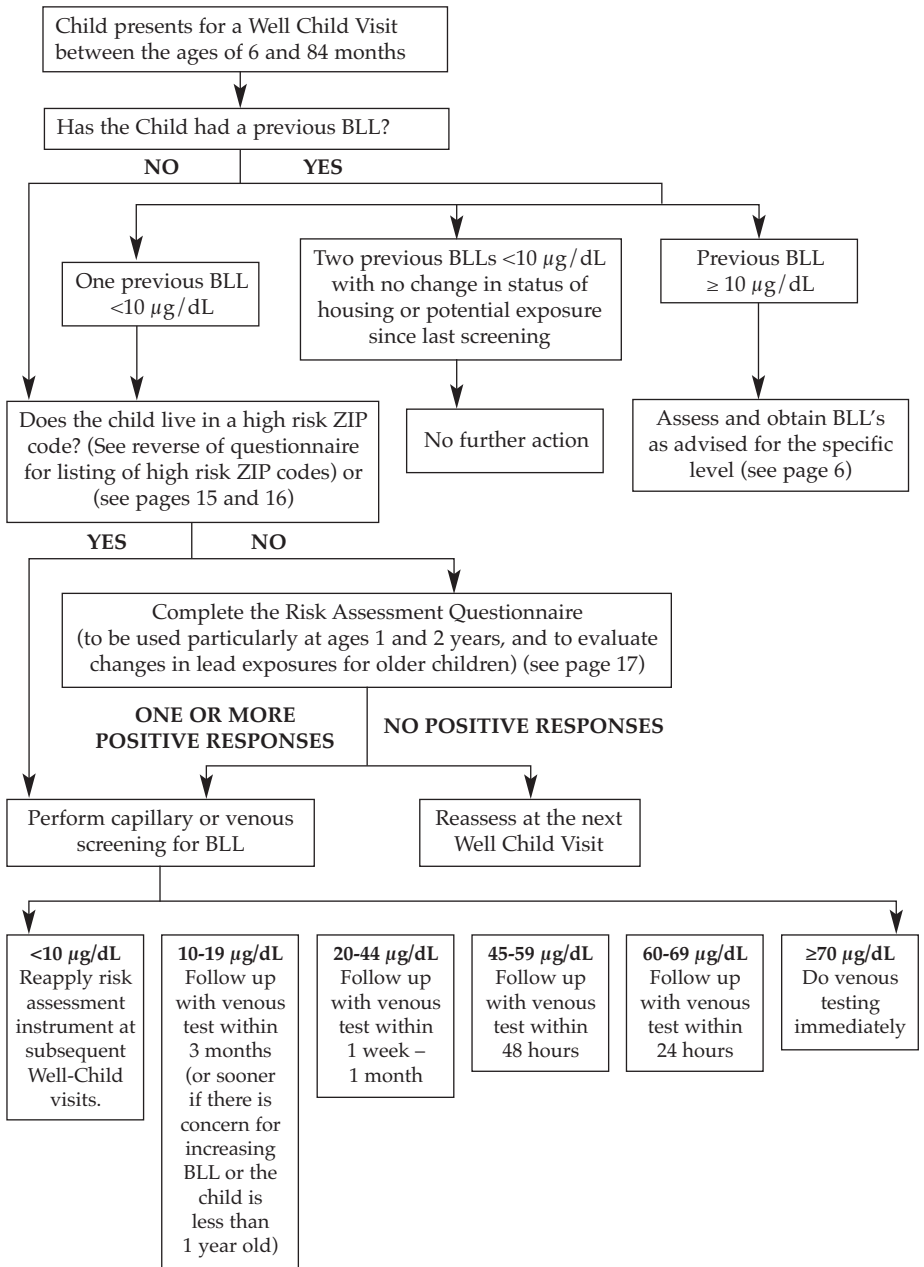
\_\_\_\_\_  
Date

**Illinois Lead Program**  
**866-909-3572 or 217-782-3517**  
**TTY (hearing impaired use only) 800-547-0466**

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# APPENDIX C

## ILLINOIS CHILDHOOD LEAD POISONING ASSESSMENT AND SCREENING ALGORITHM



Recommendations for subsequent assessment, screening, and/or treatment are based on the follow-up blood test.

## **WEB LINKS TO LAW**

Screening Requirements -

[www.ilga.gov/commission/jcar/admincode/077/077008450000150R.html](http://www.ilga.gov/commission/jcar/admincode/077/077008450000150R.html)

Illinois Department of Public Health Lead Risk Assessment Questionnaire –

[www.idph.state.il.us/envhealth/pdf/Lead\\_LRAQ\\_6\\_07.pdf](http://www.idph.state.il.us/envhealth/pdf/Lead_LRAQ_6_07.pdf)

Illinois Department of Public Health High-Risk ZIP Code list –

[www.idph.state.il.us/envhealth/pdf/Lead\\_ZIP\\_Codes.pdf](http://www.idph.state.il.us/envhealth/pdf/Lead_ZIP_Codes.pdf)

Reporting Obligations –

[www.ilga.gov/commission/jcar/admincode/077/077008450000200R.html](http://www.ilga.gov/commission/jcar/admincode/077/077008450000200R.html)

Proof of Blood Lead Screening (paragraph d) -

[www.ilga.gov/commission/jcar/admincode/077/077008450000150R.html](http://www.ilga.gov/commission/jcar/admincode/077/077008450000150R.html)

## REFERENCES

1. Illinois Lead Program, Surveillance Report – 2006  
[http://www.idph.state.il.us/envhealth/pdf/Lead\\_Surv\\_Rpt\\_06.pdf](http://www.idph.state.il.us/envhealth/pdf/Lead_Surv_Rpt_06.pdf)
2. National Survey of Lead and Allergens in Housing, Volume I: Analysis of Lead Hazards, FINAL REPORT, revision 7.1, October 31, 2002
3. Illinois Housing Statistics, U.S. Census 2000  
<http://www.infoplease.com/us/census/data/illinois/housing.html>
4. Illinois Department of Public Health, Children Enrolled in the Department of Healthcare and Family Services (HFS) Medical Programs Tested for Blood Lead Poisoning; State and Community Based, Illinois Lead Program, June 2007
5. Amarasiriwardena, Chitra; Aro, Antonio; etal; *Levels of lead in breast milk and their relation to maternal blood and bone lead levels at one month postpartum*, Environmental Health Perspectives, 6/1/2004,  
<http://www.encyclopedia.com/doc/1G1-137505260.html>
6. Han, Shenggao, Pfizenmajer, David, etal; *Effects of Lead Exposure before Pregnancy and Dietary Calcium during Pregnancy on Fetal Development and Lead Accumulation*, Environmental Health Perspectives, 108:527-531 (2000). [Online 18 April 2000],  
[http://findarticles.com/p/articles/mi\\_m0CYP/is\\_6\\_108/ai\\_63937872](http://findarticles.com/p/articles/mi_m0CYP/is_6_108/ai_63937872)
7. Illinois Compiled Statutes, Public Health, Lead Poisoning Prevention Act, 410 ILCS 45/  
<http://www.ilga.gov/legislation/ilcs/ilcs2.asp?ChapterID=35>
8. U.S. Centers for Disease Control and Prevention *Recommendations for Lead Poisoning Prevention in Newly Arrived Refugee Children*  
<http://www.cdc.gov/nceh/lead/Publications/RefugeeToolkit/pdfs/CDCRecommendations.pdf>
9. *Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention*,  
[http://www.cdc.gov/nceh/lead/CaseManagement/caseManage\\_main.htm](http://www.cdc.gov/nceh/lead/CaseManagement/caseManage_main.htm)
10. Illinois Administrative Code, Title 77, Part 845, Lead Poisoning Prevention Code  
<http://www.ilga.gov/commission/jcar/admincode/077/07700845sections.html>



11. U.S. Centers for Disease Control and Prevention Morbidity and Mortality Weekly Report, *Interpreting and Managing Blood Lead Levels <10 µg/dL in Children and Reducing Childhood Exposures to Lead, Recommendations of CDC's Advisory Committee on Childhood Lead Poisoning Prevention*, November 2, 2007 / 56(RR08);1-14;16,  
<http://www.cdc.gov/MMWR/preview/mmwrhtml/rr5608a1.htm>
12. American Academy of Pediatrics, Committee on Drugs. Treatment Guidelines for Lead Exposure in Children. *Pediatrics* 1995;96:155-159  
<http://aappolicy.aappublications.org/cgi/reprint/pediatrics;96/1/155.pdf>
13. Treatment of Lead-Exposed Children (TLC) Trial Group. Safety and efficacy of succimer in toddlers with blood lead levels of 20-44 µg/dL. *Pediatr Res.* 2000;48:593-599

## OTHER LEAD POISONING PUBLICATIONS

1. National Survey of Lead and Allergens in Housing, Final Report, Volume 1, Analysis of Lead Hazards, Office of Lead Hazard Control, U.S. Department of Housing and Urban Development, October, 2002
2. U.S. Centers for Disease Control and Prevention, Lead Poisoning Prevention Program, <http://www.cdc.gov/nceh/lead/lead.htm>
3. U.S. Centers for Disease Control and Prevention. Morbidity and Mortality Weekly Report, <http://www.cdc.gov/mmwr>
4. Preventing Lead Poisoning in Young Children (2005) This is the fifth revision of the statement on Preventing Lead Poisoning in Young Children by the Centers for Disease Control and Prevention. This revision accompanies a companion document, developed by the Advisory Committee on Childhood Lead Poisoning Prevention which reviews the scientific evidence for adverse effects in children at blood lead levels below 10  $\mu\text{g}/\text{dL}$   
<http://www.cdc.gov/nceh/lead/publications/PrevLeadPoisoning.pdf>
5. Appropriate level at which to initiate chelation therapy  
<http://aappolicy.aappublications.org/cgi/content/full/pediatrics;116/4/1036>
6. Pharmaceutical agents in the treatment of lead poisoning  
<http://aappolicy.aappublications.org/cgi/reprint/pediatrics;96/1/155.pdf>
7. Educational materials in foreign languages  
[www.cdc.gov/Other/languages/](http://www.cdc.gov/Other/languages/)
8. American Academy of Pediatrics regarding toys containing lead  
[www.aap.org/new/toyrecall.htm](http://www.aap.org/new/toyrecall.htm)

## **WHO CAN I CONTACT FOR MORE INFORMATION?**

### **Illinois Lead Program**

<http://www.idph.state.il.us/a-zlist.htm#L>

**217-782-3517**

Lead Education Materials, Parental Handouts, Physician Guidelines, Childhood Blood Lead Test Reporting

### **Illinois Department of Public Health**

Information and Referral Hotline

**866-909-3572**

TTY (Hearing impaired use only)

**800-547-0466**

### **State Laboratory – Springfield**

**217-782-6562**

### **Lead Abatement Program**

For information about licensed lead inspectors or lead abatement contractors, or about abatement/remediation funds

**217-782-3517**

### **Chicago Department of Public Health**

Childhood Lead Poisoning Prevention Program

**312-747-LEAD, 312-746-7810 or 312-746-7820**

[www.cityofchicago.org/health](http://www.cityofchicago.org/health)

### **National Lead Information Center**

[www.epa.gov/lead](http://www.epa.gov/lead)

### **National Lead Information Clearing House**

**800-424-LEAD**

### **Alliance for Healthy Homes**

[www.cehn.org/cehn/resourceguide/ateclp.html](http://www.cehn.org/cehn/resourceguide/ateclp.html)

### **U.S. Centers for Disease Control and Prevention**

Lead recalls

<http://www.cdc.gov/nceh/lead/Recalls/default.htm>

If you need more information, call

Illinois Department of Public Health  
Illinois Lead Program

866-909-3572 or 217-782-3517

TTY (hearing impaired use only) 800-547-0466

