TEXAS DEPARTMENT OF HEALTH

GUIDELINES FOR THE DETECTION AND MANAGEMENT OF CHILDHOOD LEAD POISONING FOR PHYSICIANS AND HEALTH CARE PROVIDERS

August 1994

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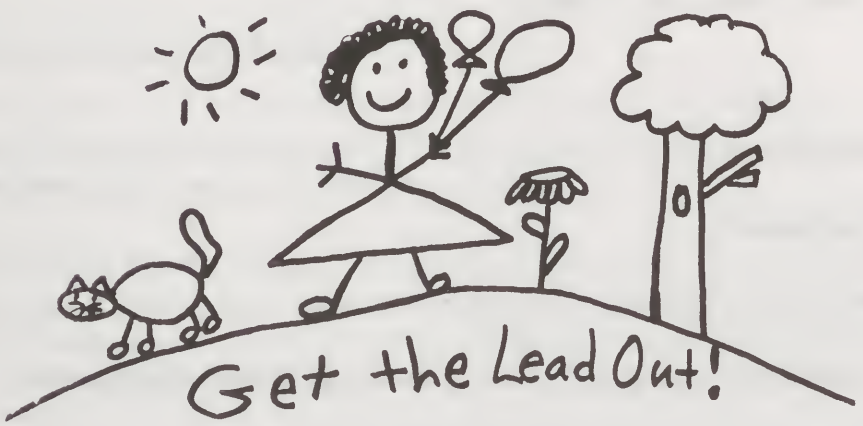
Texas Department of Health
Bureau of Women and Children
Children's Health Division
Childhood Lead Poisoning Prevention Program



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INTRODUCTION

Childhood lead poisoning is one of the most common and preventable pediatric health problems in the United States today. Children are particularly susceptible to lead's toxic effects. The Agency for Toxic Substances and Disease Registry estimated that in 1984, 17 percent of all American preschool children had blood lead levels exceeding 15 ug/dL. **Because of evidence showing adverse effects at low blood lead levels, new guidelines from the Centers for Disease Control have changed the definition of lead poisoning to a blood lead level greater than or equal to 10 ug/dL.**

Currently in Texas, approximately 190,000 EPSDT screenings are provided annually through the efforts of local health departments, private physicians and other health service providers. Approximately 15,000 patients were identified with elevated (>10 ug/dL) blood lead levels in 1993.

Lead poisoning is a public health problem of continuing importance. Our understanding of it has evolved over the past two decades. In the early 1970's, physicians struggled to save critically ill children with this problem. Some died of lead poisoning, and the survivors were left with severe mental retardation. The medical community responded by developing improved diagnostic tests and treatment. Public health advocates pushed for crucial legislation that decreased the amount of lead in gasoline, new paint, metal solder, and pipes in plumbing. As a result, few children suffer from the effects of lead encephalopathy, but, unfortunately, since a great deal of leaded paint exists in older housing, thousands are exposed to lower doses of lead which results in subtle but serious problems.

OVERVIEW OF THE 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 injures children starting even before birth. It can damage the central nervous system, the peripheral nervous system, the hematopoietic system, regulation of vitamin D, and the kidneys. Very high levels of lead can cause seizures, coma and death. If the child survives, he/she may have severe mental retardation. With lower lead levels, a child may suffer from developmental delay, a lower IQ, hyperactivity, learning disabilities, behavioral problems, impaired hearing, and stunted growth. Much of the damage to the brain is irreversible.

Recent research suggests blood lead levels as low as 10 ug/dL, which do not cause distinctive symptoms, are associated with decreased intelligence and slowed neurobehavioral development. Other effects may result from low blood lead levels. Fetal lead exposure has been shown to decrease stature and affects the ability to maintain steady posture. The effects of lead on decreased hearing acuity have no apparent threshold.

Lead's impairment of the biosynthesis of the active vitamin D metabolite is detectable at blood lead levels of 10

ug/dL to 15 ug/dL. It has been shown that lead poisoned children have lower serum total and ionized calcium levels. Maternal cord blood lead levels of 10 to 15 ug/dL appear to be associated with reduced gestational age and reduced weight at birth.

SOURCES OF LEAD

Lead-based paint and lead-contaminated dusts remain the primary sources of lead exposure for children. Nationwide, lead remains in approximately 74 percent of all private housing units built before 1978. Housing built before 1950 is at even greater risk of having interior lead-based paint. Household dust may also contain significant amounts of lead. This lead is in a much more absorbable form. Children can swallow it by chewing or sucking dusty toys and fingers. Lead-burdened dust may also be inhaled. Lead in dust is increased after older paint has been disturbed. **Children and pregnant women should never be allowed to remain in a house that is undergoing renovation to correct a lead problem.**

Other sources of lead are less prevalent. However, several low level sources together can accumulate significantly. Lead can be found in water and soil.

Lead in water is a less frequent but significant source. Water pipes and especially the solder that connects them may contain lead. If lead in plumbing is suspected, water from a hot water tap should not be used for drinking or food preparation until the problem is eliminated. The cold water tap should be flushed for several minutes each morning or until there is a noticeable change in temperature of the water before any water is consumed.

Lead in soil is also a cause of poisoning. Lead may have been deposited in soil from leaded gasoline, lead paint dust and industries using lead. Food grown in city gardens may be contaminated with lead from the soil. Children's outside play areas may be contaminated with lead from air pollution and paint from the outside of buildings. Outside play areas should be located away from houses and buildings and away from areas that could have been contaminated by heavy traffic.

Lead in food has been dramatically reduced due to voluntary reduction of its use by food manufacturers. Lead solder is much less commonly used for canned foods. However, it is important to transfer the food from opened cans into glass or plastic containers immediately. Metal cans with dented seams should be discarded without opening. Recent information notes that some bread wrappers are printed with lead based paint. Bread wrappers/bags should not be turned inside out and reused. Other sources of lead include gasoline sniffing, poorly glazed ceramic dishes, and folk medicines. See Appendix E for a list of common folk medicines that contain lead and should not be applied onto or ingested by humans.

The following is a list of occupations that have been found to carry a potential for exposure to lead. Such exposure represents a risk not only to the worker, but to members of the worker's family as well, unless good hygiene is observed to avoid bringing lead dust into the home from the work place. It is important to note that this list is not complete.

Lead smelting
Battery manufacture and reclamation
Radiator repair
Pottery manufacture
Automotive machine shop work
Electronics (soldering)
Spray painting (if using lead-based paint)
House (or other structure) paint removal
Firing range supervision
Firing range work
Gasoline refining
Glass manufacturing using purchased glass
Casting bullets (hobby)
Stained glass window design (hobby)
Printing (if involving the manufacture, use or reclamation of lead printing surfaces)
Cable stripping
Cable splicing
Die casting
Valve and pipe fittings (except brass goods)
Plumbing fixture fittings and trim (except brass goods)
Bridge, tunnel and elevated highway construction

Please see Appendix D for a more comprehensive listing.

SCREENING

The primary goal of screening for lead poisoning is to identify symptomatic or asymptomatic lead-poisoned children and to intervene as quickly as possible to reduce their blood lead levels. **Most cases identified will be asymptomatic.**

Symptomatic lead poisoning is a medical emergency.

Screening may also be used to collect and evaluate data to target community-wide interventions in areas with children at high risk for lead poisoning. Medical guidelines in Texas dictate that a provider screen a child at 12 and 24 months of age. In low-risk geographic areas at other ages, the provider may elect to ask a list of high risk questions, which, if all answered "no," will allow the child to skip the blood test. If the child is older than 24 months and younger than 72 months, and has never been tested for blood lead, the child must be tested.

The latest CDC guidelines (October 7, 1991) change the definition of lead poisoning to a confirmed blood lead level greater than or equal to 10 ug/dL. Because the erythrocyte protoporphyrin level does not correlate well with blood lead levels below 25 ug/dL, **the screening test of choice is a blood lead measurement. Capillary specimens may be more feasible for screening purposes.** Capillary specimens can be contaminated by surface lead from the child's hand. Contamination of capillary specimens can be minimized if proper collection technique is followed. See Appendix A for information on specimen collection. Before a child undergoes lead treatment, a confirmatory venous blood lead measurement should be taken, even if the child was initially screened using a venous blood sample. **Diagnostic blood lead levels must be measured on venous samples.**

ANTICIPATORY GUIDANCE AND RISK ASSESSMENT

Anticipatory guidance helps prevent lead poisoning by educating families on ways to reduce lead exposure.

Questions about housing and other factors are used to identify children at greatest risk for high-dose lead exposure.

Anticipatory guidance and risk assessment should be tailored to important sources and pathways of lead exposure in the child's community

Assessment of the risk of lead poisoning should be part of routine pediatric well child care. Starting at 6 months of age, and at each regular office visit thereafter, each child should receive a brief assessment, to determine whether the child is at risk for lead exposure. The issue of lead poisoning and recommended actions to reduce the risk of environmental exposure should become a consistent component of anticipatory guidance routinely provided at well child visits. A sample questionnaire appears in Appendix B.

Based on the assessment, children can be categorized as low or high risk for lead poisoning. If the answers to all questions are consistently negative, the child is considered to be at low risk for lead poisoning and should be screened with a blood lead test at 12 months and 24 months. If the answer to any question is positive, the child is potentially at high risk for lead poisoning, and a blood lead test should be obtained. For children previously at low risk, any history suggesting that exposure to lead has increased should be followed up with a blood lead test.

SITUATIONS THAT PLACE CHILDREN AT HIGH RISK FOR LEAD POISONING

1. **Children with signs and/or symptoms compatible with lead poisoning; such as loss of appetite, abdominal cramps, constipation, anemia, apathy, lethargy, or periodic vomiting.**

2. **Children who have previously had an elevated lead level, even if it has returned to an acceptable level in the interim.**

3. **Children living in a building where a lead hazard has been found.**

4. **Children who live in, or are frequent visitors to, housing constructed before 1978 that is poorly maintained.**

5. **Children who live in older housing that is being or has been renovated while the children are or were living or visiting there.**

6. **Children who are siblings, housemates, visitors, and playmates of children with known lead toxicity.**

7. **Children whose parents or other household members participate in a lead-related occupation or hobby. This includes painters and those who engage in jewelry making, pottery glazing, stained glass work, the creation of fishing weights or bullets, and soldering of metal structures.**

8. **Children who live near heavy traffic areas, near hazardous waste sites or solid waste incinerators where lead is a major pollutant or near a lead smelter or processing plant.**

9. **Children with pica or frequent hand-to-mouth activity, such as thumb-sucking. These children might also have had an incidence of an accidental ingestion of another hazardous substance.**

10. **Children with failure to thrive.**

11. **Children with a history of accidental ingestion of any non-edible item.**

12. **Children who have been administered Mexican or Asian folk medicines such as Greta or Pay-loo-ah, or who have been exposed to cosmetics such as kohl.**

Screening Schedule

Ideally, all preschool children should be screened for lead poisoning. Those children at highest risk for lead poisoning, however, are the highest priority for screening. The following is the suggested screening schedule for children. In general, children who have capillary blood levels >15 ug/dL should have venous confirmation of these levels.

1. **All children between ages of 6 and 72 months should receive, as part of routine Well Child care, a risk assessment to determine potential environmental exposure to lead. It is recommended that providers utilize a structured risk assessment process such as the sample questionnaire in Appendix B.**

2. **Children should be screened at 12 months of age and again at 24 months. If the child is between 24 and 72 months of age and has never been screened, a blood lead test should be done. The priority placed on screening should be based on the physician's judgement regarding the probability of lead exposure and the risk status of the community.**

   * **If the blood lead level is <10 ug/dL, the child's risk for lead exposure should be monitored at subsequent Well Child visits.**

   * **If the blood lead level is 10-14 ug/dL, the child is Class IIA and should be rescreened in 3-4 months. If the level has not increased over that time, the child's risk for lead exposure should be monitored at subsequent Well Child visits.**

   * **If the blood lead level is 15-19 ug/dL, the child is Class IIB and should be rescreened every three months until the lead level is below 15 ug/dL.**

3. **Children should be screened any time risk assessment or history suggests that exposure to lead may have increased (i.e., child living in an old house undergoing renovation). Indicators of a possible high blood lead include anemia, nutritional inadequacy or developmental delay.**

LABORATORY ANALYSIS FOR LEAD SCREENING

The Texas Department of Health recommends that specimens requiring analysis for lead screening be submitted to its Bureau of Laboratories. The State laboratory will provide the following supplies: 2 ML EDTA anti-coagulant tubes; 7 mg. anti-coagulant collection tubes; 7 ML plain red top vacuum tubes; EDTA anti-coagulant fingerstick collectors; 22 gauge 1" vacutainer needle; needle holders in 2 ML and 7 ML; lancets; form G-401 (EPSDT lab request form); mailing containers in small, medium and large; and mailing labels. Test results are mailed from the laboratory. Test results greater than 40 ug/dL are called to the submitter by the laboratory.

CASE DEFINITION

The Guidelines from the Centers for Disease Control provide case definitions and recommendations for follow-up as indicated in Table 1 and Table 2.

Table 1 represents the timetables for confirming screening results and determining case definition based on the new CDC Guidelines.

TABLE 1. Case Classification for Confirming Blood Lead Results

Blood lead level ug/dL	Presumptive Class	Time within which venous blood lead should be obtained
<9	I	Not applicable
10-14	IIA	Not applicable (capillary rescreen in 3-4 months)
15-19	IIB	Within 1 month
20-44	III	Within 1 week
45-69	IV	Within 48 hours
>70	V	Immediately

Table 2 presents interpretation of blood lead test results and follow-up activities.

GUIDELINES FOR Follow-up OF ELEVATED BLOOD LEADS

Advised protocols for follow-up of elevated blood lead in children under six years of age:

Blood lead <9 ug/dL (Class I):

A child in Class I is not considered lead poisoned.

Blood lead 10-14 ug/dL (Class IIA):

a. The parent should be informed (face to face, by phone, or by letter) that they should make an appointment for the child in 3-4 months.
b. Test every 3-4 months; yearly if two subsequent measurements are <10 ug/dL or three are <15 ug/dL.

Blood lead 15-19 ug/dL (Class IIB):

a. Confirm capillary results with venous blood specimen. Skin contaminants can cause falsely elevated results. The inter-assay variability of the blood lead assay is + or - 3 ug/dL. Repeat venous testing should be done within a reasonable time as levels can rise acutely.

b. As (b) above. Tracking should be employed to ensure follow-up.

c. Supply parent with information concerning nutrition (adequate iron, calcium, zinc, and protein), house cleaning (daily damp mopping, not sweeping, using a high phosphate product like dishwasher detergent), handwashing, and controlling pica.

d. Conduct an environmental assessment INTERVIEW (TDH form #M-100). This form can be obtained from the Texas Department of Health, Literature and Forms Division, 1100 West 49th Street, Austin, Texas 78756-3199. This is the first step in identifying the source of lead.

e. If two consecutive tests 3-4 months apart remain in this range, and the INTERVIEW fails to demonstrate the source of lead, a HOME VISIT may be indicated to assess water supply, use of pottery, condition of home paint, home medications, hobbies, etc. The local or regional health department may assist you in home investigations.

f. Paint, soil, water, and house dust assays are indicated only when the INTERVIEW and HOME VISIT have failed to identify the source of lead. These assays can be obtained through the local or regional health department. If the child spends most of his/her time in a daycare home, daycare center or school, this location must be investigated also.

Blood lead 20-44 ug/dL (Class III):

a. Steps (a)-(f) above. The repeat test (venous sample) should be done within one week. If confirmed to be = to or >20:

g. Conduct (or refer for) a complete medical evaluation:
- physical exam, including, but not limited to, growth assessment, blood pressure, hearing acuity, peripheral nerve function;
- developmental assessment; and
- laboratory assessment. Check for iron deficiency as it often co-exists with lead poisoning and can exacerbate lead toxicity. Serum iron, iron-binding capacity, and ferritin should be measured. Serum ferritin = to or < 12 ug/dL indicates iron deficiency. A blood lead >40 ug/dL should prompt a serum creatinine to assess renal function.

h. Some physicians advise oral medications if blood lead remains in this range. Call the Bureau of Women and Children Childhood Lead Poisoning Prevention Program for the name of a physician or institution willing to advise on treatment. It is inadvisable to treat medically without identifying and removing the source of contamination.

i. Abatement or containment of lead source - as Texas does not require licensing of lead investigation or abatement firms, the quality of private firms should be evaluated. Improperly conducted "lead abatement" procedures may INCREASE lead in the environment. Other than for HUD or Farmer's Home Administration homes, there are no public funds for abatement activities.

Blood lead 45-69 ug/dL (Class IV):

(a)-(i) as above. Begin medical treatment and environmental assessment and remediation within 48 hours. Pharmacologic treatment is indicated and should be conducted under the guidance of a physician experienced in the treatment of lead poisoning.

Blood lead >69 ug/dL (Class V):

Considered a medical emergency. Medical treatment and environmental assessment/remediation must begin immediately.

NOTE: When a child is found to have a high blood lead, it is advisable to test other children <6 years of age sharing the same environment.

DIAGNOSTIC EVALUATION

Children with a confirmatory blood lead level of >20 ug/dL, defined as Class III or greater, should receive medical and developmental evaluation and follow-up. The urgency of further medical evaluation depends on the blood lead level (BPb) and the presence of any symptoms.

THE SINGLE MOST IMPORTANT FACTOR IN PEDIATRIC CASE MANAGEMENT IS TO DRASTICALLY REDUCE THE CHILD'S EXPOSURE TO LEAD.

Screening tests are not diagnostic. Every child with a positive screening test should be evaluated in a timely manner. In cases of acute poisoning, the rise of the EP may lag behind the lead level and therefore the EP may be normal while the lead is acutely rising.

Children with symptoms that suggest lead poisoning should receive immediate evaluation, regardless of their risk classification. **Symptoms such as loss of appetite, abdominal cramps, constipation, anemia, apathy, lethargy, and periodic vomiting may indicate lead poisoning. Other behavioral disturbances compatible with lead toxicity include clumsiness, hyperirritability, and loss of recently acquired developmental skills.**

The child with an elevated blood lead level (greater than 20 ug/dL) should have a complete pediatric medical evaluation, giving special attention to the following:

1. **A detailed history, including the presence or absence of clinical symptoms; child's mouthing activities; existence of pica; nutritional status; dietary habits; family history of lead exposure; speech/language and hearing screenings; assessment of child's developmental status; and previous blood lead determinations.**

2. **The physical examination, with particular attention to the neurologic examination; height and weight; developmental assessment; and language skills.**

3. **Hematologic evaluation for iron deficiency, creatinine and urinalysis.**

4. **Trends in blood lead levels (see paragraph following this chart).**

5. **Detailed environmental and occupational histories concerning adults in the same household or other caretakers.**

Since trends are important in diagnosis and management, serial measurements of blood lead are far more valuable than data obtained at a single point in time. Analytical variability must be considered when interpreting blood lead results. Apparent changes in lead status based on successive blood lead measurements can be considered significant only when the net difference of results exceeds the limit of analytic variance allowed by the laboratory. As a general rule, trends should not be considered significant unless the magnitude of the change is >5 ug/dL.

The degree of analytical variability between laboratories, which may employ different analytic methods, exceeds that within a single laboratory. Therefore, a single laboratory using one analytical method should be used to best compare multiple blood lead results from an individual or a population. Laboratories may have a margin of error up to 5 ug/dL either way. This variability should be considered when interpreting results.

In addition an erythrocyte protoporphyrin (EP) level should be obtained prior to chelation. EP levels and concurrent measurement of blood lead are extremely helpful in following children post-chelation.

TESTS

1. Calcium Disodium EDTA Mobilization (or Provocative Chelation) Test is not recommended.

2. Assessment for Iron Deficiency

   Because iron deficiency can exacerbate lead poisoning and often coexists with it, children with

blood lead values greater than or equal to 20 ug/dL must be evaluated for iron deficiency. The hemoglobin, hematocrit, and reticulocyte count are not adequately sensitive, and the EP is not specific enough to diagnose iron deficiency. Ferritin is the most sensitive indicator of iron status. Serum iron and iron binding capacity can be used with discretion.

3. Other Tests

The diagnosis of acute lead encephalopathy can usually be made without lumbar puncture, which has considerable risk because of the increase in intracranial pressure. Flat plate of the abdomen, x-ray of long bones, microscopic examination of red cells for basophilic stippling, and tests of hair and fingernails for lead levels are not sensitive indicators for the diagnosis or clinical management of lead poisoning and are not components of the routine workup of a patient with suspected lead poisoning. However, in certain circumstances, the flat plate of the abdomen may be indicated, such as when there is evidence of lead ingestion.

MEDICAL MANAGEMENT

Pregnant Women

At present, there is insufficient clinical knowledge or experience with any chelating regimen(s) to recommend treating pregnant women or women of child-bearing age who have elevated blood lead levels. Until further clinical research is carried out, including toxicokinetic, experimental studies of the maternal-fetal unit and sequential measurements of maternal bone lead concentrations during pregnancy, no recommendations can be made. Women of child-bearing age and pregnant women who have blood lead levels above 10 ug/dL should receive environmental assessments to identify and eradicate sources of excessive lead exposure.

Breastfeeding Women

Women who have blood lead levels greater than 10 ug/dL should be counseled regarding lead poisoning as lead can be passed to the infant through breastmilk.

Children

One of the most important factors in the management of the lead poisoned child is to remove the child from the source of lead or remove the source. Health care providers can play an essential role in identifying the source of lead exposure. A thorough environmental history and parent occupational history must be obtained for all lead-poisoned children. The proximity of family homes to lead industries and high traffic roadways should be determined. Health care providers should advise families never to carry out lead paint removal themselves in their homes or apartments and should warn them of the dangers of renovating or remodeling older homes. Such repairs are safely performed only by trained and licensed contractors. The entire family should be out of the home day and night as the dwelling is properly prepared pre-abatement, during the actual abatement, and until thorough post-abatement clean-up is completed. It is the responsibility of primary care providers to promptly refer children to medical facilities with experience in the prevention, care, and management of lead poisoned

children if they are unable to provide this care themselves. See Appendix C for advice to parents.

General Supportive Management for Symptomatic Lead Poisoning. For children with a blood lead level >70 ug/dL and symptoms suggestive of lead encephalopathy, all oral intake is prohibited until the child's condition has significantly improved. Parenteral fluid therapy is started immediately; fluid volume is restricted to basal requirements plus a careful assessment of ongoing losses. Excessive intravenous fluid administration should be avoided. Once urine flow is established, chelation treatment, already begun with BAL alone for one dose, is continued with simultaneous administration of $CaNa_2EDTA$. An adequate flow of urine must be established before intravenous chelation therapy with $CaNa_2EDTA$ is begun. Parenteral fluid therapy minimizes vomiting that may accompany administration of BAL and ensures prompt excretion of $CaNa_2EDTA$. For immediate control of seizures, diazepam or paraldehyde are the preferred drugs. Barbiturate and phenytoin are reserved for the long-term management of recurring seizures, only after the acute encephalopathic episode is managed and consciousness has been fully recovered. Although it is desirable to evaluate any residual lead from the bowel, this must never delay the start of chelation therapy. The diagnosis of acute lead encephalopathy can usually be made without lumbar puncture, which has considerable risk because of the increase in intracranial pressure. Management of increased intracranial pressure and cerebral edema should be conducted in a pediatric intensive care setting.

General Supportive Management for Asymptomatic Lead Poisoning. For a child whose blood lead is greater than or equal to 45 ug/dL, general supportive management should follow the guidelines recommended for children with symptomatic lead poisoning.

Medical Treatment

TREATMENT GUIDELINES FOR CHILDREN WITH BLOOD LEAD LEVELS >20 Ug/dL

* **The most important factor in managing childhood lead poisoning is reducing the child's exposure to lead.**
* **Children with symptomatic lead poisoning, with and without encephalopathy, should be managed by a multidisciplinary team.**
* **Asymptomatic children with blood lead levels >45 ug/dL should receive chelation therapy.**
* **Different clinical centers and programs use different protocols to medically manage children with blood lead levels of 25 to 44 ug/dL.**

The following medical treatment schedule is recommended for each classification of lead level:

Blood lead level <10 ug/dL (Class I). A blood lead level <10 ug/dL is not considered indicative of lead poisoning.

Blood lead level 10 to 14 ug/dL (Class IIA). Children with blood lead levels in this range are in a border zone. Since the laboratory tests for measuring blood lead levels are not always accurate and precise at these levels, many of these children's blood lead levels may, in fact, be <10 ug/dL. Although a detailed environmental history should be taken since an obvious remediable source of lead may be found, it is unlikely there is a single predominant source of lead exposure for most of these children. Thus, a full home inspection is not recommended. It is, however, prudent, to try to decrease exposure to lead with some simple interventions. In addition, these children should receive follow-up blood lead testing in about 3-4 months. The adverse effects of blood lead levels of 10 to 14 ug/dL are subtle and are not likely to be recognizable or measurable in the individual child. It is important to make sure that these children's blood lead levels do not go up.

Blood lead level 15 to 19 ug/dL (Class IIB). Children with venous blood lead levels 15-19 ug/dL need more careful follow-up. The pediatric health care provider should take a careful history, asking about sources of lead exposure. Parents should receive guidance about interventions to reduce blood lead levels. Children with blood lead levels in this range are at risk for lower than expected IQ and other subtle effects. The effects of lead at these levels are significant enough that the health care provider should emphasize to parents the importance of follow-up screening to make sure the levels have not increased. The provider should also discuss interventions to reduce the blood lead levels. In addition, these children should receive follow-up testing. If their blood lead levels persist at >15 ug/dL, environmental investigation and remediation should be completed, if resources permit. In some communities, childhood lead poisoning prevention programs may be able to manage the environmental investigation and remediation.

Blood lead level 20 to 24 ug/dL (Class III). A child with confirmed blood lead of 20 to 24 ug/dL will require individual case management by a pediatric health care provider. The child should have a complete pediatric evaluation within 10 working days of the initial confirmation, with special attention to nutritional, developmental and iron status. Parents should receive education about lead poisoning that includes information about: 1) the causes and effects of lead poisoning; 2) the need for more routine blood lead testing; 3) possible sources of lead intake and means of reducing intake; 4) nutrition, emphasizing the need for three nutritious meals a day and two snacks, with a diet high in callcium and iron; and 5) resources for further information. Sequential measurements of blood lead along with review of the child's clinical status should be done monthly. Children with higher blood lead levels require referral for environmental investigation and management. The identification and eradication of specific sources of excessive lead exposure are essential to ensure that blood lead levels decrease.

Blood lead level 25 to 44 ug/dL (Class III). Many experienced lead clinics will proceed with chelation therapy for a child with a blood lead level 25 to 44 ug/dL. Some clinicians recommend the use of Succimer for treatment of children in this category. Currently FDA limits its recommendations for the use of Succimer to children with blood lead levels >45 ug/dL. Clinical judgment should be used in this situation.

Supportive management, decreasing the child's exposure to lead from all sources, nutritional interventions (correcting iron deficiency and maintaining adequate calcium intake), and more frequent testing to ensure blood

lead levels decrease are the minimum medical management for children with these blood lead levels.

Blood lead level 45 to 69 ug/dL (Class IV). For blood lead values between 45 and 69 ug/dL, chelation treatment should be limited to $CaNa_2EDTA$ or Succimer. Generally, Succimer would be the preferred chelation agent unless for compliance reasons, $CaNa_2EDTA$ must be used.

$CaNa_2EDTA$ is given for five days at a dose of 1000 mg/m^2/day, preferably by continuous infusion or in divided doses intravenously. During treatment, evaluate renal and hepatic function and serum electrolyte levels. $CaNa_2EDTA$ treatment should be continued for five days and no longer. Repeated courses of treatment may be necessary, as mobilization of lead from bone causes a rebound in serum lead level. It is prudent to allow a period of five to seven days before beginning a second course.

Blood lead level >70 ug/dL (Class V). Children with blood lead levels >70 ug/dL (with or without symptoms) represent an acute medical emergency. If the blood lead level is >70 ug/dL, both BAL and $CaNa_2EDTA$ should be given, in the same doses and using the same guidelines as for treatment of symptomatic lead poisoning. A second course of chelation therapy with $CaNa_2EDTA$ alone may be required if the blood lead concentration rebounds to a level of >45 ug/dL within five to seven days after treatment. It is desirable to allow at least five to seven days before beginning a second course of $CaNa_2EDTA$.

See the following chart for recommendations concerning chelation therapy and $CaNa_2EDTA$ test.

CHELATING AGENTS USED IN TREATING CHILDREN WITH LEAD POISONING			
Product Name	**Generic Name**	**Chemical Name**	**Abbreviation**
Calcium Disodium Versenate	Edetate disodium calcium	Calcium disodium ethylenediamine tetraacetate	$CaNa_2EDTA$
BAL in Oil	Dimercaprol	2, 3-dimercapto-1-propanol	BAL
Chemet	Succimer	Meso 2,3-dimercaptosuccinic acid	DMSA

SUCCIMER (CHEMET). The Food and Drug Administration has approved Succimer for use in lead-poisoned children with blood lead levels >45 ug/dL. The use of Succimer is not indicated for use with children having blood lead levels 70 ug/dL or higher. Succimer (trade name: Chemet), by McNeil Consumer Products Company, is an approved oral chelating agent effective in the treatment of lead poisoning. The route of administration allows the option of outpatient management of lead intoxication. The drug's specificity for lead substantially reduces the risk of essential mineral depletion associated with conventional parenteral chelating agents. The efficacy of this drug is comparable with other treatment modalities and may be superior in some situations. Succimer is a more efficacious chelating agent than EDTA in addition to being available in an oral form which is less toxic (see bibliography article by Graziano).

Indications and Usage

Succimer (Chemet) is indicated for the treatment of lead intoxication in children with blood lead levels above 45 ug/dL. The drug is not indicated for the prophylaxis of lead poisoning in areas of high-risk exposure. Use of

Succimer (Chemet) should always be accompanied by an active ongoing lead abatement program.

Dosage and Administration

Dosage should begin at 10 mg/kg or 350 mg/m^2 orally every 8 hours for 5 days. The dose should then be reduced to 10 mg/kg or 350 mg/m^2 every 12 hours for an additional two weeks. The total length of a single treatment course is 19 days. Repeated courses may be necessary if indicated by weekly monitoring of blood lead concentrations. A minimum of two weeks between courses is recommended unless blood lead concentrations dictate the need for more prompt treatment. Succimer (Chemet) is available in capsule form (100 mg). The capsules may be opened and the beads inside can be sprinkled on top of and mixed with food or fruit drinks for young children who cannot swallow the capsule whole. The beads elicit a characteristic "rotten egg" sulfur odor due to the presence of the sulfhydryl moieties on the molecular structure. Doses should be rounded up or down to the nearest whole capsule increment when initiating therapy.

Monitoring Parameters

Baseline and post-chelation therapy blood lead concentrations are, of course, important parameters to follow in patients being treated with Succimer (Chemet). Lead level concentrations may rise following completion of chelation therapy due to redistribution of lead from bone stores. Succimer chelates are excreted in urine; therefore, adequate hydration is essential to maintain good urine flow. Serum transaminase should be obtained prior to initiation of treatment with Succimer (Chemet) and periodically thereafter.

Summary

Clinical studies indicate that Chemet (dimercaptosuccinic acid - DMSA) is a relatively selective and highly effective agent for the treatment of lead intoxication. Succimer (Chemet) reverses the metabolic effects of lead on heme synthesis while increasing urinary lead output. This novel orally active chelator offers the distinct advantage of outpatient treatment and subsequent lower health care costs for the persistent problem of lead poisoning.

FUTURE TRENDS IN THE MANAGEMENT OF CHILDHOOD LEAD POISONING

Bone Lead Measurements Using X-Ray Fluorescence (XRF)

The development of L-line XRF techniques to measure tibial bone lead in children permits noninvasive assessments of skeletal lead levels and more accurately reflects the accumulated lead burden over an individual's lifetime. In contrast, blood lead values reflect recent lead exposure and absorption during the past one to three months and provide only limited information about lead toxicokinetics over time. Endogenous release of lead from bone occurs and is the equivalent of new exposure. Knowing the toxicokinetics associated with endogenous release will add a new dimension to basic and clinical research. Evaluations using XRF methods have shown that blood lead values may markedly underestimate the body burden of lead in lead-poisoned children. In one study, the majority of 59 lead-toxic children, with blood lead values between 23 and 53 ug/dl, had bone lead

values equal to those measured in industrially exposed adults. Hence, by 7 years of age, lead-poisoned children may have remarkably elevated skeletal burdens of lead, which may exert profound effects on their health in later years. The L-line technique has also documented decreases in bone lead content sequentially following $CaNa_2EDTA$ treatment in lead-poisoned children.

When considering published data concerning radiation dosimetry, counting time, minimum detection limits, and clinical data in lead-paint poisoned children, the L-line XRF technique appears to be the most valuable technique for epidemiological and clinical analyses of infants, children, pregnant women, and women of child-bearing age. For studies of industrial workers and post-menopausal women, the K-line XRF method appears most appropriate. Together, these XRF methods will be valuable tools for studying the association between bone lead concentration and renal disease, hypertension, and adverse effects on the central nervous system. L-line XRF, measuring lead over longer exposure periods, will be increasingly incorporated into management and treatment protocols. At present, the availability of XRF equipment is limited to a few centers in the United States and Europe.

TREATMENT AND FOLLOW-UP

POST CHELATION FOLLOW-UP

Recheck blood lead levels 7 to 21 days after treatment.

Determine if retreatment is necessary.

Do not discharge a child from the hospital until a lead-free environment can be assured.

At the end of each treatment cycle, the blood lead concentration usually declines to values <25 ug/dL. Within a few days, however, reequilibration among body lead compartments takes place and may result in a rebound; thus, the blood lead level must be rechecked 7 to 21 days after the end of treatment.

In children who have received chelation therapy, repeated cycles are indicated if the blood lead concentration rebounds to within 5 ug/dL of the original pretreatment value 7 to 21 days posttreatment. In all children, regardless of age, with elevated blood lead values but with an excretion ratio less than 0.60 on the provocative chelation test, blood lead should be measured monthly. If the elevation in blood lead values persists, chelation therapy should be repeated.

Any child who undergoes chelation treatment requires longterm follow-up preferably from pediatric health care providers, nutritionists, environmental specialists, and community outreach workers. The last group provides a critical bridge among hospital-based or clinic-based (outpatient) medical care, health advocacy education, and environmental remediation outside the hospital. **A child should not be discharged from the hospital until appropriate alternative housing is provided while all lead hazards in his/her home or elsewhere are being controlled and eliminated. Lead free "safe housing" (with friends, relatives, or in designated transitional housing) must be arranged in which a successfully treated child can live with his/her family during the entire abatement process through post-abatement clean-up.** With appropriate public health measures,

complete and safe abatement should take place during the treatment period.

Once a child is discharged to a safe environment, frequent follow-up is mandatory. In general, depending on the initial blood lead value, most children who require chelation therapy must be followed closely for at least one year or more until the blood lead and EP concentrations reach values <25 and 35 ug/dL, respectively. **All children undergoing chelation treatment should be seen every other week for eight weeks, then once a month for six months. A child treated with BAL and $CaNa_2EDTA$ should be followed more closely: every two weeks for six weeks, then monthly for 12 months.**

With prompt diagnosis, removal from lead sources and chelation therapy (when indicated), the toxic biochemical effects of lead may be reversible; the reversibility of these indices has been shown to follow different time courses. The return to normal EP concentrations (<35 ug/dL) takes several weeks to several months. The gradual decline that should occur in EP values (with successful environmental and medical intervention) is a valuable parameter to follow post-treatment.

At each clinic visit, environmental and housing information should be updated. Re-evaluation of the environment may be necessary (preferably by an environmental specialist from the local health department who plays a central role to ensure prompt, safe and technically sound abatement). Nutritionists can provide nutritional advice. Continued improvement in serial blood lead and EP data indicate no excessive new exposure to lead; rising blood lead concentrations, which may be accompanied by a rising EP level, indicate increased exposure to lead. Re-investigation often reveals previously undetected sources of environmental lead, inadequate abatement, or unsound structures in buildings.

A comprehensive developmental evaluation, including a hearing screen, should be conducted yearly on any child with lead poisoning. The children need evaluation for problems such as attention deficit disorders and behavioral problems, as well as lowered IQ or obvious neurologic or learning problems. Appropriate early intervention or early childhood services and counseling of parents should be provided as necessary. Early intervention agencies or the early childhood programs of public school districts and Head Start programs should be used for developmental screening and monitoring of neurobehavioral status.

When a child with earlier elevated blood lead concentrations approaches school age, psychometric evaluation may be indicated, even though the blood lead concentration at the time is <20 ug/dL.

COMMUNITY INTERVENTION

Local health officials who have traditionally carried out all or most of the lead poisoning prevention activities in a community will work in collaboration with physicians and other education, social service and housing agencies that have a role in community-wide primary prevention efforts. Lead poisoning prevention strategies will work best as part of an integrated program for creating safe and affordable housing and/or providing impoverished people in the community with the full range of needed social services. Local, state, and federal agencies dealing with health, housing, environmental, and children's issues should be identified and contacted. Optimally, a regular, formal mechanism should be established for communication among agencies and decision-making on joint prevention strategies.

To be successful, community-level intervention will require four different types of activities:

1. Surveillance and Risk Assessment: Determining populations at risk and areas where the most exposures are occurring.

2. Outreach and Education: Informing health care providers, parents, day care providers, early childhood educators, property owners, and other key audiences about lead poisoning prevention.

3. Infrastructure Building: Creating the resources needed for a successful program of risk abatement.

4. Hazard Abatement: Abating the hazards of lead paint, dust and soil, particularly in high-risk buildings and neighborhoods.

THE ROLE OF THE TEXAS DEPARTMENT OF HEALTH

At 12 and 24 months, along with other times as prescribed by responses to the parent questionnaire, the EPSDT health care provider will obtain a blood sample in order to ascertain if the child has a high blood lead level. After obtaining the sample, the blood should be sent to the State laboratory. The laboratory usually reports the results by mail within four working days after specimen receipt.

In addition to reporting results to the health care provider, the lab also sends the information to the Bureau of Women and Children Childhood Lead Poisoning Prevention Program (CLPPP). If the blood lead level is greater than or equal to 20 ug/dL, the child is entered into the CLPPP database. A child maintains active status in the database until the blood lead drops below 20 ug/dL.

Six weeks after receipt of the results from the laboratory, a certified letter is sent to both the provider and parent/guardian of the lead poisoned child. The provider receives, along with the letter, a questionnaire which requests basic information regarding the child's case. See Appendix F for a sample provider questionnaire. With the letter, the parent/guardian is sent an informational brochure which describes sources of lead, lead's affect on a child's body and ways to prevent lead poisoning. The brochure is available in both English and Spanish.

In the event that a child's blood lead is 40 ug/dL or greater, the laboratory notifies the health care provider immediately by phone, and also notifies the CLPPP via fax. Usually within about a week of notification, the CLPPP calls the provider in order to find out if the family has brought the child in for follow-up and if the provider needs help getting an environmental investigation or would benefit from advice on medical treatment of the child. If the provider cannot locate the family, the CLPPP can obtain help from EPSDT Services or Medicaid Eligibility in finding the family. If the provider has trouble obtaining an environmental investigation, the CLPPP can work with the Texas Department of Health regional offices and local health departments to arrange an environmental assessment.

In addition to case management and tracking, the CLPPP also develops educational materials for parents and health providers. See Appendix G for a listing of resources that are presently available. These materials and in-service education are available on request. By tracking blood lead results, the CLPPP is able to identify areas

of Texas with a high incidence of lead poisoning. Public health authorities in those areas are notified of the situation and are encouraged to initiate environmental assessment and ensure that health care providers are adequately educated concerning lead poisoning prevention.

APPENDIX A

SPECIMEN COLLECTION

Blood lead determinations on microspecimens collected by fingerstick are usual on small children; however, these are subject to contamination with surface lead on the patient's finger. Special steps are used to minimize this contamination. These special procedures include thorough scrubbing of the hand and finger with soap and water prior to alcohol sterilization.

Several types of pediatric blood collection containers (maximum volume <500 uL) exist. These containers are made of plastic and offer safety advantages.

Materials used in the collection procedures also have the potential for contaminating the specimen (e.g., blood container, alcohol swabs, barrier spray) and must be lead-free. The State Laboratory will recommend or supply suitable collection materials.

Procedure:

(Note: This written procedure is explained in greater detail in the laboratory handbook for EPSDT. Illustrations are also provided in the booklet.)

The specimen may be obtained either by venipuncture or by capillary fingerstick. Venipuncture is preferred since there is less chance of contaminating the specimen. If collecting the specimen by fingerstick, this procedure should be followed:

1. Wash patient's hand with soap and water, dry, then wipe with alcohol.
2. Wear gloves.
3. Discard any dropped collection vials.
4. Use long-point metal lancet and make collection stick.
5. Wait for large drop to form. Hold collector container parallel to the ground to let capillary action pull blood in.
6. May use the capillary top of the collection container or you may remove it and let blood drop directly into the tube. Cap tightly.
7. Collection vial should be half full. More will cause the cap to dislodge due to expansion of air and blood in the unit.
8. Snap specimen vial sharply 10 times to insure proper mixing while inverting several times.
9. Do not draw blood using venipuncture tube and then pour into capillary tube. There will be excessive anticoagulant and test results will be invalid.
10. Mail on the day of collection. If not possible, refrigerate, but hold no longer than two days. DO NOT FREEZE.
11. Specimens should be placed in the dark immediately after collection. Falsely elevated EP values can occur from excessive exposure to light.
12. Be sure vials are stored before use in ziplock bag with drying pack.

APPENDIX B

PARENT QUESTIONNAIRE

PRESCREENING QUESTIONS FOR A CHILD WHO HAS NEVER HAD A HIGH BLOOD LEAD

These questions should be asked at least once a year until the child is 6 years old. "Yes" to any of the following questions should prompt lead testing according to the recommended periodicity schedule, REGARDLESS OF PREVIOUS BLOOD LEAD RESULTS.

* 1) Do you live in or often visit a house that was built before 1978? YES NO

* 2) Does your child live in or often visit a house that is being painted, remodeled, or having the paint scraped or sanded? YES NO

* 3) Does your child eat or chew on things like paint chips or dirt? YES NO

* 4) Have any other members of the family or your child's playmates had high blood leads? YES NO

* 5) Does anyone living in your house work at a place where any of these things happen or have a hobby that involves these things (circle the ones that apply):

radiator repair
lead industry
welding
battery manufacture or repair
house construction or repair
smelting
chemical preparation
making pottery
going to a firing range
stained glass with lead solder
brass/copper foundry
valve and pipe fittings
bridge, tunnel and elevated highway construction
industrial machinery and equipment
casting ammunition, fishing weights, or toy soldiers
refinishing furniture
burning lead-painted wood
automotive repair shop

Does anybody that your child spends a lot of time with (outside of your home) do any of these things or work at a place where these things are done? YES NO

* 6) Does your family live near or does your child play near any of these

(circle the ones that apply):

smelter
hazardous waste site
lead industry
place where batteries are manufactured or repaired
house construction site
heavily traveled major highway
place where cars are abandoned or repaired?

7) Do you give your child, or have you ever given your child any of these products from another country:

- MEDICINES like greta or azarcon for empacho, alarcon, alkohl, bali goli, coral, ghasard liga, pay-loo-ah, or rueda? YES NO
- NUTRITIONAL SUPPLEMENTS OTHER THAN VITAMINS? YES NO
- COSMETICS like surma or kohl? YES NO

8) Does your home's plumbing have lead pipes, lead solder or lead-containing holding tanks? YES NO

9) Is imported or antique pottery used to cook or store your food? YES NO

10) Does your child eat foods canned outside the U.S.? YES NO

(**NOTE**: Asterisks by questions indicate that answers to these questions are particularly important in determining if a child may have a high blood lead.)

QUESTIONARIO A LOS PADRES PREGUNTAS PARA NINOS QUE NUNCA HAN TENIDO ALTOS NIVELES DE PLOMO EN LA SANGRE

Estas preguntas se deben hacer por lo menos una vez al año hasta cuando el niño tiene seis años. En el caso de que una de las respuestas sea "si", se necesita hacer una prueba para determinar el nivel de plomo en la sangre. Esta prueba se debe hacer siguiendo el cuadro de periodicidad y a pesar de los resultados anteriores.

*1. Hay alguien que **vive** en su casa que trabaja o tiene un pasatiempo en una de las actividades siguientes? (Haz un círculo alrededor de las respuestas que apliquen.):

El reparo de radiadores
Una fábrica donde se utiliza plomo
La soldadura
La fábrica o reparo de baterías
La renovación de casas
La fundición de plomo, acero, cobre, o cualquier otro metal
La preparación o mezcla de químicas
La alfarería
Va a un campo de tiro
La fábrica de vidrio con dibujos coloreados con soldadura de plomo
La maquinaría o tubería hecha de piezas de plomo
La construcción de puentes, tuneles, o carreteras elevadas
La maquinaría industrial
El moldeado de plomo para fabricar municiones, equipo para la pesca, o soldaditos de plomo
El dar de acabado nuevo a muebles
La quemada de madera cubierta con pintura de plomo
El reparo de automóviles

2. **Visita** su niño(a) alguien que hace una las actividades listadas arriba?

Si No No se

*3. Come su niño cosas por casualidad como pintura que está pelada, o tierra?

Si No No se

*4. **Vive** su niño(a) en una casa donde la pintura se está pelando o se está rajada?

Si No No se

*5. **Visita** su niño(a) una casa donde la pintura se está pelando o se está rajada?

Si No No se

*6. **Vive** su niño(a) en una casa donde alguien está pintando, o lijando o quitando la pintura?

Si No No se

*7. **Visita** su niño(a) una casa donde alguien está pintando, o lijando o quitando la pintura?

Si No No se

*8. **Vive** su niño(a) en una casa que está en el proceso de renovación o recientemente fue renovada?

Si No No se

*9. **Visita** su niño(a) una casa que está en el proceso de renovación o recientemente fue renovada?

Si No No se

10. Juega su niño(a) donde hay automóviles que están abandonados o donde los reparan?

Si No No se

11. Le da o le ha dado a su niño uno de estos productos? (Haz un círculo alrededor de las respuestas que apliquen.)

Medicinas como: greta, azarcon para empacho, alarcon, alkohl, bali goli, coral, ghasard, liga, pay-loo-ah, o rueda
Vitaminas o suplementos naturales
Cosméticos como: surma, kohl

12. Come su niño(a) comidas enlatadas de países fuera de los Estados Unidos?

Si No No se

13. Utiliza Ud. la alfería para cocinar o guardar la comida?

Si No No se

*14. Fue construida su casa antes de 1978?

Si No No se

15. Está su casa cerca de las actividades siguientes? (Haz un círculo alrededor de las respuestas que apliquen.)

La fundición
Fábricas u otros lugares donde haya químicas peligrosas
Una fábrica donde se utiliza plomo
La fábrica o reparo de baterías
La renovación de casas

*16. Hay otros miembros de su familia que tienen o han tenido altos niveles de plomo en la sangre?

Si No No se

* Los asteriscos que están al lado de los números indican que estás preguntas son muy importantes para determinar si el niño tiene niveles altos de plomo en la sangre.)

APPENDIX C

PREVENTION OF LEAD POISONING
Advice to Parents

LEAD PAINT: Intact paint is not a hazard to your child, but peeling paint and paint dust is a danger.

Most homes built before 1950 contain lead paint and about half of houses built between 1950 and 1980 are likely to contain lead paint.

1. Check your home inside and out for peeling paint, looking especially around wooden door and window frames, where weather and friction tend to grind and chip painted surfaces.

2. Clean up any peeling paint and cover peeling areas so your child cannot touch them until they are repaired.

3. To prevent your children from eating dust contaminated with lead, wet mop wooden and tile floors, wash the toys of young children, and wash children's hands before they eat.

4. You can determine if lead paint is present by using a do-it-yourself lead testing kit or by contacting your county or state health department to get a referral to a professional contractor or laboratory to test for lead. Home test kits are available in most hardware stores and are also sold by:

   - Frandon Enterprises, 511 N. 48th St., Seattle, WA 98103, 1-800-359-9000

   - HybriBet Systems, Inc., P.O. GBHox 1210, Framingham, MA 01701, 1-800-262-LEAD

5. **It is very dangerous to attempt to remove lead paint yourself since you need protective devices to prevent inhalation of lead dust, and the home needs to be carefully sealed to prevent spreading of lead dust. Regular vacuums tend to spread rather than contain the dust. Scraping and sanding paint are dangerous, and heating lead paint with torches is very dangerous since it vaporizes the lead so that it is easily inhaled. For guidelines that should be followed in removing lead paint, contact:**

   Bureau of Environmental Health
   Texas Department of Health
   1100 West 49th Street
   Austin, Texas 78756-3199
   512/834-6600

SOIL: Soil gets contaminated with lead from paint washed off of buildings, automobile exhaust, and emissions from local industry.

1. Try to find play areas away from old painted buildings or provide your child with a covered sandbox.

2. Make sure your children wash their hands before they eat after playing outside.

DRINKING WATER: Water may be contaminated by lead solder used to connect your plumbing to the water main.

The new safe standard for lead content of water is 15ppb (parts per billion).

You can get your drinking water tested by calling the EPA's water safety hotline at 1-800-426-4791 for a list of state-certified testing laboratories. If your water's lead content is more than 10 to 15 ppb, do the following:

a. Before you draw water for drinking or cooking, run the cold water for 1 to 2 minutes if the taps have been turned off for more than six hours. Keep a pitcher of cold water in the refrigerator.

b. Always use cold water for drinking and cooking. Hot water contains more lead.

DISHWARE AND CANNED FOODS: Some of the lead in the glazes on pottery and china may not be properly fired during manufacture and may leak into food or solutions such as fruit juices or coffee.

1. You can use the containers for serving, but do not use them to store foods or beverages. Likewise, do not store liquor in crystal decanters.

2. Lead solder is no longer used in most tin cans made in the United States but is still used in canned foods from some other countries.

NUTRITION: Iron or calcium deficiency promotes increased absorption of lead from the intestines; therefore, be sure your child has enough iron and calcium in the diet. More iron is absorbed on an empty stomach; therefore, children should eat at least three meals and two snacks daily.

APPENDIX D

INDUSTRIES WITH A MODERATE PRIORITY FOR OCCUPATIONAL LEAD EXPOSURE
NIOSH

Industrial inorganic chemicals
Explosives
Printing ink
Tires and inner tubes
Mechanical rubber goods
Fabricated rubber products
Unsupported plastics film & sheets
Unsupported plastics profile shapes
Laminated plastics plate & sheet
Plastics bottles
Plastics foam products
Custom compound purchased resins
Pressed and blown glass
Vitreous china table & kitchenware
Blast furnaces & steel mills
Gray and ductile iron foundries
Primary copper
Copper rolling and drawing
Nonferrous rolling and drawing
Nonferrous wire drawing & insulating
Aluminum die-castings
Aluminum foundries
Nonferrous foundries
Primary metal products
Metal cans
Hand and edge tools
Hardware
Metal sanitary ware
Sheet metal work
Miscellaneous metal work
Screw machine products
Crowns and closures
Metal stamping
Ammunition
Misc. fabricated wire products
Metal foil and leaf
Refrigeration and heating equipment
Relays and industrial controls
Telephone and telegraph apparatus
Primary batteries, dry and wet
Aircraft
Aircraft parts and equipment
Instruments to measure electricity
Radiotelephone communications
Telephone communications, exc. radio
Industrial machinery and equipment

INDUSTRIES W/ HIGH & VERY HIGH PRIORITY FOR OCCUPATIONAL LEAD EXPOSURE

Very High Priority Industries are Italicized

NIOSH

Secondary nonferrous metals
Plumbing fixture fittings and trim
Storage batteries
Inorganic pigments
Adhesives and sealants
Chemical preparations
Plastic products
Products of purchased glass
Ceramic wall and floor tile
Pottery products
Primary nonferrous metals
Nonferrous die-casting exc. aluminum
Copper foundries
Industrial valves
Fluid power valves & hose fittings
Valves and pipe fittings
Elevators and moving stairways
Power transmission equipment
Radio & TV communications equipment
Communications equipment
Electrical equipment & supplies
Motor vehicles and car bodies
Truck and bus bodies
Motor vehicle parts and accessories
Search and navigation equipment
Measuring & controlling devices
Signs and advertising specialties
Scrap and waste materials
General automotive repair shops
Automotive repair shops

APPENDIX E

FOLK REMEDIES/MEDICINES WHICH MAY BE DANGEROUS

Pay-loo-ah	Indochinese remedy (red powder) for high fever prevalent in the Hmong community
Azarcon	Mexican treatment (bright orange powder) for empacho (intestinal illness) which is 90% lead (also known as Rueda, Coral, Maria Luisa, Liga, Alarcon, and Alarzon) - any amount is poisonous to children and adults
Greta	Mexican treatment (yellow powder) for empacho which is 90% lead - any amount is poisonous to children and adults
Ghasard	Asian Indian folk remedy (brown powder) administered to aid digestion
Bali Goli	Asian Indian folk remedy, which is a round, flat black bean that is dissolved in "gripe water" and used for stomachache
Kandu	Asian Indian folk remedy (red powder) used to treat stomachache
Surma or Kohl	Arab powder used both as a cosmetic eye make-up and applied to skin infections and the navel of a newborn child

APPENDIX F

QUESTIONNAIRE TO PROVIDERS

Name of child_____

Birthdate_____ Medicaid #_____

Was the initial test a capillary? NO _____ YES _____

Has a venous confirmation been done? NO _____ YES _____

What were the results of the follow-up test? _____

Has child moved to another residence and cannot be located?

NO _____ YES _____

Has parent/guardian failed to bring child in for appointments?

NO _____ YES _____

Child's current address, according to your records:

STREET/PO BOX_____
_____

CITY, STATE, ZIP_____
PHONE #_____

Has child been referred to another health care provider?

NO _____ YES _____

If yes: NAME_____
_____
ADDRESS_____
CITY,STATE,ZIP_____
PHONE #_____

DO YOU NEED HELP GETTING AN ENVIRONMENTAL INVESTIGATION? NO _____ YES_____

NOTE: Please retain this questionnaire until the above information is available. If you have any questions about physician guidelines or need a referral to someone who can offer advice on the medical treatment of childhood lead poisoning, feel free to call Kay Randall at 512/458-7700.

When questionnaire has been completed, please mail to:
Bureau of Women and Children
Childhood Lead Poisoning Prevention Program
1100 W. 49th Street
Austin, TX 78756-3199

APPENDIX G

CLPPP RESOURCES

NUTRITION

Nutrition and Childhood Lead Poisoning Prevention: A Quick Reference Guide for Health Professionals
- Handout for health care providers. Copy of article published by the National Center for Education in Maternal and Child Health. Offers information concerning lead's effect on the body and the relationship between lead contamination and diet, and includes a nutrition and lead bibliography.

Nutrition and Lead Fact Sheet for Health Professionals
- Handout for health care providers. Contains information concerning lead's effect on the body, the relationship between nutrition and lead contamination, and sources of lead contamination.

Iron for Strong Red Blood Cells
- Handout targeted at parents. Provides information concerning the nutritional benefits of a diet rich in iron, calcium and vitamin C. English only.

***Foods with Iron**
- Handout targeted at parents. Lists foods which are rich in iron. English and Spanish.

***Calcium**
- Handout targeted at parents. Lists foods which are rich in calcium. English only.

LEAD-BASED PAINT

Lead Paint Hazards Fact Sheet: Health and Safety Precautions
- Handout produced by the Texas Department of Health Bureau of Epidemiology. Provides detailed discussion of effects of lead on body, identification of lead paint hazards, removal of lead-based paint, and containment or clean up of lead-bearing dust and debris.

National Lead Information Center: Home Repairs and Renovations, What You Should Know About Lead-Based Paint
- Handout targeted at parents. Produced by the National Lead Information Center and offers basic information for persons who know or suspect that their home may contain lead-based paint. English only.

HEALTH CARE PROVIDER PROTOCOLS AND GUIDANCE IN MEDICAL MANAGEMENT OF HIGH BLOOD LEADS

Specimen Collection for Lead Screening
- Handout for health care providers. Instruction from the State laboratory on the collection of venous and capillary specimens.

EPSDT Parent Questionnaire
- Questionnaire to be administered to parent by health care provider. Negative responses to all questions on form may allow child to forego blood lead test. Some conditions apply. English and Spanish.

Health Care Provider Guidelines for Follow-up of High Blood Leads
- Handout with Texas Department of Health health care provider guidelines for the management of children with elevated blood lead levels.

Succimer
- Handout for health care providers. Contains basic information about succimer, an oral chelation drug used to treat

children with very high blood lead levels.

Physiologic Effects of Lead on Body/Medical Evaluation, Management and Treatment
- Handout for health care providers. Contains specific physician-oriented information about treatment and management of high blood lead levels.

Screening Schedule for High Blood Leads
- Handout for health care providers. Contains a chart showing the instances when the health care provider may administer the parent questionnaire and the times when a child must receive a blood lead test.

ENVIRONMENTAL ASSESSMENT

List of Local Health Departments
- Handout for health care providers which lists several local health departments. Can be utilized when arranging a home visit or environmental investigation.

List of Public Health Regions
- Handout for health care providers which lists the Texas Department of Health Public Health Regions. Can be utilized when arranging a home visit or environmental investigation.

***Texas Department of Health Lead Assessment Interview Tool**
- Form for health care providers. To be utilized when health care provider questions parent regarding possible sources of lead contamination.

Points of Contact for an Environmental Investigation
- Handout for health care providers which lists persons at the TDH regional offices who can be contacted when an environmental investigation is needed.

SOURCES OF LEAD

Folk Medicines Which May Be Dangerous to Children
- Handout for health care provider. Lists seven of the most common folk remedies and medicines that can cause lead contamination.

Industries with Lead Exposure
- Handout for health care provider. Lists industries with a moderate priority for occupational lead exposure and industries with high priority for occupational lead exposure. May be utilized when attempting to determine source of child's lead contamination.

GENERAL INFORMATION

CDC: Preventing Lead Poisoning in Young Children (October 1991)
- Definitive statement from CDC on the prevention of childhood lead poisoning and management of a child with an elevated blood lead. The document offers guidance for health care professionals, public health entities and communities. **This book may be obtained from the Department of Health and Human Services, Public Health Service, Centers for Disease Control, Atlanta, GA 30333.** The Texas Department of Health DOES NOT stock this item.

Getting the Lead Out of Just About Everything
- Copy of an article from FDA Consumer Magazine which provides an overview of the hazards of lead in our environment.

Facts About Lead
- Handout targeted at parents. Provides basic information regarding lead absorption, the effects of lead on health, sources of lead, and preventing lead contamination. English only.

Resources for Childhood Lead Poisoning Prevention
- Handout suitable for health care providers or parents. Lists nationwide government agencies and non-profit organizations which can offer assistance and information on lead-related topics. Addresses, phone numbers and names of contact persons are listed. English only.

National Lead Information Hotline and Clearinghouse
- Handout suitable for health care providers or parents. Information sheet describing the services offered by the National Lead Information Hotline and Clearinghouse. Sheet lists toll-free phone numbers, address and hours of operation. English only.

Health Effects in Children and Fetuses from Lead Exposure
- Handout targeted at parents. Chart which shows the effects of lead at various levels in a child's body. English only.

National Lead Information Center: Questions Parents Ask About Lead Poisoning
- Handout targeted at parents. Lists several common questions that parents ask concerning childhood lead poisoning and offers brief answers. English only.

EPA: Lead Poisoning and Your Children
- Brochure targeted at parents. Created by the Environmental Protection Agency and lists sources of lead, ways in which children get contaminated and ways to prevent lead poisoning. Health care provider may request the brochures from EPA and receive 50 free copies - additional copies available for nominal cost. English only.

***What Parents Need to Know About Lead Poisoning**
- Handout targeted at parents. Describes lead's effect on a child's body, sources of lead and ways to prevent lead poisoning. English and Spanish.

* **Item may be obtained by writing to Literature and Forms, 1100 W. 49th Street, Austin, TX 78756-3199, and stating name of the resource, the amount needed and the place to which copies should be mailed.**

APPENDIX H

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