LEAD SCREENING DURING THE DOMESTIC MEDICAL EXAMINATION FOR NEWLY ARRIVED REFUGEES

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Screening for Lead during the Domestic Medical Examination for Newly Arrived Refugees

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Update from previous lead guidelines: *The current cutoff value that CDC currently recommends for action and reporting is blood lead level ≥5 mcg/dL (previously was ≥10 mcg/dl).*

Background

Epidemiology and Geographic Distribution

Following the phasing out of leaded gasoline and the ban on lead-based paint, the prevalence of lead poisoning, previously defined as a blood lead level (BLL) ≥ 10 mcg/dL, among children in the United States, has dramatically declined since the 1970s--decreasing from 78% from 1976-1980 to 1.6% from 1996-2002.[1] In contrast, refugee children arriving in the United States in recent years have increased average rates of BLL at their time of arrival.

For example, among 1,724 refugee children 0-72 months old arriving in Minnesota between 2004and 2005, 4.3% had a BLL of ≥ 10 mcg/dl.[2] This indicates the prevalence of lead poisoning in newly arrived refugee children may be 14 times greater than that of the general US population of comparable age. Although children from all regions of the world are at risk for having elevated BLL upon entering the United States, this risk appears to vary to some degree. In an analysis of new arrival screening data from Massachusetts from the mid- to late 1990s, the prevalence of elevated BLL among newly arrived refugee children under 7 years old was 7%, 25%, 27%, 37%, and 40% among those from Northern Eurasian countries, the Near East (predominately Iraq), Africa, Asia (predominately Vietnam), and Central American/Caribbean countries, respectively. None of 33 Bosnian children born in Germany had elevated BLL. This finding suggests that birthplace and other areas lived are more important predictors of elevated lead levels than ethnicity.[3] In 2009, BLL was tested in 642 Burmese children from refugee camps in Thailand before they departed for the United States. Among children ages 6 months through 14 years, 5% had elevated BLLs(≥10 µg/dL). Among those under 2 years of age, the rate of elevated BLL was as high as 15%. In the younger age group, anemia with hemoglobin <10 g/dL, exposure to lead acid car batteries, and use of traditional remedies were found to be associated with elevated BLL. Putting cosmetic products in the mouth was also a suspected contributor.[4] In many areas of the world where refugees originate, potential lead exposures include lead-containing gasoline combustion; industrial emissions; ammunition manufacturing and use; burning of fossil fuels and waste; and lead-containing traditional remedies, foods, ceramics, and utensils.[2,3,4]

In addition, refugee children are at above average risk for lead poisoning from ongoing exposures once in the United States since they often settle into high-risk areas with older housing. Ongoing lead exposure among refugee children within the United States has been well documented. Anywhere from 6-29% of children who have normal BLL at new arrival screening may have elevated BLLs when retested several weeks to months later, based on reports from Massachusetts and New Hampshire.[3,5] In New Hampshire, malnutrition was fairly common among children with elevated BLL (22% had low weight for their height and 35% had low height for their age at the time of repeat testing). The median age of those with elevated BLL on repeat testing was 4.9 years (range 14 months-13 years), which is considerably older than the ages of recommended screening for most children in the United States. The most common lead exposure identified among children with elevated BLL at repeat testing was lead-based paints and lead-contaminated soil where the children had played. Of the refugee children in New Hampshire with BLLs >15 mcg/dL, 89% lived in rental homes built before 1978 when lead-based paints were still used. Furthermore, two-thirds of the parents reported witnessing their children partaking in behaviors that may increase lead exposure such as pica (craving and eating nonfood items), picking at loose paint, plaster, or putty; or chewing on painted surfaces. Investigators also noted limited parental awareness of the dangers associated with lead exposure.[5]

In addition to exposure to lead-based paints and contaminated soil, refugee children are vulnerable to other unique sources of lead exposure. A variety of foods, candies, and traditional therapies have been found to be the source of exposure for many refugee children (Table 1).

Immigrant and Refugee Populations at Risk

- Refugee children from all regions of the world, especially those from resource-poor countries, are at risk of having lead poisoning upon their arrival in the United States.
- Malnourished children may be at increased risk for lead poisoning, likely through increased intestinal lead absorption mediated by micronutrient deficiencies. The best studied micronutrient deficiency related to lead levels is iron deficiency. Iron deficient children are at increased risk of developing lead poisoning.[6] Deficiencies in calcium and zinc may also increase a child's risk.[7]

Clinical Presentation

From 1991-2011, the value indicating elevated BLL was ≥10 mcg/dL. Above this value, lead is known to impair intelligence and neurodevelopment.[8] However, more recent studies have called into question whether levels lower than 10 mcg/dL are safe. The results of one study suggest that the magnitude of the decrease in intelligent quotient (IQ) for each incremental increase in BLL is greatest among those children with levels below 10 mcg/dL.[9] In 2011, in response to the Advisory Committee on Childhood Lead Poisoning Prevention Recommendations , CDC issued a policy statement stating that the BLL indicating high lead exposure ("reference value") will be revised every four years based on the 97.5th percentile identified in the National Health and Nutrition Survey (NHANES). *Based on these criteria, the current cutoff value that CDC currently recommends for action and reporting is ≥5 mcg/dL.*

At higher levels, acute symptoms of toxicity may appear. Above a level of 60 mcg/dL, individuals may experience headaches, abdominal pain, anorexia, constipation, clumsiness, agitation, and lethargy.[9] At a level of 70 mcg/dL, children may develop severe neurological complications, including seizures, ataxia, mental status changes, coma, and death.[7] Although such severe poisonings are now rare, the death of a two-year-old Sudanese refugee girl with a BLL of 392 mcg/dL--the first lead-poisoning-related death in the US in a 10-year period--five weeks after her arrival in the United States in 2000 underscores the unique vulnerability of refugee children to this condition.[10]

Evaluation and Treatment of Persons with Elevated Blood Levels

An in-depth discussion of the clinical management of elevated BLL is beyond the scope of this document. Information on case management and follow-up of elevated BLL is available from the CDC at Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention.[11]The key recommendations from this reference, including history taking, medical management, environmental assessments, and follow-up testing, are summarized below. The new reference value does not change previous recommendations for children with blood lead levels ≥ 10 µg/dL. Further guidance for BLLs <10 can be found at www.cdc.gov/nceh/lead/acclpp.

The medical and environmental exposure history can give clues to potential lead exposure (Table 2), which should be assessed in a culturally sensitive manner. If no lead sources can be identified in children with lead poisoning, clinicians should consider checking BLLs in other family members. If other family members of various ages have

elevated levels, shared source exposures, such as ceramicware, spices, foods, or remedies, may be present.[12,13,14,15] (Table 1)

Appropriate management of children with confirmed (venous) elevated BLLs is based on the extent of the elevation. Continued follow-up testing is mandatory for all children with documented elevated venous BLLs, in addition to all refugee children aged 6 months-6 years, regardless of their initial level.

Recommendations for Post-Arrival Lead Screening

1. Check BLL of all refugee children **6 months–16 years of age** upon their arrival in the United States (generally within 90 days, preferably within 30 days of arrival).
2. Within 3–6 months post-resettlement, a follow-up blood lead test should be conducted on all refugee children aged **6 months–6 years of age**, regardless of the initial screening BLL result.
3. Within 90 days of their arrival in the United States, children aged **6 months–6 years of age** should also undergo nutritional assessment and testing for hemoglobin or hematocrit level with one or more of the following: mean corpuscular volume (MCV) with the red cell distribution width (RDW), ferritin, transferrin saturation, or reticulocyte hemoglobin content. A routine complete blood count with differential is recommended for all refugees following their arrival in the United States, and these red cell parameters are included in this testing.
4. Provide daily pediatric multivitamins with iron to all refugee children aged **6 months–6 years of age**.

Sources of Additional Information

CDC Lead homepage

CDC Lead Exposure Among Refugee Children fact sheet

CDC Lead Poisoning Prevention in Newly Arrived Refugee Children: Tool Kit
(This educational kit has modules intended for both refugee resettlement workers and medical providers. CD-ROM copies can be obtained by calling 1-800-CDC-INFO)

Centers for Disease Control and Prevention (CDC). Elevated blood lead levels in refugee children--New Hampshire, 2003-2004. *MMWR Morb Mortal Wkly Rep*. 2005;54(02);42-46.

Table 1. Examples of culture-specific exposures associated with elevated blood-lead levels in children.

Exposure	Area of origin	Reported uses	Description
Pay-loo-ah	Southeast Asia	Treatment of fever and rash	Orange-red colored powder. Administered by itself or mixed in tea
Daw tway gaw mo dah	Burmese traditional remedy	General infant remedy (multi-symptom)	Brown pellets
Greta	Mexico	Treatment of digestive problems	Yellow-orange colored powder. Administered with oil, milk, sugar, or tea. Sometimes it is added to baby bottles and tortilla dough
Azarcon	Mexico	Treatment of digestive problems	Bright orange powder. Administered similarly to greta
Litargirio	Dominican Republic	Deodorant/antiperspirant; treatment of burns and fungal infections of the feet	Yellow or peach-colored powder
Surma	India	Improve eyesight	Black powder administered to inner lower eyelid
Unidentified ayuvedic	Tibet	Treatment for slow development	Small gray-brown colored balls administered several times a day
Tiro (also known as tozali and kwalli)	Nigeria	Eye cosmetic; improve vision; ward off "evil-eye"	Fine powder
Lozeena	Iraq	Added to foods for flavor, particularly rice and meat dishes	Bright orange spice

Tamarind	Mexico	As a key ingredient in lollipops, fruit rolls, candied jams	'Bolirindo' lollipops by Dulmex are soft and are dark brown in color. Candied jams aretypically packaged in ceramic jars
Lead-glazed ceramics	Often made in Latin America	Provides a glaze for vessels and helps ceramics hold water. Often found on bean pots and water jugs.	Shiny coating on vessels
Make-up and beauty products	Multiple cultures	Enhance beauty	Many types

Table 2. Questions on history that may reveal a child's exposure to lead

- Medical history
  - Does the child have symptoms of lead toxicity?
  - Is there a history of pica?
  - Are there known previous exposures or documented elevated blood lead levels (BLL's)?
  - Is there a family history of siblings with elevated BLL's?
  - Is there anything concerning upon thorough review of the child's developmental history?

- Environmental exposures
  - Paint, soil, and metal
    - What is the age and condition of the residence?
    - Does the child chew or eat peeling paint on woodwork, furniture, or toys?
    - How long has the child lived in this residence?
    - When was the house built?
    - Were recent renovations or repairs done in the home or immediate area?
    - Inquire about other areas where the child spends significant amounts of time (day care, schools, etc.).
    - Do the child's outdoor play areas contain bare soil?
    - Does the home contain mini-blinds made overseas and purchased before 1997?
    -
  - Relevant behavioral characteristics of the child
    - To what degree does the child exhibit hand-to-mouth activity, or pica?
    - Are the child's hands washed before meals and snacks?
  - Exposures to and behaviors of household members
    - What are the caregiver's occupations?

- What are the occupational and hobby history of adults with whom the child spends time (e.g., fishing, ceramic work, stained glass work, hunting)?
- Are there potential cultural exposures as discussed in Table 1 (e.g., imported foods, cosmetics, folk remedies)?
- Are painted materials or unusual materials burned in the household fireplace?
- Is food prepared or stored in imported pottery or metal vessels?

Adapted from Centers for Disease Control and Prevention's Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention. Available at: http://www.cdc.gov/nceh/lead/casemanagement/casemanage_chap3.htm. Accessed May 13, 2013.

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